* 0000800000001 *

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

* 1 4 5 5 1 8 3 8 5 2 *

MATHEMATICS **0580/41**

Paper 4 (Extended) **October/November 2024**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

DC (DE/FC) 336592/3

1 **(a)** **(i)** Write 70 as a product of its prime factors.

..... [2]

(ii) Find the highest common factor (HCF) of 70 and 112.

..... [2]

(iii) Find the lowest common multiple (LCM) of $70x^4y^2$ and $112x^3y^5$.

..... [2]

(b) Simplify.

(i) $a^{12} \div a^4$

..... [1]

(ii) $\frac{5}{2b} \times \frac{bc}{20}$

..... [2]

(c) Solve.

$4 + 2x = 15$

$x =$ ..... [2]

(d) Solve. $\frac{34+2x}{5} = 4-x$

$x =$ ..... [3]

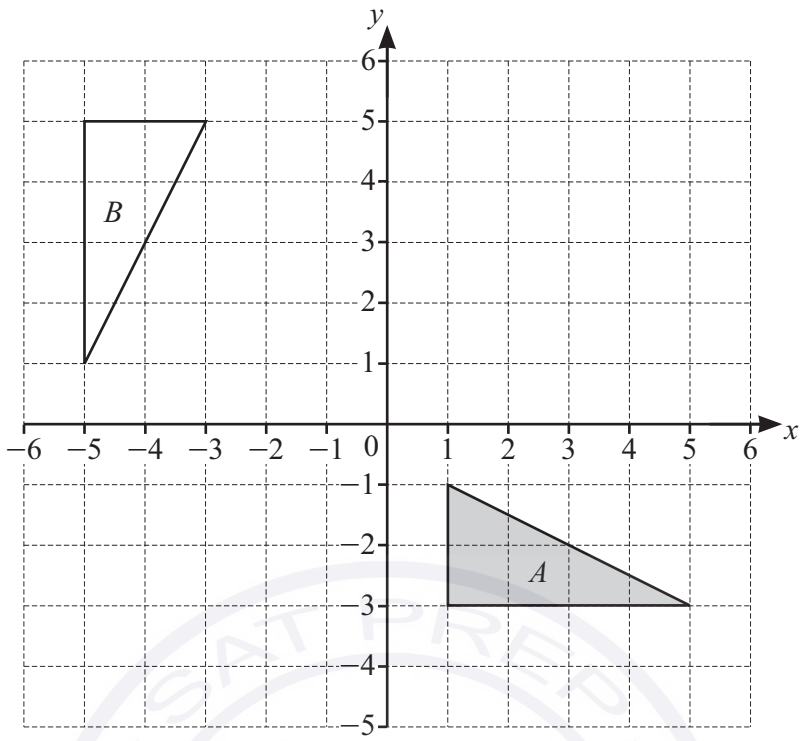
(e) $P = d + \sqrt[3]{m^2}$

(i) Find P when $d = 7$ and $m = -8$.

$P =$ ..... [2]

(ii) Rearrange the formula to make m the subject.

$m =$ ..... [3]



(a) On the grid, draw

(i) the image of triangle A after a reflection in the line $x = 1$ [2]

(ii) the image of triangle A after an enlargement by scale factor $\frac{1}{2}$ with centre (5, 1). [2]

(b) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

(c) The point (a, b) is reflected in the line $y = k$ where k is an integer and $b < k$.

Write the coordinates of the image of point (a, b) in terms of a, b and k.

(..... , ...) [2]

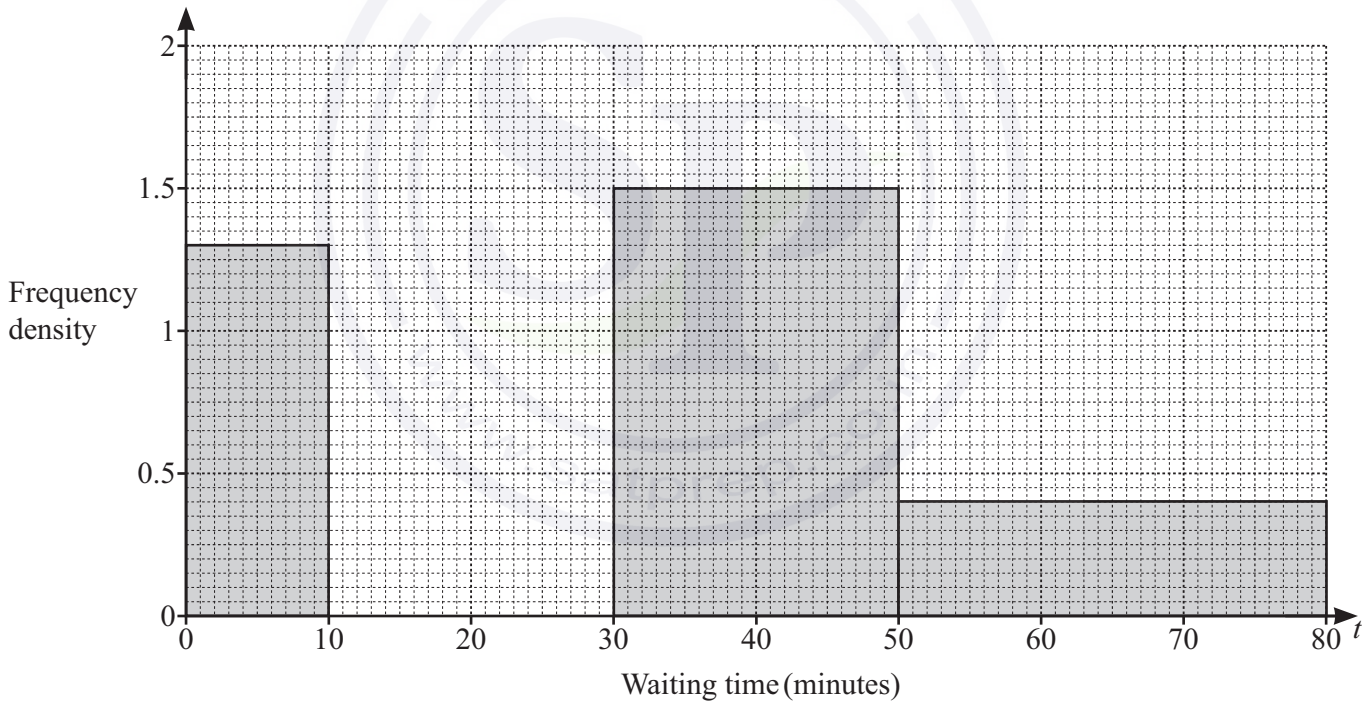
3 **(a)** The table shows the waiting times for 120 patients at a medical centre.

Waiting time (t minutes)	$0 < t \leqslant 10$	$10 < t \leqslant 20$	$20 < t \leqslant 40$	$40 < t \leqslant 50$	$50 < t \leqslant 80$
Frequency	2	46	33	26	13

Calculate an estimate of the mean waiting time.

..... min [4]

(b) The histogram shows some information about the waiting times at a different medical centre.



The total number of patients is 90 and no patient waits for more than 80 minutes.

Complete the histogram for the patients that have a waiting time between 10 and 30 minutes.

[4]

4 **(a)** Enzo, Rashid and Blessy each swim as many lengths of a swimming pool as they can in 15 minutes. The results are shown in the table.

Name	Number of lengths
Enzo	11.25
Rashid	18.75
Blessy	20

(i) Find the number of lengths Enzo swims **as a percentage** of the total number of lengths all three people swim.

..... % [2]

(ii) Write the ratio of the number of lengths each person swims in the form

Enzo : Rashid : Blessy.

Give your answer in its simplest form.

..... : ..... : ..... [2]

(iii) Each length of the pool is 25 m.

(a) Work out Blessy's average swimming speed for the 15 minutes.
Give your answer in metres per second.

..... m/s [3]

(b) Rashid continues to swim at the same rate.

Calculate the time it takes Rashid to swim a total distance of 5 km.
Give your answer in hours and minutes.

..... h ..... min [4]

(iv) Blessy swims for one hour.
The number of lengths she swims decreases by 5% every 15 minutes.

Calculate the number of lengths she swims in the final 15 minutes.

..... [3]

(b) Another swimmer, Adam, swims 450 m, correct to the nearest 25 metres.
This takes 10 minutes, correct to the nearest minute.

Calculate the minimum distance Adam swims in one hour at this rate.

..... m [3]

5 A box contains 3 blue pens and 5 red pens.

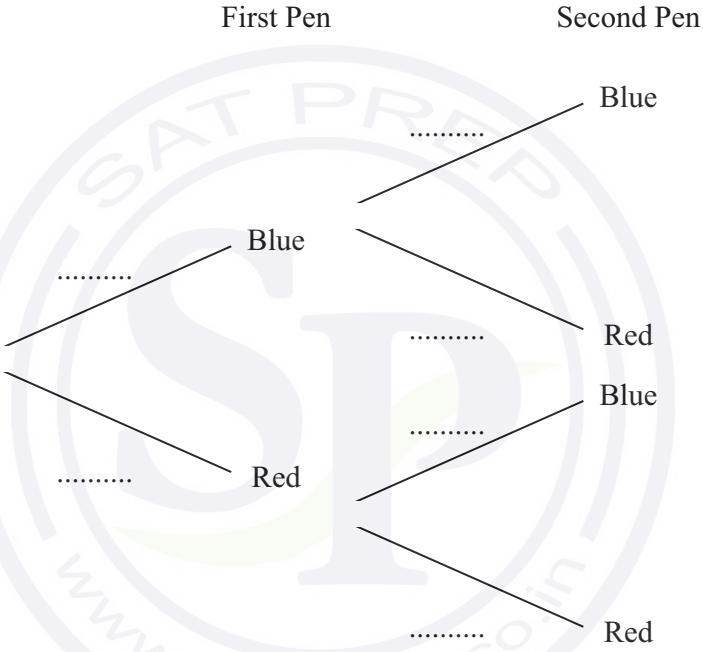
(a) Mia picks a pen from the box at random.

Find the probability that she picks a red pen.

..... [1]

(b) Mia puts the pen back into the box.
She then picks a pen at random and replaces it.
She then picks a second pen at random.

(i) Complete the tree diagram.



[2]

(ii) Find the probability that Mia picks two pens that have the same colour.

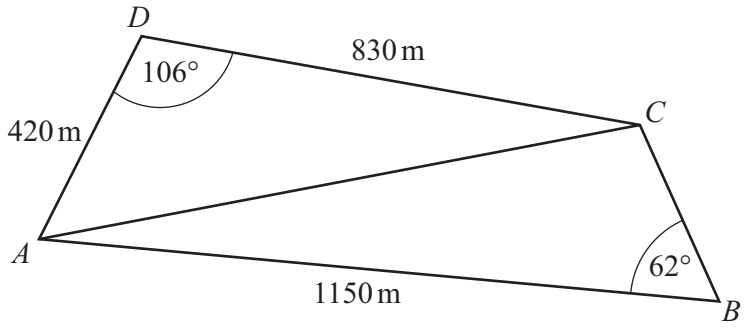
..... [3]

(c) Mia now picks 3 of the 8 pens in the box at random **without** replacement.

Find the probability that she picks 2 blue pens and 1 red pen.

..... [3]

6 The diagram shows a field $ABCD$.
A straight path AC goes across the field.



NOT TO SCALE

(a) Show that $AC = 1028$ m, correct to the nearest metre.

[3]

(b) Angle ACB is obtuse.

Calculate angle ACB.

Angle ACB = ... [4]

(c) Part of the field, triangle ACD, is sold for \$41 500.

Calculate the cost of 1 hectare of this part of the field.
Give your answer correct to the nearest dollar.
[1 hectare = 10 000 m^2]

\$ ..... [4]

7 A company makes scientific calculators and graphic calculators.
Each day they make x scientific calculators and y graphic calculators.

These inequalities describe the number of scientific and graphic calculators they make each day.

$x < 180$ $y \leqslant 90$ $x + y \leqslant 240$

(a) Complete these two statements.

The company makes fewer than ..... scientific calculators each day.

The company can make a maximum of ..... calculators each day. [2]

(b) Scientific calculators cost \$12 to make.
Graphic calculators cost \$18 to make.
Each day the company spends at least \$2700 making calculators.

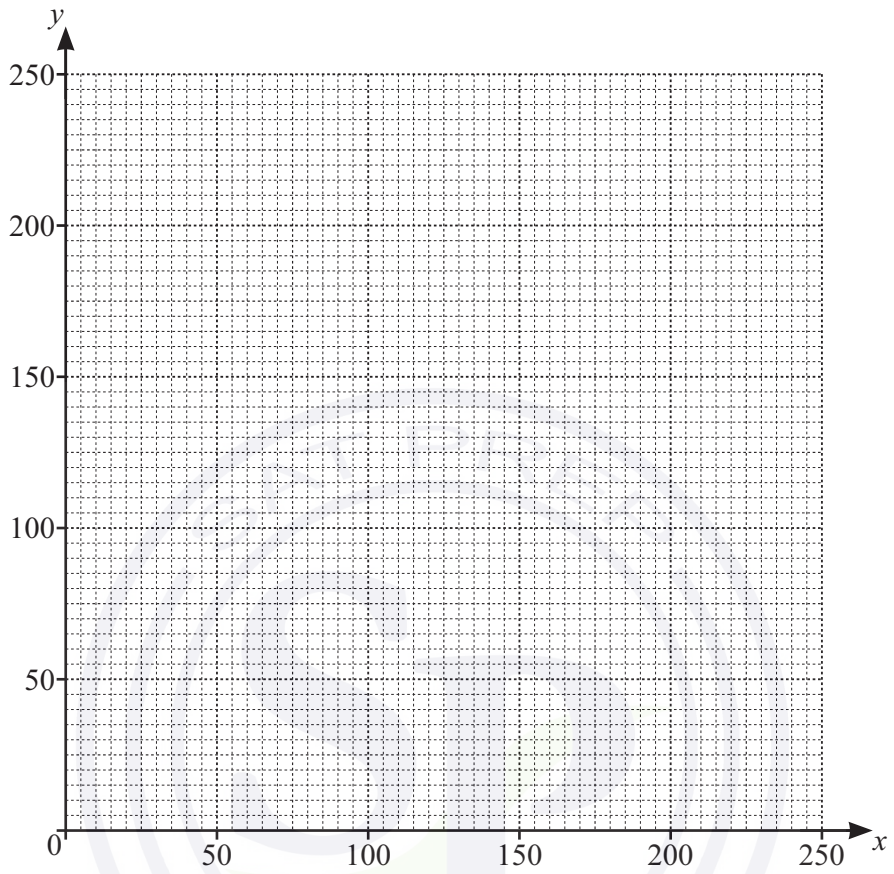
Show that $2x + 3y \geqslant 450$.

[1]

(c) The region R satisfies these four inequalities.

$x < 180$ $y \leqslant 90$ $x + y \leqslant 240$ $2x + 3y \geqslant 450$

By drawing four suitable lines and shading unwanted regions, find and label the region R.



[7]

(d) Scientific calculators are sold for a profit of \$10.
Graphic calculators are sold for a profit of \$30.

Calculate the maximum profit made by the company in one day.

\$ ..... [2]

8 **(a)** $f(x) = 7 - 3x$ $g(x) = x^2 - 16$

(i) Find the values of x when $g(x) = 20$.

$x =$ ..... or $x =$ ..... [2]

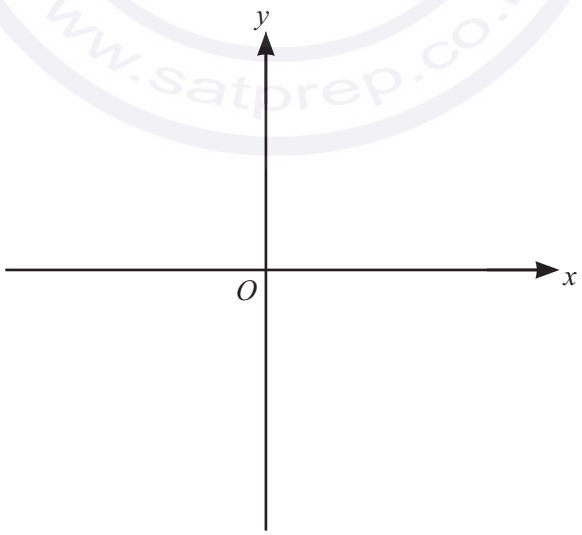
(ii) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(iii) Find $gf(x) + 1$, giving your answer in its simplest form.

..... [3]

(iv) On the axes, sketch the graph of $y = g(x)$.
On your sketch, indicate the values where the graph crosses the axes.



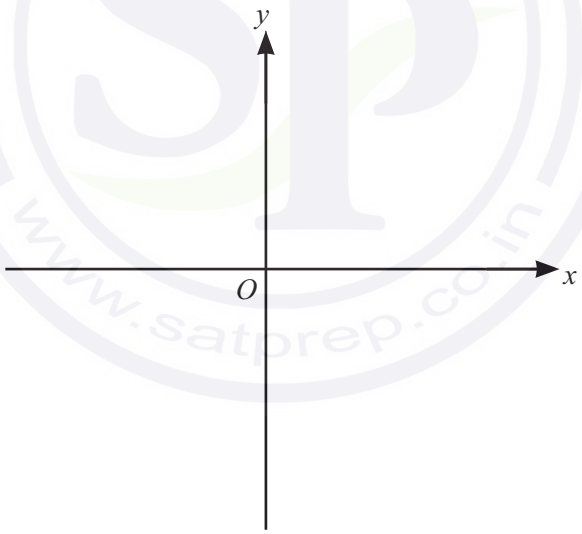
[4]

(v) Find the equation of the tangent to the graph of $y = g(x)$ when $x = -3$.
Give your answer in the form $y = mx + c$.

$y =$ ..... [5]

(b) $h(x) = 3^x$

(i) On the axes, sketch the graph of $y = h(x)$.

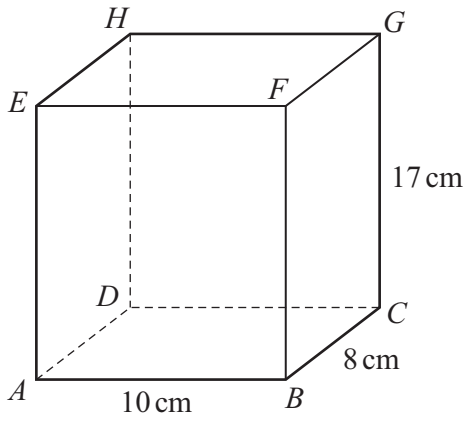


[2]

(ii) Write down the equation of the asymptote to the graph of $y = h(x)$.

..... [1]

9



NOT TO SCALE

ABCDEFGH is a solid cuboid.
$AB = 10$ cm, $BC = 8$ cm and $CG = 17$ cm.

(a) Work out the volume of the cuboid.

..... cm^3 [1]

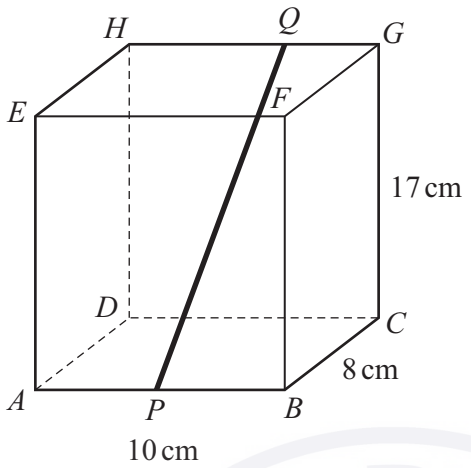
(b) Work out the total surface area of the cuboid.

..... cm^2 [3]

(c) Calculate the angle between *GA* and the base *ABCD*.

..... [4]

(d) A straight rod PQ is placed inside the cuboid.
One end of the rod, P, is placed at the midpoint of AB.
The other end of the rod, Q, rests on GH.
$HQ : QG = 4 : 1$.



NOT TO SCALE

Calculate the length of the rod PQ.

..... cm [4]

10 (a)

NOT TO SCALE

This rectangle has area 190 cm^2.

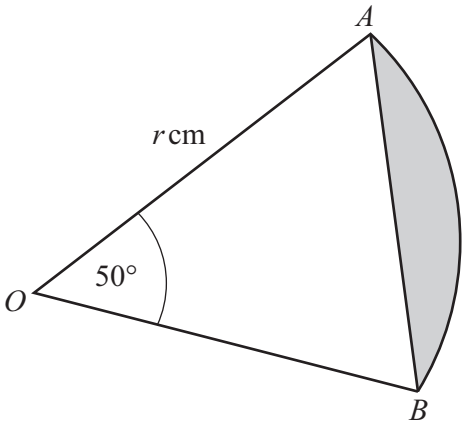
(i) By forming and solving an equation, show that $x = 8.5$.

[4]

(ii) Work out the perimeter of the rectangle.

..... cm [2]

(b)



NOT TO SCALE

The diagram shows a sector OAB of a circle, with centre O, and a chord AB.
The shaded segment has area $30\,\text{cm}^2$.

(i) Show that $r = 23.7$ cm, correct to 1 decimal place.

[4]

(ii) Calculate the perimeter of the shaded segment.

..... cm [4]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2024**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

[Turn over

1 **(a)** Anvi buys a new car.

(i) The price of the car is $28 240.
She is given a 7.5% discount.

Calculate the amount she pays.

$ ..... [2]

(ii) The fuel tank in the new car has a capacity of 45 litres.
This is 72% of the capacity of the fuel tank in her old car.

Calculate the capacity of the fuel tank in her old car.

..... litres [2]

(b) Aadi buys a new car costing $28 000.
He pays for the car using a finance plan.
The finance plan is

- a deposit
- 47 equal monthly payments of $330
- a final payment of $11 490.

Using this finance plan, Aadi pays a total of $31 900 for the car.

Calculate the deposit paid as a percentage of $28 000.

..... % [4]

(c) A car travels 64 km and uses 2.5 litres of fuel.
It then travels 128 km and uses 6 litres of fuel.

Calculate the rate at which the car uses fuel during the whole journey.
Give your answer in litres per 100 km.

..... litres per 100 km [2]

(d) At the start of 2021 the value of a car was $46 500.
At the end of 2021 the value of the car was 20% less.
At the end of 2022 the value of the car was 15% less than its value at the end of 2021.

Calculate the value of the car at the end of 2022.

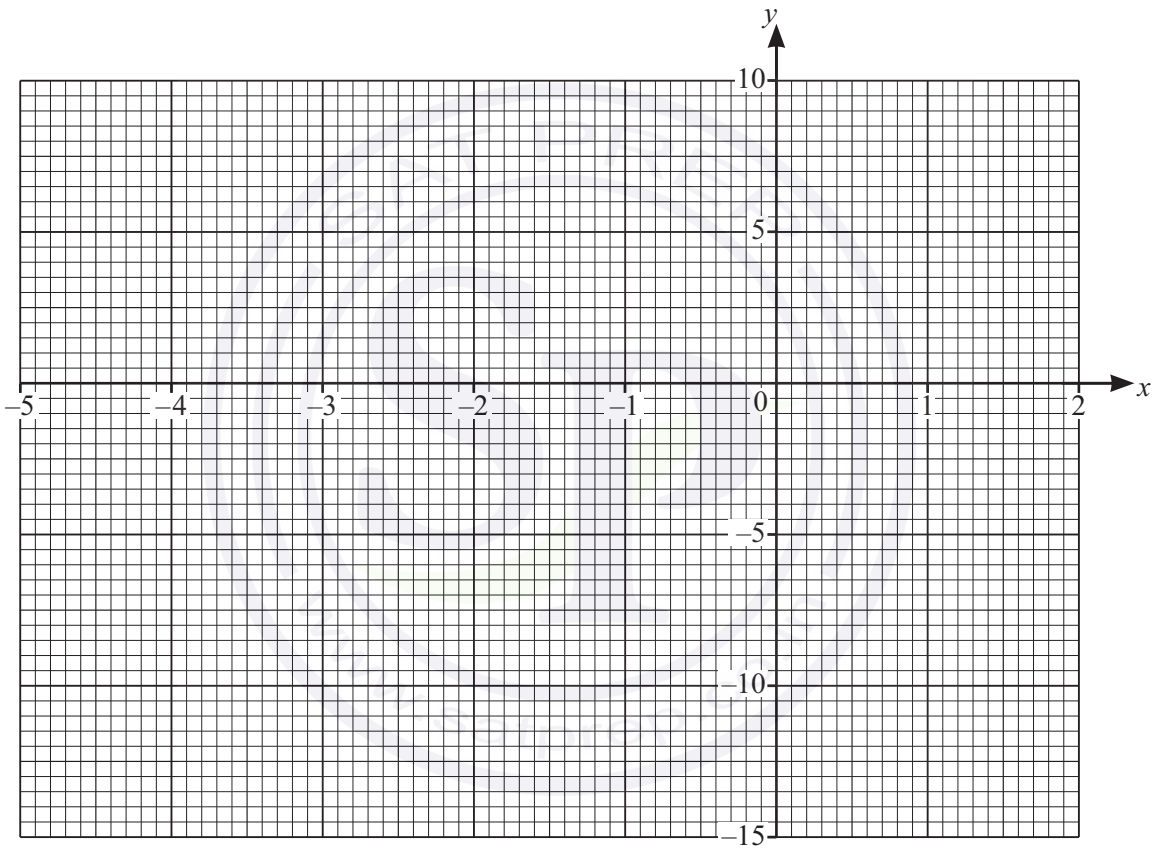
$ ..... [2]

2 The table shows some values for $y = x^3 + 4x^2 - 4$.

x	-4.5	-4	-3	-2	-1	0	1	1.5
y	-14.1		5	4		-4	1	8.4

(a) Complete the table. [2]

(b) On the grid, draw the graph of $y = x^3 + 4x^2 - 4$ for $-4.5 \leqslant x \leqslant 1.5$.



[4]

(c) **(i)** Draw the tangent to the graph at the point $(1, 1)$. [1]

(ii) Use your tangent to estimate the gradient of the curve at the point $(1, 1)$.

..... [2]

(d) By drawing a suitable straight line on the grid, solve the equation $x^3 + 4x^2 - x - 6 = 0$.

$x =$ ..... or $x =$ ..... or $x =$ ..... [4]

3 **(a)** Simplify.

(i) $3m - 5n - 4m + 8n$

..... [2]

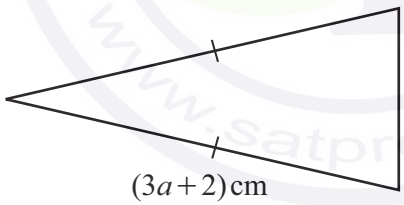
(ii) $(3a^2c^3)^4$

..... [2]

(iii) $\frac{4x}{5} - \frac{3x}{10} + \frac{2x}{15}$

..... [2]

(b) This isosceles triangle has a perimeter of 35.5 cm.



NOT TO SCALE

Find the value of a.

$a =$ ..... [3]

(c) Using the quadratic formula, solve $5x^2 - 4x - 3 = 0$.
You must show all your working.

$x =$ ..... or $x =$ ..... [3]

(d) Solve these simultaneous equations.

$$y = x^2 - 4x + 5$$
$$y = 2x - 3$$

You must show all your working.

$x =$ ..... $y =$ .....

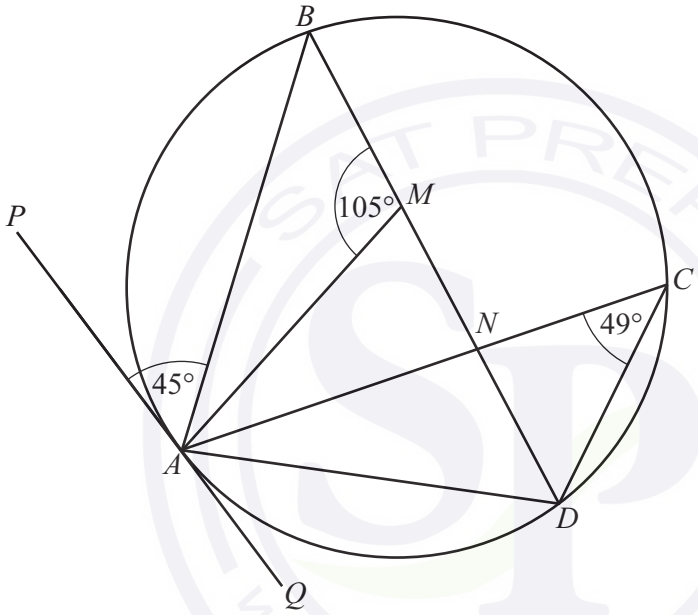
$x =$ ..... $y =$ ..... [5]

4 **(a)** The angles of a quadrilateral are $w°$, $x°$, $y°$ and $z°$.
The ratio $w : (x+y+z) = 3 : 5$.

Find the value of w.

$w =$ ..... [2]

(b)



NOT TO SCALE

A, B, C and D are points on a circle.
PQ is the tangent to the circle at A.
$BMND$ is a straight line.
Angle $ACD = 49°$, angle $AMB = 105°$ and angle $PAB = 45°$.

(i) Find angle BAM.

Angle $BAM =$ ..... [2]

(ii) **(a)** Find angle BAD.

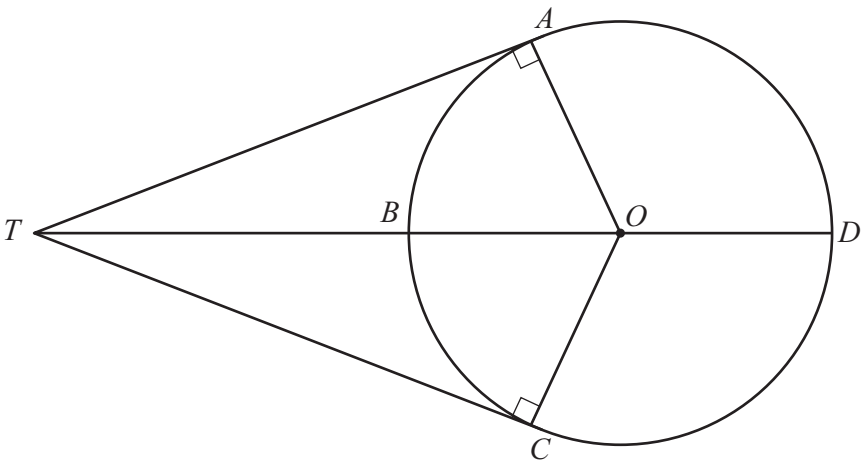
Angle $BAD =$ ..... [2]

(b) Give a geometrical reason why BD is **not** the diameter of the circle.

.....

..... [1]

(c)



NOT TO SCALE

A, B, C and D are points on a circle, centre O.
TA and TC are tangents to the circle.
$OA = 6.75$ cm and $OT = 11.5$ cm.

(i) Show that angle $AOC = 108.12°$, correct to 2 decimal places.

[3]

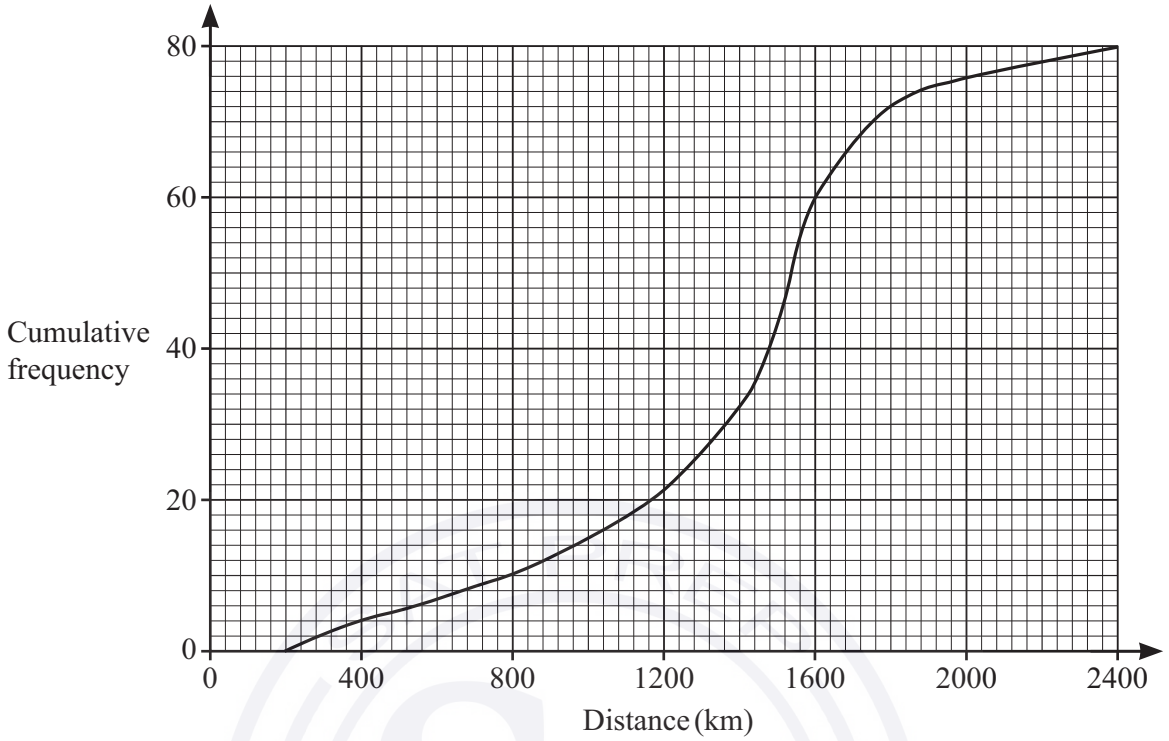
(ii) Calculate the length of the **minor** arc ABC.

..... cm [2]

(iii) Calculate the area of the **major** sector $OCDA$.

..... cm^2 [3]

5 **(a)** The cumulative frequency diagram shows information about the distance travelled by each of 80 motorists in a month.



(i) Use the cumulative frequency diagram to find an estimate for

(a) the median

..... km [1]

(b) the interquartile range

..... km [2]

(ii) One of these motorists is picked at random.

Find the probability that this motorist travels more than 1800 km.

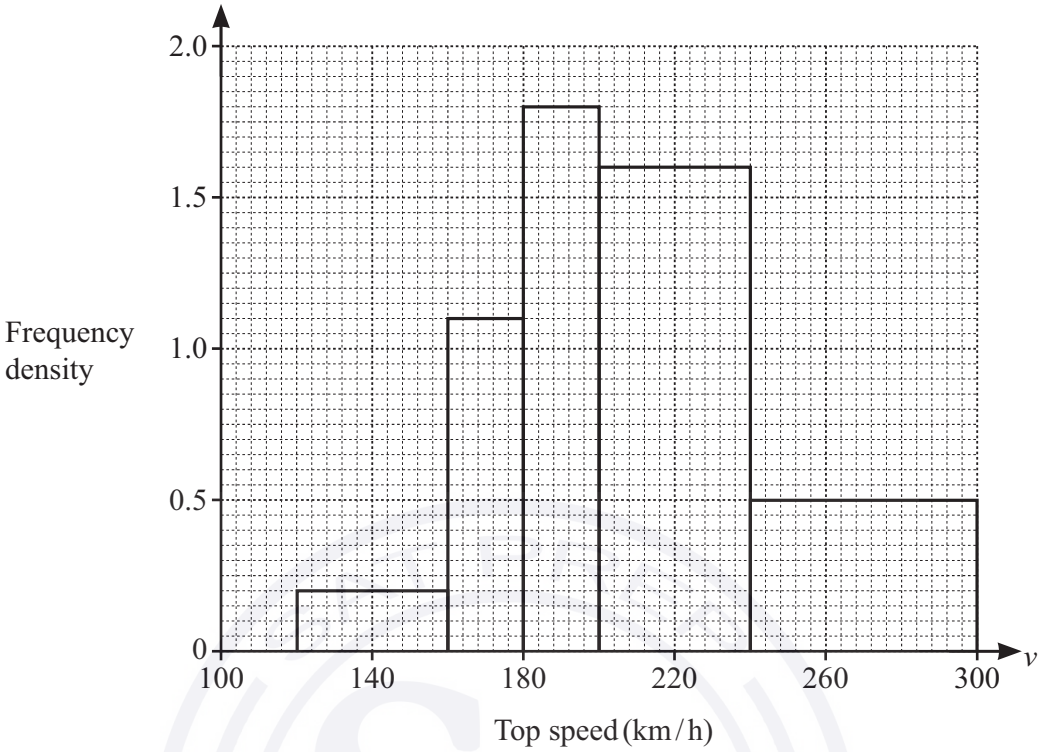
..... [2]

(b) The distance around a racing track is 5.104 km.
The time taken by a car to complete one lap of the track is 1 min 18 s.

Calculate the average speed of the car.
Give your answer in km/h.

..... km/h [3]

(c) The top speed, v km/h, of each of 160 cars is recorded.
The histogram shows this information.



(i) Show that there are 8 cars with a top speed in the interval $120 < v \leqslant 160$.

[1]

(ii) Calculate an estimate of the mean top speed.
You must show all your working.

..... km/h [6]

6 **(a)** Work out $2\begin{pmatrix} 3 \\ -5 \end{pmatrix} - \begin{pmatrix} 2 \\ -7 \end{pmatrix}$.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(b) $\overrightarrow{MN} = \begin{pmatrix} -6 \\ 4 \end{pmatrix}$.

(i) M is the point $(2, -5)$.

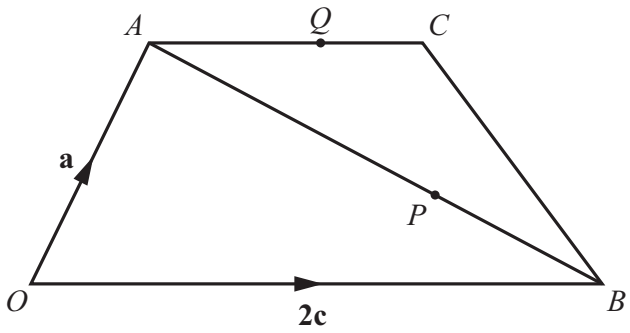
Find the coordinates of N.

(..... , ...) [1]

(ii) Find $\left|\overrightarrow{MN}\right|$.

..... [2]

(c)



NOT TO SCALE

$OACB$ is a trapezium with $OB = 2AC$.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{2c}$.
$AP : PB = 4 : 1$ and $AQ = \frac{4}{5}AC$.

(i) Write each of the following in terms of **a** and **c**.
Give each answer in its simplest form.

(a) $\overrightarrow{AB}$

..... [1]

(b) $\overrightarrow{CB}$

..... [1]

(c) $\overrightarrow{OP}$

..... [2]

(d) $\overrightarrow{QP}$

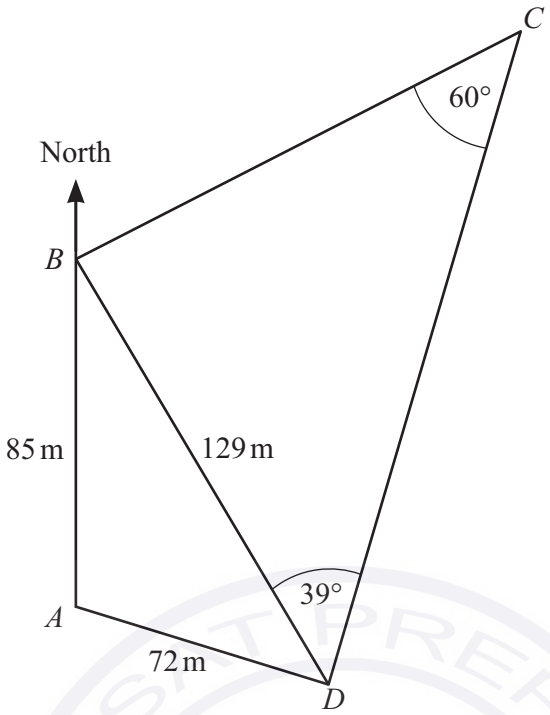
..... [2]

(ii) Use your answers to make **two** statements about the relationship between lines QP and CB.

.....

..... [2]

7 (a)



NOT TO SCALE

The diagram shows a field, $ABCD$ with B north of A.
BD is a path across the field.
$AB = 85$ m, $AD = 72$ m, $BD = 129$ m, angle $BDC = 39°$ and angle $BCD = 60°$.

(i) Show that angle $CBD = 81°$.

[1]

(ii) Calculate CD.

..... m [3]

(iii) Show that angle $ABD = 31.6°$, correct to 1 decimal place.

[4]

(iv) Find the shortest distance from A to BD.

..... m [3]

(v) Find the bearing of B from C.

..... [2]

(vi) Trees are planted in the field.
The number of trees planted is 1100 per hectare.

Calculate the total number of trees planted in the field.
[1 hectare = 10 000 m^2]

..... [4]

(b) A rectangle has an area of 9400 cm^2, correct to the nearest 100 cm^2.
The length of the rectangle is 80 cm, correct to the nearest 10 cm.

Calculate the upper bound of the width of the rectangle.

..... cm [3]

8 **(a)** A bag contains 24 coloured beads.
Some are red, some are blue and 10 are yellow.
One bead is picked at random from the bag.

Find the probability that

(i) the bead is yellow

..... [1]

(ii) the bead is not yellow.

..... [1]

(b) Another bag contains 5 green marbles, 6 white marbles and 4 black marbles.
Meera picks 2 marbles at random from the bag, without replacement.

Find the probability that

(i) the first marble is black and the second marble is white

..... [2]

(ii) both marbles have different colours.

..... [4]

9 $f(x) = 2x - 5$ $g(x) = x^2 - 2x$

(a) Find

(i) $f(7)$

..... [1]

(ii) $gf(7)$

..... [1]

(iii) $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(b) Find $gf(x) - 3g(x)$.
Give your answer in the form $ax^2 + bx + c$.

..... [4]

10 A curve has the equation $y = x^3 - 9x^2 - 48x$.

(a) Differentiate $x^3 - 9x^2 - 48x$.

..... [2]

(b) Find the coordinates of the turning points of the graph of $y = x^3 - 9x^2 - 48x$.
You must show all your working.

(..... , ...) and (..... , ...)
[4]

(c) Determine whether each of the turning points is a maximum or a minimum.
Give reasons for your answers.

[3]

BLANK PAGE

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2024**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

DC (DE/SW) 337639/3

[Turn over

1 Dinari sells fruit and vegetables.

(a) One day the mass of fruit and vegetables he sells is in the ratio fruit : vegetables = 9 : 8.
He sells 48 kg of vegetables.

Find the mass of the fruit he sells.

..... kg [2]

(b) On another day he receives \$280 for the fruit and vegetables he sells.
The \$280 is in the ratio fruit : vegetables = $(c+3) : (c-1)$.

Find the amount he receives from selling the fruit.

\$ ..... [3]

(c) In one week Dinari buys fruit and vegetables for \$1620.
He sells the fruit and vegetables for \$1750.

Calculate his percentage profit.

..... % [2]

(d) In another week Dinari sells fruit and vegetables for \$1738.
He makes a profit of 10%.

Calculate the amount he paid for the fruit and vegetables in that week.

\$ ..... [2]

2 **(a)** A is the point $(3, 7)$ and B is the point $(-1, 5)$.

(i) Find the coordinates of the midpoint of the line AB.

(..... , ...) [2]

(ii) Write $\overrightarrow{AB}$ as a column vector.

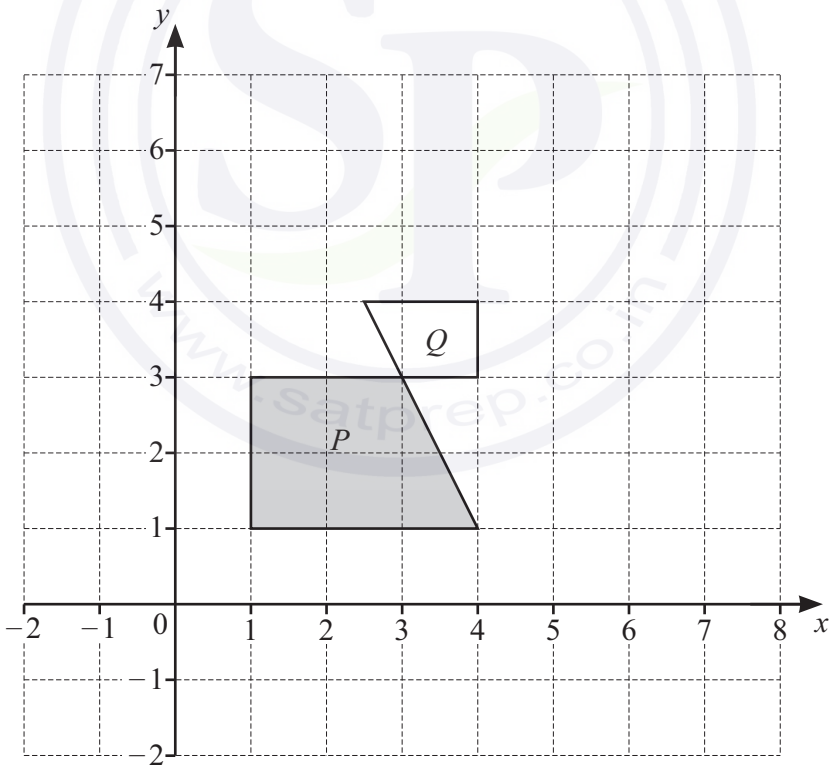
$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(iii) $\overrightarrow{AC} = 3\overrightarrow{BA}$

Find the coordinates of C.

(..... , ...) [2]

(b)



(i) Rotate shape P through 180° about the point $(4, 1)$. [2]

(ii) Reflect shape P in the line $y = x + 2$. [2]

(iii) Describe fully the **single** transformation that maps shape P onto shape Q.

.....

..... [3]

3 **(a)** Ed invests \$500 in an account paying r% per year simple interest.
At the end of 14 years the total amount in Ed's account is \$675.

Find the value of r.

$r =$ ..... [3]

(b) Eva invests \$400 at a rate of 2.2% per year compound interest.

Calculate the total interest earned at the end of 11 years.

\$ ..... [3]

(c) Erin invests \$700 at a rate of p% per **month** compound interest.
At the end of 21 years the value of Erin's investment is \$1074, correct to the nearest dollar.

Calculate the value of p.

$p =$ ..... [3]

4 **(a)** A box contains 50 cuboids.
Each cuboid has a mass of 135 g.
The total mass of the cuboids and the box is 7 kg.

Calculate the mass of the box.
Give your answer in grams.

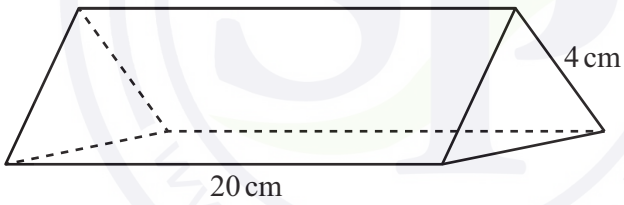
..... g [2]

(b) A solid cube of side 4 cm is fixed to the base inside an empty cube of side 6 cm.
Water is poured into the larger cube until it reaches the top of the smaller cube.

Calculate the amount of water poured into the larger cube.

..... cm^3 [2]

(c)



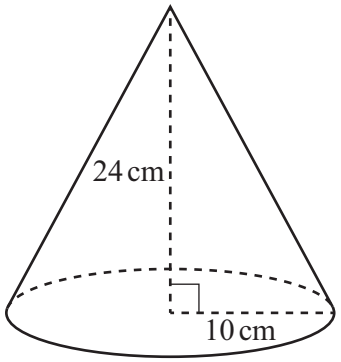
NOT TO SCALE

The diagram shows a solid triangular prism of length 20 cm.
The cross-section is an equilateral triangle with side length 4 cm.
The prism is made of wood with a density of 0.85 g/cm^3.

Calculate the mass of the prism.
[Density = mass ÷ volume]

..... g [4]

(d)



NOT TO SCALE

The diagram shows a solid cone with base radius 10 cm and height 24 cm.

(i) Show that the **total** surface area of the cone is 1131 cm^2, correct to the nearest cm^2.
[The curved surface area of a cone with base radius r and slant height l is $A = \pi rl$.]

[4]

(ii) The total surface area of the cone is painted.

(a) The cost to paint the cone is \$1.71 .

Calculate the cost to paint 1 cm^2 of the cone.
Give your answer in cents.

..... cents [1]

(b) One tin of paint has enough paint to cover 2.5 m^2.

Calculate the number of these cones that can be painted completely using one tin of paint.

..... [2]

5 **(a)** Naomi runs 100 m in 15 seconds.

Calculate Naomi's average speed in kilometres per hour.

..... km/h [2]

(b) Olav runs for 45 minutes at a speed of 9.5 km/h.
He then runs 8.1 km at a speed of 7.5 km/h.

Calculate Olav's average speed for the whole run.

..... km/h [3]

(c) A train has length p metres.
The train passes through a station of length q metres.
The speed of the train is v kilometres per hour.

Find an expression for the time the train takes to completely pass through the station.
Give your answer in seconds, in terms of p, q and v.

..... s [3]

6 **(a)** Simplify $\frac{24u}{5y} \times \frac{10}{3u}$.

..... [2]

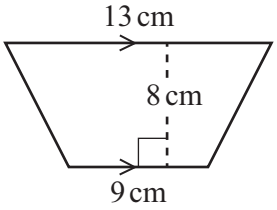
(b) Expand and simplify $(x-1)(x+2)(x+3)$.

..... [3]

(c) Solve the equation $2x^2 + x - 5 = 0$.
You must show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

7 (a) (i)

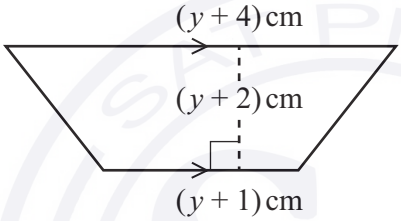


NOT TO SCALE

Calculate the area of the trapezium.

..... cm^2 [2]

(ii)



NOT TO SCALE

The area of this trapezium is 264 cm^2.

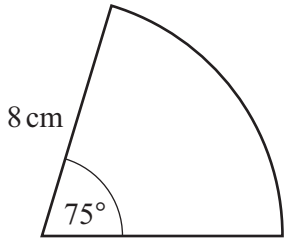
(a) Show that $2y^2 + 9y - 518 = 0$.

[3]

(b) Solve $2y^2 + 9y - 518 = 0$ by factorisation to find the value of y.

$y =$ ..... [3]

(b)



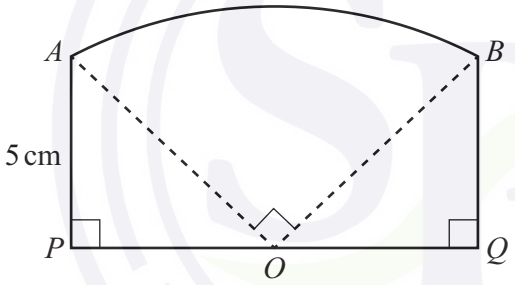
NOT TO SCALE

The diagram shows a sector of a circle with radius 8 cm and angle 75°.

Find the perimeter of the sector.

..... cm [3]

(c)



NOT TO SCALE

The diagram shows a shape $ABQP$ made from three straight lines and an arc of a sector of a circle.
The sector has centre O and angle 90°.
POQ is a straight line and $AP = PO = OQ = QB = 5$ cm.

Find the area of $ABQP$.
Give your answer in the form $a + k\pi$.

..... cm^2 [4]

8 Guillaume measures the speed of each of 100 cars.
The results are shown in the table.

Speed (v km/h)	$30 < v \leqslant 40$	$40 < v \leqslant 45$	$45 < v \leqslant 50$	$50 < v \leqslant 70$
Frequency	15	20	35	30

(a) Guillaume draws a pie chart for this data.

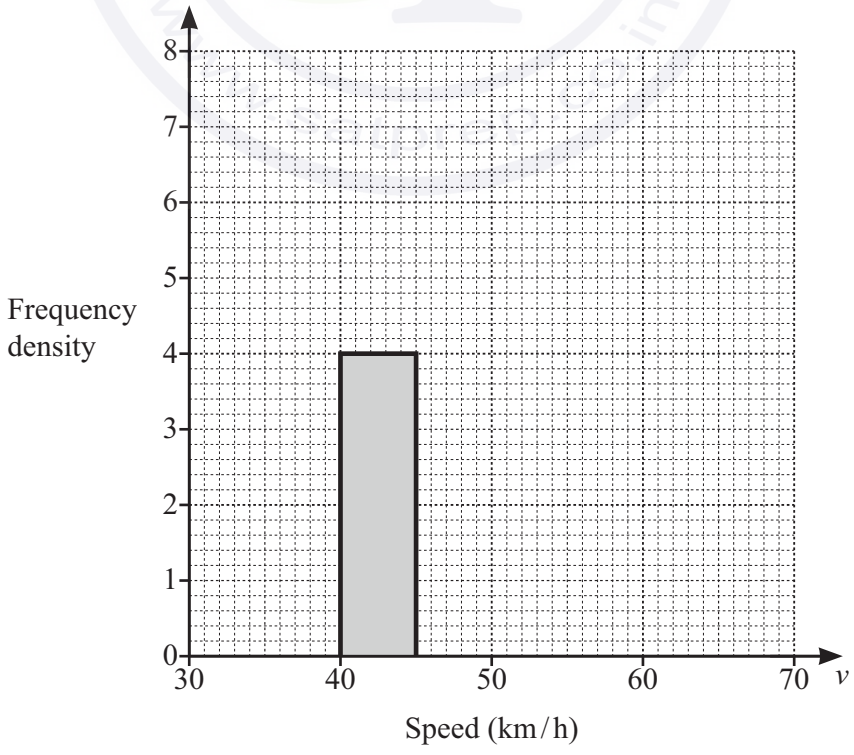
Calculate the angle for the interval $45 < v \leqslant 50$.

..... [2]

(b) Calculate an estimate of the mean speed.

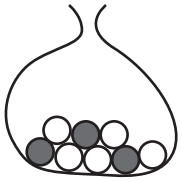
..... km/h [4]

(c) Complete the histogram to show the data in the table.



[3]

9



A bag contains 5 white balls and 3 black balls.

(a) **(i)** Marwan picks a ball from the bag at random and then replaces it.

Find the probability that the ball is white.

..... [1]

(ii) Naomi picks a ball from the bag at random and then replaces it.
She repeats this 120 times.

Find the number of times the ball is expected to be white.

..... [1]

(b) Oscar picks a ball from the bag at random.
He replaces it and then picks a second ball from the bag at random.

(i) Find the probability that the balls are the same colour.

..... [3]

(ii) Find the probability that the balls are not the same colour.

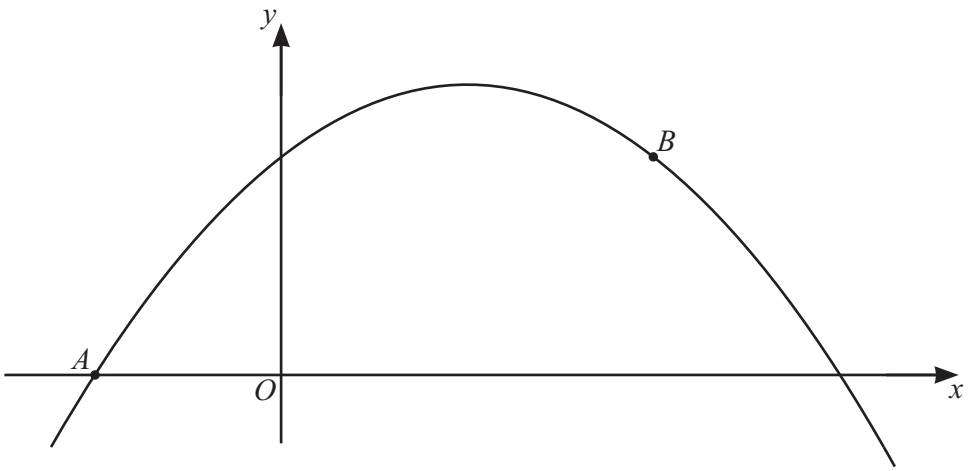
..... [1]

(c) Priya picks 3 of the 8 balls from the bag at random without replacement.

Find the probability that she picks two white balls and one black ball.

..... [3]

10



NOT TO SCALE

The diagram shows a sketch of the graph of $y = 3 + 2x - x^2$.
A is the point $(-1, 0)$ and B is the point $(2, 3)$.

(a) Find the derivative of $3 + 2x - x^2$.

..... [2]

(b) (i) Show that the equation of the tangent at A is $y = 4x + 4$.

[3]

(ii) The line L is perpendicular to the line $y = 4x + 4$.
The line L passes through the point B.

Find the equation of the line L.
Give your answer in the form $y = mx + c$.

$y =$ ..... [3]

(c) Find the coordinates of the maximum point on the graph of $y = 3 + 2x - x^2$.

(..... , ...) [3]

11 $f(x) = 2x + 5$ $g(x) = 1 - 2x$ $h(x) = \frac{1}{x+1}, x \neq -1$ $j(x) = 2^x$

(a) Find $g(-3)$.

..... [1]

(b) Find $f(x)g(x) + fg(x) + 1$.
Give your answer in its simplest form.

..... [4]

(c) Find $g^{-1}(x)$.

$g^{-1}(x) =$ ..... [2]

(d) Find $hh(1)$.

..... [2]

(e) Simplify $\frac{1}{\mathrm{f}(x)} - \mathrm{h}(x)$.

Give your answer as a single fraction in its simplest form.

..... [3]

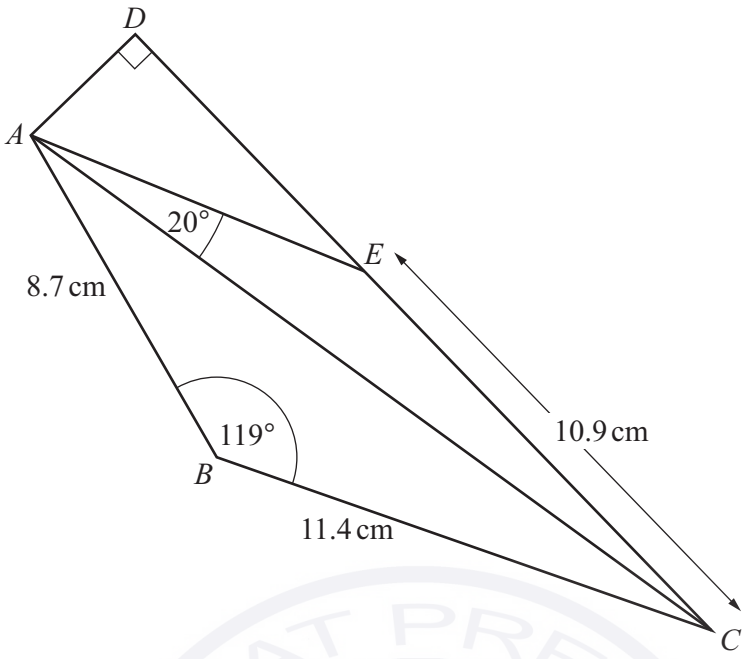
(f) Find x when $\mathrm{j}(x) = \frac{1}{32}$.

$x =$ ..... [1]

(g) Find x when $\mathrm{j}^{-1}(x) = 0$.

$x =$ ..... [1]

12



NOT TO SCALE

ABCD is a quadrilateral and *E* is a point on *CD*.
AB = 8.7 cm, *BC* = 11.4 cm and *CE* = 10.9 cm.
Angle *ADE* = 90°, angle *ABC* = 119° and angle *CAE* = 20°.

(a) Show that *AC* = 17.37 cm, correct to 2 decimal places.

[3]

(b) Angle AEC is obtuse.

Calculate angle ACE.

Angle ACE = ... [4]

(c) Calculate the perimeter of quadrilateral $ABCD$.

..... cm [3]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2743470414

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2024**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

1 **(a)** The table shows the areas, in km^2, of the four largest rainforests in the world.

Rainforest	Area (km^2)
Amazon	5 500 000
Congo	2 000 000
Atlantic	1 315 000
Valdivian	250 000

(i) Find the area of the Valdivian rainforest as a percentage of the area of the Amazon rainforest.

..... % [1]

(ii) Write, in its simplest form, the ratio of the areas of the rainforests Valdivian : Atlantic : Congo.

..... : ..... : ..... [2]

(iii) The Amazon rainforest has 60% of its area in Brazil and 10% of its area in Colombia.
$43\frac{1}{3}$% of the **remaining area** of the rainforest is in Peru.

Find the percentage of the Amazon rainforest that is in Brazil, Colombia and Peru.

..... % [3]

(iv) The area of the Amazon rainforest represents $\frac{27}{50}$ of the total area of rainforest in the world.

Calculate the total area of rainforest in the world.
Give your answer correct to the nearest 100 000 km^2.

..... km^2 [3]

(v) In the world, 60.7 hectares of rainforest are lost every minute.

Calculate the total area, in hectares, of rainforest that is lost in 365 days.
Give your answer in standard form.

..... hectares [3]

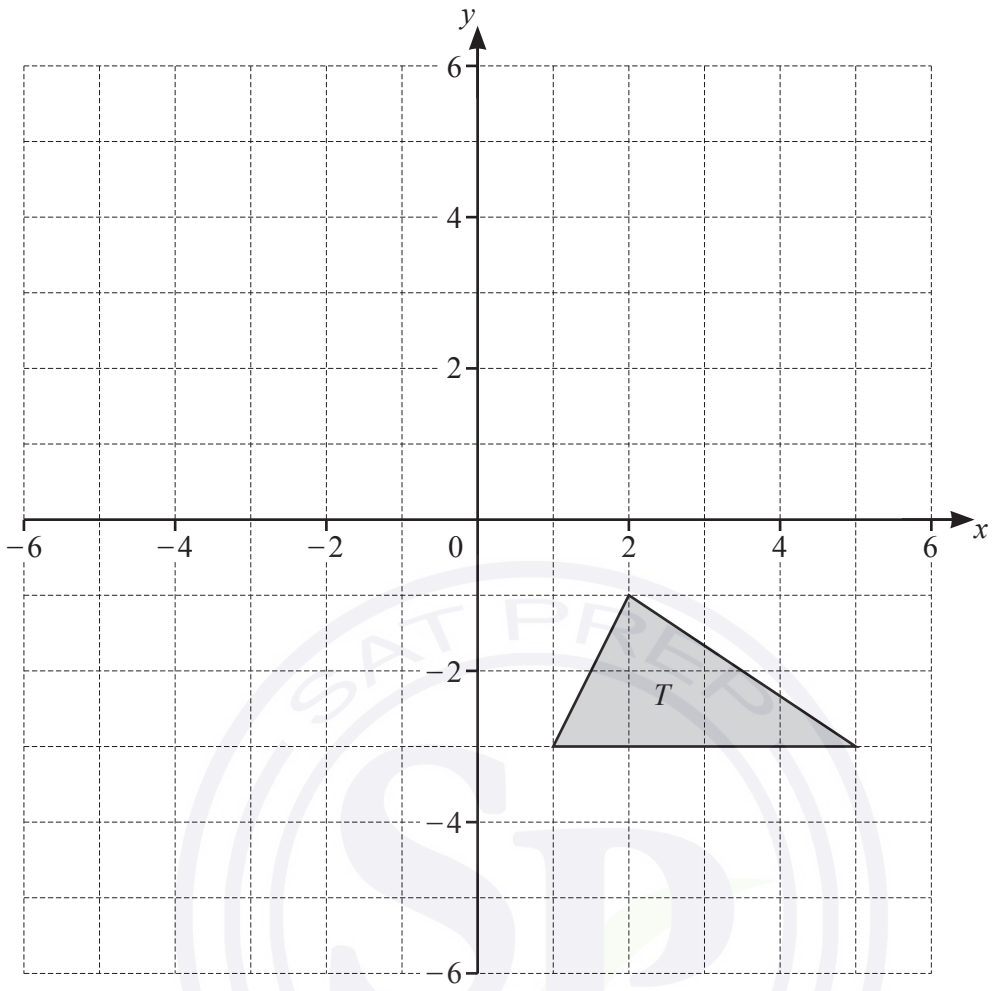
(b) The Amazon river has a length of 6440 km, correct to the nearest 10 km.
The Congo river has a length of 4400 km, correct to the nearest 100 km.

Calculate the upper bound of the difference between the lengths of the Amazon river and the Congo river.

..... km [3]

[Turn over

2 (a)



On the grid, draw the image of

(i) triangle T after a reflection in the x-axis [1]

(ii) triangle T after a translation by the vector $\begin{pmatrix}-5\\-2\end{pmatrix}$ [2]

(iii) triangle T after an enlargement by scale factor $-\frac{1}{2}$ with centre $(-1, 1)$. [2]

(b) A shape P is enlarged by scale factor 3 to give shape Q.
Shape Q is then enlarged by scale factor $\frac{2}{5}$ to give shape R.

The area of shape P is $10\,\text{cm}^2$.

Calculate the area of shape R.

..... cm^2 [3]

3 **(a)** $C = \frac{1}{4}xy^2$

(i) Find C when $x = 5$ and $y = 8$.

$C =$ ..... [2]

(ii) Find the positive value of y when $C = 15$ and $x = 2.4$.

$y =$ ..... [2]

(b) Write as a single fraction in its simplest form.

$$\frac{4}{x-1} - \frac{3}{2x+5}$$

..... [3]

(c) Expand and simplify.

$$(2x+3)(4-x)^2$$

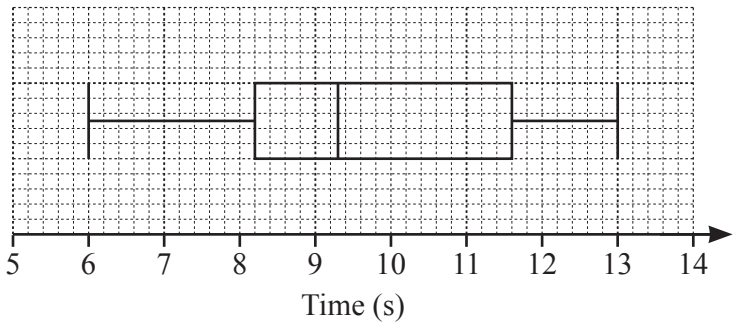
..... [3]

(d) Simplify.

$$\left(\frac{y^8}{16x^{16}}\right)^{-\frac{3}{4}}$$

..... [3]

4 **(a)** Jianyu records the time, in seconds, that some cars take to travel 195 m.
The box and whisker plot shows this information.



(i) Find the median time.

..... s [1]

(ii) Find the interquartile range.

..... s [1]

(iii) Find the difference between the average speed of the fastest car and the average speed of the slowest car.
Give your answer in **kilometres per hour**.

..... km/h [5]

(b) Matilda records the distances that 80 different cars can travel with a full tank of fuel.
The table shows this information.

Distance (d km)	$250 < d \leqslant 300$	$300 < d \leqslant 400$	$400 < d \leqslant 420$	$420 < d \leqslant 450$	$450 < d \leqslant 500$
Frequency	7	13	19	21	20

(i) Write down the class interval that contains the median.

..... $< d \leqslant$ ..... [1]

(ii) Calculate an estimate of the mean.

..... km [4]

(iii) A histogram is drawn to show the information in the table.
The height of the bar for the interval $250 < d \leqslant 300$ is 2.8 cm.

Calculate the height of the bar for each of the following intervals.

$300 < d \leqslant 400$ ..... cm

$400 < d \leqslant 420$ ..... cm

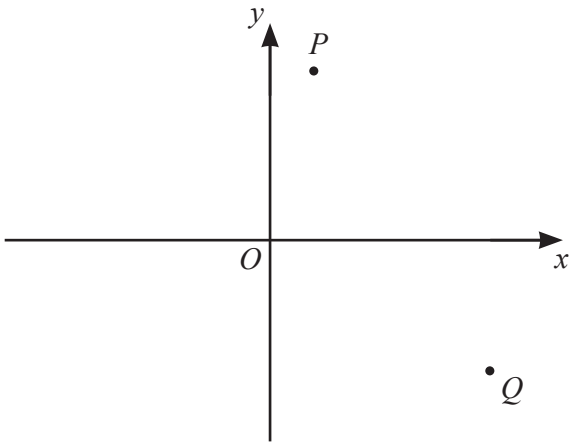
$420 < d \leqslant 450$ ..... cm [3]

(iv) Two of the 80 cars are chosen at random.

Find the probability that, with a full tank of fuel, one of the cars can travel more than 450 km and the other car can travel **not** more than 300 km.

..... [3]

5 **(a)** P is the point (1, 7).
Q is the point (5, –5).



NOT TO SCALE

(i) Find $\overrightarrow{PQ}$.

$\overrightarrow{PQ} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(ii) Show that $|\overrightarrow{OP}| = |\overrightarrow{OQ}|$.

[3]

(iii) PQ is a chord of a circle with centre O.

Calculate the circumference of this circle.

..... [2]

(iv) PQ is the diameter of a different circle with centre R.

Find the coordinates of R.

(..... , ...) [2]

(v) Find the equation of the perpendicular bisector of PQ.
Give your answer in the form $y = mx + c$.

$y =$ ..... [4]

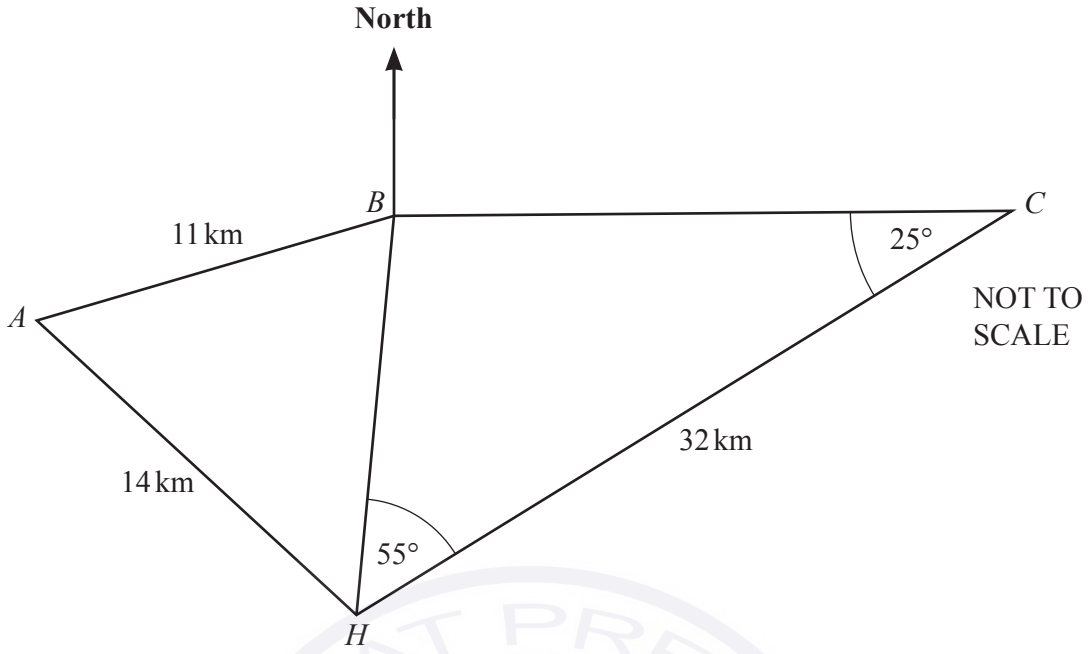
(b) The position vector of A is **a**.
The position vector of B is **b**.

M is a point on AB such that $AM : MB = 2 : 3$.

Find, in terms of **a** and **b**, the position vector of M.
Give your answer in its simplest form.

..... [4]

6



The diagram shows the positions of two lighthouses A and B, a boat C and a harbour H.
C is due east of B.

(a) Find the bearing of the harbour from boat C.

..... [1]

(b) **(i)** Show that angle $CBH = 100°$.

[1]

(ii) Show that $BH = 13.7$ km, correct to 1 decimal place.

[3]

(c) Calculate the bearing of A from B.

..... [5]

(d) At 1 pm boat C sails 32 km directly to the harbour at a speed of 10 knots.

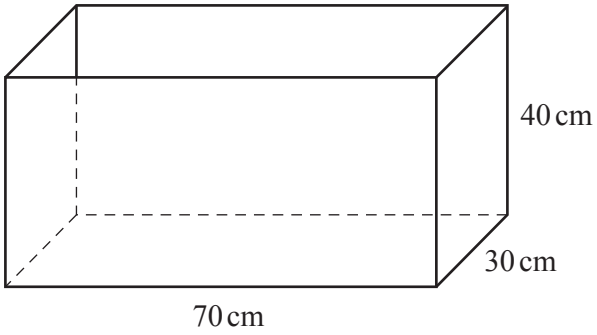
(i) Calculate the time when boat C arrives at the harbour.
Give this time correct to the nearest minute.
[1 knot = 1.852 km/h]

..... [4]

(ii) Calculate the distance of boat C to the harbour when boat C is at the shortest distance from lighthouse B.

..... km [3]

7 (a)



NOT TO SCALE

The diagram shows a box in the shape of a cuboid.
The box is open at the top.

(i) Work out the surface area of the inside of the open box.

..... cm^2 [3]

(ii) Cylinders with height 20 cm and diameter 15 cm are placed in the box.

Work out the maximum number of these cylinders that can completely fit inside the box.

..... [3]

(b) A solid bronze cone has a mass 750 g.
The density of the bronze is 8.9 g/cm^3.

The ratio radius of cone : height of cone = 1 : 3.

(i) Show that the radius of the cone is 2.99 cm, correct to 3 significant figures.
[Density = mass ÷ volume]

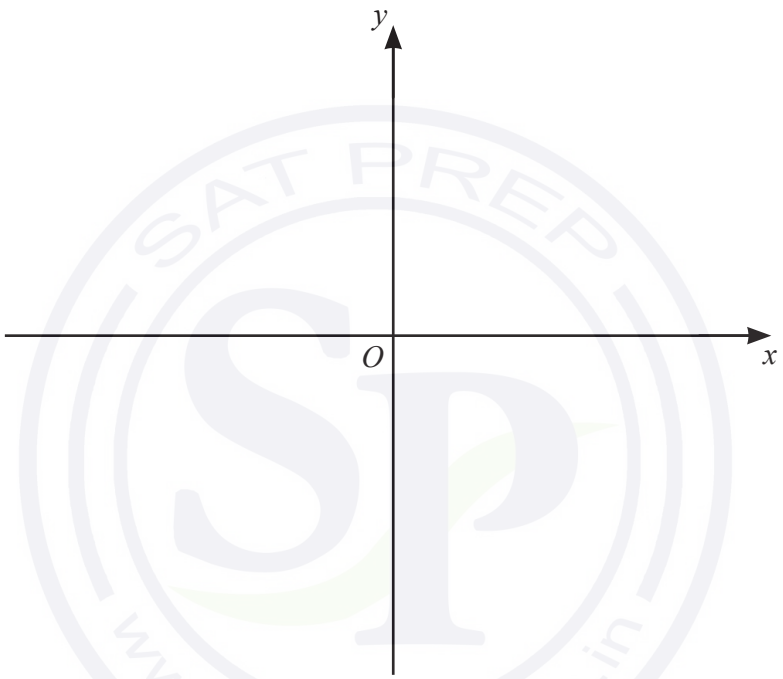
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

[4]

(ii) Calculate the total surface area of the cone.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi r l$.]

..... cm^2 [5]

8 **(a)** On the axes, sketch the graph of $y = x^2 + 7x - 18$.
On your sketch, write the values where the graph meets the x-axis and the y-axis.



[4]

(b) **(i)** Find the derivative of $y = x^2 - 3x - 28$.

..... [2]

(ii) Find the coordinates of the turning point of $y = x^2 - 3x - 28$.

(..... , ...) [3]

(c) The line $y = 5 - 2x$ intersects the graph of $y = x^2 - 3x - 28$ at point P and point Q.

Find the coordinates of P and Q.
You must show all your working and give your answers correct to 2 decimal places.

(..... , ...)

(..... , ...) [6]

9 $f(x) = 4x + 1$ $g(x) = 6 - 2x$ $h(x) = 3^{x-2}$

(a) Find

(i) $f(3)$

..... [1]

(ii) $gf(3)$.

..... [1]

(b) Find $g^{-1}(x)$.

$g^{-1}(x) =$ ..... [2]

(c) Find x when $f(x) = g(2x - 7)$.

$x =$ ..... [4]

(d) Find the value of hh(2).

..... [2]

(e) Find x when $h^{-1}(x) = 10$.

$x =$ ..... [2]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

6406182559

MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2024**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

1 **(a)** A fruit drink is made using 1.5 litres of apple juice and 450 millilitres of mango juice.

Write the ratio apple juice : mango juice in its simplest form.

..... : ..... [2]

(b) One litre of fruit drink is shared between three cups.
The amount in the cups is in the ratio 9 : 6 : 10.

Calculate the number of millilitres in each cup.

..... ml , ... ml , ... ml [3]

(c) A shop buys bottles of the fruit drink for $3.20 each.
It sells them at a profit of 15%.

Calculate the selling price of each bottle of fruit drink.

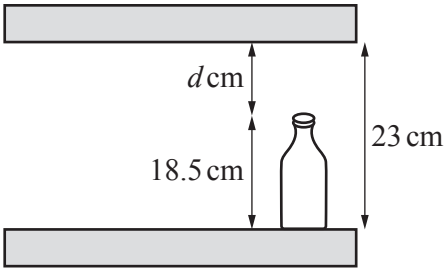
$ ..... [2]

(d) The number of bottles of fruit drink sold has grown exponentially at a constant rate of 2.5% per year.
5 years ago, the shop sold 16 620 bottles.

Calculate the number of bottles sold this year.

..... [2]

(e)



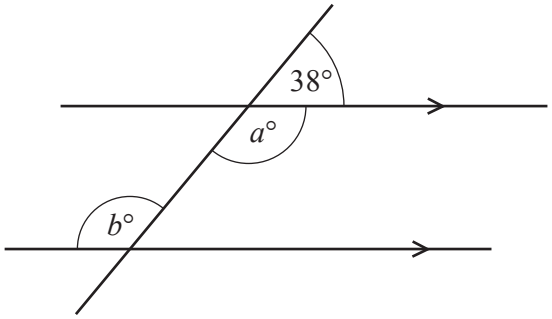
NOT TO SCALE

The bottles of juice are 18.5 cm tall, correct to the nearest millimetre.
They are stored on shelves.
The distance between the shelves is 23 cm, correct to the nearest centimetre.

Calculate the lower bound for the distance, d cm, between the top of a bottle and the shelf above it.

..... cm [3]

2 **(a)**



NOT TO SCALE

The diagram shows a straight line intersecting two parallel lines.

Find the value of a and the value of b.

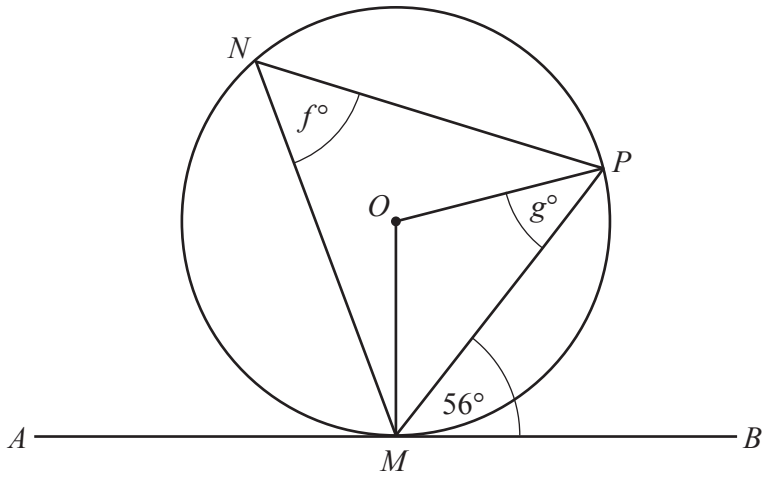
$a =$ .....

$b =$ ..... [2]

(b) Calculate the interior angle of a regular 12-sided polygon.

..... [2]

(c)



NOT TO SCALE

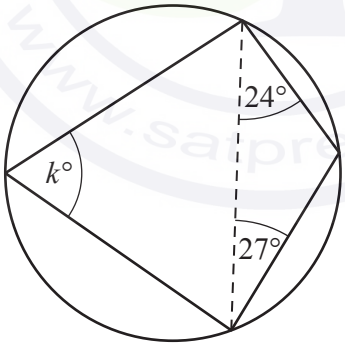
The diagram shows a circle, centre O.
The points M, N and P lie on the circumference of the circle.
AMB is a tangent to the circle at M.

Find the value of f and the value of g.

$f =$ .....

$g =$ ..... [3]

(d)



NOT TO SCALE

The diagram shows a cyclic quadrilateral.

Find the value of k.

$k =$ ..... [2]

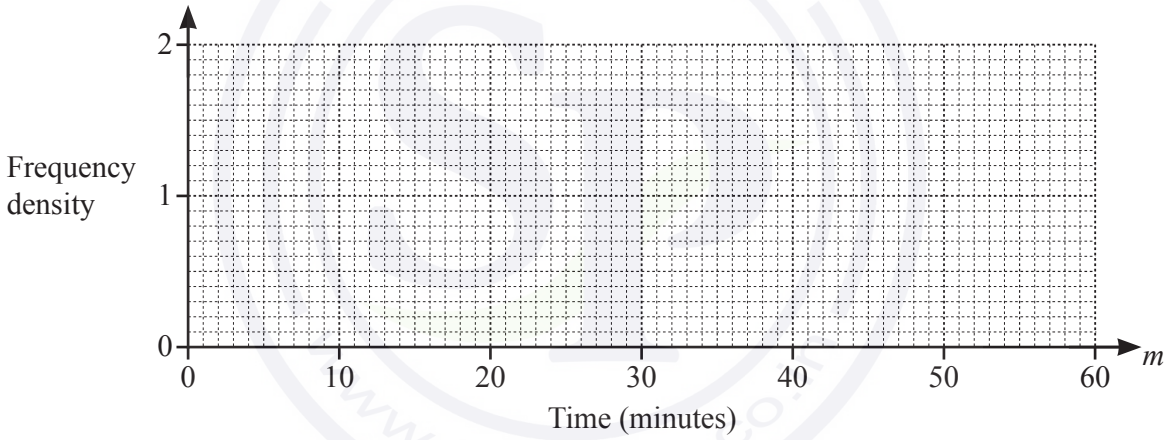
3 **(a)** The table shows the time that each of 40 students takes to travel to school.

Time (m minutes)	$0 < m \leqslant 10$	$10 < m \leqslant 25$	$25 < m \leqslant 40$	$40 < m \leqslant 60$
Frequency	3	18	15	4

(i) Calculate an estimate of the mean.

..... min [4]

(ii) On the grid, draw a histogram to show the information in the table.



[3]

(iii) Two students are selected at random from the 40 students.

Calculate the probability that one student takes more than 25 minutes and the other student takes 10 minutes or less to travel to school.

..... [3]

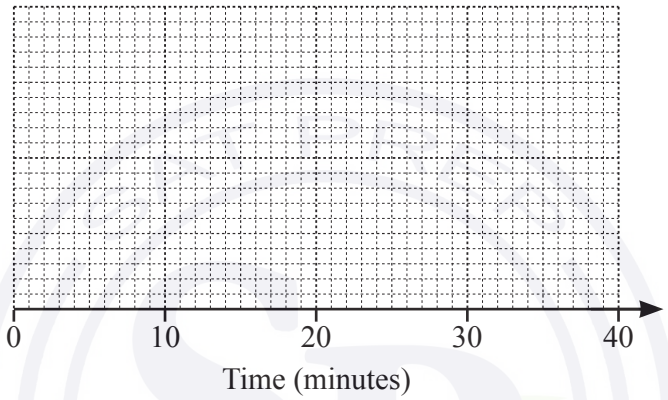
(b) This is some information about the time that 200 people took to fill in a questionnaire:

- The longest time taken was 30 minutes.
- The median time was 22 minutes.
- The lower quartile was 8 minutes.
- The interquartile range was 19 minutes.
- The range was 25 minutes.

(i) Write down the shortest time taken.

..... minutes [1]

(ii) On the grid, draw a box-and-whisker plot to show this information.



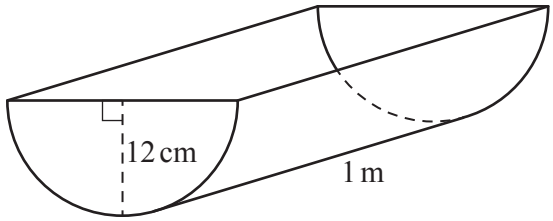
[3]

(iii) George says that 101 of the 200 people took more than 22 minutes to fill in the questionnaire.

Explain why he is wrong.

..... [1]

4 (a)



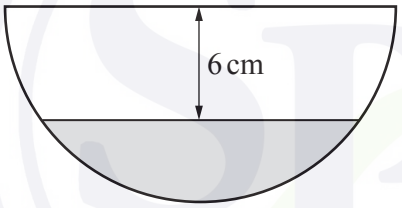
NOT TO SCALE

The diagram shows a tank in the shape of a half-cylinder of radius 12 cm and length 1 metre. The tank is fixed horizontally and is completely filled with water.

(i) Calculate the volume of water in the tank.
Give your answer correct to the nearest 10 cm^3.

..... cm^3 [3]

(ii)



NOT TO SCALE

Water is removed from the tank until the level of water is 6 cm below the top of the tank. The diagram shows the cross-section of the tank.

Calculate the volume of water that is now in the tank.

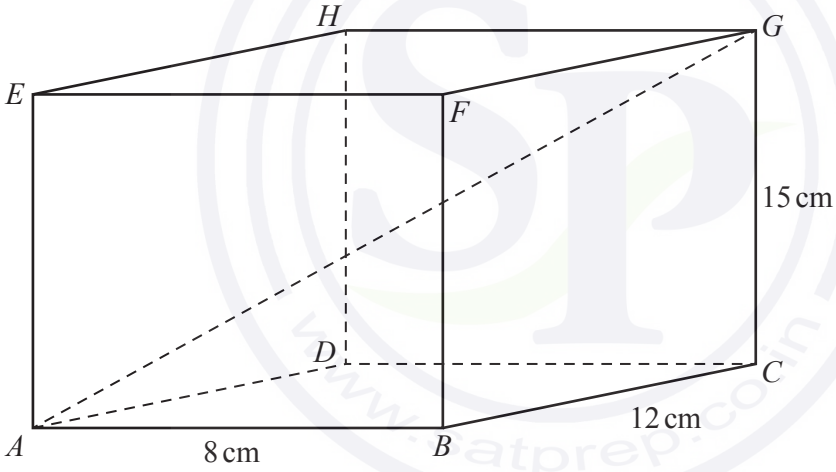
..... cm^3 [5]

(b) A rectangular fish tank with length 42 cm and width 35 cm is full of water.
A stone lies at the bottom of the tank.
When the stone is removed from the tank, the depth of the water decreases by 0.2 cm.
The density of the stone is 2.2 g/cm^3.

Calculate the mass of the stone in grams.
[Density = mass ÷ volume]

..... g [3]

(c)



NOT TO SCALE

The diagram shows a cuboid, *ABCDEFGH*.

Calculate the angle that *AG* makes with the base of the cuboid.

..... [4]

5 **(a)** Simplify $\left(25x^6\right)^{\frac{3}{2}}$.

..... [2]

(b) These are the first five terms of a sequence.

$$\frac{1}{6} \qquad 1 \qquad 6 \qquad 36 \qquad 216$$

Find the nth term of the sequence.

..... [2]

(c) Expand and simplify.

$$(x+4)(x-3)(3x-1)$$

..... [3]

(d) **(i)** Show that $(3x+5)+\frac{7}{x-2}=x$ simplifies to $2x^2+x-3=0$.

[4]

(ii) Solve by factorisation $2x^2+x-3=0$.

$x =$ ..... or $x =$ ..... [3]

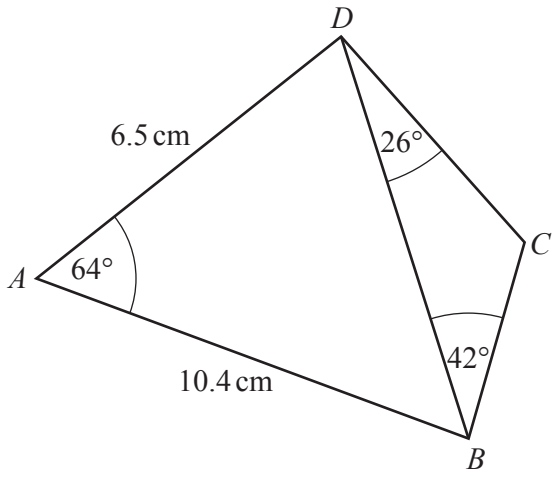
(e) A solid cylinder has base radius x and height $3x$.
The **total** surface area of the cylinder is the same as the **total** surface area of a solid hemisphere of radius $5y$.

Show that $x^2=\frac{75y^2}{8}$.

[The surface area, A, of a sphere with radius r is $A=4\pi r^2$.]

[4]

6



NOT TO SCALE

$ABCD$ is a quadrilateral with $AB = 10.4$ cm and $AD = 6.5$ cm.
Angle $DAB = 64°$, angle $BDC = 26°$ and angle $DBC = 42°$.

(a) Show that $BD = 9.55$ cm, correct to 2 decimal places.

[3]

(b) **(i)** Show that angle $BCD = 112°$.

[1]

(ii) Calculate CD.

$CD =$ ..... [3]

(c) Find the shortest distance from D to AB.

..... cm [3]

7 **(a)** Solve $3x-8=6-4x$.

$x =$ ..... [2]

(b) Factorise fully $10a^2+5a$.

..... [2]

(c) Factorise fully $(2x-3)^2-9$.

..... [2]

(d) $\mathrm{f}(x)=\frac{1}{4x-1},\ x\neq\frac{1}{4}$ $\mathrm{g}(x)=3^x$

(i) Find $\mathrm{f}(4)$.

..... [1]

(ii) Find $\mathrm{gg}(2)$.

..... [2]

(iii) Find k when $\mathrm{g}(k)=\mathrm{f}(7)$.

..... [2]

8 A baker decorates x small cakes and y large cakes.
In one day, he decorates:

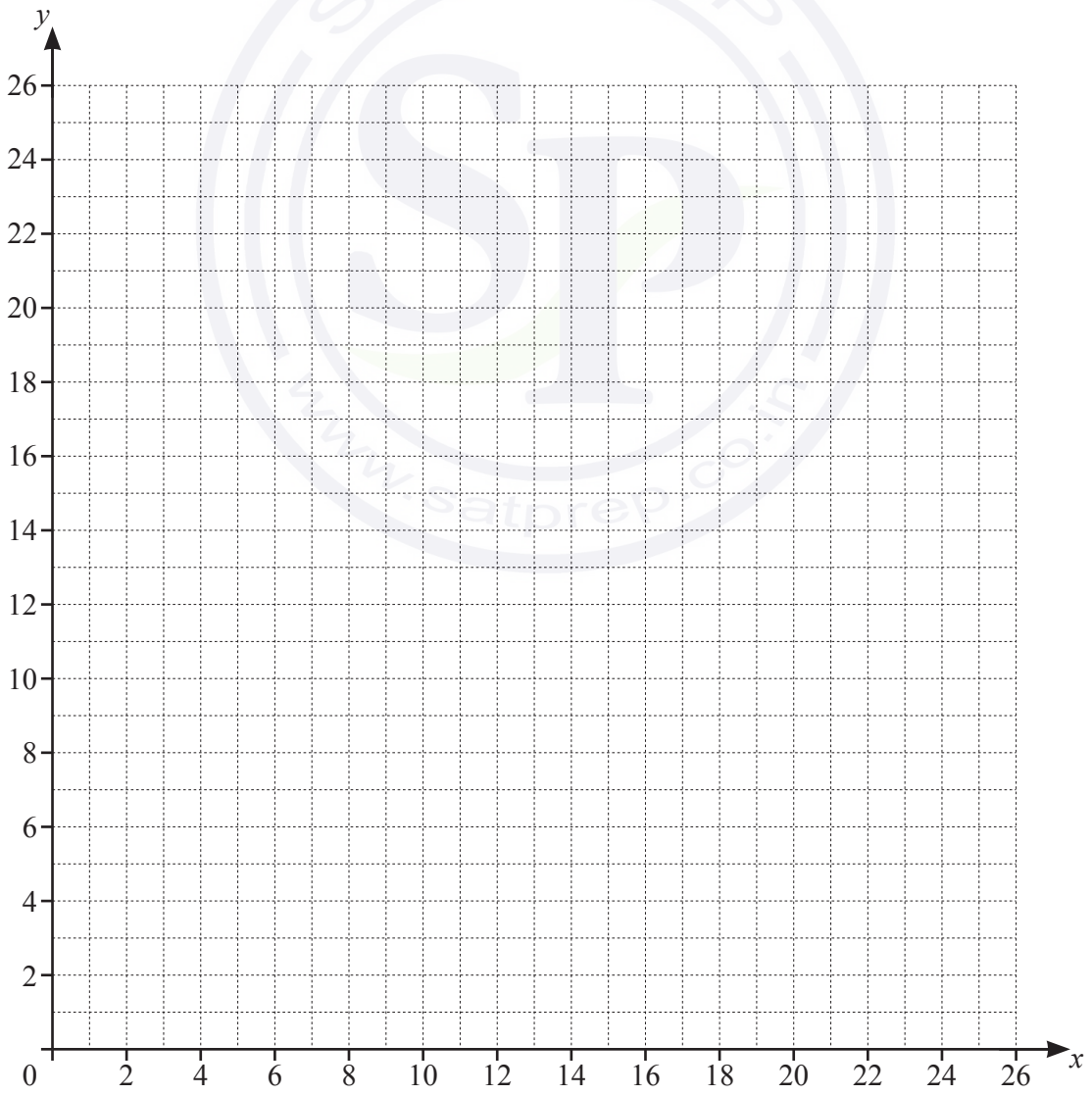
- not more than 16 small cakes
- less than 10 large cakes
- more small cakes than large cakes
- a total of not more than 24 cakes.

One of the inequalities that shows this information is $x \leqslant 16$.

(a) Write down the other three inequalities in x and/or y.

.... [3]

(b) On the grid, draw four straight lines and shade the unwanted regions to show these inequalities.
Label the region, R, which satisfies the four inequalities.



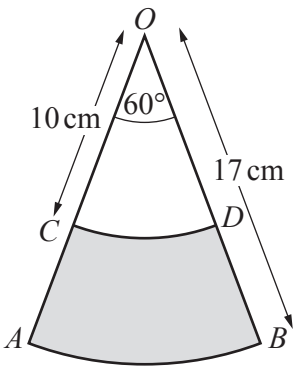
[6]

(c) The baker earns \$8 for decorating a small cake and \$12 for decorating a large cake.

Use your diagram to find the largest amount the baker can earn in one day by decorating cakes.

\$ ..... [2]

9 (a)



NOT TO SCALE

OAB is a sector of a circle, centre *O*, radius 17 cm.
OCD is a sector of a circle, centre *O*, radius 10 cm.
OCA and *ODB* are straight lines and angle $AOB = 60°$.

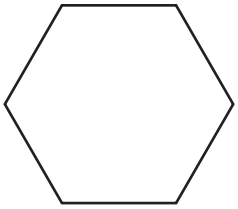
The perimeter of the shaded shape *ABDC* can be written in the form $(a\pi + b)$ cm.

Find the value of *a* and the value of *b*.

a = ...

b = ... [3]

(b)



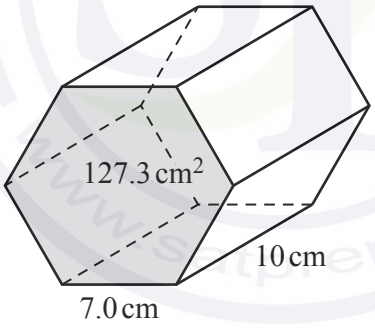
NOT TO SCALE

The diagram shows a regular hexagon.
The area of the hexagon is 127.3 cm^2.

(i) Show that the length of one side of the hexagon is 7.0 cm, correct to 1 decimal place.

[4]

(ii) The hexagon is the cross-section of a prism of length 10 cm.



NOT TO SCALE

(a) Find the volume of the prism.

..... cm^3 [1]

(b) Calculate the surface area of the prism.

..... cm^2 [2]

[Turn over

10 **(a)** A is the point (6, 2) and B is the point (3, -4).

(i) Find the coordinates of the midpoint of AB.

(..... , ...) [2]

(ii) Calculate the length AB.

..... [3]

(b) The equation of line l is $4x + 3y - 12 = 0$.

(i) Find the gradient of l.

..... [2]

(ii) Find the coordinates of the point where l crosses the y-axis.

(..... , ...) [2]

(iii) Line p is perpendicular to l and passes through (6, 5).

Find the equation of p in the form $y = mx + c$.

$y =$ ..... [3]

11 **(a)** The point $(-1, 6)$ lies on a curve.

This curve has the derived function $\frac{dy}{dx} = -4x^3 - 9x^2 + 5$.

Show that $(-1, 6)$ is a stationary point of the curve.

[2]

(b) A different curve has equation $y = 2x^3 - 6x + 8$.

(i) Calculate the gradient of the tangent to this curve at the point $(-2, 2)$.

..... [3]

(ii) Find the x-coordinates of the stationary points of this curve.

$x =$ ..... and $x =$ ..... [2]

BLANK PAGE

* 0019655323301 *

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 5 8 1 4 1 3 4 1 0 4 *

MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2024**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **24** pages. Any blank pages are indicated.

[Turn over

1 **(a)** In 2023 a football club had 50 adult members and 70 child members.
The membership fee for an adult was \$40 and the membership fee for a child was \$15.

(i) Calculate the total of the membership fees received by the club in 2023.

\$ ..... [2]

(ii) The cost of running the club in 2023 was \$2780.

Calculate \$2780 as a percentage of the total of the membership fees received by the club.

..... % [1]

(iii) In 2023 there were 120 members.
This was a decrease by 4% of the number of members in 2022.

Calculate the number of members in 2022.

..... [2]

(iv) In 2024 the total number of members increased from the 120 members in 2023.
The number of adult members and the number of child members each increased by the same number.
The ratio number of adult members : number of child members changed to 14 : 19.

(a) Find the total number of members in 2024.

..... [2]

(b) Calculate the percentage increase in the total number of members from 2023 to 2024.

..... % [2]

(b) The population of a village is 2500.
The population is decreasing exponentially at a rate of 3% per year.

(i) Calculate the population at the end of 3 years.

..... [2]

(ii) Find the number of complete years it takes for the population to first fall below 2000.

..... years [2]

2 **(a)** The nth term of a sequence is $120 - n^3$.

(i) Find the 4th term of this sequence.

..... [1]

(ii) Find the value of n when the nth term is -1211.

$n =$ ..... [2]

(b) The nth term of a different sequence is $3 \times (0.2)^{n-1}$.

Find the 5th term of this sequence.

..... [1]

(c) The table shows the first four terms of sequences A, B and C.

Sequence	1st term	2nd term	3rd term	4th term	5th term		nth term
A	7	4	1	-2			
B	$\frac{1}{4}$	$\frac{2}{5}$	$\frac{3}{6}$	$\frac{4}{7}$			
C	0	2	6	12			

Complete the table for each sequence.

[8]

3 **(a)** Rahul rolls a dice 60 times.
The results are shown in the table.

Score	1	2	3	4	5	6
Frequency	10	6	11	13	14	6

Find the mode, the median and the mean.

mode = ...

median = ...

mean = ... [5]

(b) Sangita measures the speed of each of 100 cars.
The results are shown in the table.

Speed (v km/h)	$20 < v \leqslant 30$	$30 < v \leqslant 50$	$50 < v \leqslant 75$
Frequency	10	72	18

(i) Calculate an estimate of the mean speed.

..... km/h [4]

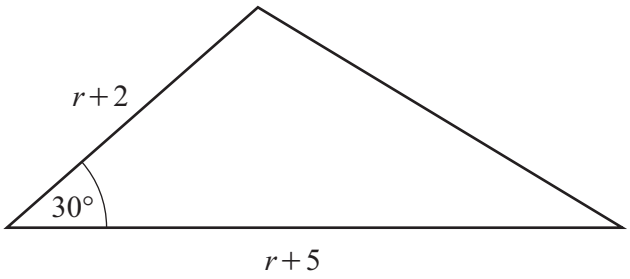
(ii) Sangita draws a histogram to show the information in the table.
The height of the bar that represents $20 < v \leqslant 30$ is 3 cm.

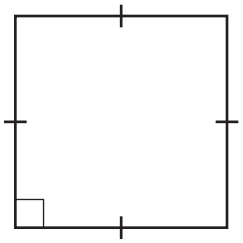
Calculate the height of each of the other two bars on this histogram.

height of bar for $30 < v \leqslant 50$ ..... cm

height of bar for $50 < v \leqslant 75$ ..... cm [2]

4 In this question all the measurements are in centimetres.





NOT TO SCALE

The area of the triangle is equal to the area of the square.

(a) Show that $3r^2 + r - 6 = 0$.

[4]

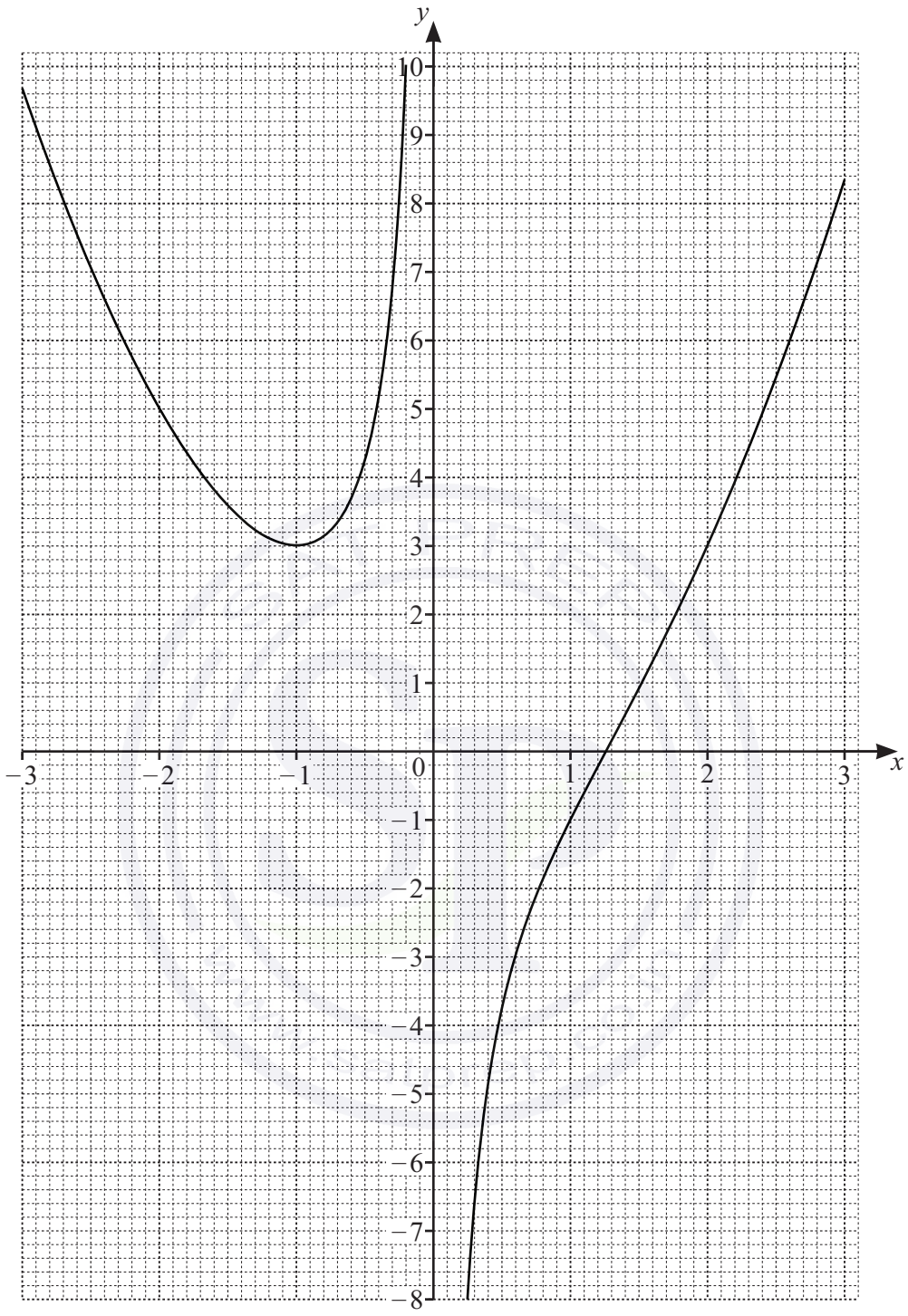
(b) Solve the equation $3r^2 + r - 6 = 0$.
Give your answer to 2 decimal places.
You must show all your working.

$r =$ ..... or $r =$ ..... [3]

(c) Find the perimeter of the square.

..... cm [2]

5



The diagram shows the graph of $y = f(x)$ for values of x from -3 to 3.

(a) (i) Use the graph to find $f(2)$.

..... [1]

(ii) Use the graph to solve the equation $f(x) = 5$.

$x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(iii) The equation $f(x) = k$ has exactly two solutions.

Write down the value of k.

$k =$ ..... [1]

(iv)

tangent	asymptote	root	perpendicular

Choose the correct word from the box to complete the statement.

The line $x = 0$ is the ..... to the graph of $y = f(x)$. [1]

(b) (i) On the grid, draw the graph of $y = x - 2$ for values of x from -3 to 3. [2]

(ii) Find x when $f(x) = x - 2$.

$x =$ ..... [1]

(c) $f(x) = x^2 - \frac{c}{x}, x \neq 0$

Use the graph to show that $c = 2$.

[2]

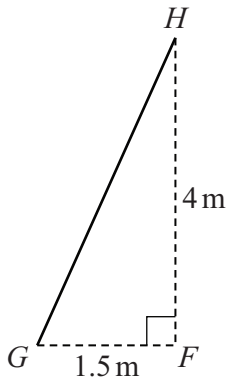
(d) The equation $f(x) = x - 2$ can be written as $x^3 + px^2 + qx = 2$.

Find the value of p and the value of q.

$p =$ .....

$q =$ ..... [2]

6 (a)



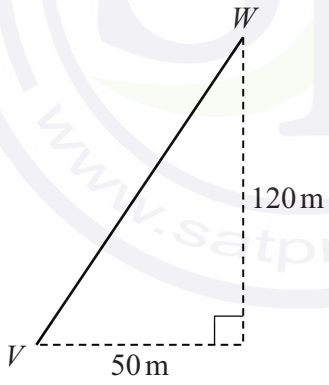
NOT TO SCALE

The diagram shows a ladder, GH, on horizontal ground, leaning against a vertical wall, HF. $GF = 1.5\,\text{m}$ and $HF = 4\,\text{m}$.

Calculate the length of the ladder, GH.

..... m [2]

(b)



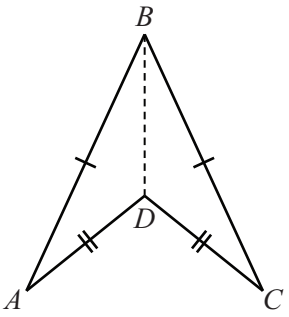
NOT TO SCALE

W is 120 m north of V and 50 m east of V.

Calculate the bearing of V from W.

..... [3]

(c)



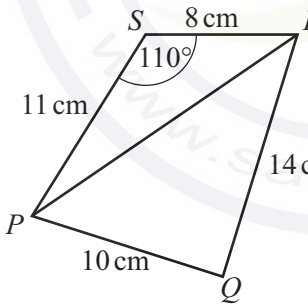
NOT TO SCALE

In the quadrilateral $ABCD$, $AD = DC = 5$ cm and $AB = BC$.
Angle $ABD = 25°$ and angle $BAD = 15°$.

Calculate the perimeter of the quadrilateral $ABCD$.

..... cm [5]

(d)



NOT TO SCALE

$PQRS$ is a quadrilateral.

Calculate angle PQR.

Angle PQR = ... [5]

7 (a) (i) A car travels 50 km at an average speed of 75 km/h.

Find the time taken.
Give your answer in minutes.

..... min [2]

(ii) Another car travels 47 km, correct to the nearest kilometre.
The average speed of this car is 75 km/h, correct to the nearest 5 km/h.

Calculate the lower bound of the time taken.
Give your answer in minutes.

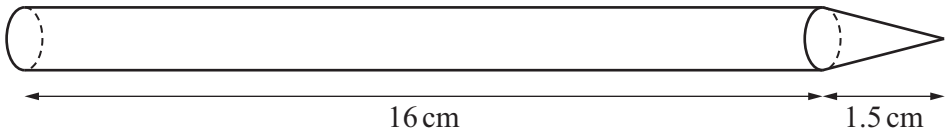
..... min [3]

(b) A train travels a total of 240 km.
The train travels for t **minutes** at an average speed of 100 km/h.
It then travels for $(t + 60)$ **minutes** at an average speed of 110 km/h.

Find the average speed for the whole journey.

..... km/h [6]

8 (a)



NOT TO SCALE

The diagram shows a solid made from a cylinder and a cone.
The height of the cylinder is 16 cm and the height of the cone is 1.5 cm.
The radius of the cylinder and the base radius of the cone are each 0.35 cm.

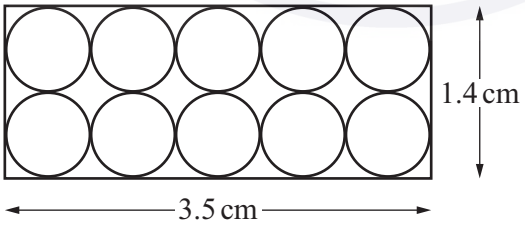
(i) Calculate the total surface area of the solid.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]

..... cm^2 [5]

(ii) Calculate the volume of the solid.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [3]

(iii)



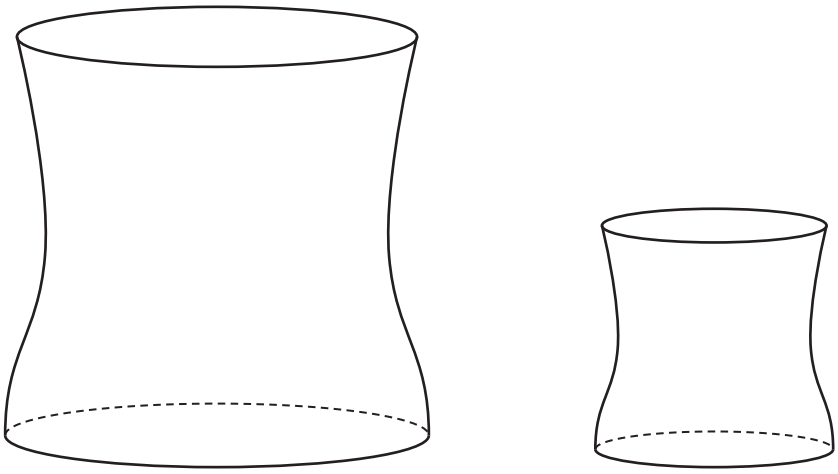
NOT TO SCALE

10 of the solids are placed in a box in the shape of a cuboid of length 17.5 cm.
The diagram shows one end of the box.

Calculate the volume of the empty space in the box.

..... cm^3 [3]

(b)



NOT TO SCALE

The diagram shows two mathematically similar solids.
The surface area of the larger solid is $200\,cm^2$ and the surface area of the smaller solid is $98\,cm^2$.
The volume of the larger solid is $450\,cm^3$.

Calculate the volume of the smaller solid.

..... cm^3 [3]

9

N	A	M	I	B	I	A

The diagram shows 7 cards.

(a) Amir picks a card at random.

Find the probability that the card shows

(i) the letter H

..... [1]

(ii) the letter B.

..... [1]

(b) Fumika picks one of the 7 cards at random.
She replaces it and picks a second card at random.

Find the probability that both cards show the letter I.

..... [2]

(c) Marcos picks two of the 7 cards at random, **without** replacement.

(i) Find the probability that one card shows the letter I and the other card shows the letter N.

..... [3]

(ii) Find the probability that the two cards show different letters.

..... [3]

(d) Nina picks one of the 7 cards at random without replacement.
She continues picking cards at random without replacement until she picks a card that shows the letter A.

The probability that this occurs when she picks the nth card is $\frac{4}{21}$.

Find the value of n.

$n =$ ..... [2]

10 $y = x^7 - 7x^6$

(a) Find the derivative of y with respect to x.

..... [2]

(b) Find the equation of the tangent to the graph of $y = x^7 - 7x^6$ at the point where $x = -1$.
Give your answer in the form $y = mx + c$.

$y =$ ..... [4]

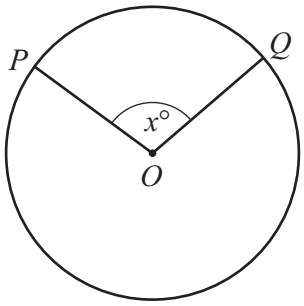
(c) The graph of $y = x^7 - 7x^6$ has two turning points.

Find the coordinates of these points.
You must show all your working.

(..... , ...)

(..... , ...) [5]

11 (a)

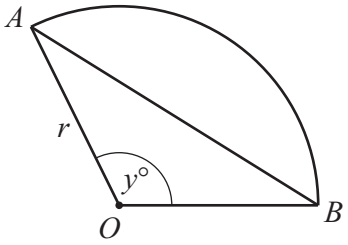


NOT TO SCALE

In the circle, centre O, the length of the minor arc PQ is $\frac{3}{7}$ of the length of the major arc PQ.
Show that $x = 108$.

[3]

(b)



NOT TO SCALE

The diagram shows a sector, OAB, of a circle with centre O and radius r.
The area of triangle OAB is half the area of the sector.
Angle $AOB = y°$ and is obtuse.

(i) Show that $360 \sin y = \pi y$.

[2]

(ii) Complete the table, giving your answers correct to two decimal places.

y	$360 \sin y$	πy
108.4	341.60	340.55
108.5	341.40	340.86
108.6	341.20	
108.7		

[3]

(iii) Complete the statement.

The value of y, correct to one decimal place, that satisfies the equation $360 \sin y = \pi y$ is ..... .

[1]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

9928435260

MATHEMATICS **0580/42**

Paper 4 (Extended) **February/March 2024**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

1 A grocer sells potatoes, mushrooms and carrots.

(a) A customer buys 3 kg of mushrooms at $1.04 per kg and 4 kg of carrots at $1.28 per kg.

Calculate the total cost.

$ ..... [2]

(b) In one week, the ratio of the masses of vegetables sold by the grocer is

potatoes : mushrooms : carrots = 11 : 8 : 6.

(i) Work out the mass of mushrooms sold as a percentage of the total mass.

..... % [2]

(ii) The total mass of potatoes, mushrooms and carrots sold is 1500 kg.

Find the mass of carrots the grocer sells this week.

..... kg [2]

(iii) The profit the grocer makes selling 1 kg of carrots is $0.75 .

Find the total profit the grocer makes selling carrots this week.

$ ..... [1]

(iv) On the last day of the week, the grocer reduces the price of 1 kg of potatoes by 8% to \$1.15 .

Calculate the original price of 1 kg of potatoes.

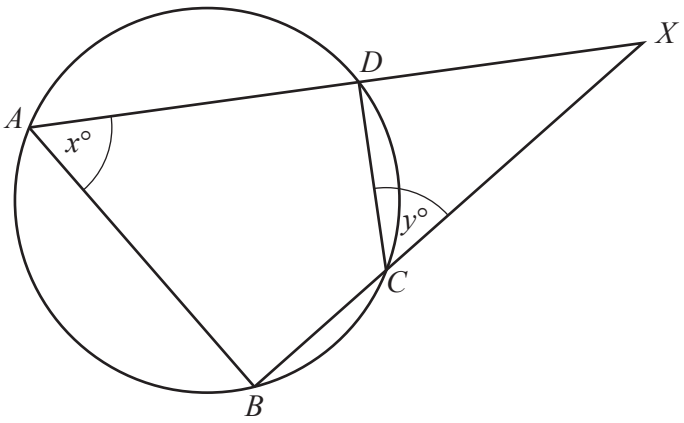
\$ ..... [2]

(c) The grocer buys 620 kg of onions, correct to the nearest 20 kg.
He packs them into bags each containing 5 kg of onions, correct to the nearest 1 kg.

Calculate the upper bound for the number of bags of onions that he packs.

..... [3]

2



NOT TO SCALE

A, B, C and D are points on a circle.
ADX and BCX are straight lines.
Angle $BAD = x°$ and angle $DCX = y°$.

(a) Explain why $x = y$.
Give a geometrical reason for each statement you make.

[2]

(b) Show that triangle ABX is similar to triangle CDX.

[2]

(c) $AD = 15\,\text{cm}$, $DX = 9\,\text{cm}$ and $CX = 12\,\text{cm}$.

(i) Find BC.

$BC =$ ..... cm [3]

(ii) Complete the statement.

The ratio area of triangle ABX : area of triangle CDX = ... : 1. [1]

3 **(a)** The table shows information about the marks gained by each of 10 students in a test.

Mark	15	16	17	18	19	20
Frequency	4	1	2	1	0	2

(i) Calculate the range.

..... [1]

(ii) Calculate the mean.

..... [3]

(iii) Find the median.

..... [1]

(iv) Write down the mode.

..... [1]

(b) Paulo's mean mark for 7 homework tasks is 17.
After completing the 8th task, his mean mark is 17.5 .

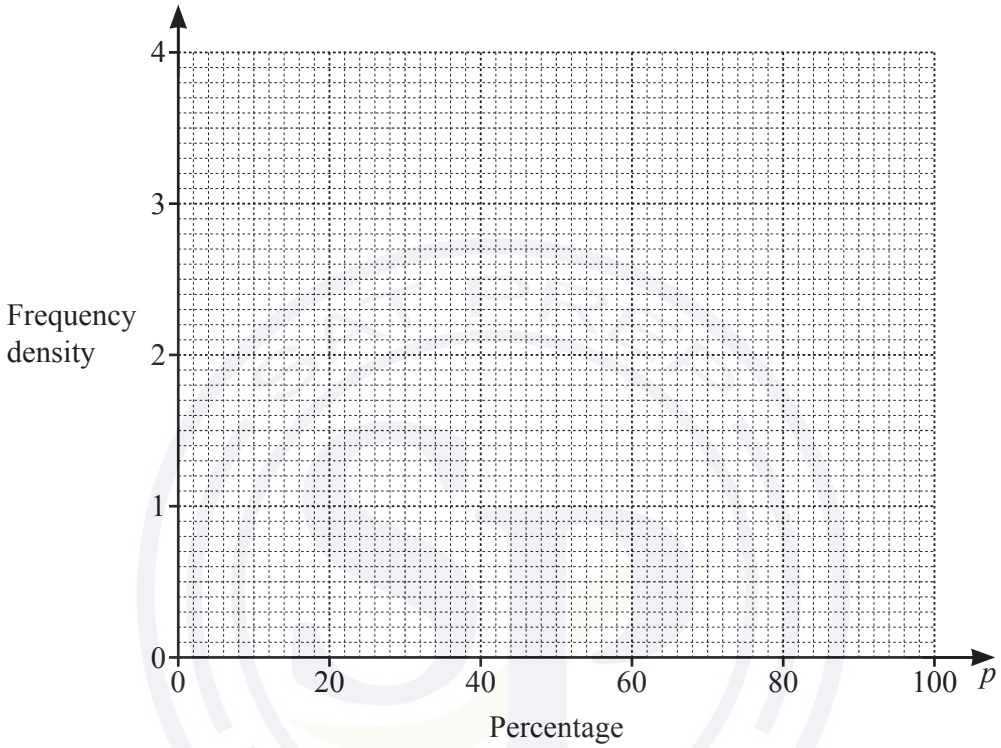
Calculate Paulo's mark for the 8th task.

..... [3]

(c) The table shows the percentage scored by each of 100 students in their final exam.

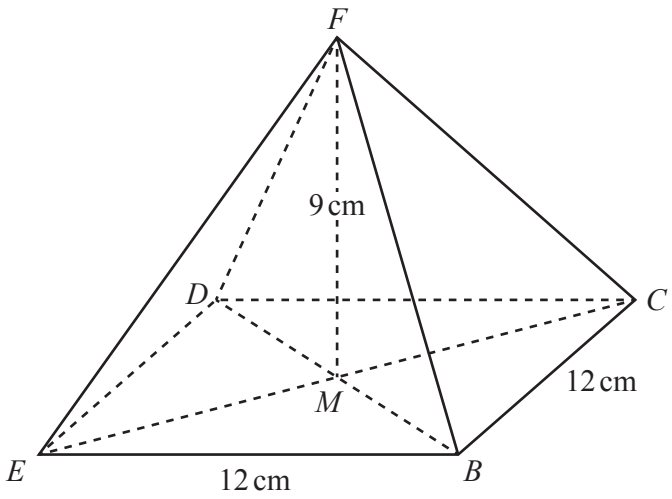
Percentage (p)	$0 < p \leqslant 30$	$30 < p \leqslant 50$	$50 < p \leqslant 60$	$60 < p \leqslant 70$	$70 < p \leqslant 100$
Frequency	12	18	35	20	15

On the grid, draw a histogram to show this information.



[4]

4 (a)



NOT TO SCALE

The diagram shows a pyramid with a square base $BCDE$.
The diagonals CE and BD intersect at M, and the vertex F is directly above M.
$BE = 12$ cm and $FM = 9$ cm.

(i) Calculate the volume of the pyramid.

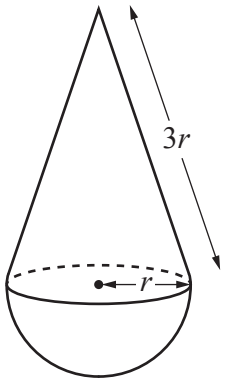
[The volume, V, of a pyramid with base area A and height h is $V = \frac{1}{3}Ah$.]

..... cm^3 [2]

(ii) Calculate the total surface area of the pyramid.

..... cm^2 [5]

(b)



NOT TO SCALE

The diagram shows a toy made from a cone and a hemisphere.
The base radius of the cone and the radius of the hemisphere are both r cm.
The slant height of the cone is $3r$ cm.

The total surface area of the toy is $304\,\text{cm}^2$.

Calculate the value of r.

[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]
[The curved surface area, A, of a sphere with radius r is $A = 4\pi r^2$.]

$r =$ ..... [4]

5 **(a)** **(i)** Factorise.

$$x^2 - x - 12$$

..... [2]

(ii) Simplify.

$$\frac{x^2 - 16}{x^2 - x - 12}$$

..... [2]

(b) Simplify.

$$(2x - 3)^2 - (x + 1)^2$$

..... [3]

(c) Write as a single fraction in its simplest form.

$$\frac{2x + 4}{x + 1} - \frac{x}{x - 3}$$

..... [4]

(d) Expand and simplify.

$$(x-3)(x-5)(2x+1)$$

..... [3]

(e) Solve the simultaneous equations.
You must show all your working.

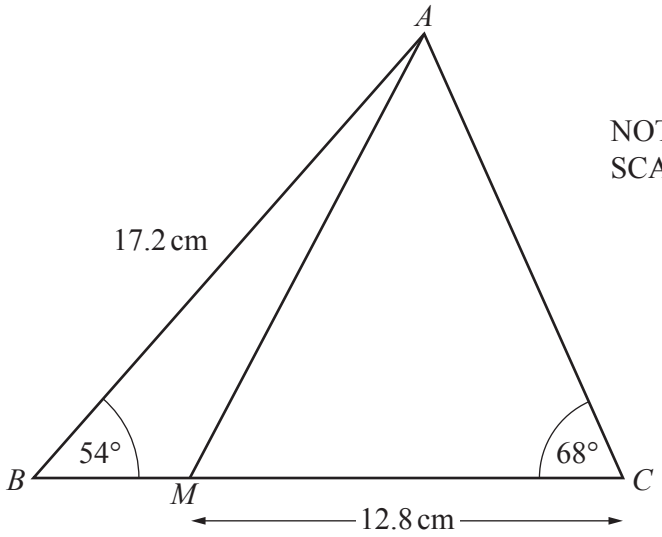
$$x-3y=13$$
$$2x^2-9y=116$$

$x =$ ..... $y =$ .....

$x =$ ..... $y =$ ..... [6]

[Turn over

6



The diagram shows triangle ABC with $AB = 17.2$ cm.
Angle $ABC = 54°$ and angle $ACB = 68°$.

(a) Calculate AC.

$AC =$ ..... cm [3]

(b) M lies on BC and $MC = 12.8$ cm.

Calculate AM.

$AM =$ ..... cm [3]

(c) Calculate the shortest distance from A to BC.

.....cm [3]

7 **(a)** $\mathbf{p} = \begin{pmatrix} 8 \\ -5 \end{pmatrix}$ $\mathbf{q} = \begin{pmatrix} -4 \\ 5 \end{pmatrix}$

(i) Find $3\mathbf{q}$.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

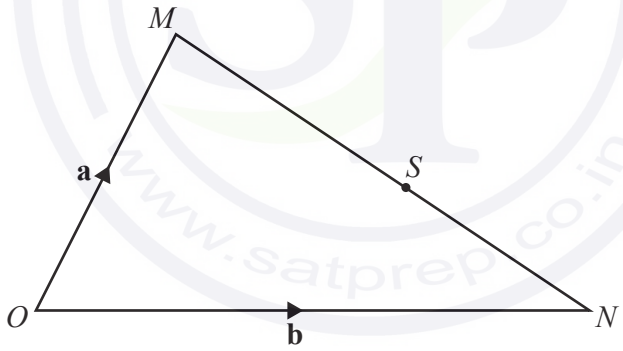
(ii) **(a)** Find $\mathbf{p} - \mathbf{q}$.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(b) Find $|\mathbf{p} - \mathbf{q}|$.

..... [2]

(b)



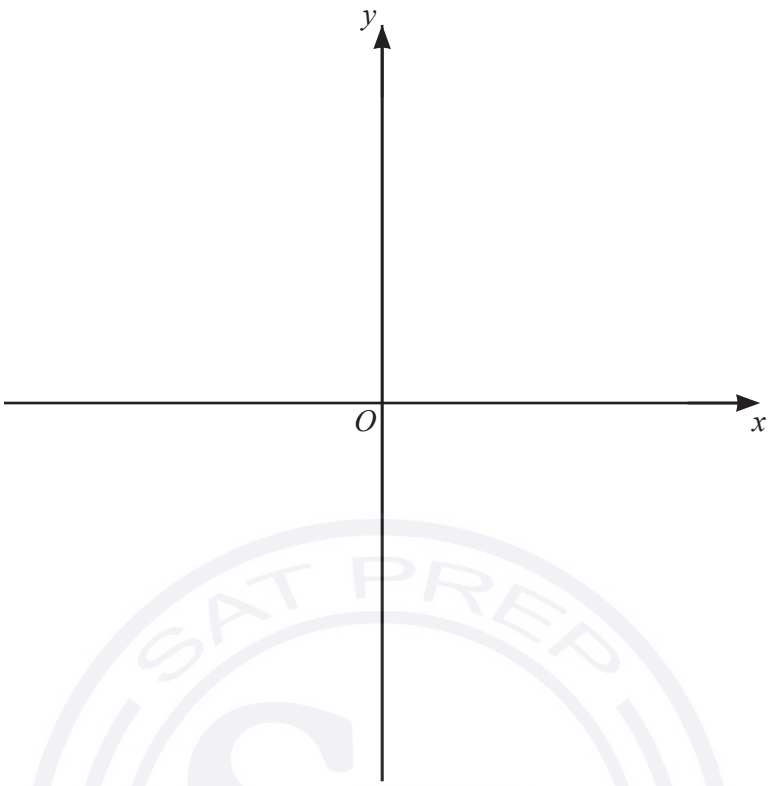
NOT TO SCALE

In triangle OMN, O is the origin, $\overrightarrow{OM} = \mathbf{a}$ and $\overrightarrow{ON} = \mathbf{b}$.
S is a point on MN such that $MS : SN = 5 : 3$.

Find, in terms of **a** and/or **b**, the position vector of S.
Give your answer in its simplest form.

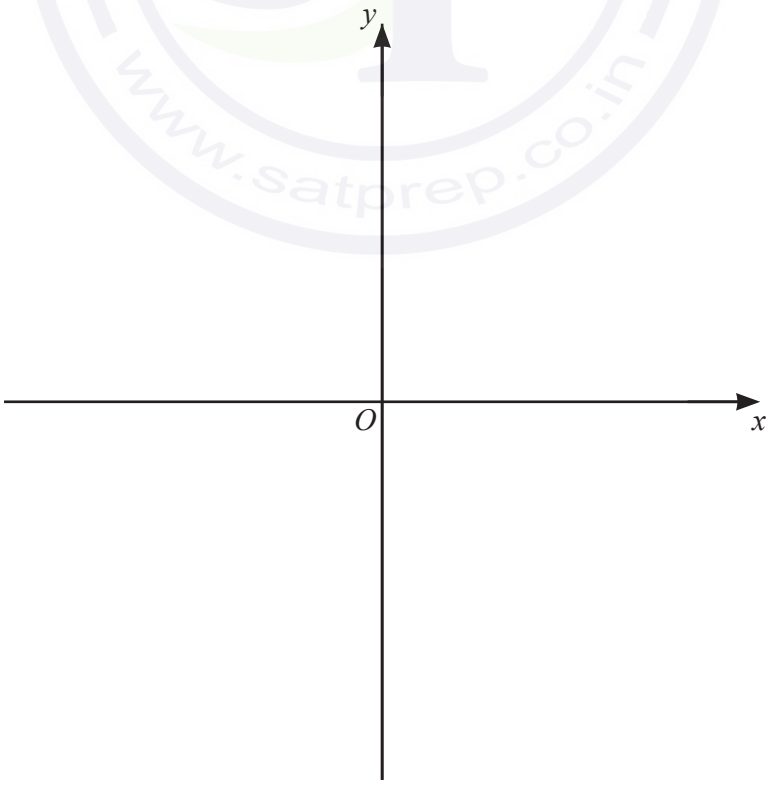
..... [3]

8 **(a)** On the axes, sketch the graph of $y = 4 - 3x$.



[2]

(b) On the axes, sketch the graph of $y = -x^2$.



[2]

(c) **(i)** Find the coordinates of the turning points of the graph of $y = 10 + 9x^2 - 2x^3$.
You must show all your working.

(..... , ...) and (..... , ...) [5]

(ii) Determine whether each turning point is a maximum or a minimum.
Show how you decide.

[3]

9 **(a)** Janna and Kamal each invest \$8000.
At the end of 12 years, they each have \$12 800.

(i) Janna invests in an account that pays simple interest at a rate of r% per year.

Calculate the value of r.

$r =$ ..... [3]

(ii) Kamal invests in an account that pays compound interest at a rate of R% per year.

Calculate the value of R.

$R =$ ..... [3]

(b) The population of a city is growing exponentially at a rate of 1.8% per year.
The population now is 260 000.

Find the number of complete years from now when the population will first be more than 300 000.

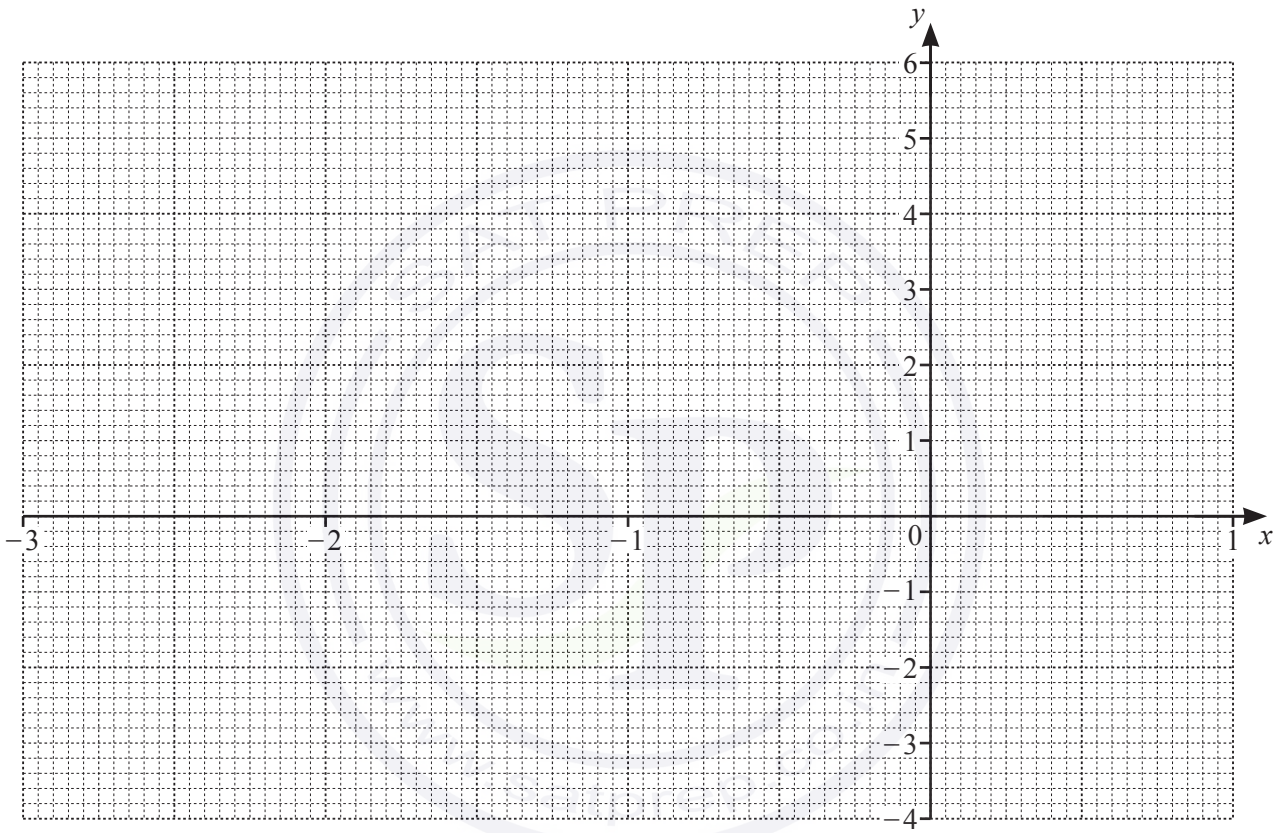
..... years [3]

10 The table shows some values for $y = 2x^3 + 6x^2 - 2.5$.

x	-3	-2.5	-2	-1.5	-1	-0.5	0	0.5	1
y		3.75	5.5	4.25	1.5		-2.5	-0.75	

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = 2x^3 + 6x^2 - 2.5$ for $-3 \leqslant x \leqslant 1$.



[4]

(c) By drawing a suitable line on the graph, solve the equation $2x^3 + 6x^2 = 4.5$.

$x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(d) The equation $2x^3 + 6x^2 - 2.5 = k$ has exactly two solutions.

Write down the two possible values of k.

$k =$ ..... or $k =$ ..... [2]

11 $f(x) = \frac{1}{x}, x \neq 0$ $g(x) = 3x - 5$ $h(x) = 2^x$

(a) Find.

(i) $gf(2)$

..... [2]

(ii) $g^{-1}(x)$

$g^{-1}(x) =$ ..... [2]

(b) Find in its simplest form $g(x-2)$.

..... [2]

(c) Find the value of x when

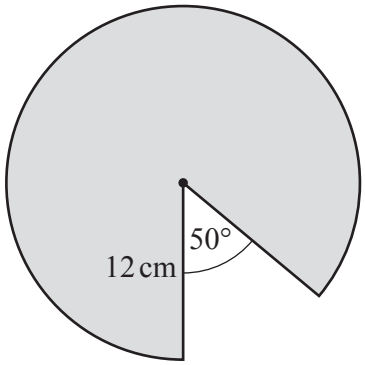
(i) $fg(x) = 0.1$

$x =$ ..... [2]

(ii) $h(x) - g(7) = 0$.

$x =$ ..... [2]

12 (a)



NOT TO SCALE

The diagram shows a circle of radius 12 cm, with a sector removed.

Calculate the perimeter of the remaining shaded shape.

..... cm [4]

(b) The diagram in **part(a)** shows the top of a cylindrical cake with a slice removed.
The volume of cake that remains is 3510 cm^3.

Calculate the height of the cake.

..... cm [3]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2592033674

MATHEMATICS **0580/41**

Paper 4 (Extended) **October/November 2023**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

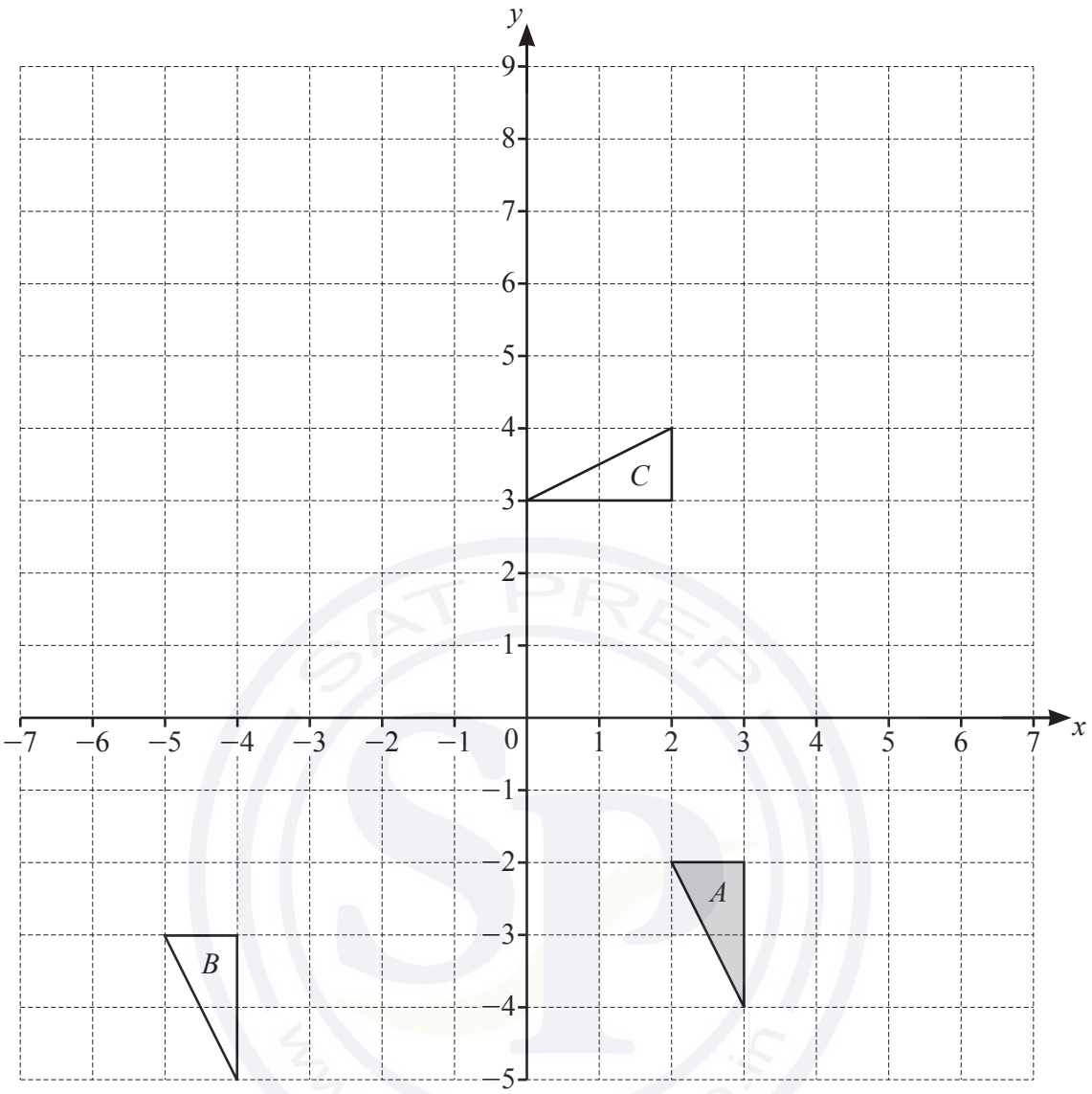
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

1



(a) Describe fully the **single** transformation that maps

(i) shape *A* onto shape *B*

.....

..... [2]

(ii) shape *A* onto shape *C*.

.....

..... [3]

(b) On the grid, draw the image of

(i) shape *A* after a reflection in the line $y = 2$ [2]

(ii) shape *A* after an enlargement, scale factor -2, centre (0, 0). [2]

2 **(a)** $s = \frac{1}{2}at^2$

Find the value of s when $a = 9.8$ and $t = 20$.

$s =$ ..... [2]

(b) Solve.

$5(4y - 3) = 15$

$y =$ ..... [3]

(c) Expand and simplify.

$3(5x - 8) - 2(3x - 7)$

..... [2]

(d) Rearrange $A = 2b^2 - 3c^3$ to make c the subject.

$c =$ ..... [3]

(e) Factorise completely.

$6pq - 4q - 3p + 2$

..... [2]

3 **(a)** The table shows information about some of the planets in the solar system.

Planet	Diameter (km)	Average distance from the Sun (km)
Earth	12 800	1.496×10^8
Mars	6 800	2.279×10^8
Jupiter	143 000	7.786×10^8
Saturn	120 500	1.434×10^9
Neptune	49 500	4.495×10^9

(i) The average distance of Mars from the Sun is 2.279×10^8 km.

Write this distance as an ordinary number.

..... km [1]

(ii) The planet Uranus has a diameter that is 35.8% of the diameter of Jupiter.

Calculate the diameter of Uranus.

..... km [2]

(iii) The ratio diameter of Neptune : diameter of Saturn can be written in the form 1 : n.

Find the value of n.

$n =$ ..... [1]

(iv) Find the average distance of Neptune from the Sun as a percentage of the average distance of the Earth from the Sun.

..... % [2]

(v) Distances within the solar system are also measured in astronomical units (AU).
The average distance of Jupiter from the Sun is 5.20 AU.

Calculate the average distance of Mars from the Sun in astronomical units.

..... AU [2]

(vi) The diameter of Mars is 39.2% greater than the diameter of Mercury.

Calculate the diameter of Mercury.

..... km [2]

(b) One light year is the distance that light travels in a year of 365.25 days.
The speed of light is 2.9979×10^5 kilometres per second.

(i) Show that one light year is 9.461×10^{12} km, correct to 4 significant figures.

[2]

(ii) The distance from the Andromeda Galaxy to Earth is 2.40×10^{19} km.

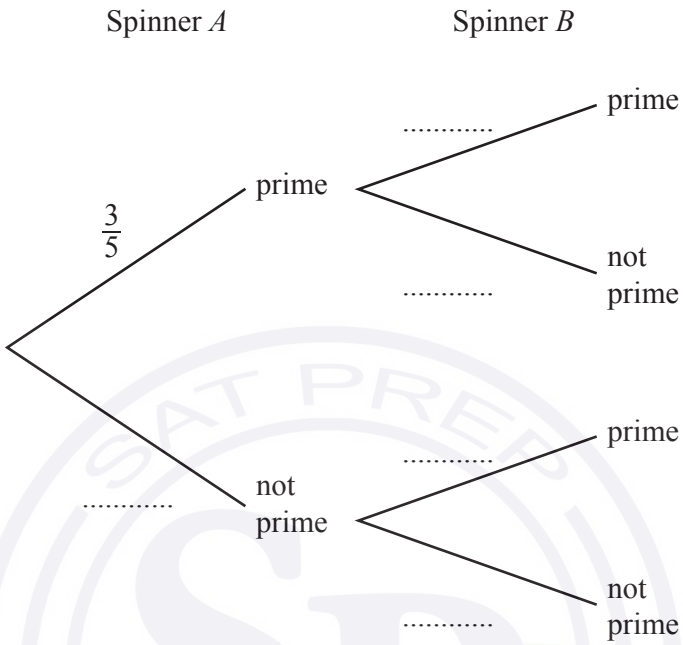
Calculate the time taken for light to travel from this galaxy to Earth.
Give your answer in millions of years.

..... million years [2]

4 **(a)** Lucia has two fair spinners.
Spinner *A* is five-sided and is numbered 1, 2, 3, 4, 5.
Spinner *B* is nine-sided and is numbered 3, 3, 3, 4, 4, 4, 4, 5, 5.

Lucia spins the two spinners and records whether they land on a prime number.

(i) Complete the tree diagram.



[2]

(ii) Find the probability that

(a) the two numbers are both prime

..... [2]

(b) the two numbers are **not** both prime.

..... [1]

(b) Lucia spins Spinner *A* 120 times.

Find the expected number of times the spinner lands on a prime number.

..... [1]

(c) Lucia spins Spinner *B* twice.

Find the probability that the two numbers it lands on add up to 9 or more.

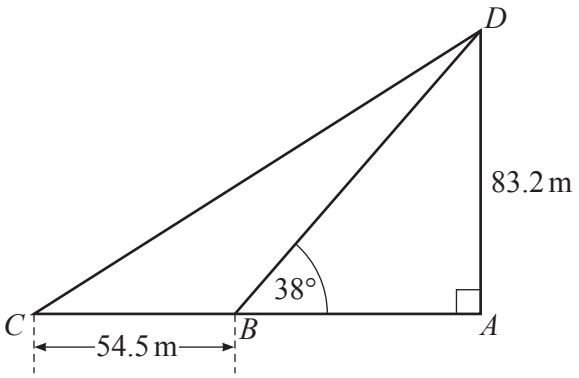
..... [3]

(d) Lucia keeps spinning Spinner *B* until it lands on a 4.

Find an expression, in terms of n, for the probability that this happens on the nth spin.

..... [2]

5 (a)



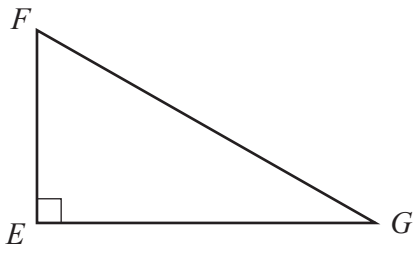
NOT TO SCALE

ACD is a right-angled triangle.
B is on AC and $BC = 54.5$ m.
$AD = 83.2$ m and angle $ABD = 38°$.

Calculate angle ACD.

Angle $ACD =$ ..... [5]

(b)



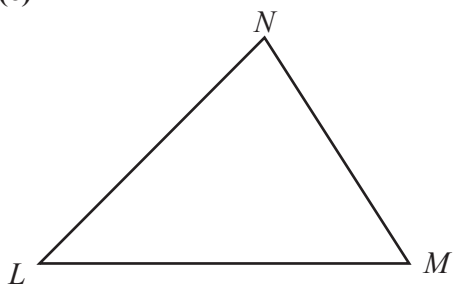
EFG is a right-angled triangle.
A circle can be drawn that passes through the three vertices of the triangle.

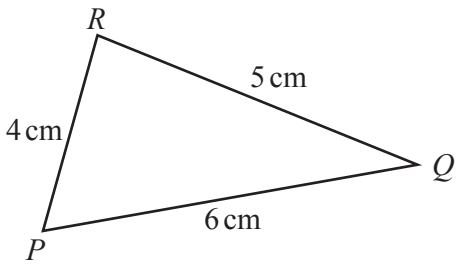
On the diagram, mark the position of the centre of the circle with a cross.
Explain how you decide.

.....

..... [2]

(c)





NOT TO SCALE

In triangle LMN, the ratio angle L : angle M : angle $N = 4 : 5 : 6$.
In triangle PQR, $PQ = 6\,\text{cm}$, $PR = 4\,\text{cm}$ and $QR = 5\,\text{cm}$.

Calculate the difference between the largest angle in triangle PQR and the largest angle in triangle LMN.

..... [7]

6 (a)

Sequence	1st term	2nd term	3rd term	4th term	5th term		*n*th term
A	-7	-3	1	5			
B	7	13	23	37			
C	$\frac{2}{27}$	$\frac{3}{81}$	$\frac{4}{243}$	$\frac{5}{729}$			

Complete the table for the three sequences.

[10]

(b) In a sequence, the sum of the first 49 terms is 7644.
The sum of the first 50 terms is 7975.

Find the 50th term of this sequence.

..... [1]

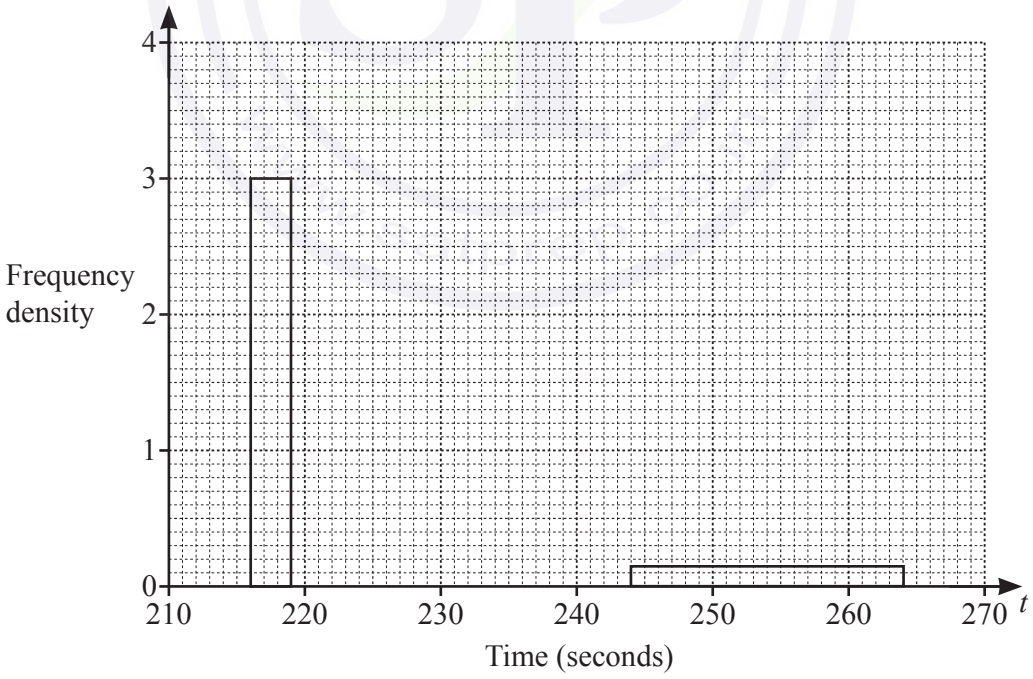
7 The frequency table shows the time of each of 42 athletes in a race.

Time (t seconds)	Number of athletes
$216 < t \leqslant 219$	9
$219 < t \leqslant 224$	14
$224 < t \leqslant 234$	14
$234 < t \leqslant 244$	2
$244 < t \leqslant 264$	3

(a) Calculate an estimate of the mean time.

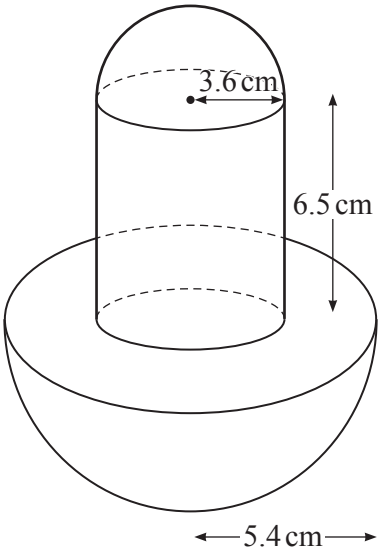
..... seconds [4]

(b) Complete the histogram to show the information in the frequency table.
Two of the blocks have been drawn for you.



[3]

8 (a)



NOT TO SCALE

The diagram shows a solid formed by joining two hemispheres and a cylinder.
The radius of the large hemisphere is 5.4 cm.
The radius of the small hemisphere and the radius of the cylinder are both 3.6 cm.
The height of the cylinder is 6.5 cm.

(i) Show that the volume of the solid is $692\,\text{cm}^3$, correct to the nearest cubic centimetre.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

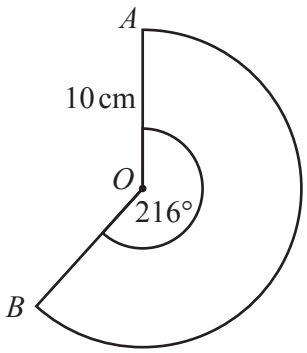
[4]

(ii) A mathematically similar solid is made of silver.
In this solid, the cylinder has radius 0.6 cm.
$1\,\text{cm}^3$ of silver has a mass of 10.49 grams.

Calculate the total mass of this silver solid.

..... g [4]

(b)



NOT TO SCALE

AOB is a sector of a circle, centre O.
$AO = 10\,\text{cm}$ and the sector angle is 216°.

(i) Calculate the length of the arc of this sector.
Give your answer as a multiple of π.

.....cm [2]

(ii) A cone is made from this sector by joining OA to OB.

Calculate the volume of the cone.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [4]

9 $f(x) = (3x+1)(x+5)(x-4)$ $g(x) = 2x-3$ $h(x) = 4^{2x-1}$

(a) Find

(i) $f(0)$

..... [1]

(ii) $g^{-1}(x)$

$g^{-1}(x) =$ ..... [2]

(iii) $gh(2)$.

..... [2]

(b) $g(2x) = 7$

Find the value of x.

$x =$ ..... [2]

(c) Simplify $g(x^2) + gg(x) + 1$.

..... [3]

(d) Find $h^{-1}(16)$.

..... [2]

(e) $f(x) = (3x+1)(x+5)(x-4)$

This can be written in the form $f(x) = ax^3 + bx^2 + cx + d$.

Find the value of each of a, b, c and d.

$a =$ ..... $b =$ ..... $c =$ ..... $d =$ ..... [3]

10 **(a)** ABC is a triangle.

B is the point $(1, -10)$, A is the point $(4, 14)$ and $\overrightarrow{CA} = \begin{pmatrix} -11 \\ 8 \end{pmatrix}$.

(i) Find the coordinates of C.

(..... , ...) [2]

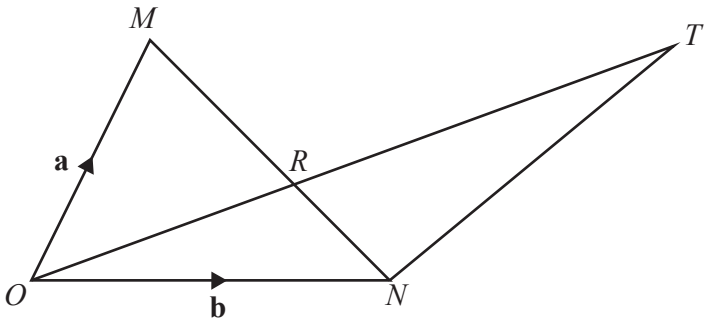
(ii) Find $\overrightarrow{BA}$.

$\overrightarrow{BA} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(iii) Find $\left|\overrightarrow{CA}\right|$.

..... [2]

(b)



NOT TO SCALE

OMN is a triangle.
$\overrightarrow{OM} = \mathbf{a}$ and $\overrightarrow{ON} = \mathbf{b}$.
R is a point on MN such that $MR : RN = 3 : 2$.
ORT is a straight line.

(i) Show that $\overrightarrow{OR} = \frac{2}{5}\mathbf{a} + \frac{3}{5}\mathbf{b}$.

[3]

(ii) **(a)** $\overrightarrow{NT} = 4\mathbf{a} + k\mathbf{b}$ and $\overrightarrow{OT} = c\overrightarrow{OR}$.

Find the value of k and the value of c.

$k =$ ..... $c =$ ..... [4]

(b) Find $\overrightarrow{MT}$.

$\overrightarrow{MT} =$ ..... [1]

11 **(a)** Differentiate $x^3 - 4x^2 - 3x$.

..... [2]

(b) A curve has equation $y = x^3 - 4x^2 - 3x$.

Work out the coordinates of the two stationary points.
Show all your working.

(..... , ...)

(..... , ...) [5]

(c) Determine whether each stationary point is a maximum or a minimum.
Show all your working.

[3]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

7392438156

MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2023**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

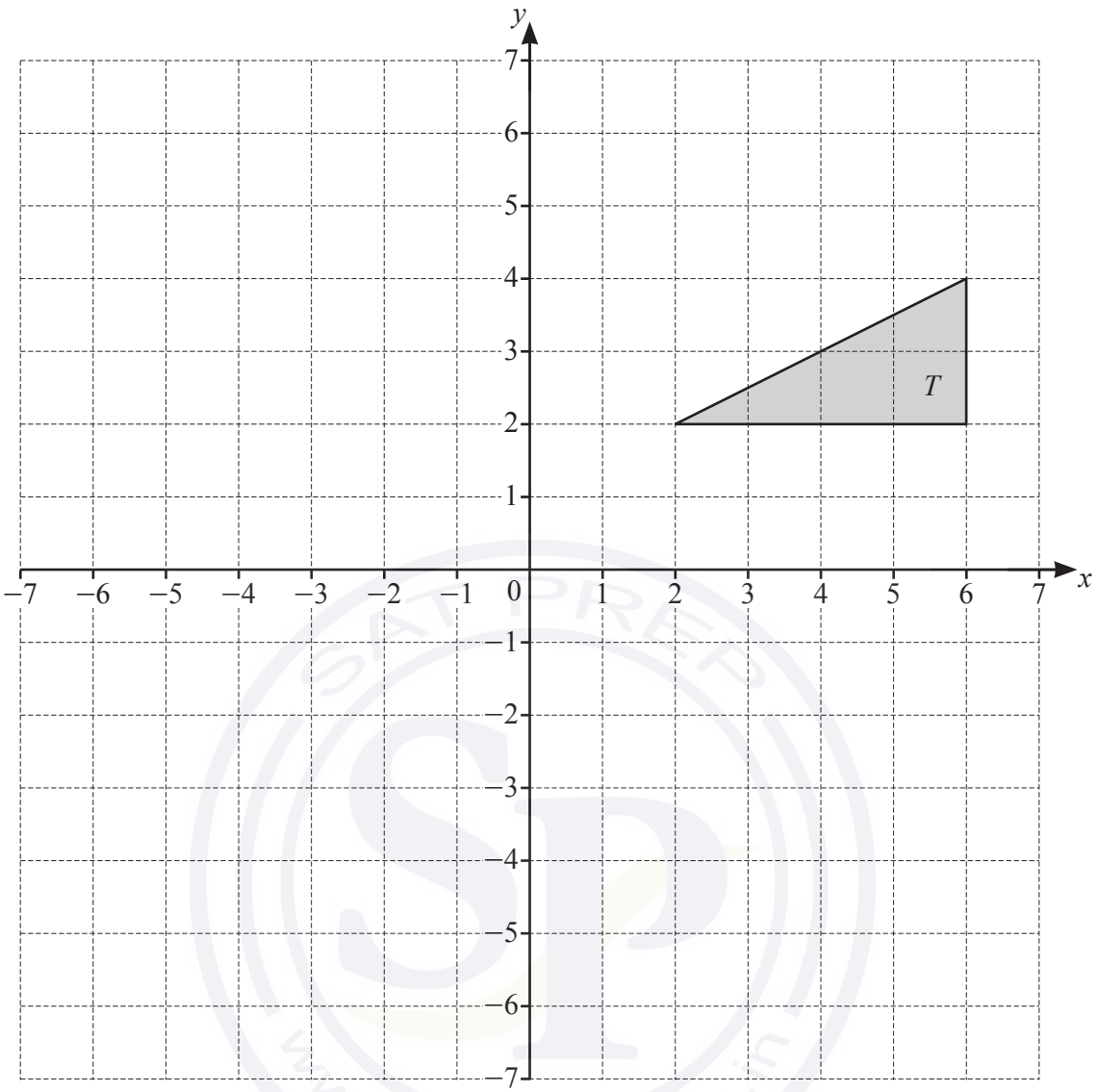
INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

[Turn over

1



(a) **(i)** Translate triangle T by the vector $\begin{pmatrix} -7 \\ 1 \end{pmatrix}$. Label the image K. [2]

(ii) Describe fully the **single** transformation that maps triangle K onto triangle T.

.....

..... [1]

(b) Reflect triangle T in the line $y = 4$. [2]

(c) Rotate triangle T through 90° clockwise about (0, 0). [2]

(d) **(i)** Enlarge triangle T by scale factor $-\frac{1}{2}$, centre (0, 0). Label the image P. [2]

(ii) Describe fully the **single** transformation that maps triangle P onto triangle T.

.....

..... [2]

2 **(a)** Daisy records her 50 homework marks.
The table shows the results.

Homework mark	15	16	17	18	19	20
Frequency	1	3	19	11	10	6

(i) Write down the range.

..... [1]

(ii) Write down the mode.

..... [1]

(iii) Find the median.

..... [1]

(iv) Calculate the mean.

..... [3]

(b) 21 33 20 25 21 34 22 21 20 30 18

The list shows Ed's scores in 11 tests.

(i) Complete the stem-and-leaf diagram to show this information.

1	
2	
3	

Key: 2|5 represents 25

[2]

(ii) Find the median.

..... [1]

(iii) Find the interquartile range.

..... [2]

[Turn over

3 **(a)** The value of Priya's car decreases by 10% every year.
The value today is \$7695.

(i) Calculate the value of the car after one year.

\$ ..... [2]

(ii) Calculate the value of the car one year ago.

\$ ..... [2]

(b) Ali invests \$600 at a rate of 2% per year simple interest.

Calculate the value of Ali's investment at the end of 5 years.

\$ ..... [3]

(c) Sara invests \$500 at a rate of r% per year compound interest.
At the end of 12 years, the value of Sara's investment is \$601.35, correct to the nearest cent.

Find the value of r.

$r =$ ..... [3]

(d) The mass of a radioactive substance decreases exponentially at a rate of 3% each day.

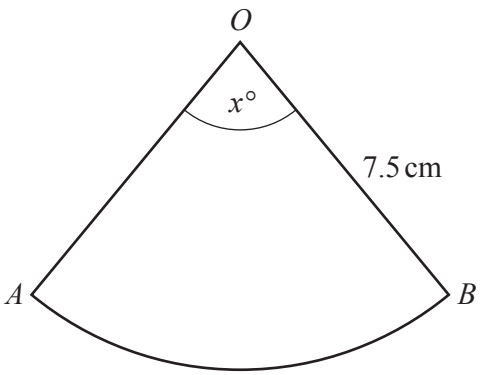
(i) Find the overall percentage decrease at the end of 10 days.

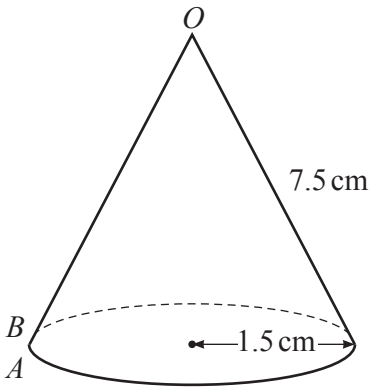
..... % [2]

(ii) Find the number of whole days it takes until the mass of this substance is one half of its original amount.

..... [3]

4 **(a)**





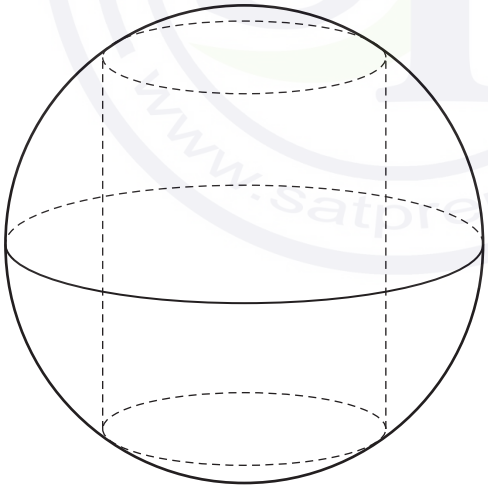
NOT TO SCALE

The diagram shows a sector of a circle that is made into a cone by joining OA to OB.
The sector angle is $x°$ and the radius of the sector is 7.5 cm.
The base radius of the cone is 1.5 cm.

Calculate the value of x.

$x =$ ..... [3]

(b)



NOT TO SCALE

The diagram shows a cylinder with radius 8 cm inside a sphere with radius 17 cm.
Both ends of the cylinder touch the curved surface of the sphere.

(i) Show that the height of the cylinder is 30 cm.

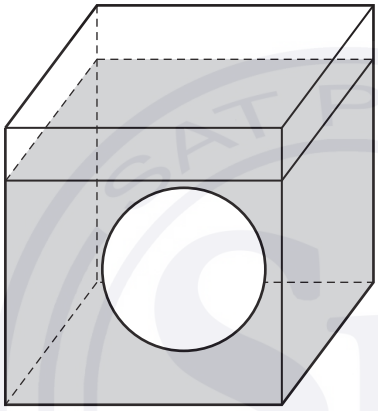
[2]

(ii) Calculate the volume of the cylinder as a percentage of the volume of the sphere.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... % [4]

(c)



NOT TO SCALE

The diagram shows a solid sphere with radius 6 cm inside a cube with side length 20 cm.
The cube contains water to a depth of 15 cm.
The sphere is removed.

Calculate the new depth of water in the cube.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm [3]

5 **(a)** In a shop the cost of a fiction book is $\$x$ and the cost of a reference book is $\$(x+2)$.
The cost of 11 fiction books is the same as the cost of 10 reference books.

Find the value of x.

$x =$ ..... [2]

(b) In another shop, the cost of a fiction book is $\$y$ and the cost of a reference book is $\$(y+2)$.
Maria spends \$95 on fiction books and \$147 on reference books.
She buys a total of 12 books.

(i) Show that $6y^2 - 109y - 95 = 0$.

[4]

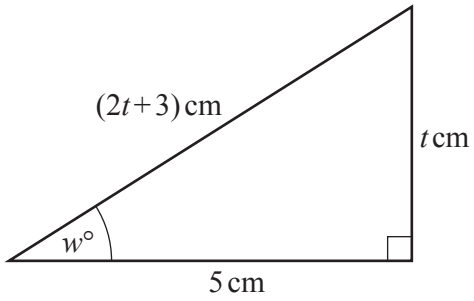
(ii) Factorise $6y^2 - 109y - 95$.

..... [2]

(iii) Find the value of y.

$y =$ ..... [1]

6



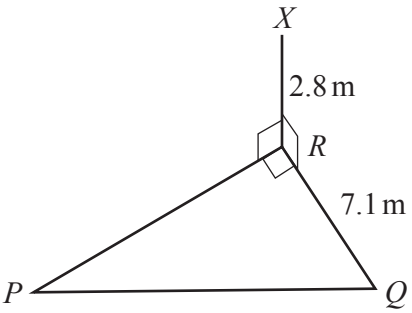
NOT TO SCALE

The diagram shows a right-angled triangle.

Find the value of w.

$w =$ ..... [7]

7 **(a)**



NOT TO SCALE

The diagram shows a right-angled triangle PQR on horizontal ground.
X is vertically above R and the angle of elevation of X from P is 21°.
$XR = 2.8$ m and $RQ = 7.1$ m.

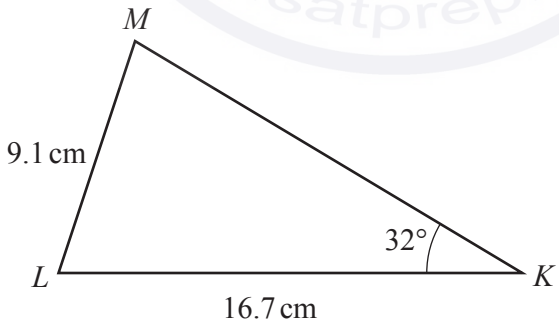
(i) Calculate the angle of elevation of X from Q.

..... [2]

(ii) Calculate PQ.

..... m [3]

(b)

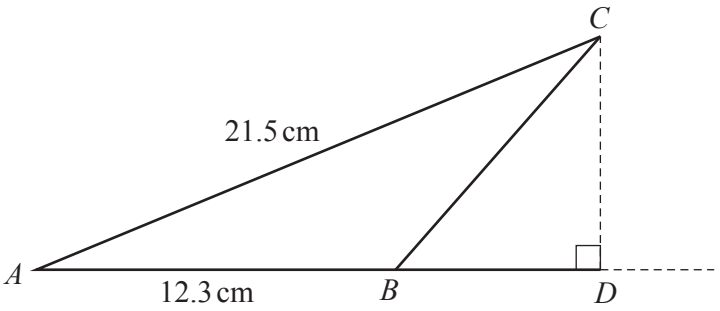


NOT TO SCALE

Calculate the acute angle KML.

Angle KML = ... [3]

(c)



NOT TO SCALE

The area of triangle ABC is $62.89\,\text{cm}^2$.

(i) Show that angle $BAC = 28.4°$, correct to 1 decimal place.

[2]

(ii) Calculate BC.

..... cm [3]

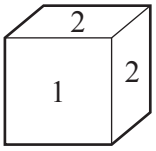
(iii) AB is extended to a point D such that angle $BDC = 90°$.

Calculate BD.

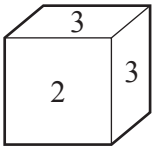
..... cm [3]

[Turn over

8



Dice A



Dice B

The diagram shows two fair dice.
Dice A is numbered 1, 2, 2, 2, 3, 6.
Dice B is numbered 2, 3, 3, 4, 4, 4.

(a) (i) Dice A is rolled once.

Write down the probability that it lands on the number 6.

..... [1]

(ii) Dice A is rolled 150 times.

Find the number of times it is expected to land on the number 6.

..... [1]

(b) Dice A and Dice B are each rolled once.

(i) Find the probability that the two numbers they land on have a total of 6.

..... [3]

(ii) Find the probability that when the two numbers they land on have a total of 6, both numbers are 3.

..... [2]

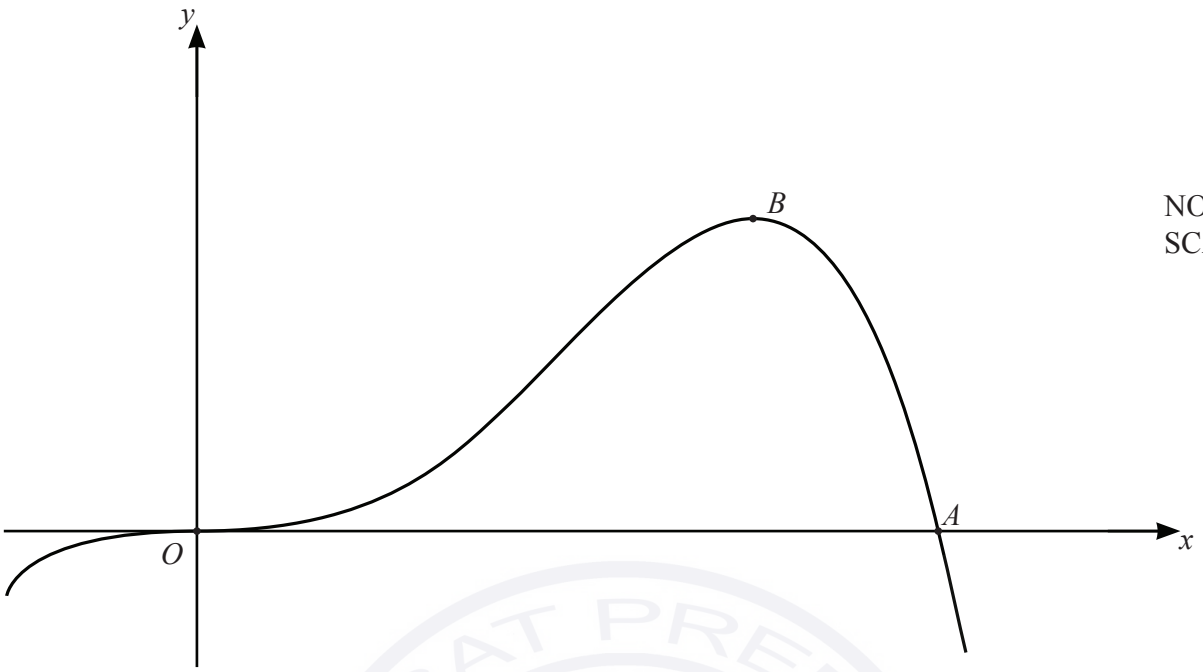
(c) Dice B is rolled n times.

The probability that on the nth roll it first lands on a number 3 is $\frac{32}{729}$.

Find the value of n.

$n =$ ..... [2]

9



NOT TO SCALE

The diagram shows a sketch of the graph of $y = 4x^3 - x^4$.
The graph crosses the x-axis at the origin O and at the point A.
The point B is a maximum point.

(a) Differentiate $4x^3 - x^4$.

..... [2]

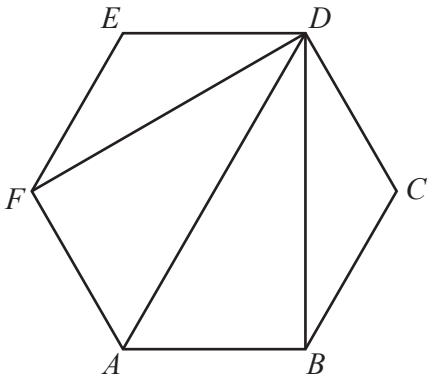
(b) Find the coordinates of B.

(..... , ...) [3]

(c) Find the gradient of the graph at the point A.

..... [3]

10 (a)



NOT TO SCALE

ABCDEF is a regular hexagon.
DF, *DA* and *DB* are diagonals.

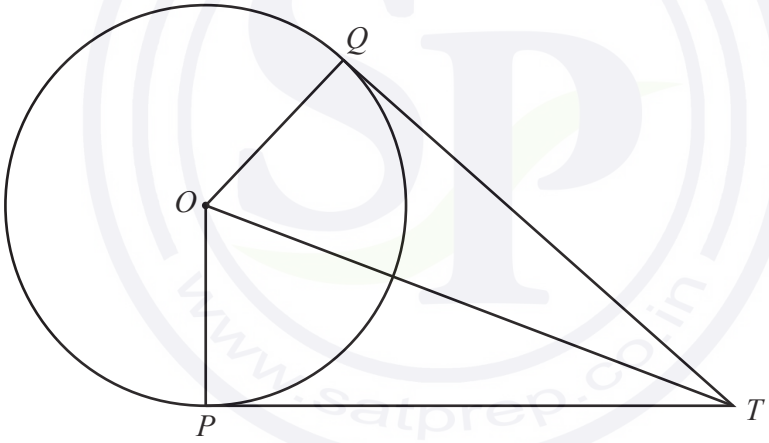
Complete the following statements using three different triangles.

Triangle *DEF* is congruent to triangle .....

Triangle ..... is congruent to triangle .....

[2]

(b)



NOT TO SCALE

P and *Q* are points on the circle with centre *O*.
TP and *TQ* are tangents to the circle from the point *T*.

Complete the following statements and reasons.

In triangles *OPT* and *OQT*

OP = ... because each is a radius of the circle

OT is a common side

Angle *OPT* = angle ..... = 90° because .....

Triangles *OPT* and *OQT* are congruent using the criterion .....

This proves that the tangents *TP* and *TQ* are .....

[5]

11 $f(x) = 1 - 3x$ $g(x) = (x-1)^2$ $h(x) = \frac{3}{x}, x \neq 0$

(a) Find g(3).

..... [1]

(b) Find $f(x-2)$, giving your answer in its simplest form.

..... [2]

(c) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(d) $gf(x) - g(x)f(x) = 3x^3 + ax^2 + bx + c$

Find the value of each of a, b and c.

$a =$ .....

$b =$ .....

$c =$ ..... [5]

(e) Find $h(x) - f(x)$, giving your answer as a single fraction in its simplest form.

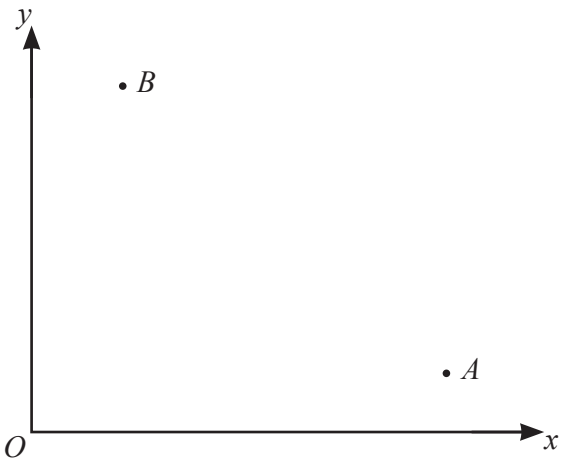
..... [3]

(f) $h(x^n) = 3x^7$

Find the value of n.

$n =$ ..... [1]

12



NOT TO SCALE

O is the origin (0, 0), A is the point (8, 1) and B is the point (2, 5).

(a) Write as column vectors.

(i) $\overrightarrow{OB}$

$\overrightarrow{OB} =$ $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(ii) $\overrightarrow{AB}$

$\overrightarrow{AB} =$ $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(b) Find the equation of the line AB.
Give your answer in the form $y = mx + c$.

$y =$ ..... [3]

(c) Find the equation of the perpendicular bisector of AB.
Give your answer in the form $y = mx + c$.

$y =$ ..... [4]

(d) The line AB meets the y-axis at P.
The perpendicular bisector of AB meets the y-axis at Q.

Find the length of PQ.

..... [2]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2850835929

MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2023**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

1 The table shows the amount received when exchanging **$100** in some countries.

Country	Amount received for $100
Wales	77.05 pounds
India	7437.05 rupees
China	671.20 yuan
Spain	85.35 euros

(a) Brad changes $250 to Indian rupees.

Calculate the amount he receives correct to the nearest rupee.

..... rupees [2]

(b) Wang changes 5400 Chinese yuan into dollars.

Calculate how much he receives in dollars, correct to the nearest cent.

$ ..... [2]

(c) Gretal lives in Spain and goes on holiday to Wales.
She spends 3500 euros in total on travel and hotels in the ratio

$$\text{travel} : \text{hotels} = 4 : 3.$$

(i) Work out how much Gretal spends, in euros, on travel.

..... euros [2]

(ii) Work out how much she spends, **in pounds**, on hotels.

..... pounds [3]

(iii) Gretal flies home to Spain.
The plane flies a distance of 2200 km, correct to the nearest 100 km.
The average speed of the plane is 740 km/h, correct to the nearest 20 km/h.

Calculate the lower bound of the time taken, in hours and minutes, for this flight.

..... h ..... min [3]

2 The table shows the number of each type of bird seen in a garden on Monday.

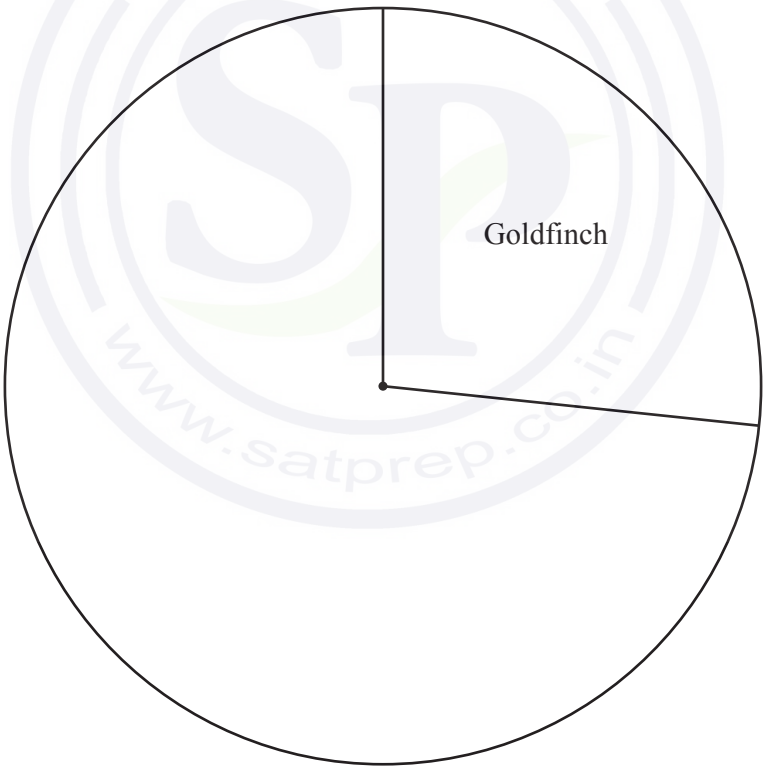
Type of bird	Frequency	Pie chart sector angle
Goldfinch	8	96°
Jay	6	
Starling	11	
Robin	5	

(a) Find the percentage of the birds that are Starlings.

..... % [2]

(b) **(i)** In the table, complete the column for the pie chart sector angle. [2]

(ii) Complete the pie chart to show the information in the table.



[2]

(c) On Tuesday, the number of Goldfinches seen in the garden increased by 262.5%.

Calculate the number of Goldfinches seen on Tuesday.

..... [2]

(d) One of the most common birds in the world is the Red-Billed Quelea which lives in Sub-Saharan Africa.
There are approximately 1500 million of these birds in this area.

(i) Write 1500 million in standard form.

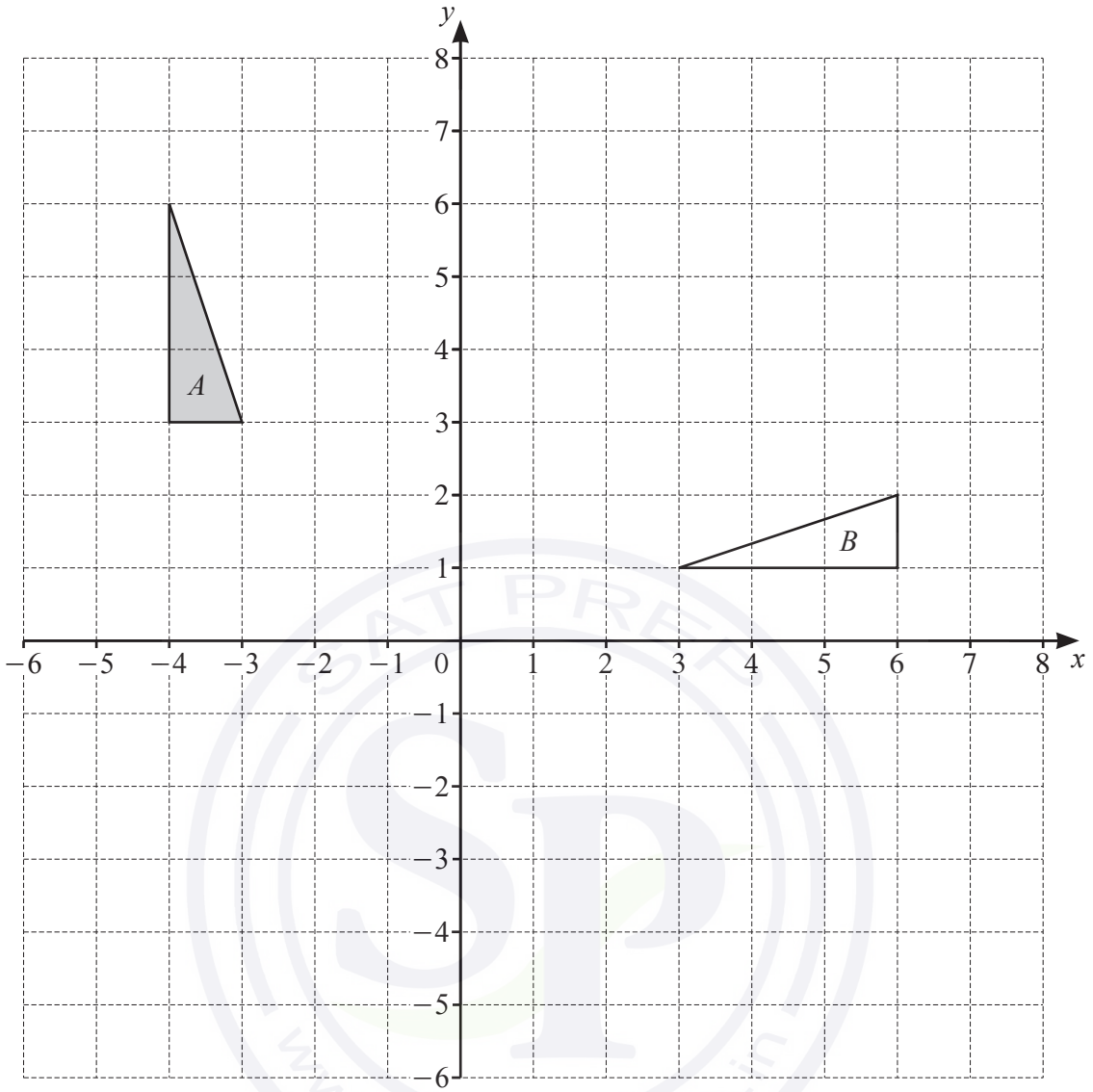
..... [1]

(ii) The land area of Sub-Saharan Africa is approximately 21.2 million square kilometres.

Work out the average number of these birds per square kilometre.

..... birds/km^2 [2]

3



(a) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

(b) Draw the image of triangle A after

(i) a reflection in the line $y = 1$ [2]

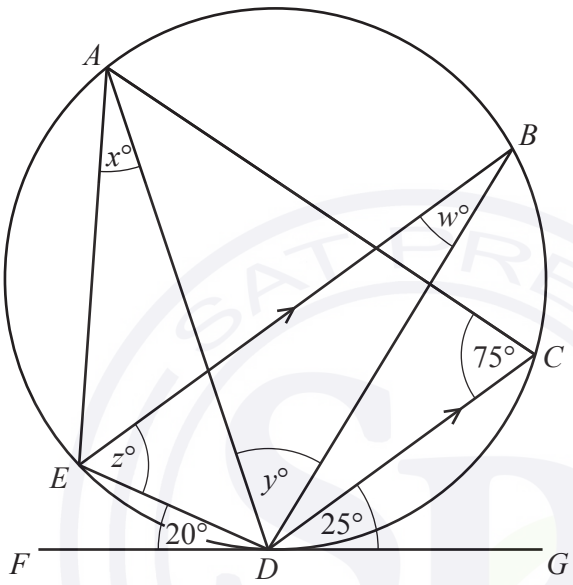
(ii) a translation by the vector $\begin{pmatrix} 5 \\ -7 \end{pmatrix}$ [2]

(iii) an enlargement, scale factor 2, centre $(-4,\ 5)$. [2]

4 **(a)** Find the size of one interior angle of a regular 10-sided polygon.

..... [2]

(b)



NOT TO SCALE

The points A, B, C, D and E lie on a circle.
FG is a tangent to the circle at D.
EB is parallel to DC.

Find the value of each of w, x, y and z.

$w =$ .....

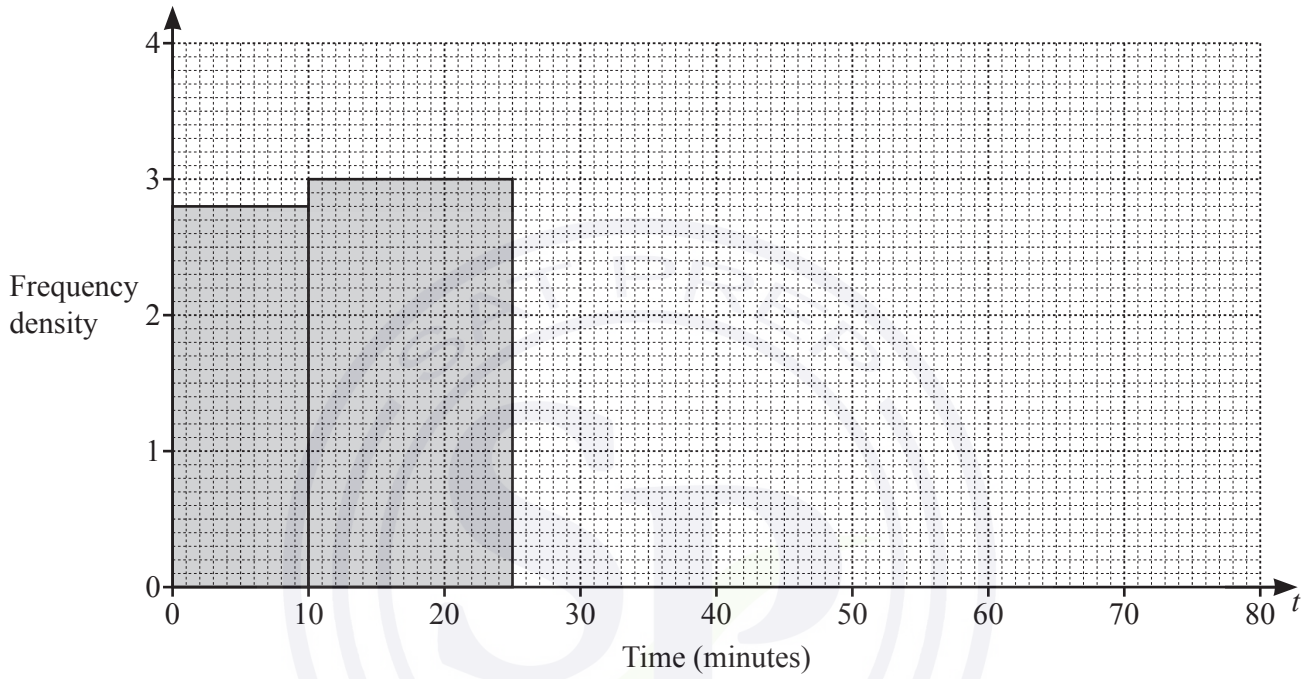
$x =$ .....

$y =$ .....

$z =$ ..... [5]

5 Indira records the time taken for workers in her company to travel to work.
The table and the histogram each show part of this information.

Time (t minutes)	$0 < t \leqslant 10$	$10 < t \leqslant 25$	$25 < t \leqslant 40$	$40 < t \leqslant 60$	$60 < t \leqslant 80$
Frequency			57	38	12



(a) Complete the table and the histogram.

[5]

(b) Calculate an estimate of the mean time.

..... min [4]

(c) Rashid says:

'The longest time that any of these workers take to travel to work is 80 minutes.'

Give a reason why Rashid may be wrong.

.....

..... [1]

(d) Indira picks three workers at random from those who take longer than 25 minutes to travel to work.

Calculate the probability that one worker takes 60 minutes or less and the other two each take more than 60 minutes.

..... [4]

6 $f(x) = 5x - 3$ $g(x) = 64^x$ $h(x) = \frac{2}{x+1}, \quad x \neq -1$

(a) Find the value of

(i) $f(2)$

..... [1]

(ii) $gf(0.5)$.

..... [2]

(b) Find $h^{-1}(x)$.

$h^{-1}(x) =$ ..... [3]

(c) Find x when $g(x) = \frac{1}{2^5}$.

$x =$ ..... [2]

(d) Write as a single fraction in its simplest form $\frac{1}{f(x)} - h(x)$.

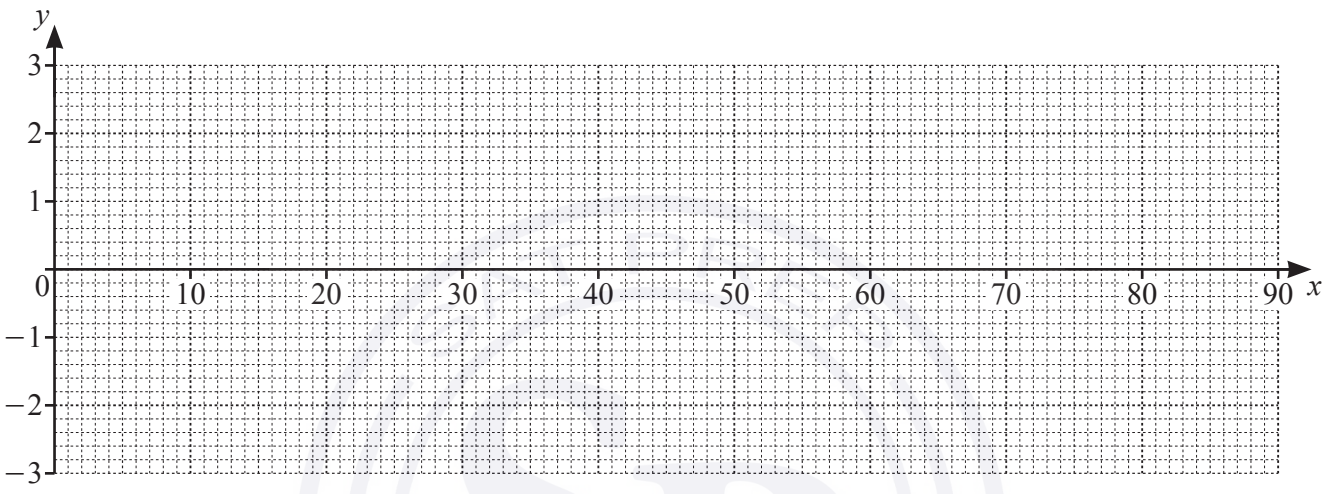
..... [4]

7 **(a)** Complete the table of values for $y = 3\cos 2x°$.
Values are given correct to 1 decimal place.

x	0	10	20	30	40	45	50	60	70	80	90
y	3.0	2.8	2.3	1.5	0.5		−0.5		−2.3		−3.0

[3]

(b) Draw the graph of $y = 3\cos 2x°$ for $0 \leqslant x \leqslant 90$.



[4]

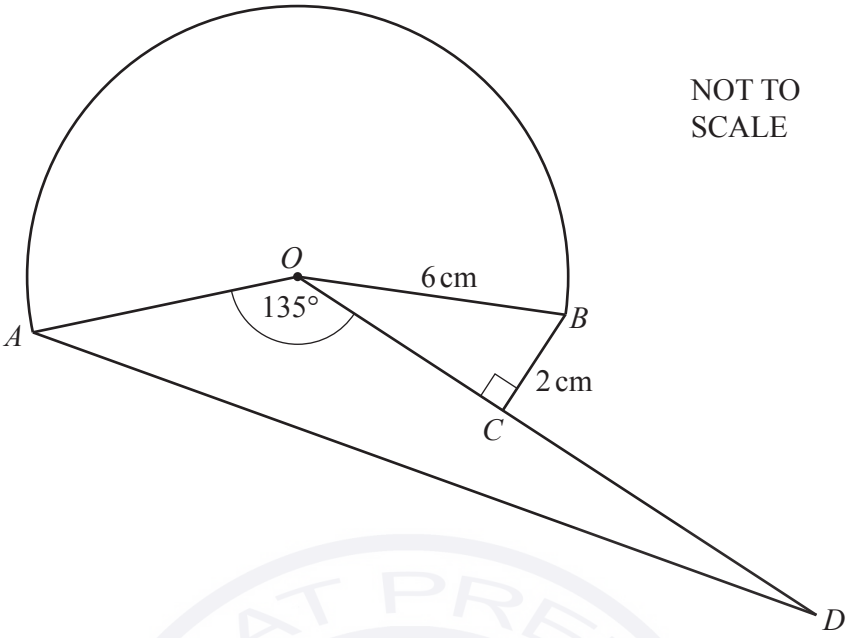
(c) Use your graph to solve the equation $3\cos 2x° = -2$ for $0 \leqslant x \leqslant 90$.

$x =$ ..... [1]

(d) By drawing a suitable straight line, solve the equation $120\cos 2x° = 80 - x$ for $0 \leqslant x \leqslant 90$.

$x =$ ..... [3]

8 (a)



The diagram shows a shape made from a major sector AOB and triangles OBC and AOD.
$OB = 6\,\text{cm}$, $BC = 2\,\text{cm}$, obtuse angle $AOC = 135°$ and angle $BCO = 90°$.

(i) Show that angle $BOC = 19.5°$, correct to 1 decimal place.

[2]

(ii) Calculate the area of the major sector AOB.

..... cm^2 [3]

(iii) C is the midpoint of OD.

Calculate AD.

..... cm [5]

(iv) Calculate the total area of the shape.

..... cm^2 [4]

(b) A sector of a circle has radius 8 cm and area 160 cm^2.
A mathematically similar sector has radius 20 cm.

Calculate the area of the larger sector.

..... cm^2 [3]

[Turn over

9 A is the point (0, 2), B is the point (3, 3) and C is the point (4, 0).

(a) Determine if triangle ABC is scalene, isosceles or equilateral.
You must show all your working.

[4]

(b) **(i)** Find the equation of the line AC.
Give your answer in the form $y = mx + c$.

$y =$ ..... [3]

(ii) Find the equation of the perpendicular bisector of AC.
Give your answer in the form $y = mx + c$.

$y =$ ..... [4]

(iii) $ABCD$ is a kite.
The point D has coordinates $(w, 4w + 1)$.

Find the coordinates of D.

(..... , ...) [3]

10 **(a)** Expand and simplify.

$$4(2x-1)-6(3-x)$$

..... [2]

(b) Factorise completely.

(i) $6x^2y+9xy$

..... [2]

(ii) $4x^2-y^2+8x+4y$

..... [3]

(c) Antonio travels 100 km at an average speed of x km/h.
He then travels a further 150 km at an average speed of $(x + 10)$ km/h.
The time taken for the whole journey is 4 hours 20 minutes.

(i) Show that $13x^2 - 620x - 3000 = 0$.

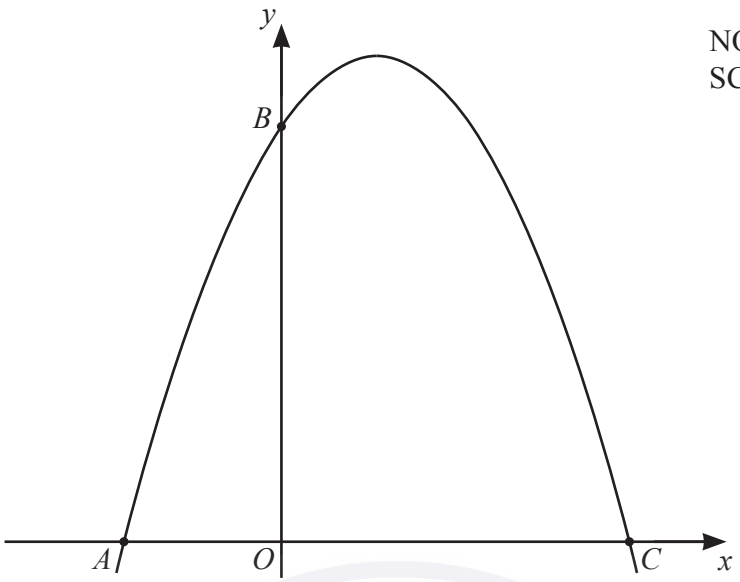
[4]

(ii) Solve $13x^2 - 620x - 3000 = 0$ to find the speed Antonio travels for the first 100 km of the journey.
You must show all your working and give your answer correct to 1 decimal place.

..... km/h [3]

[Turn over

11



NOT TO SCALE

The diagram shows a sketch of $y = 18 + 5x - 2x^2$.

(a) Find the coordinates of the points A, B and C.

A (..... , ...)

B (..... , ...)

C (..... , ...) [4]

(b) Differentiate $18 + 5x - 2x^2$.

..... [2]

(c) Find the coordinates of the point on $y = 18 + 5x - 2x^2$ where the gradient is 17.

(..... , ...) [3]

BLANK PAGE

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

8881225793

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2023**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages.

BLANK PAGE

1 **(a)** An orchard has 1250 trees.
The trees are in the ratio apple : pear : cherry = 12 : 9 : 4.

(i) Calculate the number of apple trees.

..... [2]

(ii) Last year in the orchard, the mean mass of fruit produced was 64 kg per tree.

Calculate the total mass of fruit produced last year.
Give your answer in tonnes.
[1 tonne = 1000 kg]

..... tonnes [2]

(iii) Last year, the mean mass of pears produced was 54 kg per tree.
This was a decrease of 10% on the mean mass of pears produced per tree from the year before.

Calculate the mean mass of pears produced by each pear tree the year before.

..... kg [2]

(iv) The orchard loses $\frac{1}{5}$ of its total number of trees in a storm.

Calculate the number of trees that remain.

..... [2]

(b) Paulo buys some pears from a market.
Pears cost \$0.54 each or 0.51 euros each.

(i) Paulo pays **in dollars** for 12 pears.

Calculate the change he receives from \$10.

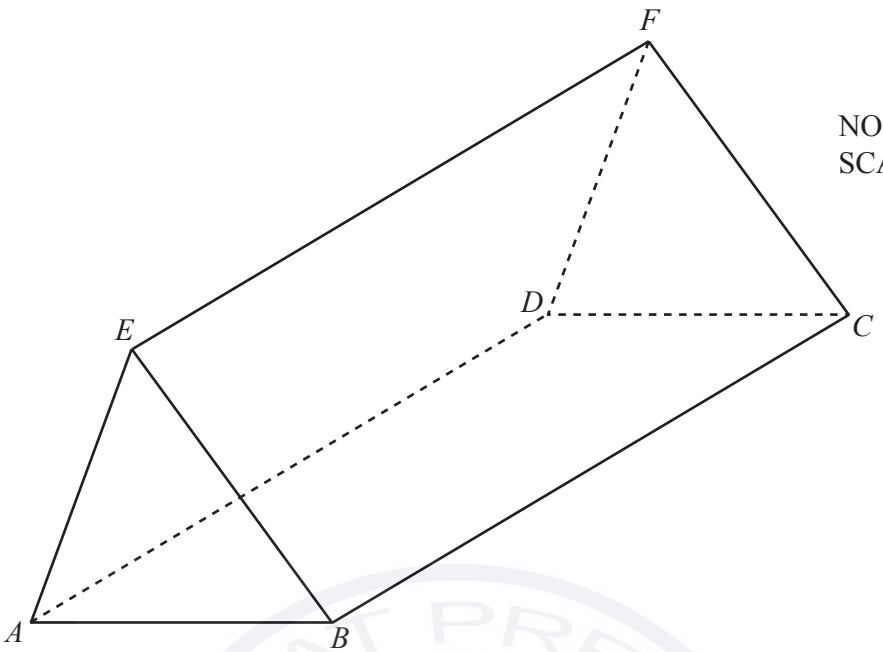
\$ ..... [2]

(ii) The exchange rate is \$1 = 0.826 euros.

Calculate how much more Paulo pays for **each** pear when he pays in euros.
Give your answer in dollars, correct to the nearest cent.

\$ ..... [3]

2



The diagram shows a solid triangular prism $ABCDEF$ of length 15 cm.
$AB = 6.4$ cm, $EB = 5.7$ cm and the volume of the prism is 145 cm^3.

(a) Show that angle $EBA = 32°$, correct to the nearest degree.

[3]

(b) Find the length of EA.

..... cm [3]

(c) Calculate the shortest distance from E to AB.

..... cm [3]

(d) Calculate the angle BF makes with the base, $ABCD$, of the prism.

..... [4]

(e) The prism is made of plastic with density $938\,kg/m^3$.

Calculate the mass of the prism in **grams**.
[Density = mass ÷ volume]

..... g [3]

3 **(a)** The table shows information about the mass of each of 1000 eggs.

Mass (m grams)	$40 < m \leqslant 50$	$50 < m \leqslant 56$	$56 < m \leqslant 64$	$64 < m \leqslant 70$
Frequency	126	520	154	200

(i) Calculate an estimate of the mean.

..... g [4]

(ii) An egg is picked at random from the 1000 eggs.

Find the probability that this egg has a mass greater than 56 g.
Give your answer as a fraction in its simplest form.

..... [2]

(b) One year, a farmer makes a profit of $24 730 selling eggs.

Write this profit

(i) correct to 2 significant figures

$ ..... [1]

(ii) in standard form.

$ ..... [1]

(c) On a farm, there are 500 hens, correct to the nearest 10.

(i) In one year, the mean number of eggs laid per hen was 320 eggs, correct to the nearest 20.

Calculate the upper bound for the total number of eggs all the hens lay in that year.

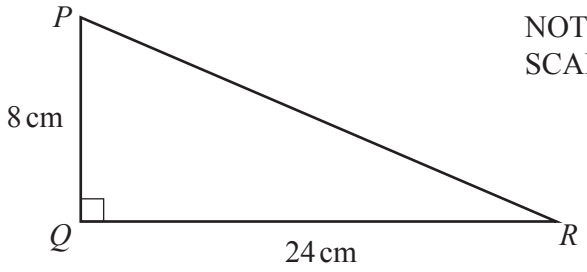
..... [3]

(ii) Another farm has 800 hens, correct to the nearest 20.

Calculate the lower bound for the difference between the number of hens on the two farms.

..... [2]

4 **(a)**



NOT TO SCALE

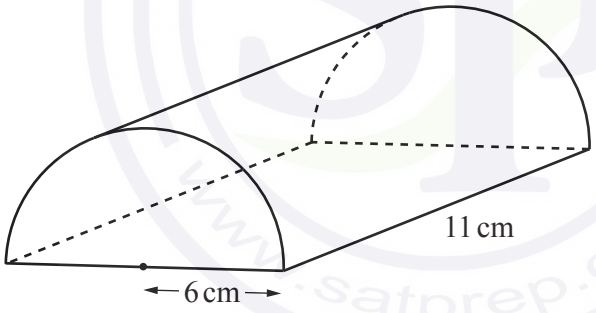
(i) Calculate the area of triangle PQR.

..... cm^2 [2]

(ii) Calculate angle PRQ.

Angle PRQ = ... [2]

(b)



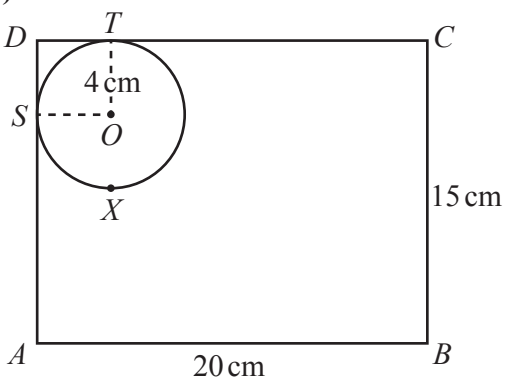
NOT TO SCALE

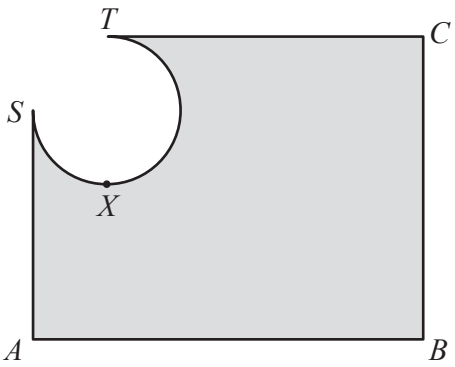
The diagram shows a half-cylinder of radius 6 cm and length 11 cm.

Calculate the volume of the half-cylinder.

..... cm^3 [2]

(c)





NOT TO SCALE

(i) *ABCD* is a rectangle with $AB = 20$ cm and $BC = 15$ cm.
S, *X* and *T* are points on a circle centre *O*, such that *DSA* and *DTC* are tangents to the circle.
The radius of the circle is 4 cm and *TX* is a diameter of the circle.
The shape *DSXT* is removed from the corner of the rectangle, leaving the shaded shape shown in the second diagram.

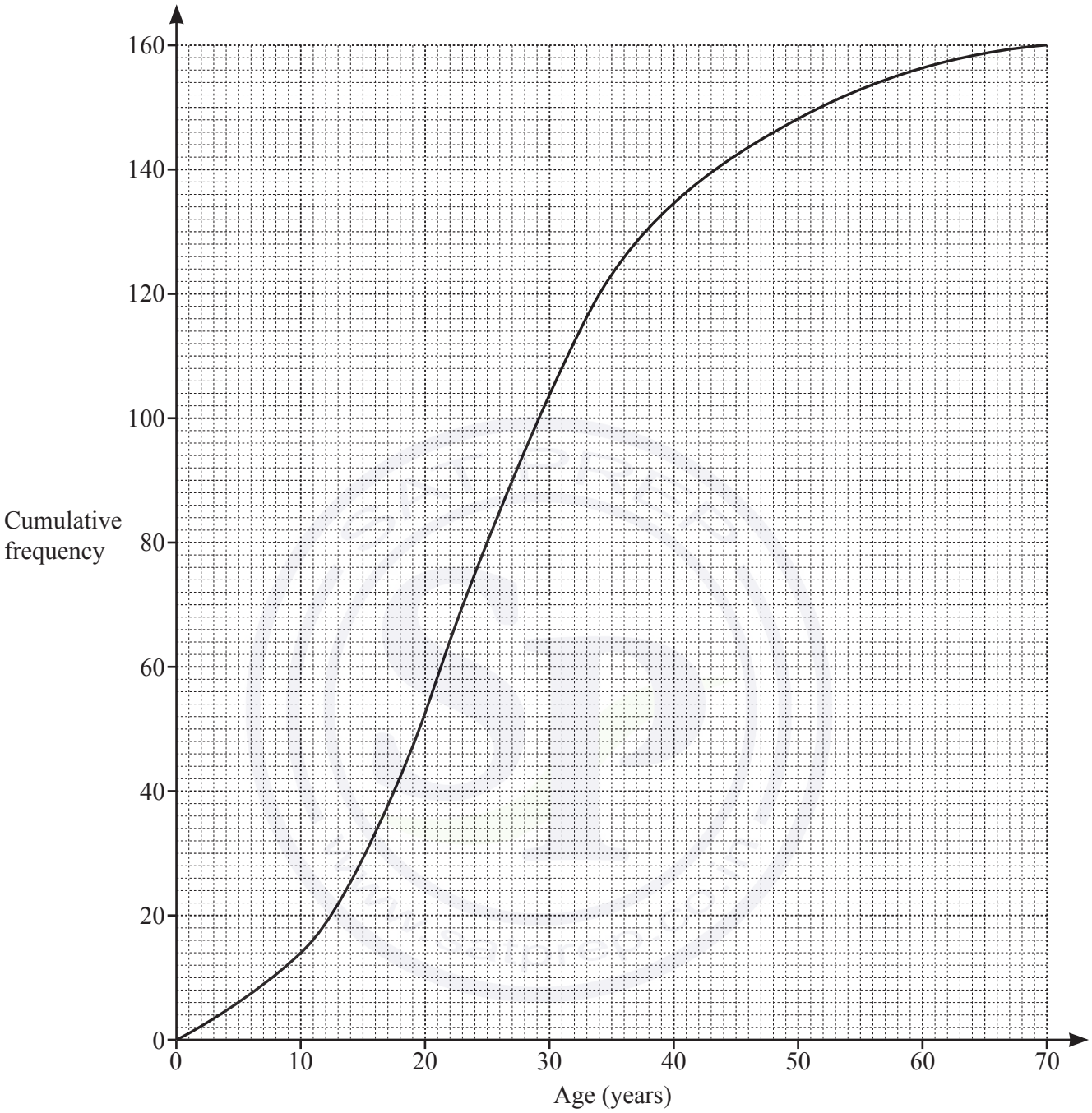
Calculate the area of the shaded shape.

..... cm^2 [5]

(ii) Calculate the perimeter of the shaded shape.

..... cm [3]

5 **(a)** There are 160 people in a village.
The cumulative frequency diagram shows information about their ages.



(i) Find an estimate for

(a) the median age

..... [1]

(b) the lower quartile

..... [1]

(c) the number of people who are 50 or more years of age

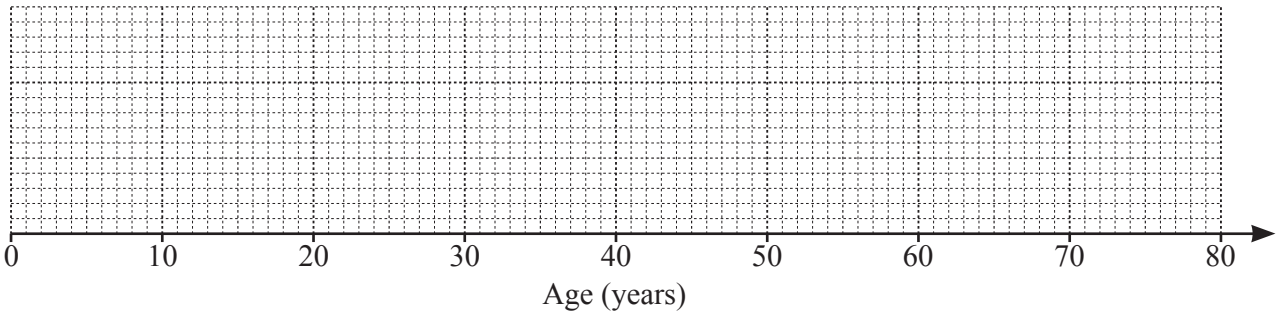
..... [2]

(d) the 65th percentile.

..... [2]

(ii) The youngest person in the village is 1 year old and the oldest is 70 years old.

(a) Draw a box-and-whisker plot to show the distribution of ages in the village.



[3]

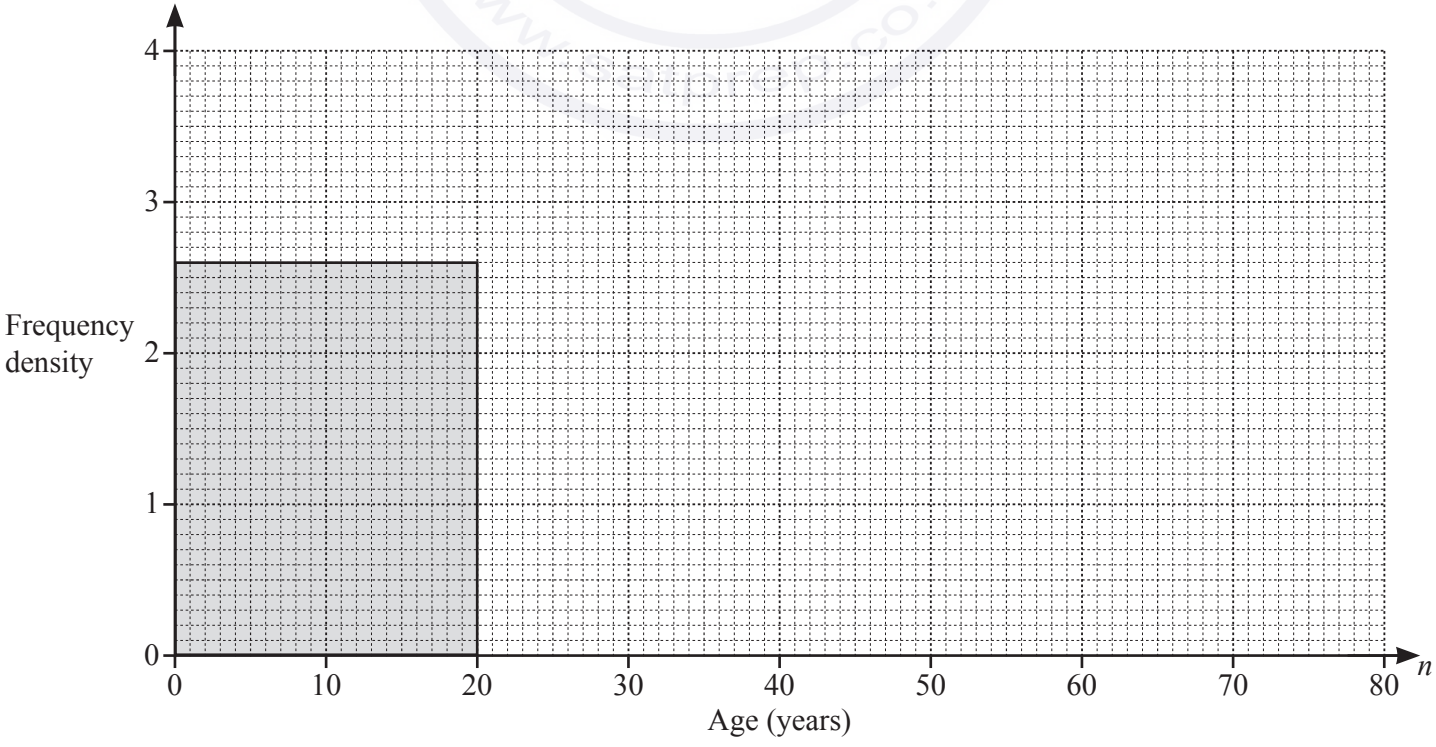
(b) Write down an estimate of the percentage of people in the village that are younger than the median age.

..... % [1]

(b) The frequency table shows information about the age of each person in another village.

Age (n years)	$0 < n \leqslant 20$	$20 < n \leqslant 30$	$30 < n \leqslant 50$	$50 < n \leqslant 80$
Frequency	52	37	24	60

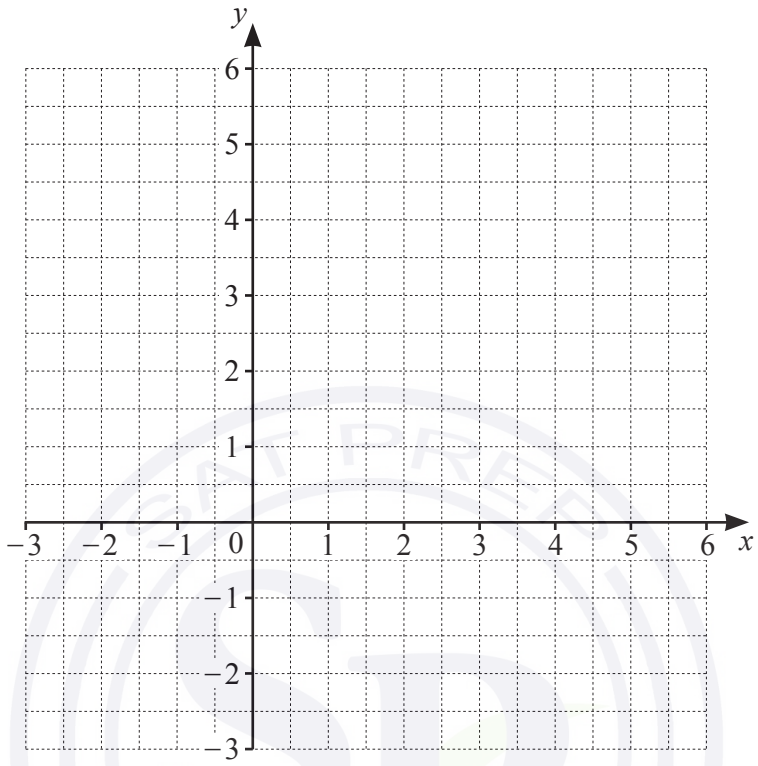
On the grid, complete the histogram to show this information.
The first block has been drawn for you.



[3]

6 **(a)** In the square $ABCD$, A has coordinates $(-2, 1)$ and B has coordinates $(1, 5)$.
C has coordinates (a, b), where a and b are both positive integers.

Find the coordinates of C and the coordinates of D.
You may use the grid to help you.



C (..... , ...)

D (..... , ...) [4]

(b) P has coordinates $(-1, 3)$ and Q has coordinates $(6, 4)$.

(i) Find the coordinates of the midpoint of PQ.

(..... , ...) [2]

(ii) Find the length PQ.

..... [3]

(iii) Find the gradient of PQ.

..... [2]

(iv) Find the equation of the line parallel to PQ that crosses the x-axis at $x = 2$.

..... [3]

7 **(a)** Factorise fully.

(i) $27y^2 - 3$

..... [3]

(ii) $2m - pk + 2k - pm$

..... [2]

(b) Solve $\frac{x-1}{x+1} - \frac{6}{x-1} = 1$.

$x =$ ..... [5]

(c) Solve $4x^2 - 3x - 2 = 0$.
You must show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

(d) Make k the subject of the formula.

$$\frac{k}{m} = 4 + kp$$

$k =$ ..... [4]

8 A tailor makes x dresses and y shirts in one week.
In one week

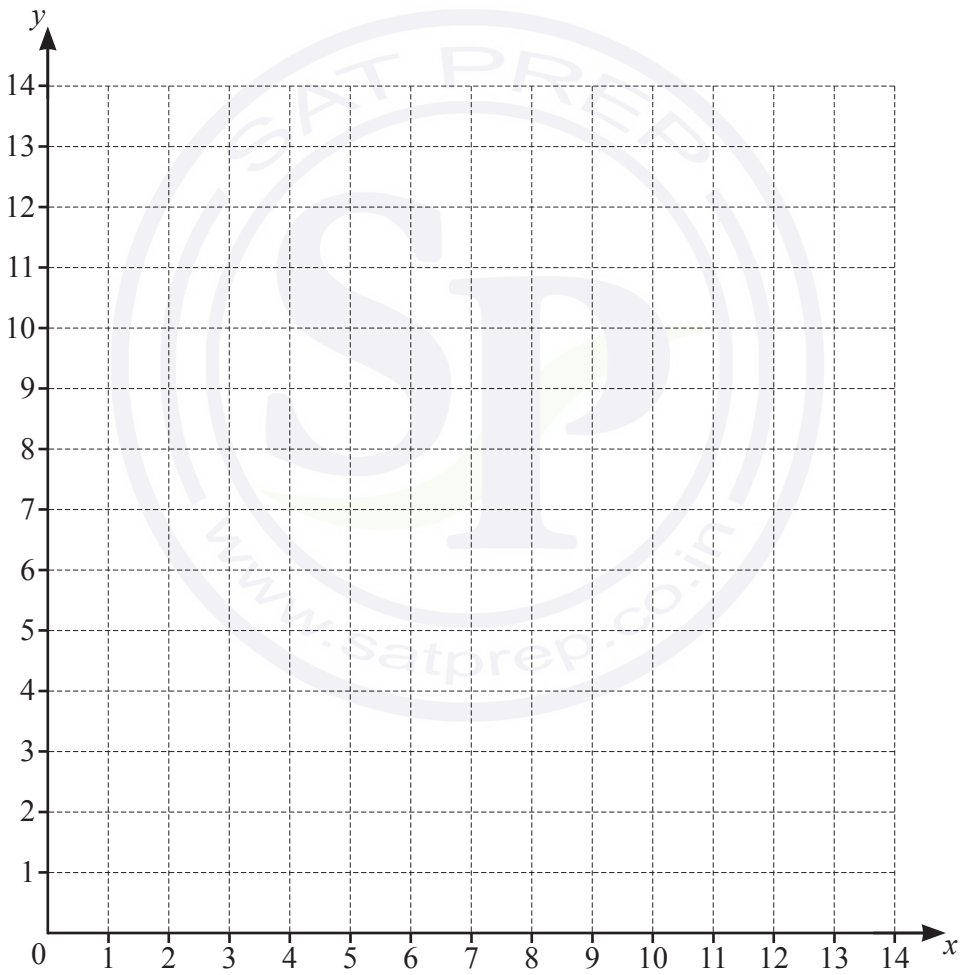
- he makes at least 4 dresses
- he makes no more than 7 shirts
- he makes less than 14 dresses and shirts altogether
- the number of shirts he makes is more than $\frac{2}{3}$ of the number of dresses.

One of the inequalities that shows this information is $x \geqslant 4$.

(a) Write down the other three inequalities in x and/or y.

.... [3]

(b)



On the grid, draw 4 straight lines and shade the unwanted regions to show these inequalities.
Label the region R that satisfies the 4 inequalities. [6]

(c) Use your diagram to find the smallest number of dresses and the smallest number of shirts the tailor makes in one week.

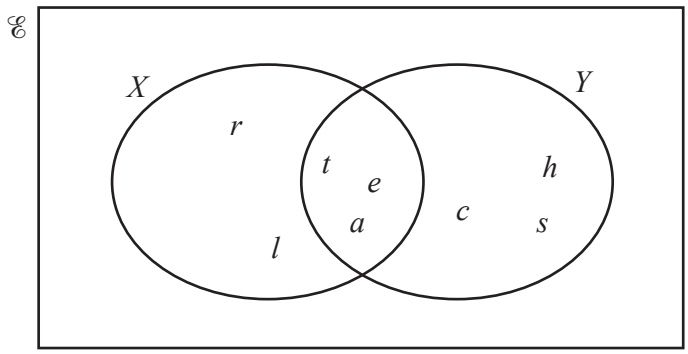
..... dresses and ..... shirts [1]

(d) The profit the tailor makes on one dress is $10 and the profit on one shirt is $6.

Use your diagram to find the largest profit the tailor can make in one week.

$ ..... [2]

9 **(a)** The Venn diagram shows set X and set Y.



(i) List the elements of X.

..... [1]

(ii) Find $n(Y')$.

..... [1]

(b) In each Venn diagram, shade the required region.

$P \cup Q$ $P' \cap Q$

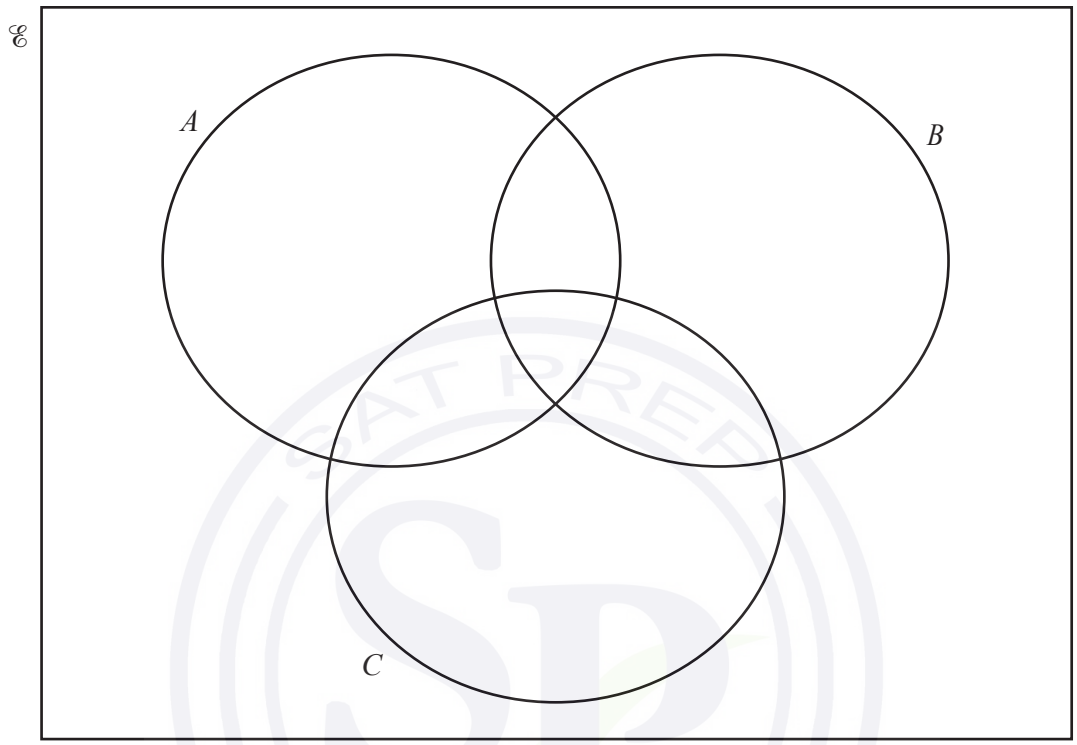
[2]

(c) $\mathscr{E} = \{\text{positive integers} < 13\}$

$A = \{x : x < 9\}$

$B = \{x : x \text{ is even}\}$

$C = \{x : x \text{ is a multiple of } 3\}$



(i) Complete the Venn diagram. [3]

(ii) Find $\text{n}(A' \cup (B \cap C))$.

..... [1]

Question 10 is printed on the next page.

10 $f(x) = x - 4$ $g(x) = 2x + 5$ $h(x) = 3^x$

(a) Find

(i) $f(-3)$

..... [1]

(ii) $g^{-1}(x)$

$g^{-1}(x) =$ ..... [2]

(iii) $f(x) \times g(x) \times f(x)$.

..... [4]

(b) Find x when $h(x) = g(f(2))$.

$x =$ ..... [2]

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

1638716757

MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2023**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

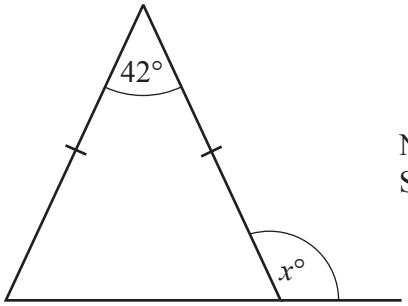
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

1 (a)



NOT TO SCALE

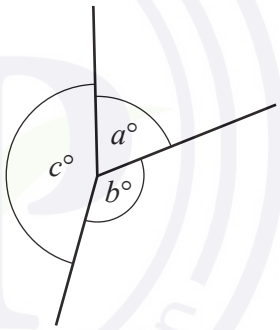
The diagram shows an isosceles triangle with the base extended.

Find the value of x.

$x =$ ..... [3]

(b) The diagram shows three lines meeting at a point.
The ratio $a : b : c = 3 : 4 : 5$.

Find the value of c.



NOT TO SCALE

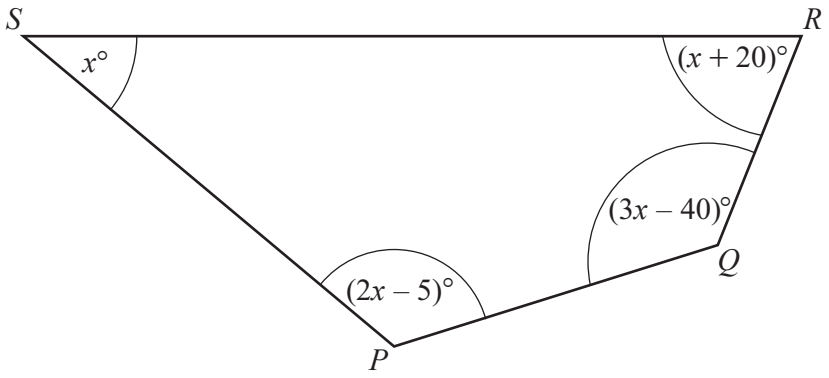
$c =$ ..... [3]

(c) A regular pentagon has an exterior angle, d.
A regular hexagon has an interior angle, h.

Find the fraction $\frac{d}{h}$.
Give your answer in its simplest form.

..... [4]

(d)

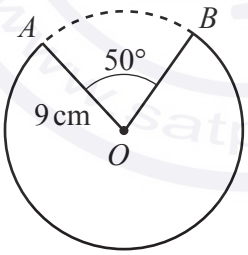


NOT TO SCALE

Show that *PQRS* is a cyclic quadrilateral.

[5]

(e)



NOT TO SCALE

The diagram shows a circle of radius 9 cm, centre *O*.
The minor sector *AOB*, with sector angle 50°, is removed from the circle.

Calculate the length of the major arc *AB*.

..... cm [3]

2 **(a)** Anil changes \$830 into euros when the exchange rate is 1 euro = \$1.16 .
He spends 500 euros.
He then changes the remaining money back into dollars at the same exchange rate.

Work out how much, in dollars, Anil receives.

\$ ..... [3]

(b) In 2021, Anil earns \$37 000.

(i) He spends \$12 400 on bills in 2021.

Calculate the percentage of his earnings he spends on bills.

..... % [2]

(ii) His earnings of \$37 000 increase by 3.2% in 2022.

Calculate his earnings in 2022.

\$ ..... [2]

(c) Anil invests \$3500 in an account that pays a rate of 2.4% per year compound interest.

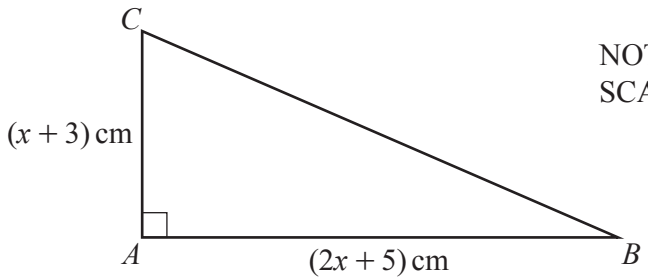
(i) Calculate the total interest earned at the end of 5 years.

\$ ..... [3]

(ii) Find the number of complete years before Anil has at least \$5000 in this account.

..... years [3]

3



The diagram shows a right-angled triangle ABC.

(a) (i) The area of the triangle is $60\,\text{cm}^2$.

Show that $2x^2 + 11x - 105 = 0$.

[3]

(ii) Solve by factorisation.

$$2x^2 + 11x - 105 = 0$$

$x =$ ..... or $x =$ ..... [3]

(iii) Calculate angle ACB.

..... [3]

(b) Triangle ABC is similar to triangle DEF.
Triangle DEF has an area of $93.75\,\text{cm}^2$.

(i) Find the size of the smallest angle of triangle DEF.

..... [1]

(ii) Find the length of the shortest side of triangle DEF.

..... cm [3]

4 The table shows information about the heights of 80 children.

Height (h metres)	$1.2 < h \leqslant 1.4$	$1.4 < h \leqslant 1.5$	$1.5 < h \leqslant 1.65$	$1.65 < h \leqslant 1.8$	$1.8 < h \leqslant 1.9$
Frequency	2	13	24	32	9

(a) (i) Write down the interval containing the median.

..... $< h \leqslant$ ..... [1]

(ii) Calculate an estimate of the mean height.

..... m [4]

(b) (i) One of these children is chosen at random.
Calculate the probability that they have a height of 1.4 m or less.

..... [1]

(ii) Two of these children are chosen at random.
Calculate the probability that both children are taller than 1.5 m but only one of them is taller than 1.8 m.

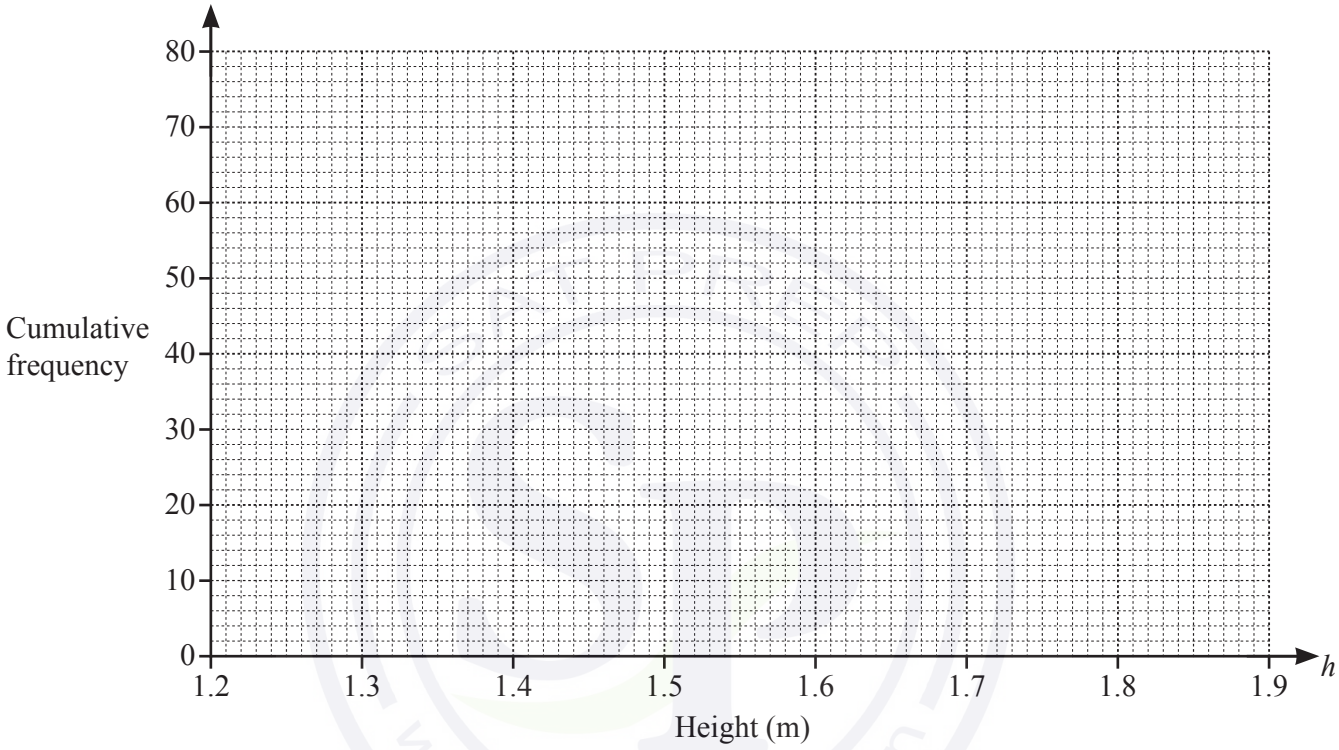
..... [3]

(c) **(i)** Complete the cumulative frequency table for the heights.

Height (h metres)	$h \leqslant 1.4$	$h \leqslant 1.5$	$h \leqslant 1.65$	$h \leqslant 1.8$	$h \leqslant 1.9$
Cumulative frequency	2				

[2]

(ii) On the grid, draw the cumulative frequency diagram.



[3]

(d) Use your diagram to find an estimate of

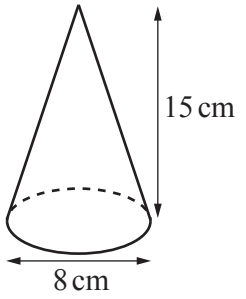
(i) the interquartile range

..... m [2]

(ii) the 60th percentile.

..... m [2]

5 (a)



NOT TO SCALE

A cone has base diameter 8 cm and perpendicular height 15 cm.

(i) Calculate the volume of the cone.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

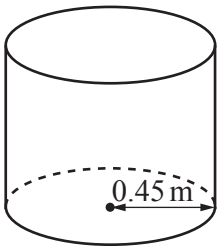
..... cm^3 [2]

(ii) A label completely covers the curved surface area of the cone.

Calculate the area of the label as a percentage of the **total** surface area of the cone.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi r l$.]

..... % [5]

(b)



NOT TO SCALE

An empty cylindrical container has radius 0.45 m.
300 litres of water is poured into the container at a rate of 375 ml per second.

(i) Find the time taken, in minutes and seconds, for all the water to be poured into the container.

..... min ..... s [3]

(ii) Calculate the height of the water in the container.

..... m [3]

6 **(a)** A sequence has nth term $\frac{n}{2n+3}$.

(i) Find the first three terms of this sequence.

Give your answers as fractions.

..... , ... , ... [2]

(ii) The kth term of this sequence is $\frac{12}{25}$.

Find the value of k.

$k =$ ..... [2]

(b) Find the nth term of each sequence.

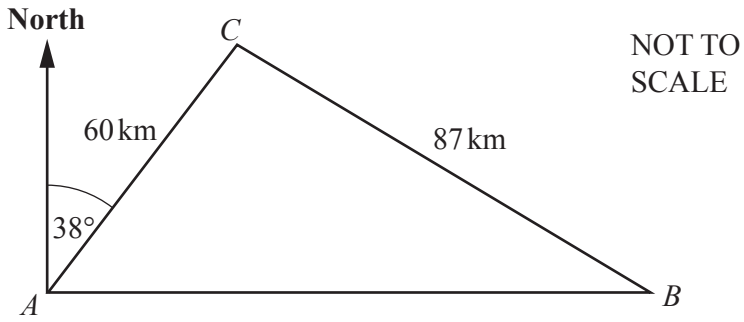
(i) 6, 13, 32, 69, 130, …

..... [2]

(ii) 100, 50, 25, 12.5, 6.25, …

..... [2]

7



The diagram shows the straight roads between town A, town B and town C.
$AC = 60\,\text{km}$, $CB = 87\,\text{km}$ and B is due east of A.
The bearing of C from A is 038°.

(a) Show that angle $ACB = 95.1°$, correct to 1 decimal place.

[5]

(b) Without stopping, a car travels from town A to town C then to town B, before returning directly to town A.
The total time taken for the journey is 3 hours 20 minutes.

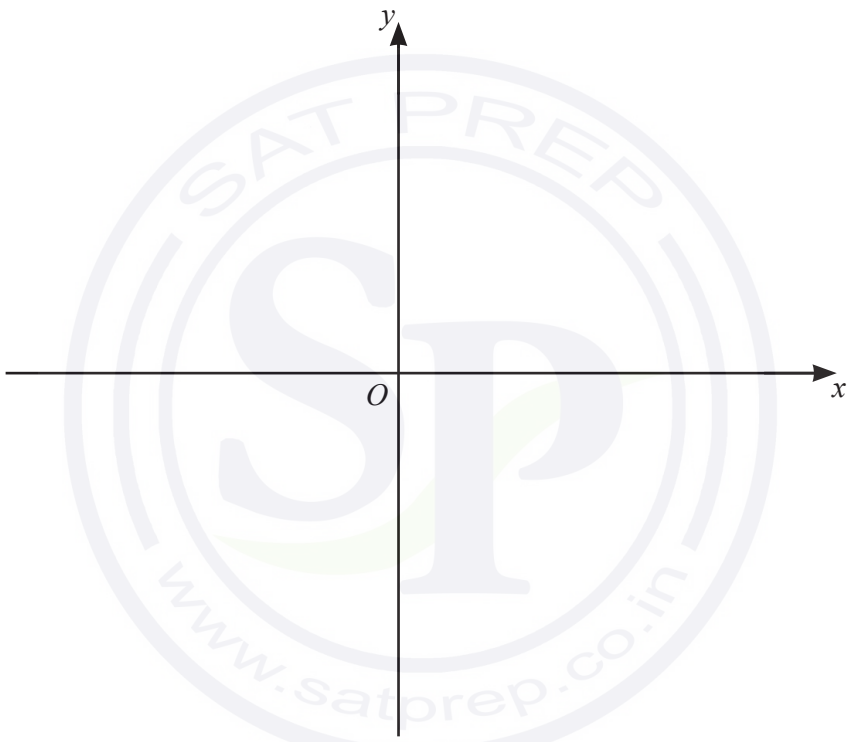
Calculate the average speed of the car for this journey.
Give your answer in kilometres per hour.

..... km/h [6]

8 **(a)** **(i)** Show that the equation $y = (x-4)(x+1)(x-2)$ can be written as $y = x^3 - 5x^2 + 2x + 8$.

[2]

(ii) On the diagram, sketch the graph of $y = x^3 - 5x^2 + 2x + 8$, indicating the values where the graph crosses the axes.



[4]

(b) The graph of $y = x^3 - 5x^2 + 2x + 8$ has two tangents with a gradient of 10.

Find the equations of these two tangents.
You must show all your working and give your answers in the form $y = mx + c$.

$y =$ .....

$y =$ ..... [7]

9 **(a)** Simplify.

(i) $(3x^2y^4)^3$

..... [2]

(ii) $\left(\frac{16}{x^{16}y^8}\right)^{-\frac{3}{2}}$

..... [3]

(b) **(i)** Factorise.

$x^2 - 9$

..... [1]

(ii) Simplify.

$$\frac{x^2 - 9}{2xy - 6y + 5x - 15}$$

..... [3]

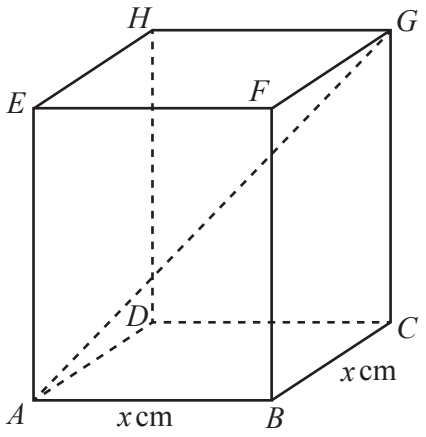
(c) Solve the simultaneous equations.
You must show all your working and give your answers correct to 2 decimal places.

$$2x + y = 7$$
$$y = 5x^2 + 2x - 13$$

$x =$ ..... , $y =$ .....

$x =$ ..... , $y =$ ..... [6]

10 (a)



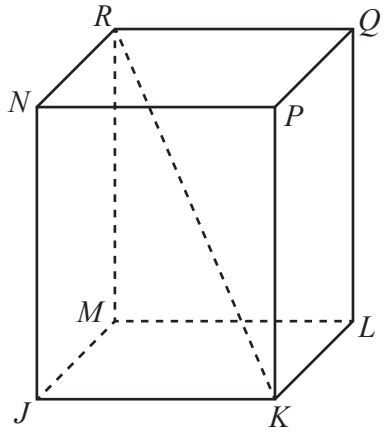
NOT TO SCALE

ABCDEFGH is a cuboid with a square base of side x cm.
$CG = 20$ cm and $AG = 28$ cm.

Calculate the value of x.

$x =$ ..... [4]

(b)



NOT TO SCALE

The diagram shows a different cuboid $JKLMNPQR$.
$MR = 30$ cm correct to the nearest centimetre.
$KR = 37$ cm correct to the nearest centimetre.

Calculate the lower bound of the angle between KR and the base $JKLM$ of the cuboid.

..... [4]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

6642892723

MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2023**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

DC (LK/SG) 312592/3

[Turn over

1 **(a)** Tomas sells a computer, a bike and a phone.
The amounts he receives are in the ratio computer : bike : phone = 14 : 17 : 9.

(i) Calculate the amount he receives for the phone as a percentage of the total.

..... % [2]

(ii) The total amount he receives is $560.

Calculate how much he receives for the bike.

$ ..... [2]

(iii) Tomas originally bought the bike for $195.
He wanted to make a profit of at least 25% when he sold it.

Does Tomas make a profit of at least 25%?
You must show all your working to support your decision.

[3]

(b) Ulla invests $725 for 6 years in an account paying simple interest at a rate of 1.3% per year.

Calculate the total interest earned at the end of 6 years.

$ ..... [2]

(c) In a sale, all prices are reduced by 24%.
Victor pays $36.86 for a pair of shoes in the sale.

Calculate the original price of the shoes.

$ ..... [2]

2 **(a)** Anna records the number of text messages she receives for 14 days.

17	15	31	38	31	22	13
18	21	27	28	21	31	29

(i) Complete the stem-and-leaf diagram.

1	
2	
3	

Key: .....

[3]

(ii) Find the median.

..... [1]

(iii) Find the mode.

..... [1]

(iv) Find the range.

..... [1]

(b) In a shop, there are 4 red and 8 grey phones.
Anna and Pete each pick one of these phones at random.

Work out the probability that they both pick a grey phone.

..... [2]

3 **(a)** The scale drawing shows two sides, AB and BC, of a field.
The scale is 5 centimetres represents 200 metres.

Scale: 5 cm to 200 m

(i) Measure angle ABC.

Angle ABC = ... [1]

(ii) X is a point on BC.
$BX = 332$ m.

Mark the point X on the diagram. [2]

(iii) Find the scale in the form 1 : n.

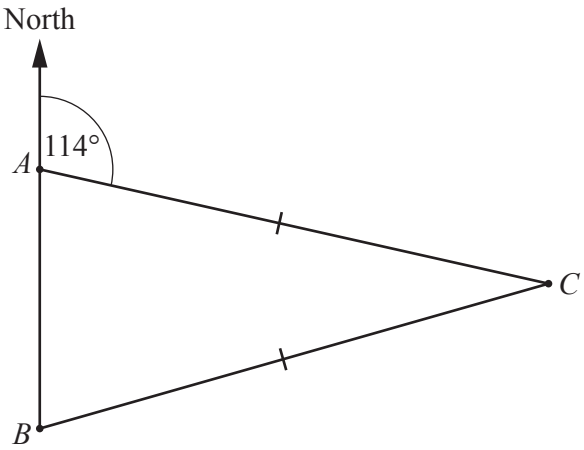
1: ..... [2]

(b) A bronze statue is 4.5 m high and has a mass of 195 200 kg.
The density of bronze is 8000 kg / m^3.
The volume of a mathematically similar model of the statue is 0.385 m^3.

Calculate the height of the model.
[Density = Mass ÷ Volume]

..... m [5]

4 **(a)**



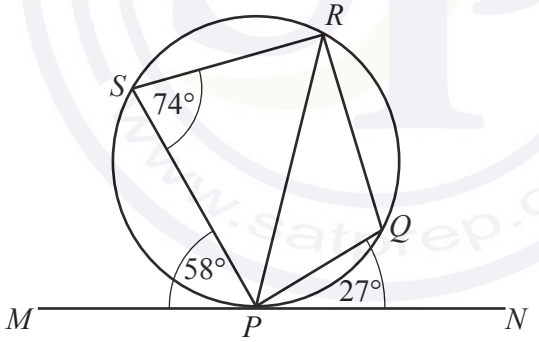
NOT TO SCALE

A, B and C are three towns and the bearing of C from A is 114°.
B is due south of A and $AC = BC$.

Calculate the bearing of B from C.

..... [3]

(b)



NOT TO SCALE

P, Q, R and S lie on a circle.
MPN is a tangent to the circle at P.
Angle $MPS = 58°$, angle $PSR = 74°$ and angle $QPN = 27°$.

(i) Find angle PRS.

Angle PRS = ... [1]

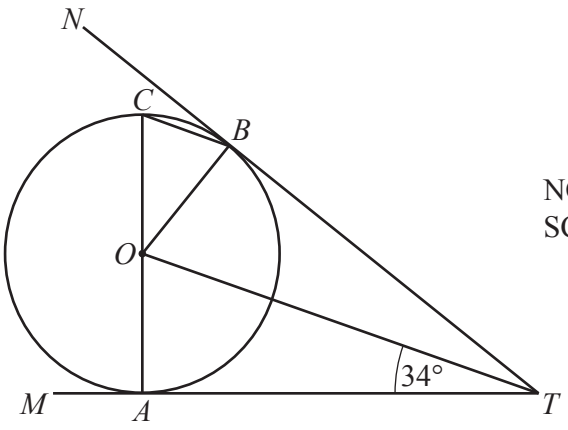
(ii) Find angle PQR.

Angle PQR = ... [1]

(iii) Find angle RPQ.

Angle RPQ = ... [2]

(c)



NOT TO SCALE

A, B and C lie on a circle, centre O, with diameter AC.
TAM and TBN are tangents to the circle and angle $ATO = 34°$.

Using values and geometrical reasons, complete these statements to show that CB is parallel to OT.

In triangles AOT and BOT, OT is common.
Angle OAT = angle $OBT = 90°$ because .....

.....

$AT = BT$ because .....

.....

Triangle AOT is congruent to triangle BOT because of congruence criterion .....

Angle AOT = angle $BOT = 56°$ because angles in a triangle add up to 180°.

Angle BOC = ... ° because .....

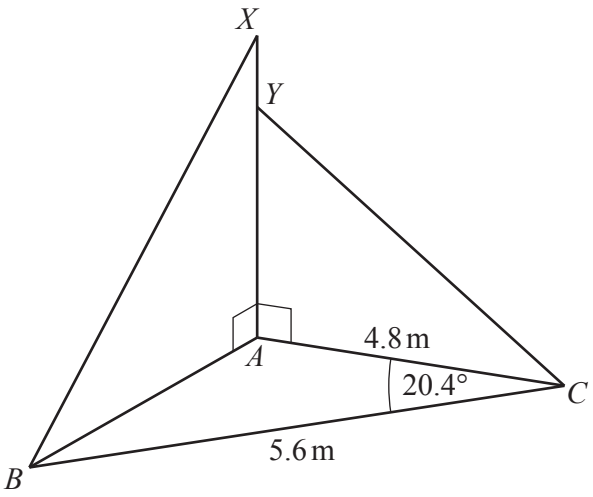
Angle OBC = ... ° because .....

.....

CB is parallel to OT because .....

[6]

5 (a)



NOT TO SCALE

ABC is a scalene triangle on horizontal ground.
AYX is a straight vertical post, held in place by two straight wires *XB* and *YC*.
AC = 4.8 m, *BC* = 5.6 m and angle *ACB* = 20.4°.

(i) Calculate *AB*.

AB = ... m [3]

(ii) Angle *XBA* = 64°.

Calculate *AX*.

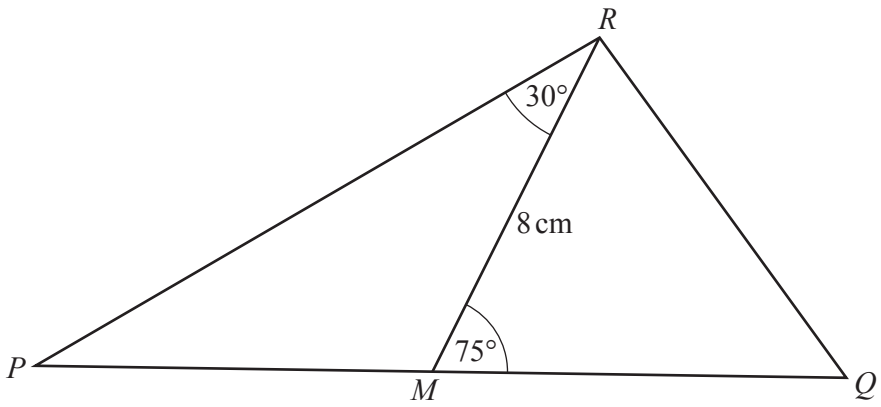
AX = ... m [2]

(iii) *AY* = 2.9 m.

Calculate the area of triangle *YAC*.

..... m^2 [2]

(b)



NOT TO SCALE

In triangle PQR, M is the midpoint of PQ.
$RM = 8$ cm, angle $PRM = 30°$ and angle $RMQ = 75°$.

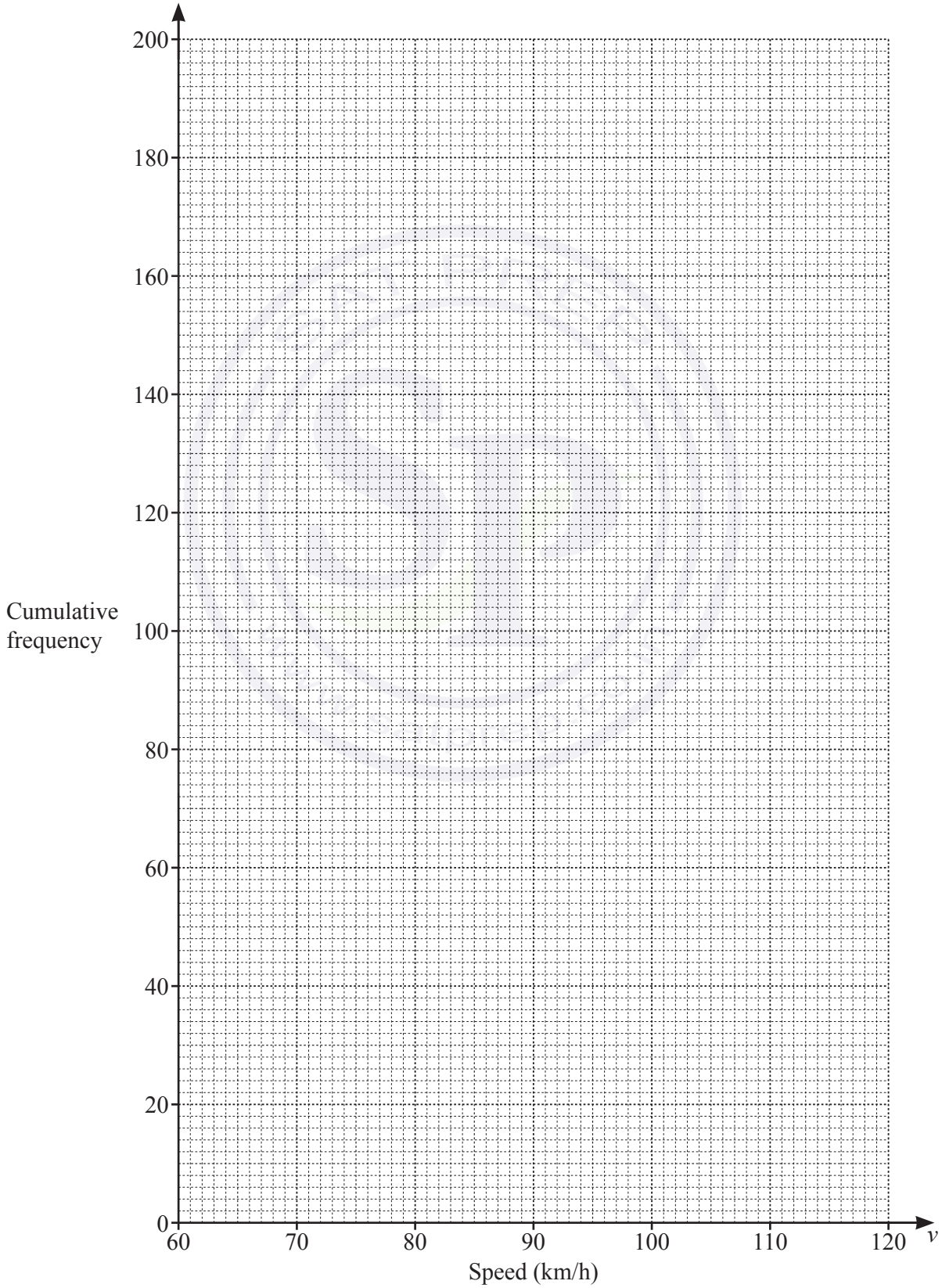
Calculate PQ.

$PQ =$ ..... cm [5]

6 **(a)** The cumulative frequency table shows information about the speed of each of 200 cars as they pass a speed camera.

Speed (v km/h)	$v \leqslant 70$	$v \leqslant 80$	$v \leqslant 90$	$v \leqslant 95$	$v \leqslant 100$	$v \leqslant 120$
Cumulative frequency	12	46	115	155	177	200

(i) On the grid, draw the cumulative frequency diagram.



[3]

(ii) Use your cumulative frequency diagram to find an estimate of

(a) the median

..... km/h [1]

(b) the interquartile range

..... km/h [2]

(c) the number of cars with a speed greater than 110 km/h.

..... [2]

(b) The frequency table shows information about the mass of each of 50 trucks.

Mass (m kg)	$2000 < m \leqslant 2600$	$2600 < m \leqslant 3500$	$3500 < m \leqslant 5000$	$5000 < m \leqslant 5700$
Frequency	12	15	16	7

(i) Calculate an estimate for the mean mass of the trucks.

..... kg [4]

(ii) In a histogram showing this information, the height of the first block is 6 cm.

Calculate the heights of the remaining three blocks.

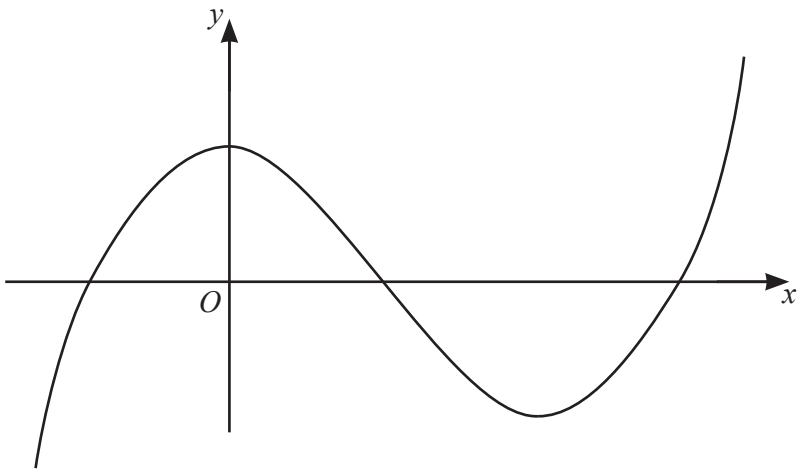
Height of block for $2600 < m \leqslant 3500$ ..... cm

Height of block for $3500 < m \leqslant 5000$ ..... cm

Height of block for $5000 < m \leqslant 5700$ ..... cm [3]

[Turn over

7 **(a)** The diagram shows the graph of a function.

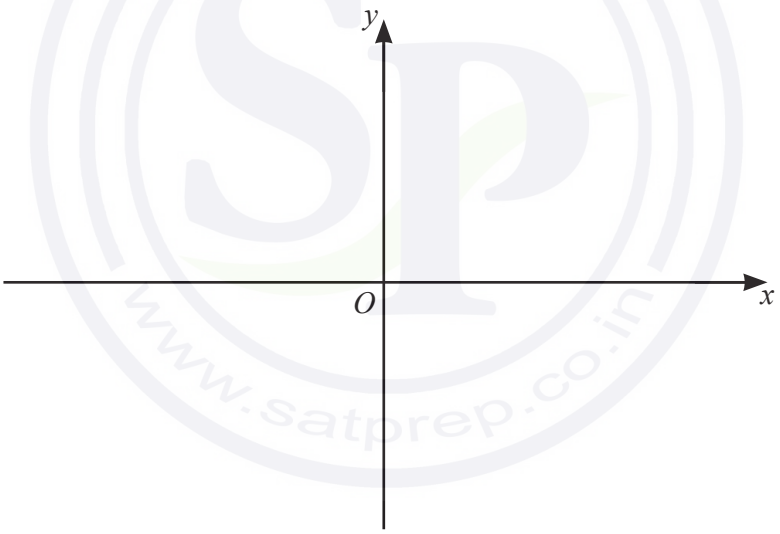


Put a ring around the word which correctly identifies the type of function.

reciprocal quadratic cubic exponential linear

[1]

(b) **(i)**

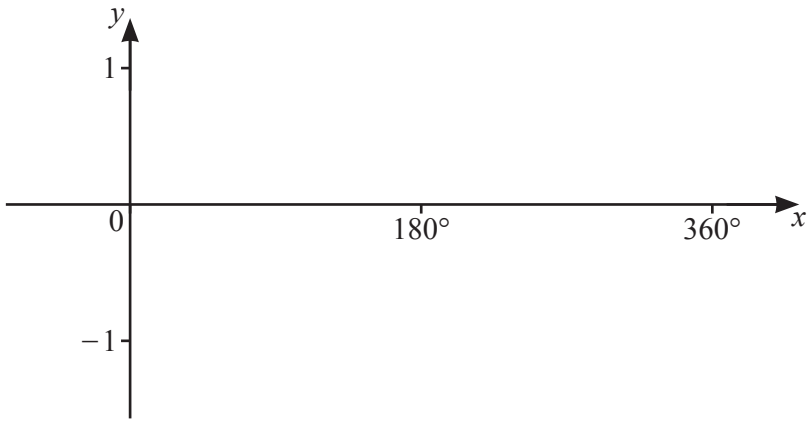


On the diagram, sketch the graph of $y = \frac{1}{2x}$, $x \neq 0$. [2]

(ii) Solve the equation $\frac{1}{2x} = 2x$.

$x =$ ..... and $x =$ ..... [2]

(c) (i)



On the diagram, sketch the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$. [2]

(ii) Solve the equation $3\sin x + 1 = 0$ for $0° \leqslant x \leqslant 360°$.

$x =$ ..... and $x =$ ..... [3]

8 **(a)** A shop sells shirts for $\$x$ and jackets for $\$(x + 27)$.
The shop sells 4 shirts and 3 jackets for a total of \$194.75 .

Write down and solve an equation to find the cost of one shirt.

\$ ..... [3]

(b) Solve the simultaneous equations.
You must show all your working.

$$x^2 + 4y = 37$$
$$5x + y = -8$$

$x =$ ..... , $y =$ .....

$x =$ ..... , $y =$ ..... [5]

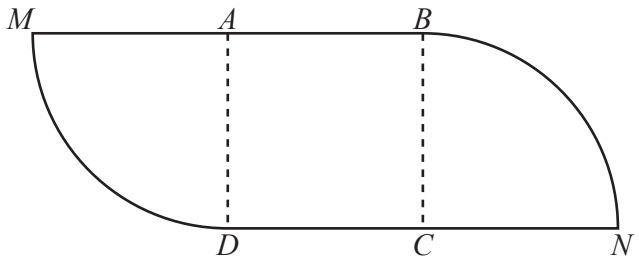
(c) A solid cylinder has radius x and height $6x$.
A sphere of radius r has the same surface area as the total surface area of the cylinder.

Show that $r^2 = \frac{7}{2}x^2$.

[The surface area, A, of a sphere with radius r is $A = 4\pi r^2$.]

[4]

9 (a)



NOT TO SCALE

The diagram shows a shape made from a square *ABCD* and two equal sectors of a circle.
The square has side 11 cm.
MAB and *DCN* are straight lines.

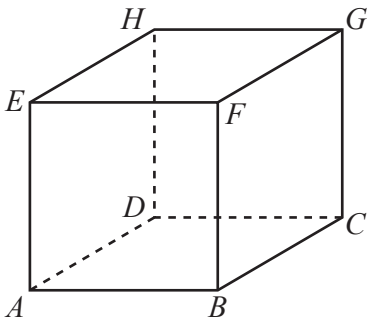
(i) Calculate the area of the shape.

..... cm^2 [3]

(ii) Calculate the perimeter of the shape.

..... cm [3]

(b)



NOT TO SCALE

The diagram shows a cube $ABCDEFGH$ of edge 7 cm.

Calculate the angle between AG and the base of the cube.

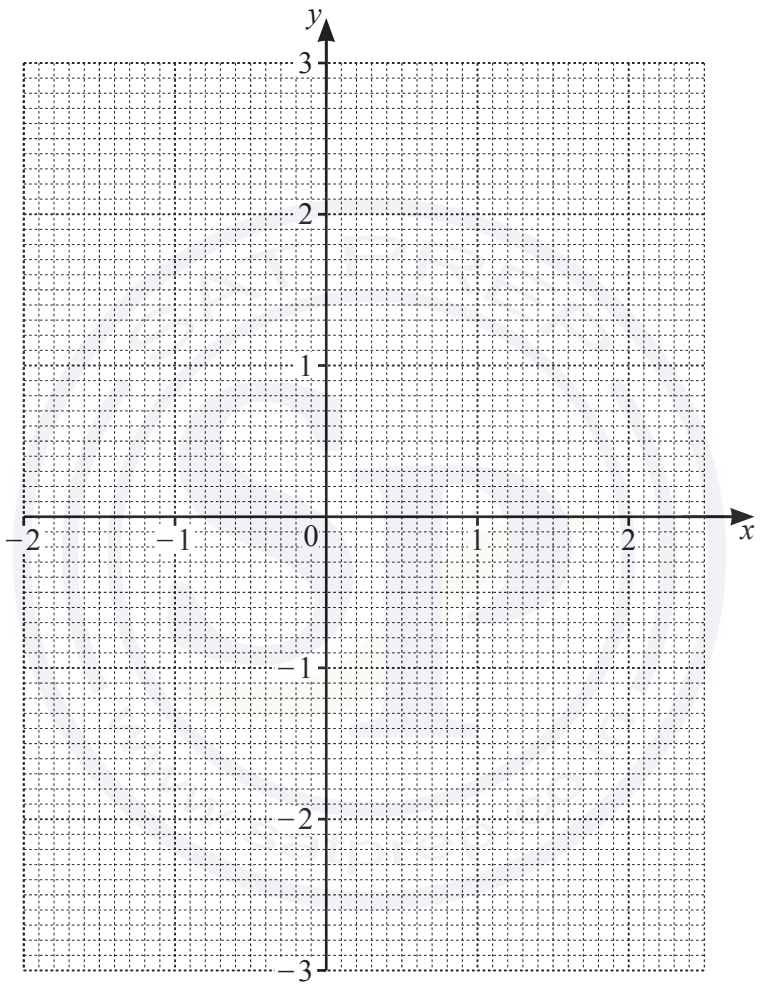
..... [4]

10 The table shows some values for $y = 2^x - 3$.

x	-2	-1	0	0.5	1	1.5	2	2.5
y	-2.75			-1.58		-0.17	1	2.66

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = 2^x - 3$ for $-2 \leqslant x \leqslant 2.5$.



[4]

(c) Use your graph to solve the equation $2^x - 3 = 2$.

$x =$ ..... [1]

(d) By drawing a suitable straight line, solve the equation $2^x - x - 1.5 = 0$.

$x =$ ..... or $x =$ ..... [4]

11 M has coordinates (4, 1) and N has coordinates (−2, −7).

(a) Find the length of MN.

..... [3]

(b) Find the gradient of MN.

..... [2]

(c) Find the equation of the perpendicular bisector of MN.

..... [4]

Question 12 is printed on the next page.

12 The equation of a curve is $y = x^4 - 8x^2 + 5$.

(a) Find the derivative, $\left(\frac{dy}{dx}\right)$, of $y = x^4 - 8x^2 + 5$.

..... [2]

(b) Find the coordinates of the three turning points.
You must show all your working.

(..... , ...) and (..... , ...) and (..... , ...) [4]

(c) Determine which one of these turning points is a maximum.
Justify your answer.

[2]

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2570892229

MATHEMATICS **0580/42**

Paper 4 (Extended) **February/March 2023**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

DC (CJ/SG) 312575/3

1 **(a)** **(i)** Alain and Beatrice share \$750 in the ratio Alain : Beatrice = 8 : 7.

Show that Alain receives \$400.

[1]

(ii) **(a)** Alain spends \$150.

Write \$150 as a percentage of \$400.

.....% [1]

(b) He invests the remaining \$250 at a rate of 2% per year simple interest.

Calculate the amount Alain has at the end of 5 years.

\$ ..... [3]

(iii) Beatrice invests her \$350 at a rate of 0.25% per **month** compound interest.

Calculate the amount Beatrice has at the end of 5 years.
Give your answer correct to the nearest dollar.

\$ ..... [3]

(b) Carl, Dina and Eva share 100 oranges.
The ratio Carl's oranges : Dina's oranges = 3 : 5.
The ratio Carl's oranges : Eva's oranges = 2 : 3.

Find the number of oranges Carl receives.

..... [2]

(c) Fred buys a house.
At the end of the first year, the value of the house increases by 5%.
At the end of the second year, the value of the house increases by 3% of its value at the end of the first year.
The value of Fred's house at the end of the second year is \$60 564.

Calculate how much Fred paid for the house.

\$ ..... [3]

(d) Gabrielle invests \$500 at a rate of r% per year compound interest.
At the end of 8 years the value of Gabrielle's investment is \$609.20 .

Find the value of r.

$r =$ ..... [3]

2 **(a)** 100 students take part in a reaction test.
The table shows the results.

Reaction time (seconds)	6	7	8	9	10	11
Number of students	3	32	19	29	11	6

(i) Write down the mode.

..... s [1]

(ii) Find the median.

..... s [1]

(iii) Calculate the mean.

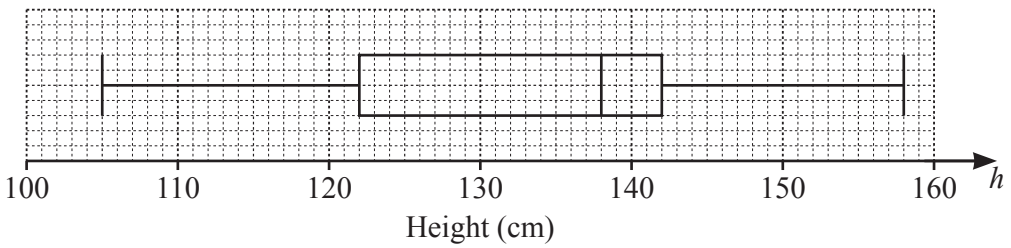
..... s [3]

(iv) Two students are chosen at random.

Find the probability that both their reaction times are greater than or equal to 9 seconds.

..... [2]

(b) The box-and-whisker plot shows the heights, h cm, of some students.



(i) Find the range.

..... cm [1]

(ii) Find the interquartile range.

..... cm [1]

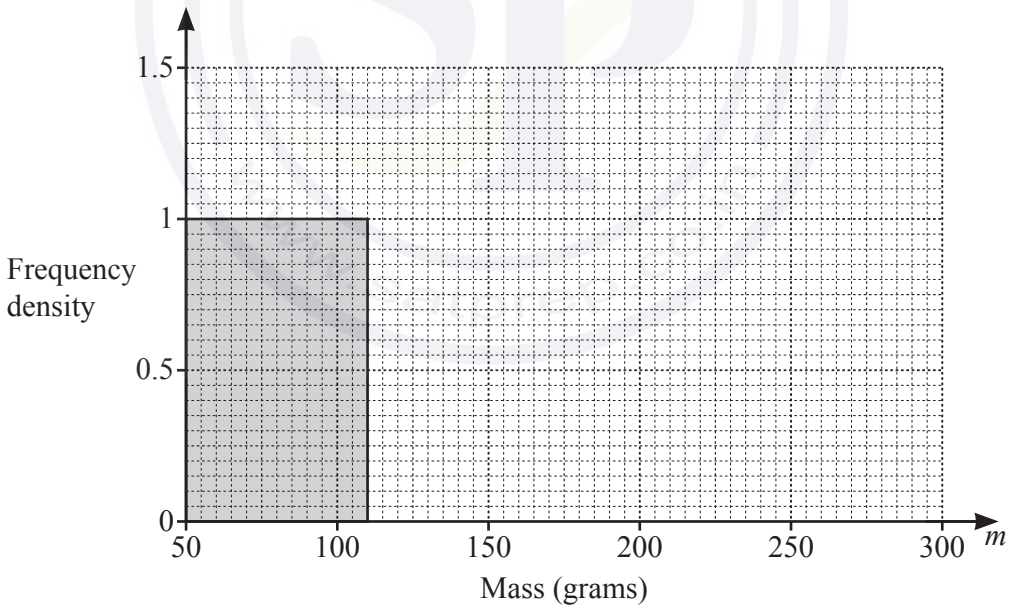
(c) The mass of each of 200 potatoes is measured.
The table shows the results.

Mass (m grams)	$50 < m \leqslant 110$	$110 < m \leqslant 200$	$200 < m \leqslant 300$
Frequency	60	99	41

(i) Calculate an estimate of the mean.

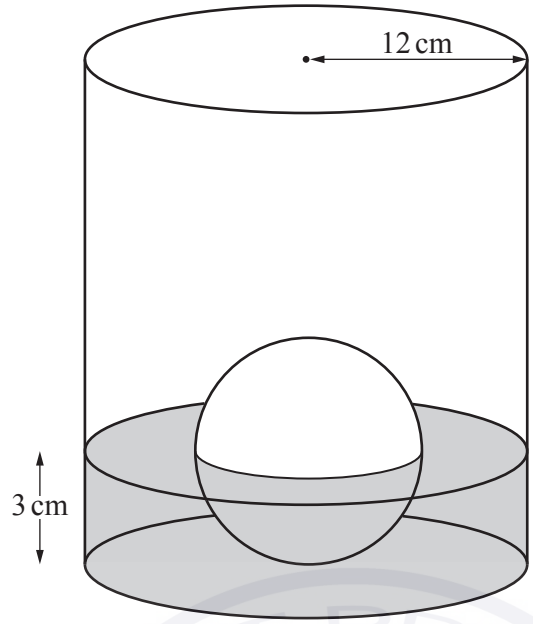
..... g [4]

(ii) Complete the histogram to show the information in the table.



[2]

3



NOT TO SCALE

The diagram shows a cylinder containing water.
There is a solid metal sphere touching the base of the cylinder.
Half of the sphere is in the water.

The radius of the cylinder is 12 cm and the radius of the sphere is 3 cm.

(a) The sphere is removed from the cylinder and the level of the water decreases by h cm.

Show that $h = 0.125$.
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

[3]

(b) The water in the cylinder is poured into another cylinder of radius R cm.
The depth of the water in this cylinder is 18 cm.

Calculate the value of R.

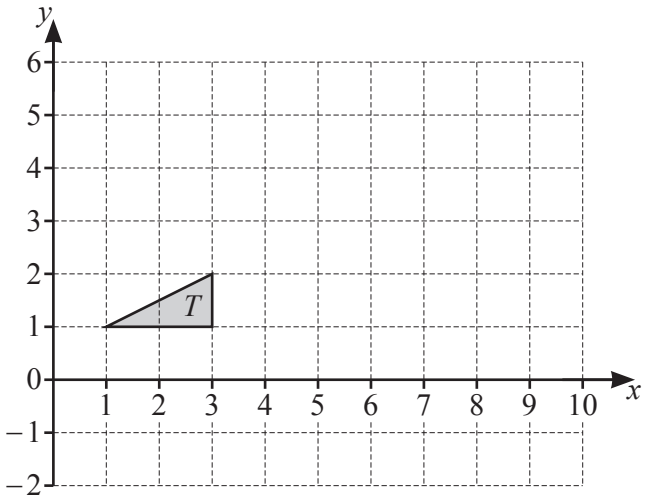
$R =$ ..... [3]

(c) The sphere is melted down and some of the metal is used to make 30 cubes with edge length 1.5 cm.

Calculate the percentage of metal **not** used.
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... % [3]

4 **(a)**



(i) Enlarge triangle T by scale factor 3, centre (0, 2). [2]

(ii) **(a)** Rotate triangle T about (4, 2) by 90° clockwise.
Label the image P. [2]

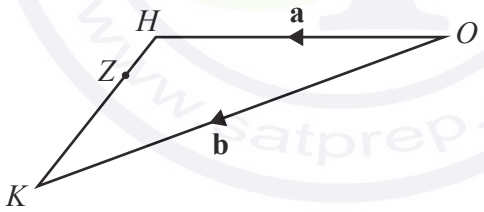
(b) Reflect triangle T in the line $x + y = 6$.
Label the image Q. [3]

(c) Describe fully the **single** transformation that maps triangle P onto triangle Q.

.....

..... [2]

(b)



NOT TO SCALE

The diagram shows triangle OHK, where O is the origin.
The position vector of H is **a** and the position vector of K is **b**.
Z is the point on HK such that $HZ : ZK = 2 : 5$.

Find the position vector of Z, in terms of **a** and **b**.
Give your answer in its simplest form.

..... [3]

5 **(a)** Expand and simplify.

$$(2p^2 - 3)(3p^2 - 2)$$

..... [2]

(b) $s = \frac{1}{2}(u + v)t$

(i) Find the value of s when $u = 20$, $v = 30$ and $t = 7$.

$s =$ ..... [2]

(ii) Rearrange the formula to write v in terms of s, u and t.

$v =$ ..... [3]

(c) Factorise completely.

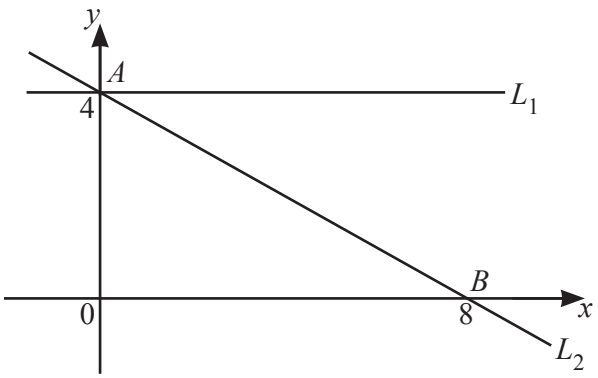
(i) $2qt - 3t - 6 + 4q$

..... [2]

(ii) $x^3 - 25x$

..... [3]

6



NOT TO SCALE

A is the point (0, 4) and B is the point (8, 0).
The line L_1 is parallel to the x-axis.
The line L_2 passes through A and B.

(a) Write down the equation of L_1.

..... [1]

(b) Find the equation of L_2.
Give your answer in the form $y = mx + c$.

$y =$ ..... [2]

(c) C is the point (2, 3).
The line L_3 passes through C and is perpendicular to L_2.

(i) Show that the equation of L_3 is $y = 2x - 1$.

[3]

(ii) L_3 crosses the x-axis at D.

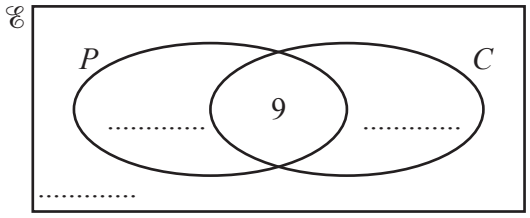
Find the length of CD.

..... [5]

7 $\mathscr{E}$ = {students in a class} P = {students who study Physics} C = {students who study Chemistry}

$n(\mathscr{E}) = 24$ $n(P) = 17$ $n(C) = 14$ $n(P \cap C) = 9$

(a) Complete the Venn diagram.



[2]

(b) **(i)** Find $n(P \cap C')$.

..... [1]

(ii) Find $n(P \cup C')$.

..... [1]

(c) Two students are picked from the class at random.

Find the probability that one student studies both subjects and one student studies Chemistry but not Physics.

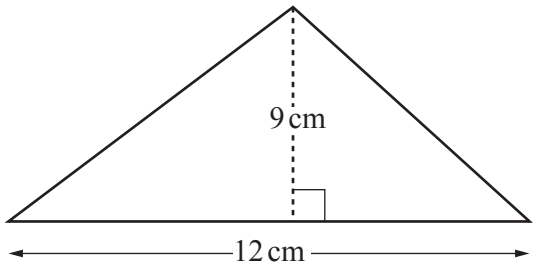
..... [3]

(d) Two of the students who study Physics are picked at random.

Find the probability that they both study Chemistry.

..... [2]

8 (a)

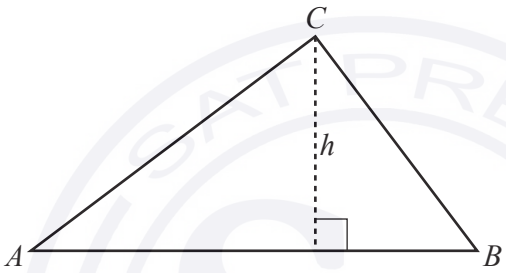


NOT TO SCALE

Calculate the area of the triangle.

..... cm^2 [2]

(b)



NOT TO SCALE

$AB = (2x + 3)$ cm and $h = (x + 5)$ cm.
The area of triangle $ABC = 50\,cm^2$.

Find the value of x, giving your answer correct to 2 decimal places.
You must show all your working.

$x =$ ..... [6]

9 $f(x) = x^3 - 3x^2 - 4$

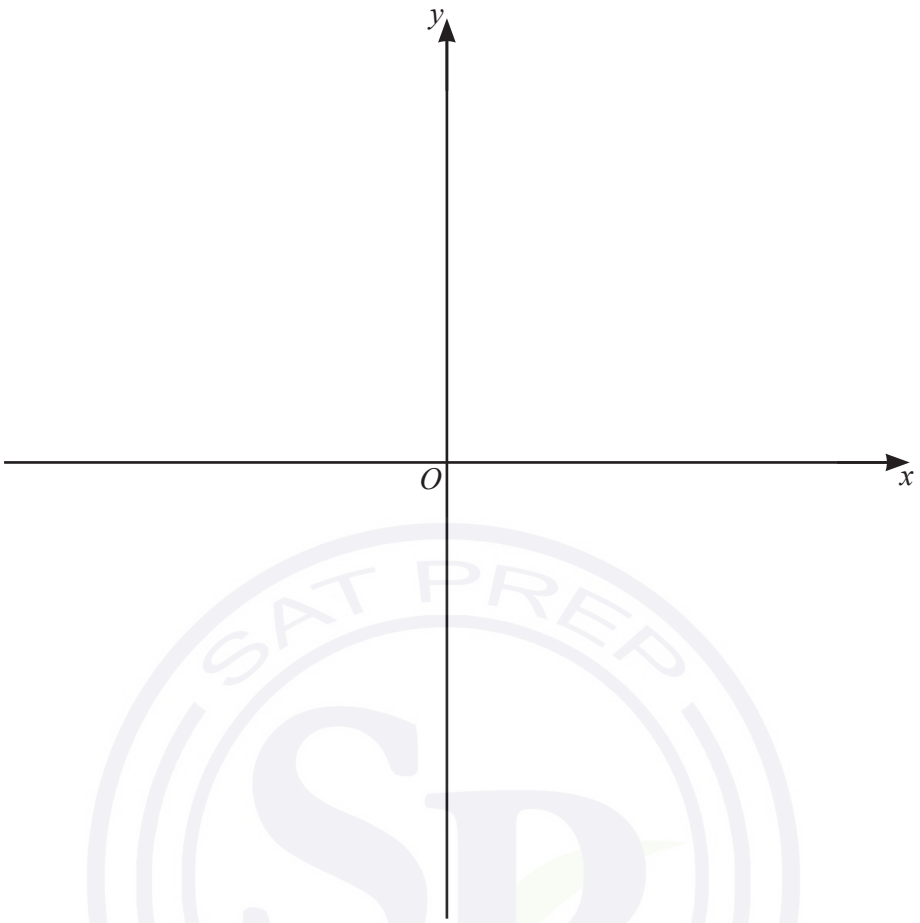
(a) Find the gradient of the graph of $y = f(x)$ where $x = 1$.

..... [3]

(b) Find the coordinates of the turning points of the graph of $y = f(x)$.

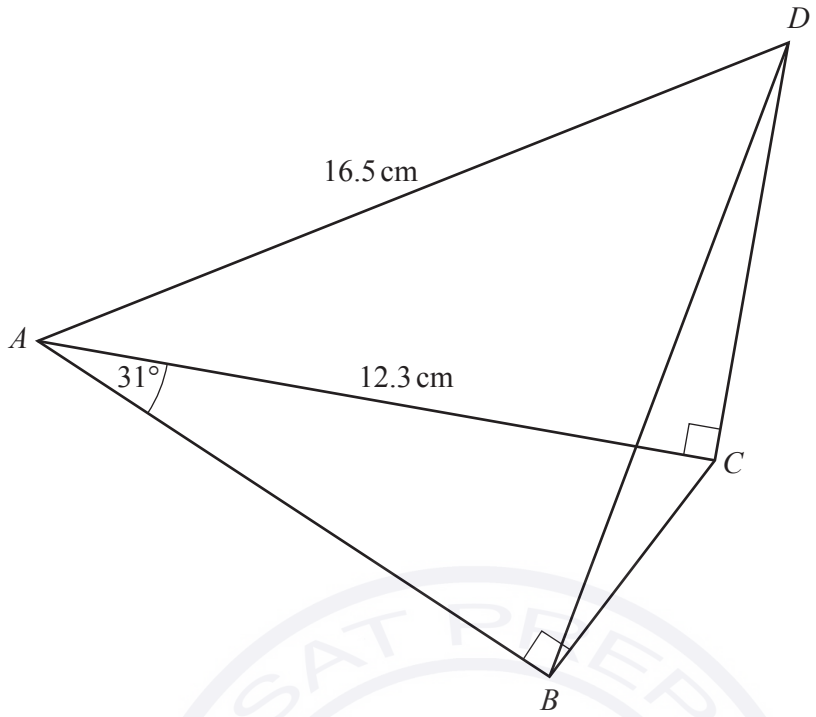
(..... , ...) , (..... , ...) [4]

(c) Sketch the graph of $y = f(x)$.



[2]

10



NOT TO SCALE

The diagram shows a quadrilateral $ABCD$.
$AC = 12.3$ cm and $AD = 16.5$ cm.
Angle $BAC = 31°$, angle $ABC = 90°$ and angle $ACD = 90°$.

(a) Show that $AB = 10.54$ cm, correct to 2 decimal places.

[2]

(b) Show that angle $DAC = 41.80°$ correct to 2 decimal places.

[2]

(c) Calculate BD.

$BD =$ .....cm [3]

(d) Calculate angle CBD.

Angle $CBD =$ ..... [4]

(e) Calculate the shortest distance from C to BD.

..... cm [4]

11 $f(x) = 2x - 1$ $g(x) = 3x + 2$ $h(x) = \frac{1}{x}, x \neq 0$ $j(x) = x^2$

(a) Find $j(-1)$.

..... [1]

(b) Find x when $f(x) + g(x) = 0$.

$x =$ ..... [2]

(c) Find $gg(x)$, giving your answer in its simplest form.

..... [2]

(d) Find $hf(x) + gh(x)$, giving your answer as a single fraction in its simplest form.

..... [4]

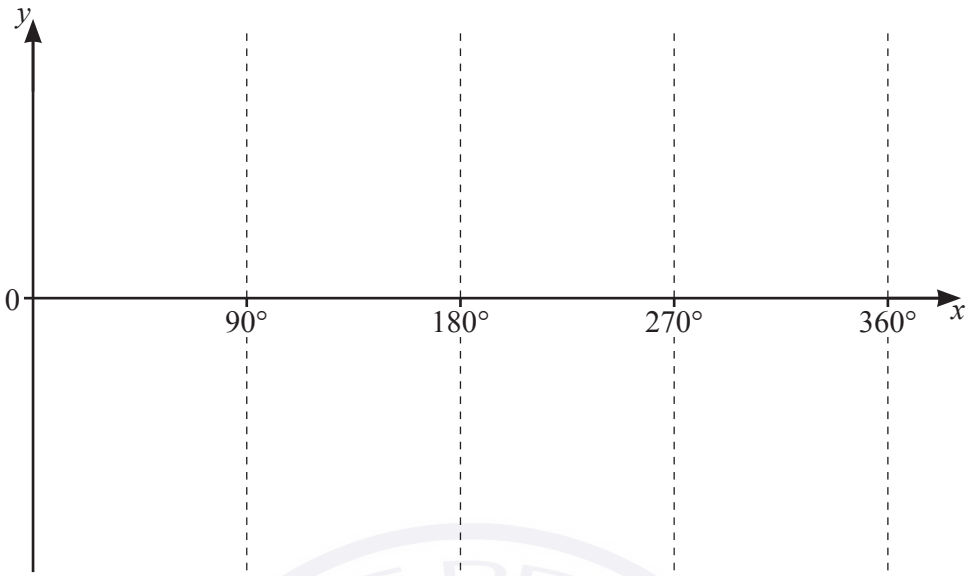
(e) When $pp(x) = x$, $p(x)$ is a function such that $p^{-1}(x) = p(x)$.

Draw a ring around the function that has this property.

$f(x) = 2x - 1$ $g(x) = 3x + 2$ $h(x) = \frac{1}{x}, x \neq 0$ $j(x) = x^2$

[1]

12 **(a)** Sketch the graph of $y = \tan x$ for $0° \leqslant x \leqslant 360°$.



[2]

(b) Find x when $\tan x = \frac{1}{\sqrt{3}}$ and $0° \leqslant x \leqslant 360°$.

..... [2]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

7920026899

MATHEMATICS **0580/41**

Paper 4 (Extended) **October/November 2022**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

1 **(a)** Calculate the volume of

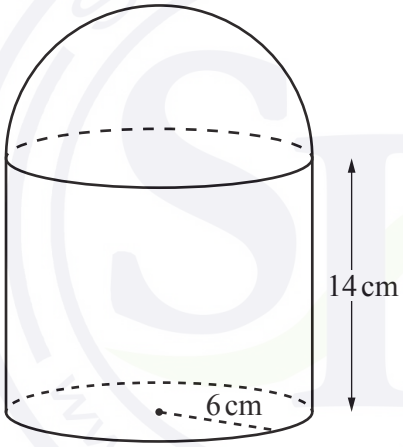
(i) a solid cylinder with radius 6 cm and height 14 cm,

..... cm^3 [2]

(ii) a solid hemisphere with radius 6 cm.
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm^3 [2]

(b)



The cylinder and hemisphere in **part (a)** are joined to form the solid in the diagram.
The solid is made of steel and 1 cm^3 of steel has a mass of 7.85 g.

(i) Show that 1 cm^3 of steel has a mass of 0.007 85 kg.

[1]

(ii) Calculate the total mass of the solid.

..... kg [2]

(c) $2000\,\text{cm}^3$ of iron is melted down and some of it is used to make 50 spheres with radius 2 cm.

(i) Calculate the percentage of iron that is left over.
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... % [3]

(ii) The iron left over is then made into a cube.

Calculate the length of an edge of the cube.

..... cm [1]

(d) A solid cone has radius $3R$ cm and slant height $9R$ cm.
A solid cylinder has radius x cm and height $7x$ cm.
The **total** surface area of the cone is equal to the **total** surface area of the cylinder.

Given that $R = kx$, find the value of k.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]

$k =$ ..... [4]

2 **(a)** Write

(i) 2994.99 correct to the nearest 10,

..... [1]

(ii) 0.983 correct to 1 decimal place,

..... [1]

(iii) 2090 correct to 2 significant figures.

..... [1]

(b) Write down a prime number between 90 and 100.

..... [1]

(c) Write 2^{-6} as a fraction.

..... [1]

(d) Write 0.007 01 in standard form.

..... [1]

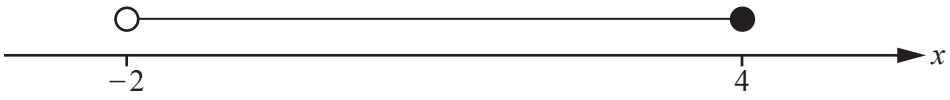
(e) Simplify $1.5 \times 10^{x} + 1.5 \times 10^{x-1}$ giving your answer in standard form.

..... [2]

(f) Write $0.3\dot{7}$ as a fraction.
You must show all your working.

..... [2]

3 **(a)**



Write down the inequality shown by the number line.

..... [1]

(b) $-3 \leqslant 2x+3 < 9$

(i) Solve the inequality.

..... [3]

(ii) Write down all the integer values of x that satisfy the inequality.

..... [2]

(c) Solve the equations.

(i) $3(3-x)-\frac{2(x+2)}{5}=1$

$x =$ ..... [4]

(ii) $\frac{5}{x+3}=\frac{3}{x+5}$

$x =$ ..... [3]

4 (a) (i) Zak invests $500 at a rate of 2% per year simple interest.

Calculate the value of Zak's investment at the end of 5 years.

$ ..... [3]

(ii) Yasmin invests $500 at a rate of 1.8% per year compound interest.

Calculate the value of Yasmin's investment at the end of 5 years.

$ ..... [2]

(iii) Zak and Yasmin continue with these investments.

How many **more complete** years is it before the value of Yasmin's investment is greater than the value of Zak's investment?

..... [3]

(b) Xavier buys a car for $2500.
The value of the car decreases exponentially at a rate of 10% each year.

Calculate the value of Xavier's car at the end of 5 years.
Give your answer correct to the nearest dollar.

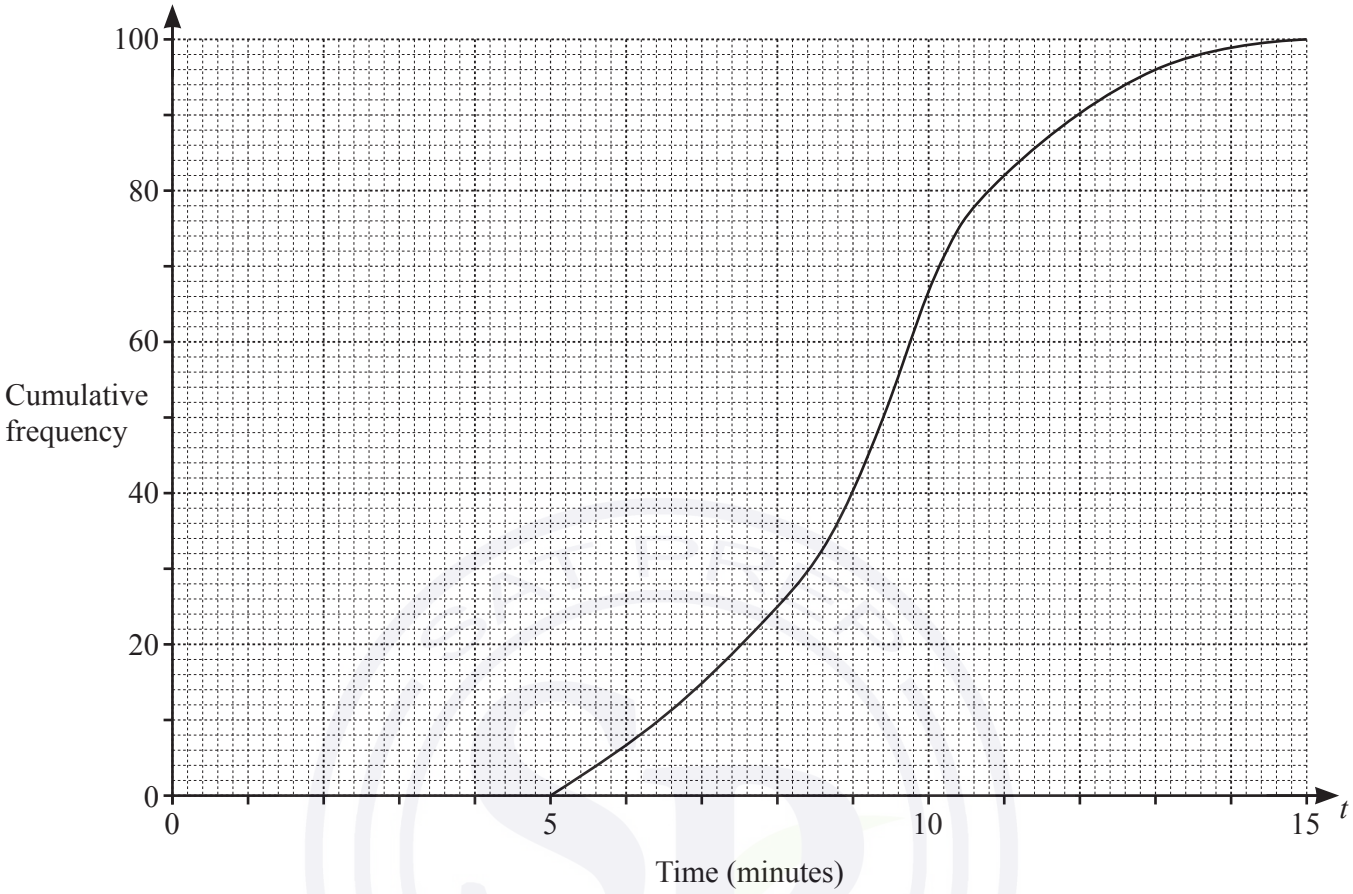
$ ..... [3]

(c) The number of a certain type of bacteria increases exponentially at a rate of r% each day.
After 22 days, the number of this bacteria has doubled.

Find the value of r.

$r =$ ..... [3]

5 **(a)** 100 students each record the time, t minutes, taken to eat a pizza.
The cumulative frequency diagram shows the results.



Find an estimate of

(i) the median,

..... min [1]

(ii) the interquartile range,

..... min [2]

(iii) the number of students taking more than 11 minutes to eat a pizza.

..... [2]

(b) 150 students each record how far they can throw a tennis ball.
The table shows the results.

Distance (d metres)	$0 < d \leqslant 20$	$20 < d \leqslant 30$	$30 < d \leqslant 35$	$35 < d \leqslant 45$	$45 < d \leqslant 60$
Frequency	4	38	40	53	15

(i) Calculate an estimate of the mean.

..... m [4]

(ii) A histogram is drawn to show this information.
The height of the bar representing $30 < d \leqslant 35$ is 12 cm.

Calculate the height of each of the other bars.

Distance (d metres)	Frequency	Height of bar (cm)
$0 < d \leqslant 20$	4	
$20 < d \leqslant 30$	38	
$30 < d \leqslant 35$	40	12
$35 < d \leqslant 45$	53	
$45 < d \leqslant 60$	15	

[3]

(iii) Two students are chosen at random.

Find the probability that they both threw the ball more than 45 m.

..... [2]

6 **(a)** $\mathbf{p} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ $\mathbf{q} = \begin{pmatrix} -1 \\ 1 \end{pmatrix}$

Find

(i) $3\mathbf{q}$,

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(ii) $\mathbf{p} - \mathbf{q}$,

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(iii) $|\mathbf{p}|$.

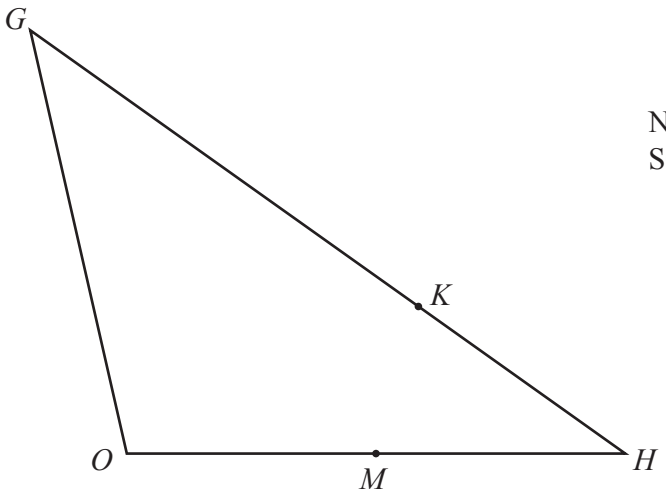
..... [2]

(b) B is the point (2, 7) and $\overrightarrow{AB} = \begin{pmatrix} -4 \\ 6 \end{pmatrix}$.

Find the coordinates of A.

(..... , ...) [2]

(c)



NOT TO SCALE

In triangle OGH, M is the midpoint of OH and K divides GH in the ratio 5 : 2.
$\overrightarrow{OG} = \mathbf{g}$ and $\overrightarrow{OH} = \mathbf{h}$.

Find $\overrightarrow{MK}$ in terms of **g** and **h**.
Give your answer in its simplest form.

$\overrightarrow{MK} =$ ..... [4]

7 $f(x) = 10 - x$ $g(x) = \frac{2}{x},\ x \neq 0$ $h(x) = 2^x$ $j(x) = 5 - 2x$

(a) (i) Find $g\left(\frac{1}{2}\right)$.

..... [1]

(ii) Find $hg\left(\frac{1}{2}\right)$.

..... [1]

(b) Find x when $f(x) = 7$.

$x =$ ..... [1]

(c) Find x when $g(x) = h(3)$.

$x =$ ..... [2]

(d) Find $j^{-1}(x)$.

$j^{-1}(x) =$ ..... [2]

(e) Write $f(x) + g(x) + 1$ as a single fraction in its simplest form.

..... [3]

(f) $\left(\mathrm{f}(x)\right)^2 - \mathrm{ff}(x) = ax^2 + bx + c$

Find the values of a, b and c.

$a =$ .....

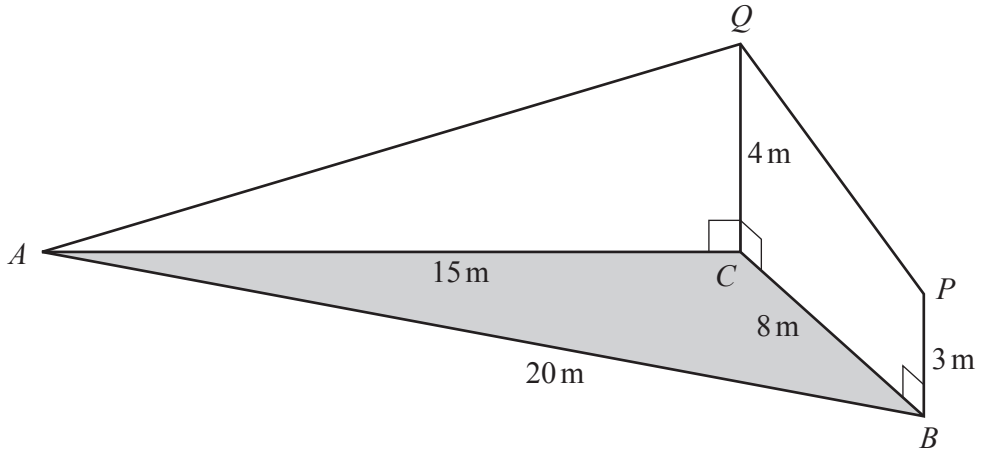
$b =$ .....

$c =$ ..... [4]

(g) Find x when $\mathrm{h}^{-1}(x) = 10$.

$x =$ ..... [2]

8



NOT TO SCALE

The diagram shows triangle ABC on horizontal ground.
$AC = 15\,\text{m}$, $BC = 8\,\text{m}$ and $AB = 20\,\text{m}$.

BP and CQ are vertical poles of different heights.
$BP = 3\,\text{m}$ and $CQ = 4\,\text{m}$.
AQ and PQ are straight wires.

(a) Show that angle $ACB = 117.5°$, correct to 1 decimal place.

[4]

(b) Calculate the area of triangle ABC.

..... m^2 [2]

(c) Calculate the length of AQ.

..... m [2]

(d) Calculate the angle of elevation of Q from P.

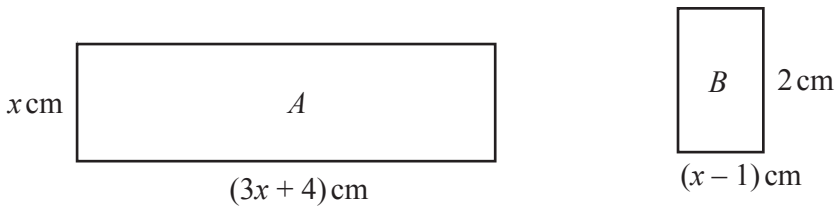
..... [3]

(e) Another straight wire connects A to the midpoint of PQ.

Calculate the angle between this wire and the horizontal ground.

..... [5]

9 (a)



NOT TO SCALE

The total of the areas of rectangles A and B is $20\,\text{cm}^2$.

(i) Show that $3x^2 + 6x - 22 = 0$.

[2]

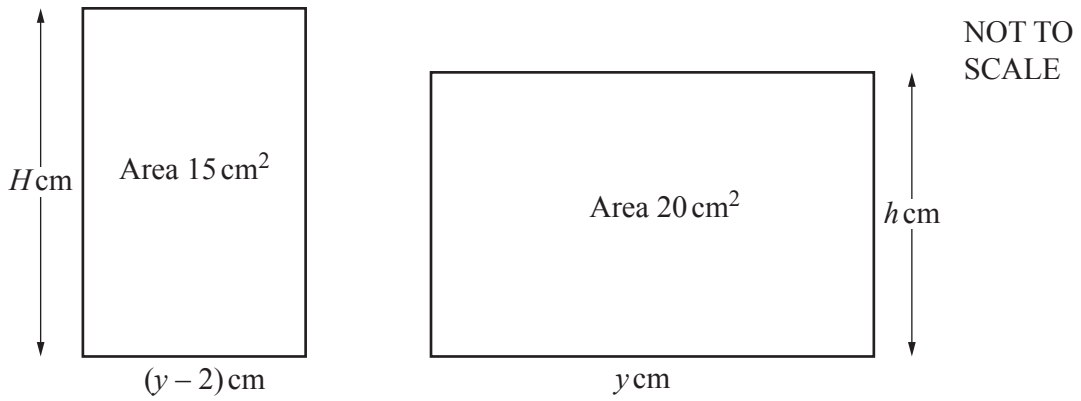
(ii) Solve the equation $3x^2 + 6x - 22 = 0$, giving your answers correct to 4 significant figures. You must show all your working.

$x =$ ..... or $x =$ ..... [4]

(iii) Find the perimeter of rectangle B.

..... cm [1]

(b)

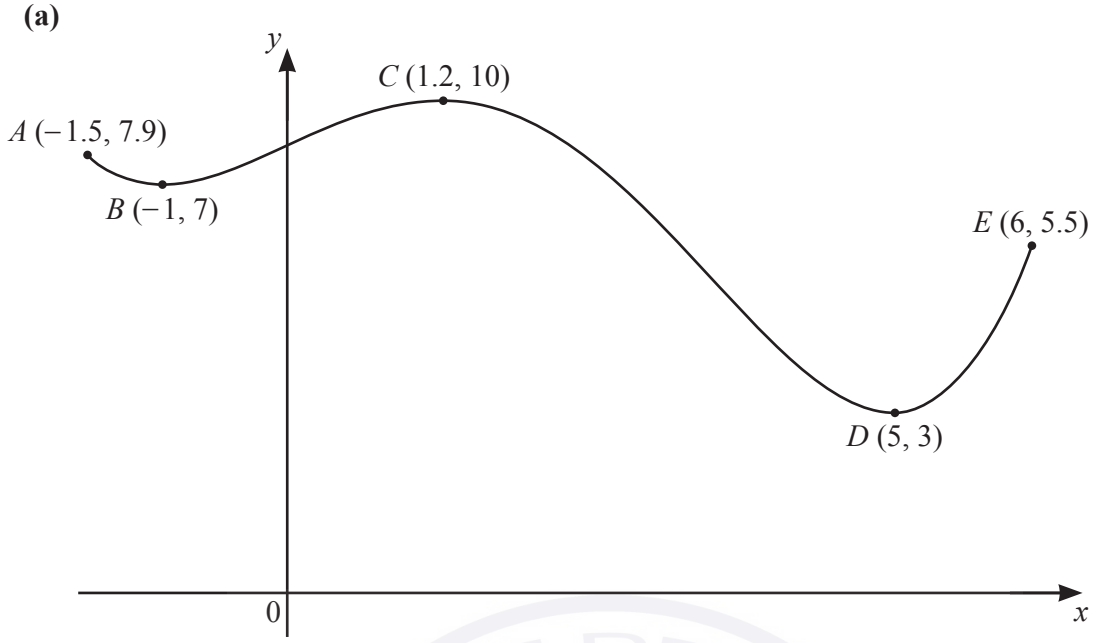


The diagram shows two rectangles where $H - h = 1$.

By forming a quadratic equation and factorising, find the value of y.

$y =$ ..... [7]

10 (a)



NOT TO SCALE

The diagram shows a sketch of the graph of $y = f(x)$ for $-1.5 \leqslant x \leqslant 6$.
The coordinates of five points on the graph of $y = f(x)$ are shown on the diagram.

(i) $f(x) = k$ has two solutions in the interval $-1.5 \leqslant x \leqslant 6$.

Write down a possible integer value of k.

$k =$ ..... [1]

(ii) $f(x) = j$ has no solutions in the interval $-1.5 \leqslant x \leqslant 6$ when $j < a$ or $j > b$.

Find the maximum value of a and the minimum value of b.

$a =$ .....

$b =$ ..... [2]

(b) Find the coordinates of the two stationary points on the graph of $y = x^6 - 6x^5$.
You must show all your working.

(..... , ...)

(..... , ...) [5]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

7001125135

MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2022**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

1 (a) (i) At a football club, season tickets are sold for seated areas and for standing areas.
The cost of season tickets are in the ratio seated : standing = 5 : 3.
The cost of a season ticket for the standing area is \$45.

Find the cost of a season ticket for the seated area.

\$ ..... [2]

(ii) In 2021, the value of the team's players was \$2.65 million.
In 2022 this value has decreased by 12%.

Find the value in 2022.

\$ ..... million [2]

(iii) The number of people at a football match is 1455.
This is 6.25% of the total number of people allowed in the stadium.

Find the total number of people allowed in the stadium.

..... [2]

(iv) The average attendance increased exponentially by 4% each year for the three years from 2016 to 2019.
In 2019 the average attendance was 1631.

Find the average attendance for 2016.

..... [3]

(b) Another club sells season tickets for individuals and for families.
In 2018, the number of season tickets sold is in the ratio family : individual = 2 : 7.

(i) The number of family season tickets sold is x.

Write an expression, in terms of x, for the number of individual season tickets sold.

..... [1]

(ii) In 2019, the number of family season tickets sold increases by 12 and the number of individual season tickets sold decreases by 26.

Complete the table by writing expressions, in terms of x, for the number of tickets sold each year.

Year	Family tickets	Individual tickets
2018	x	
2019		

[2]

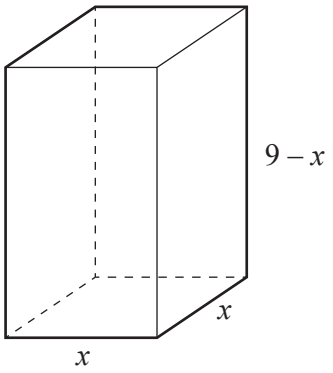
(iii) In 2019, the number of individual season tickets sold is 3 times the number of family season tickets sold.

Write an equation in x and solve it to find the number of family tickets sold in 2018.

$x =$ ..... [4]

[Turn over

2 All the lengths in this question are measured in centimetres.



NOT TO SCALE

The diagram shows a solid cuboid with a square base.

(a) The volume, $V\,\text{cm}^3$, of the cuboid is $V = x^2(9-x)$.
The table shows some values of V for $0 \leqslant x \leqslant 9$.

x	0	1	2	3	4	5	6	7	8	9
V	0	8		54	80	100	108	98	64	0

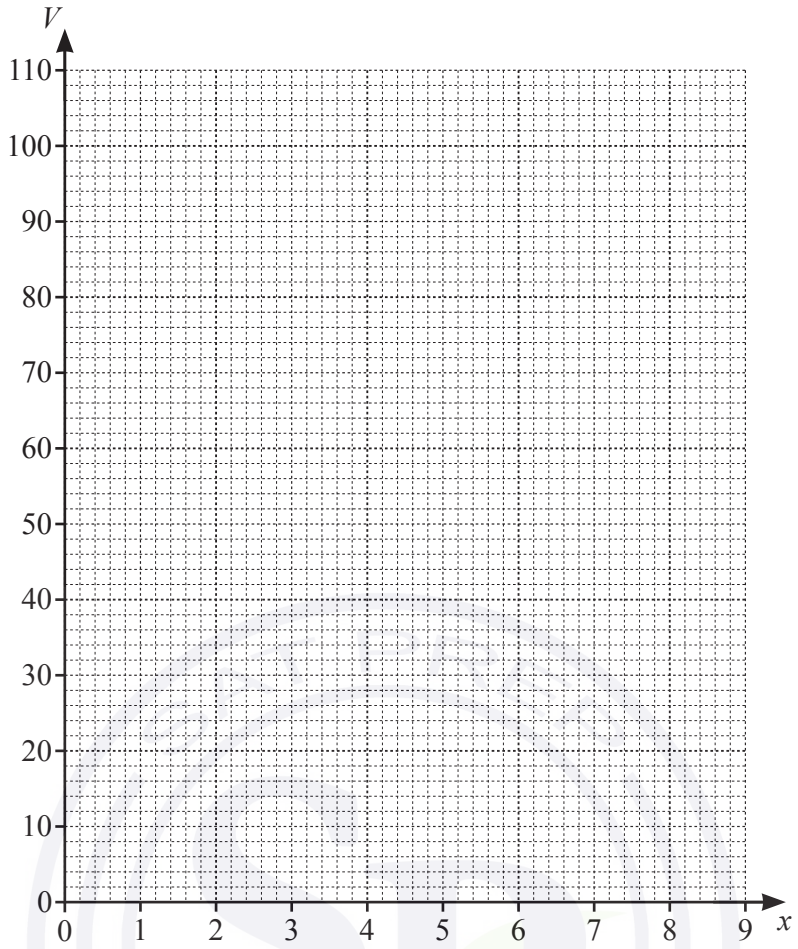
(i) Complete the table.

[1]

(ii) On the grid on the opposite page, draw the graph of $V = x^2(9-x)$ for $0 \leqslant x \leqslant 9$. [4]

(iii) Find the values of x when the volume of the cuboid is $44\,\text{cm}^3$.

$x =$ ..... or $x =$ ..... [2]



(b) (i) Show that the total surface area of the cuboid is $(36x - 2x^2)\text{cm}^2$.

[2]

(ii) Find the surface area when the volume of the cuboid is a maximum.

..... cm^2 [3]

3 Kai and Ann carry out a survey on the distances travelled, in kilometres, by 200 cars.

Kai completes this frequency table for the data collected.

Distance (d km)	$80 < d \leqslant 100$	$100 < d \leqslant 150$	$150 < d \leqslant 200$	$200 < d \leqslant 300$	$300 < d \leqslant 400$
Frequency	7	33	76	52	32

(a) (i) Calculate an estimate of the mean.

..... km [4]

(ii) Ann uses this frequency table for the same data.
There is a different interval for the final group.

Distance (d km)	$80 < d \leqslant 100$	$100 < d \leqslant 150$	$150 < d \leqslant 200$	$200 < d \leqslant 300$	$300 < d \leqslant 360$
Frequency	7	33	76	52	32

Without calculating an estimate of the mean for this data, find the difference between Ann's and Kai's estimate of the mean.
You must show all your working.

..... km [2]

(iii) A histogram is drawn showing the information in **Kai's** frequency table.
The height of the block for the interval $200 < d \leqslant 300$ is 2.6 cm.

Calculate the height of the block for each of the following intervals.

$80 < d \leqslant 100$ ..... cm

$150 < d \leqslant 200$ ..... cm

$300 < d \leqslant 400$ ..... cm [3]

(b) One car is picked at random.

Find the probability that the car has travelled more than 300 km.

..... [1]

(c) Two of the 200 cars are picked at random.

Find the probability that

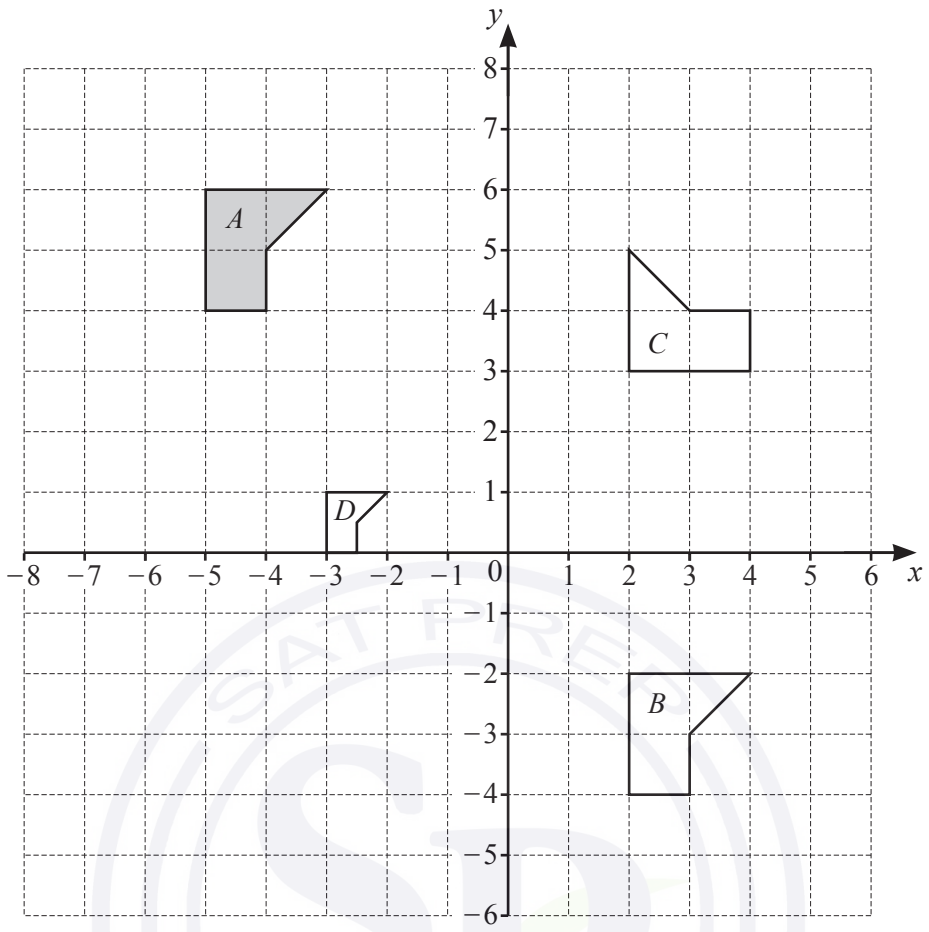
(i) both cars have travelled 150 km or less,

..... [2]

(ii) one car has travelled more than 200 km and the other car has travelled 100 km or less.

..... [3]

4



(a) Describe fully the **single** transformation that maps

(i) shape *A* onto shape *B*,

.....

..... [2]

(ii) shape *A* onto shape *C*,

.....

..... [3]

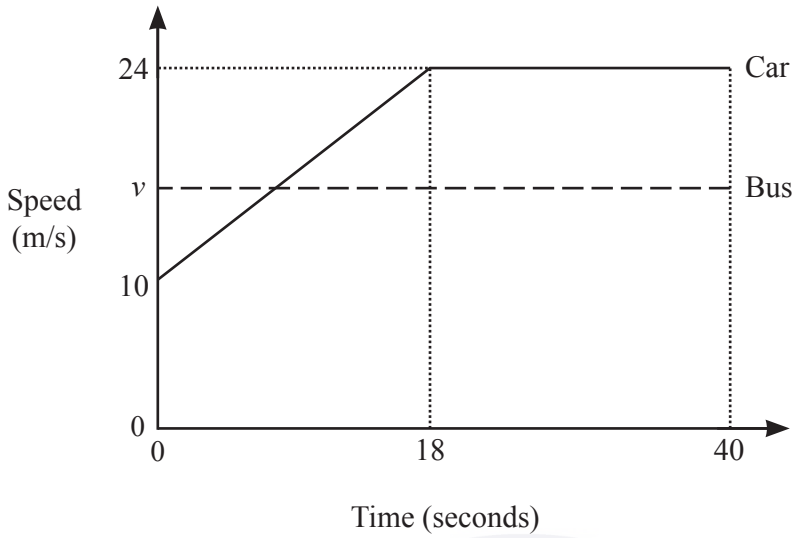
(iii) shape *A* onto shape *D*.

.....

..... [3]

(b) On the grid, draw the image of shape *A* after a reflection in the line $y = x + 8$. [2]

5 **(a)** The diagram shows the speed–time graph for part of a journey for two vehicles, a car and a bus.



NOT TO SCALE

(i) Calculate the acceleration of the car during the first 18 seconds.

..... m/s^2 [1]

(ii) In the first 40 seconds the car travelled 134 m more than the bus.

Calculate the constant speed, v, of the bus.

v = ... m/s [4]

(b) A train takes 10 minutes 30 seconds to travel 16 240 m.

Calculate the average speed of the train.
Give your answer in kilometres per hour.

..... km/h [3]

[Turn over

6 **(a)** Solve.

$$4x + 15 = 9$$

$x =$ ..... [2]

(b) Factorise.

$$a^2 - 9$$

..... [1]

(c) Write as a single fraction in its simplest form.

$$\frac{4a}{5} \div \frac{3ad}{10c}$$

..... [3]

(d) $5^n + 5^n + 5^n + 5^n + 5^n = 5^m$

Find an expression for m in terms of n.

$m =$ ..... [2]

(e) Solve by factorisation.

$$4x^2 + 8x - 5 = 0$$

$x =$ ..... or $x =$ ..... [3]

(f) **(i)** y is directly proportional to $(x+3)^3$.
When $x = 2,\ y = 13.5$.

Find x when $y = 108$.

$x =$ ..... [3]

(ii) g is inversely proportional to the square of d.
When d is halved, the value of g is multiplied by a factor n.

Find n.

$n =$ ..... [2]

(g) Expand and simplify.

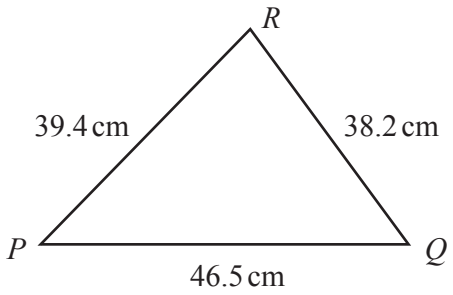
$$(2x+3)(x-1)(x+3)$$

..... [3]

(h) Find the derivative, $\frac{\mathrm{d}y}{\mathrm{d}x}$, of $y = 3x^2 + 4x - 1$.

..... [2]

7 **(a)**



NOT TO SCALE

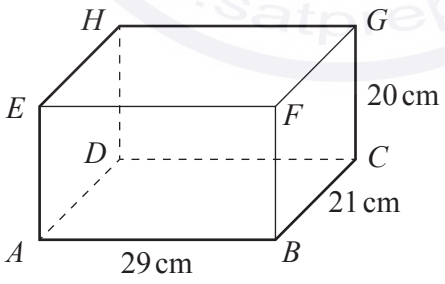
(i) Calculate angle QPR.

Angle QPR = ... [4]

(ii) Find the shortest distance from Q to PR.

..... cm [3]

(b) The diagram shows a cuboid.



NOT TO SCALE

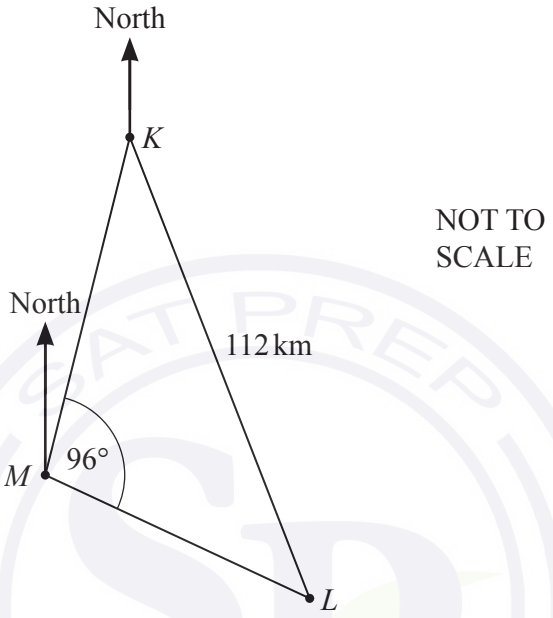
(i) Calculate the length AG.

AG = ... cm [3]

(ii) Calculate the angle between AG and the base $ABCD$.

..... [3]

(c)



The diagram shows the positions of a lighthouse, L, and two ships, K and M.
The bearing of L from K is 155° and $KL = 112\,\text{km}$.
The bearing of K from M is 010° and angle $KML = 96°$.

Find the bearing and distance of ship M from the lighthouse, L.

Bearing .....

Distance ..... km [5]

8 AB is a line with midpoint M.
A is the point (2, 3) and M is the point (12, 7).

(a) Find the coordinates of B.

(..... , ...) [2]

(b) Show that the equation of the perpendicular bisector of AB is $2y + 5x = 74$.

[4]

(c) The perpendicular bisector of AB passes through the point N.
The point N has coordinates $(2, n)$.

Find the value of n.

$n =$ ..... [1]

(d) Points A, M and N form a triangle.

Find the area of the triangle.

..... [2]

9

(a) On the diagram, sketch the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$. [2]

(b) Solve the equation $5\sin x + 4 = 0$ for $0° \leqslant x \leqslant 360°$.

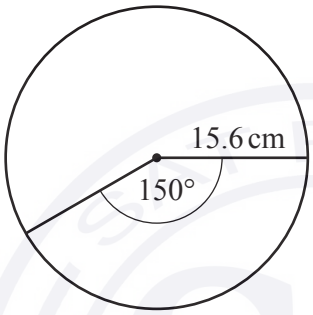
$x =$ ..... or $x =$ ..... [3]

10 **(a)** The lengths of the sides of a triangle are 11.4 cm, 14.8 cm and 15.7 cm, all correct to 1 decimal place.

Calculate the upper bound of the perimeter of the triangle.

..... cm [2]

(b)



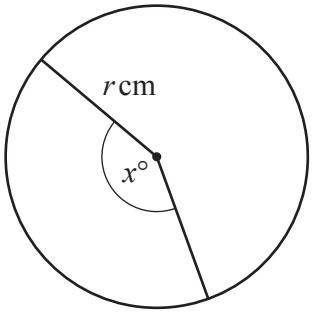
NOT TO SCALE

The diagram shows a circle, radius 15.6 cm.
The angle of the minor sector is 150°.

Calculate the area of the minor sector.

..... cm^2 [2]

(c)



NOT TO SCALE

The diagram shows a circle, radius r cm and minor sector angle $x°$.
The **perimeter** of the major sector is three times the **perimeter** of the minor sector.

Show that $x = \dfrac{90(\pi - 2)}{\pi}$.

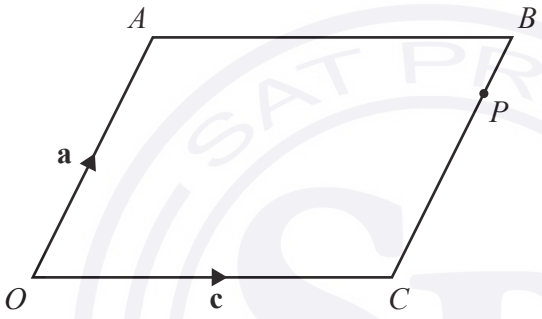
[4]

11 **(a)** $\left|\begin{pmatrix} 9m \\ 40m \end{pmatrix}\right| = \frac{205}{2}$

Find the two possible values of m.

$m =$ ..... or ..... [3]

(b)



NOT TO SCALE

$OABC$ is a parallelogram.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$.
P is the point on CB such that $CP : PB = 3 : 1$.

(i) Find, in terms of **a** and/or **c**, in their simplest form,

(a) $\overrightarrow{AC}$,

$\overrightarrow{AC} =$ ..... [1]

(b) $\overrightarrow{CP}$,

$\overrightarrow{CP} =$ ..... [1]

(c) $\overrightarrow{OP}$.

$\overrightarrow{OP} =$ ..... [1]

(ii) OP and AB are extended to meet at Q.

Find the position vector of Q.

..... [2]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

8701010157

MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2022**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

1 **(a)** Here are the ingredients needed to make a pasta bake to serve 12 people.

250 g butter
600 g pasta
460 g mushrooms
280 g cheese
800 ml milk

(i) Find the mass of the cheese as a percentage of the mass of the mushrooms.

..... % [1]

(ii) Find the mass of butter needed to make a pasta bake to serve 18 people.

..... g [2]

(iii) Monica has 2.2 litres of milk and 1.5 kg of each other ingredient.

Calculate the greatest number of people she can serve with pasta bake.

..... [3]

(b) In 2019, a packet of pasta cost $2.40. This was an increase of 25% of the cost of a packet in 2018.

(i) Work out the cost in 2018.

$ ..... [2]

(ii) In 2020, the cost of a packet increased by 15% from the cost in 2019.

Work out the total percentage increase in the cost of a packet from 2018 to 2020.

..... % [3]

(c)

NOT TO SCALE

Pasta is sold in packets with width 11.5 cm, correct to the nearest 0.5 cm.
A shop places these packets in a single line on a shelf of length 2 m, correct to the nearest 0.1 m.

Find the maximum number of these packets that will fit along this shelf.
You must show all your working.

..... [3]

2 **(a)** Simplify fully.

(i) $p^3 \times p^{11}$

..... [1]

(ii) $\dfrac{18m^6}{3m^2}$

..... [2]

(iii) $\left(\dfrac{27x^9y^{27}}{64}\right)^{-\frac{1}{3}}$

..... [3]

(b) A sequence has nth term $3n^2$.

Write down the first 3 terms of this sequence.

..... , ... , ... [2]

(c) Find the nth term for each of these sequences.

(i) 13, 16, 19, 22, 25, …

..... [2]

(ii) 3, 17, 55, 129, 251, …

..... [2]

(d) Solve.

$$\frac{3x-22}{4} = 23$$

$x =$ ..... [3]

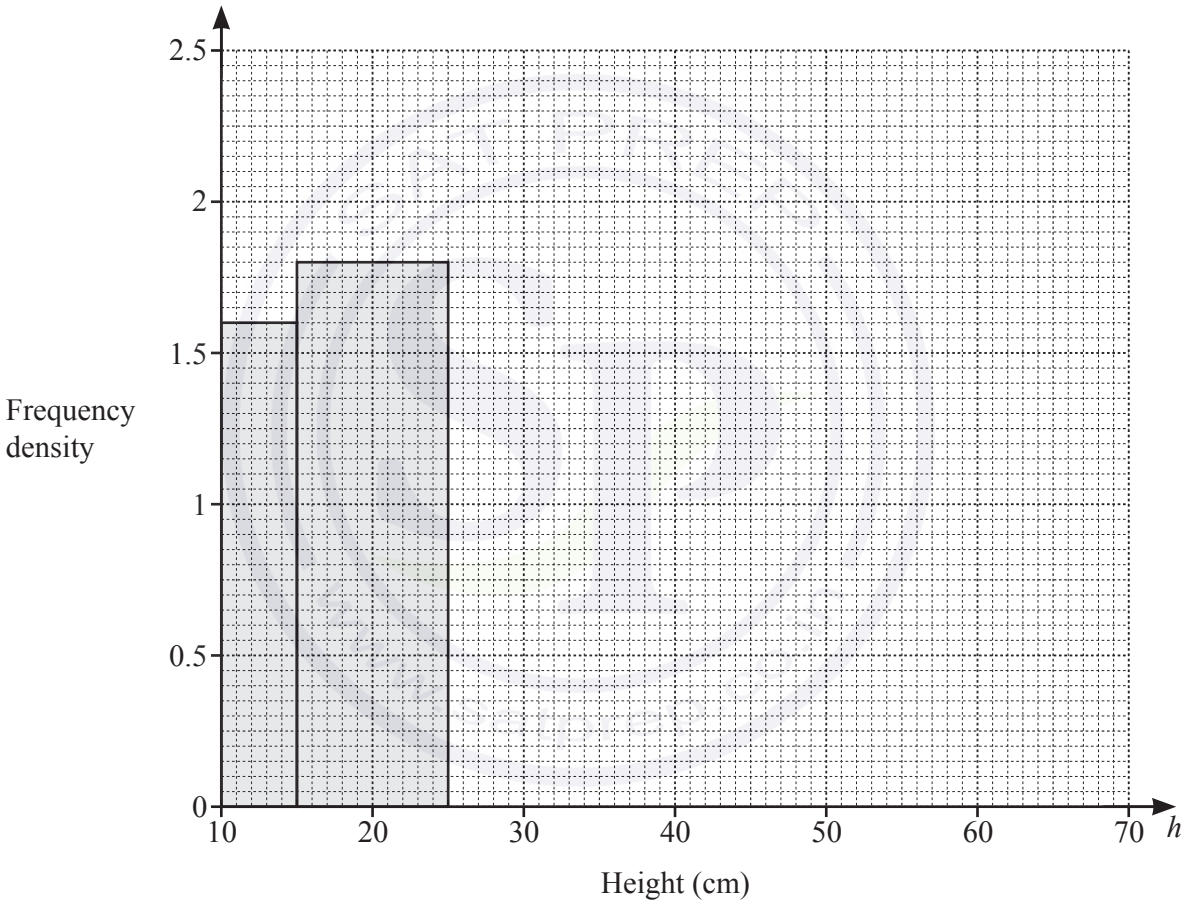
(e) Use the quadratic formula to solve $3x^2 + 8x - 20 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... , $x =$ ..... [4]

3 The height, h cm, of each of 100 plants is recorded.
The table shows information about the heights of these plants.

Height (h cm)	$10 < h \leqslant 15$	$15 < h \leqslant 25$	$25 < h \leqslant 40$	$40 < h \leqslant 60$	$60 < h \leqslant 70$
Frequency	8	18	28	33	13

(a) Complete the histogram to show this information.
The first two blocks have been drawn for you.

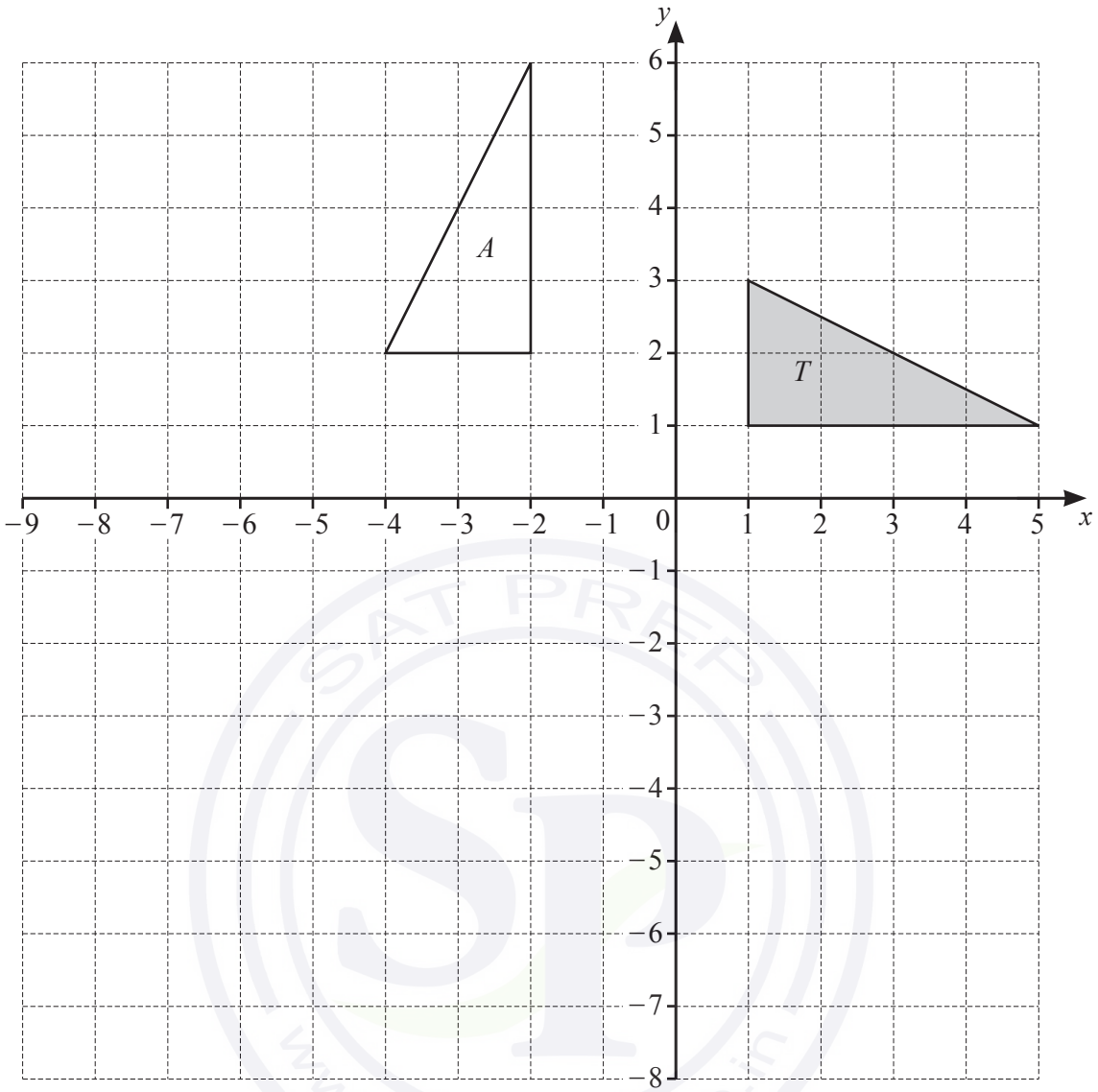


[3]

(b) Calculate an estimate of the mean height.

..... cm [4]

4



(a) Draw the reflection of triangle T in the line $y = -2$. [2]

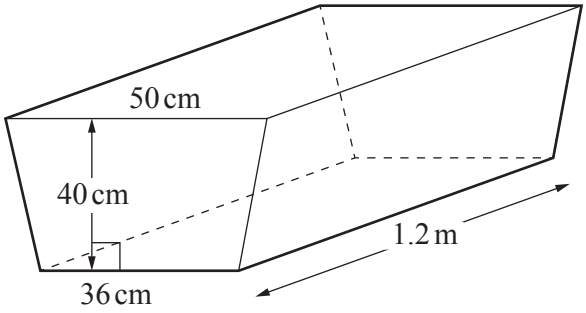
(b) Draw the enlargement of triangle T with scale factor $\frac{1}{2}$ and centre of enlargement $(-5, -3)$. [2]

(c) Describe fully the **single** transformation that maps triangle T onto triangle A.

.....

..... [3]

5



NOT TO SCALE

The diagram shows a water trough in the shape of a prism.
The prism has a cross-section in the shape of an isosceles trapezium.
The trough is completely filled with water.

(a) Show that the volume of water in the trough is 206.4 litres.

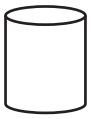
[3]

(b) The water from the trough is emptied at a rate of 600 ml per second.

Calculate the time taken, in minutes and seconds, for the trough to be emptied.

..... minutes ..... seconds [3]

(c) All the water from the trough is emptied into a vertical cylindrical tank.
The depth of the water in the tank is 84 cm.



(i) Calculate the radius of the tank.

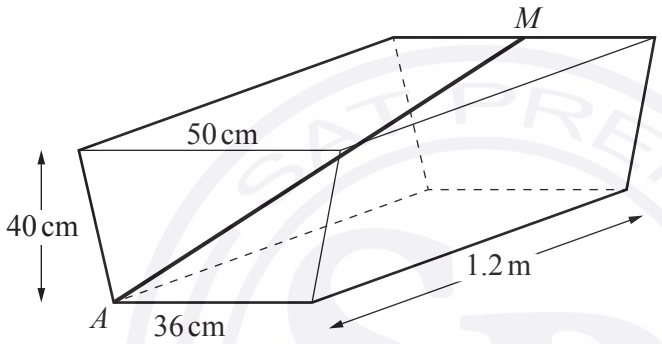
..... cm [3]

(ii) The tank is 60% full.

Calculate the height of the tank.

..... cm [2]

(d)



NOT TO SCALE

A steel rod AM is placed inside the empty water trough as shown in the diagram.
A is a vertex at the base of the isosceles trapezium and M is the midpoint of the top edge on the opposite face.

Calculate the length of the steel rod, AM.

$AM =$ ..... cm [4]

6 **(a)** $P = 5k^2 - 7$

(i) Find the value of P when $k = 3$.

$P =$ ..... [2]

(ii) Rearrange the formula to make k the subject.

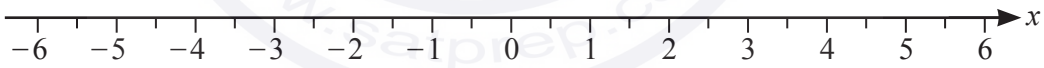
$k =$ ..... [3]

(b) **(i)** Solve.

$x - 3 \leqslant 5x + 7$

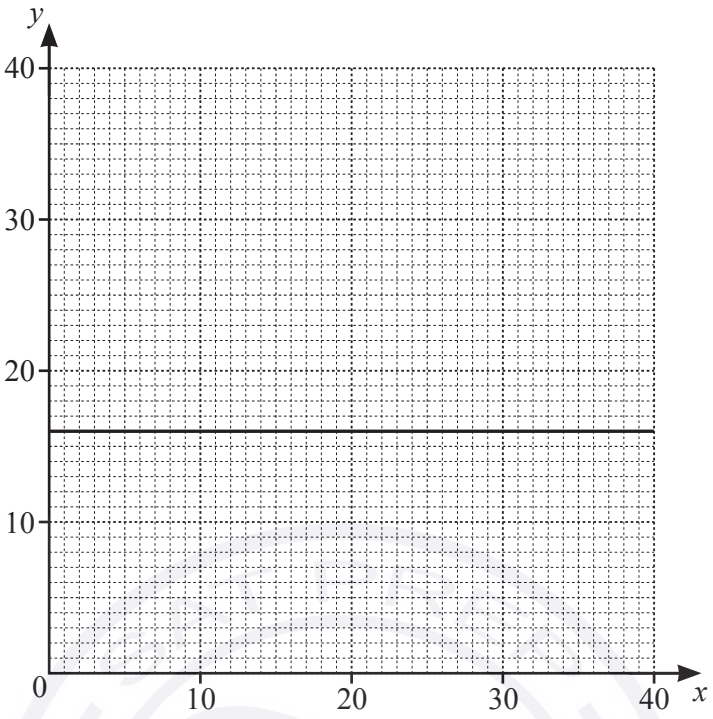
..... [2]

(ii) Show your answer to **part (b)(i)** on the number line.



[1]

(c) The line $y = 16$ is drawn on the grid.



The region R satisfies the following inequalities.

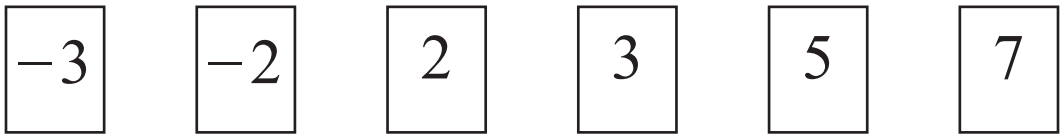
$y \geqslant 16$ $x > 2$ $2x + 3y \geqslant 72$ $y \leqslant 32 - x$

(i) By drawing three more lines and shading the region **not required**, find and label region R. [6]

(ii) Find the integer coordinates (x, y) in the region R that give the maximum value of $2x + y$.

(..... , ...) [2]

7 Regan is playing a game with these six number cards.



(a) She takes two cards at random, without replacement, and **multiplies** the two numbers to give a score.

Find the probability that

(i) the score is 35

..... [3]

(ii) the score is a positive number.

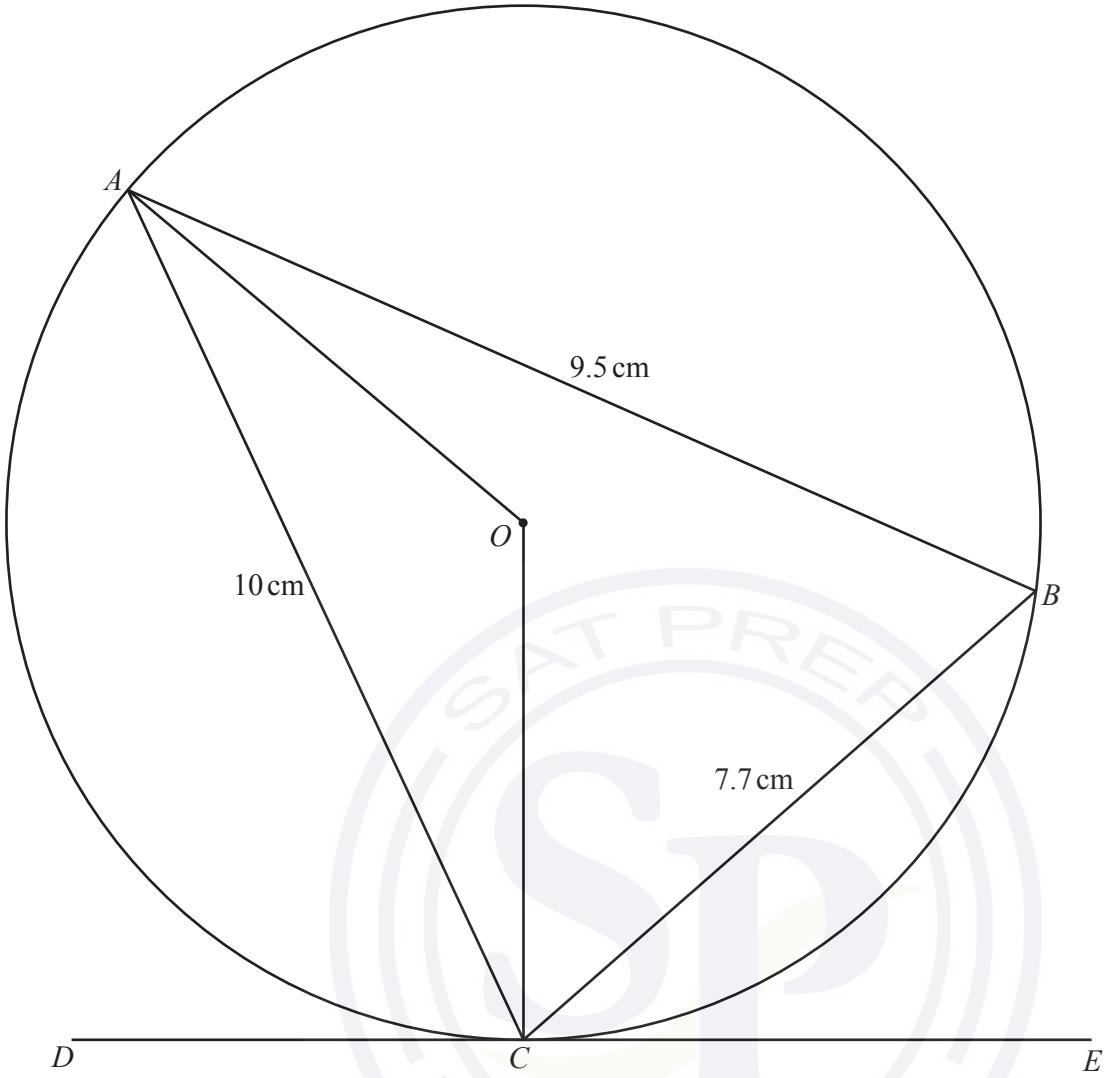
..... [3]

(b) Regan now takes three cards at random from the six cards, without replacement, and **adds** the three numbers to give a total.

Find the probability that her total is 5.

..... [4]

8



NOT TO SCALE

A, B and C are points on the circle, centre O.
DE is a tangent to the circle at C.
$AC = 10\,\text{cm}$, $AB = 9.5\,\text{cm}$ and $BC = 7.7\,\text{cm}$.

(a) Show that angle $ABC = 70.2°$, correct to 1 decimal place.

[4]

(b) Find

(i) angle AOC

Angle AOC = ... [1]

(ii) angle ACO

Angle ACO = ... [1]

(iii) angle ACD.

Angle ACD = ... [1]

(c) Calculate the radius, OC, of the circle.

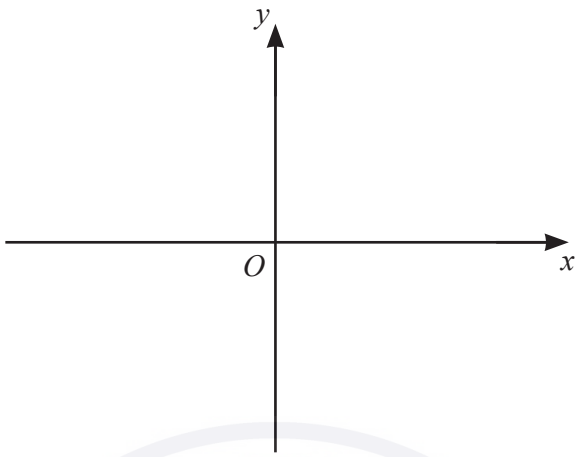
OC = ... cm [3]

(d) Calculate the area of triangle ABC as a percentage of the area of the circle.

..... % [4]

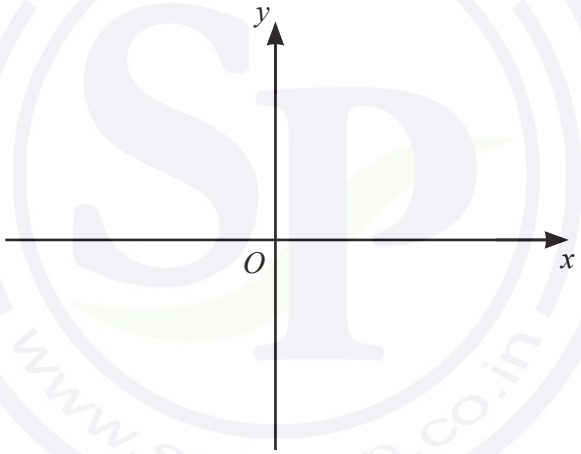
9 **(a)** Sketch the following graphs.
On each sketch, indicate any intercepts with the axes.

(i) $3x - 4y = 12$



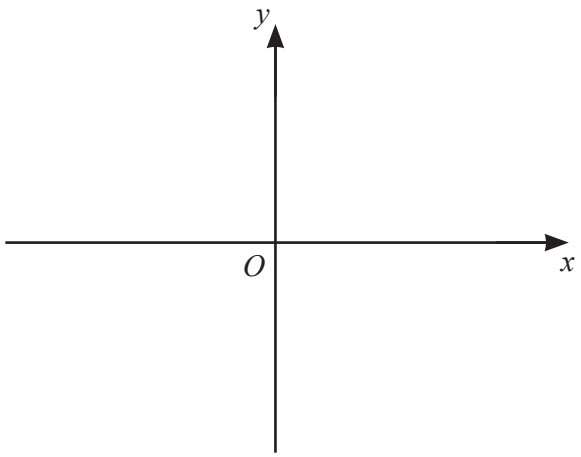
[2]

(ii) $y = x^2 - 3x - 4$



[4]

(iii) $y = 6^x$



[2]

(b) (i) Find the derivative, $\frac{dy}{dx}$, of $y = 5 + 8x - \frac{4}{3}x^3$.

..... [2]

(ii) Find the gradient of $y = 5 + 8x - \frac{4}{3}x^3$ at $x = -1$.

..... [2]

(iii) A tangent is drawn to the graph of $y = 5 + 8x - \frac{4}{3}x^3$.
The gradient of the tangent is -28.

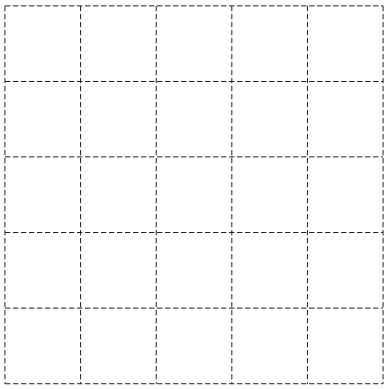
Find the coordinates of the two possible points where this tangent meets the graph.

(..... , ...)

(..... , ...) [5]

10 (a) $\mathbf{a} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -3 \\ 5 \end{pmatrix}$

(i) On the grid, draw and label vector $2\mathbf{a}$.

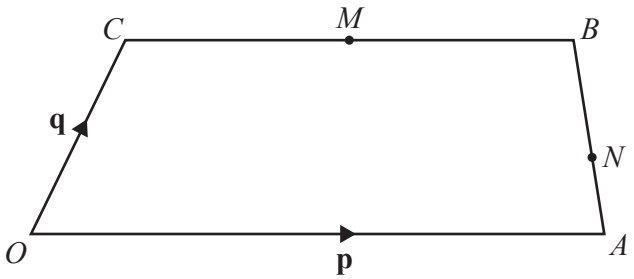


[1]

(ii) On the grid, draw and label vector $(\mathbf{a} - \mathbf{b})$.

[2]

(b)



NOT TO SCALE

$OABC$ is a trapezium with OA parallel to CB.
M is the midpoint of CB and N is the point on AB such that $AN : NB = 1 : 2$.
O is the origin, $\overrightarrow{OA} = \mathbf{p}$, $\overrightarrow{OC} = \mathbf{q}$ and $\overrightarrow{CB} = \frac{3}{4}\mathbf{p}$.

(i) Find, in terms of **p** and/or **q**, in its simplest form

(a) $\overrightarrow{OB}$

$\overrightarrow{OB} =$ ..... [1]

(b) $\overrightarrow{AB}$

$\overrightarrow{AB} =$ ..... [2]

(c) $\overrightarrow{MN}$.

$\overrightarrow{MN} =$ ..... [3]

(ii) OA and MN are extended to meet at G.

Find the position vector of G in terms of **p**.

..... [2]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2015947858

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2022**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

1 **(a)** The list shows 15 midday temperatures, in degrees Celsius, in Suntown.

17 21 21 18 23 22 25 19

21 17 19 18 21 24 23

(i) Complete the stem-and-leaf diagram to show this information.

1	7
2	

Key: 1|7 represents 17 °C

[2]

(ii) Find the median.

..... °C [1]

(iii) Find the upper quartile.

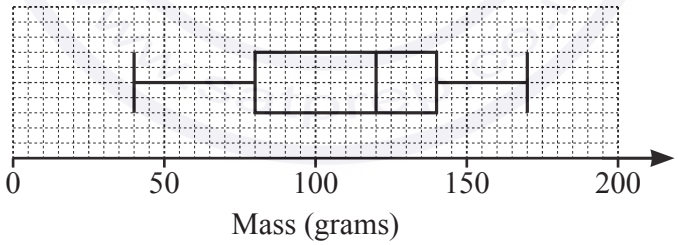
..... °C [1]

(iv) Rahul draws a pie chart to show this information.

Calculate the sector angle for the number of days the temperature is 18 °C.

..... [2]

(b)



The box-and-whisker plot shows information about the masses, in grams, of some apples.

(i) Find the median.

..... g [1]

(ii) Find the range.

..... g [1]

(iii) Find the interquartile range.

..... g [1]

(c) (i) The time, t minutes, spent on homework in one week by each of 200 students is recorded. The table shows the results.

Time (t minutes)	$40 < t \leqslant 60$	$60 < t \leqslant 80$	$80 < t \leqslant 90$	$90 < t \leqslant 100$	$100 < t \leqslant 150$
Frequency	6	10	70	84	30

Calculate an estimate of the mean.

..... min [4]

(ii) A new table with different class intervals is completed.

Time (t minutes)	$40 < t \leqslant 90$	$90 < t \leqslant 150$
Frequency	86	114

On a histogram the height of the bar for the $40 < t \leqslant 90$ interval is 17.2 cm.

Calculate the height of the bar for the $90 < t \leqslant 150$ interval.

..... cm [2]

[Turn over

2 **(a)** Alex, Bobbie and Chris share strawberries in the ratio Alex : Bobbie : Chris = 3 : 2 : 2.
Chris receives 12 strawberries.

Calculate the total number of strawberries shared.

..... [2]

(b) In a sale, a shop reduces all prices by 12%.

(i) Dina buys a book which has an original price of $6.50 .

Calculate how much Dina pays for the book.

$ ..... [2]

(ii) Elu pays $11 for a toy.

Calculate the original price of the toy.

$ ..... [2]

(c) Feri invests some money.
The rate of interest for the first year is 2.5%.
At the end of the second year the overall percentage increase of Feri's investment is 6.6%.

Find the rate of interest for the second year.

..... % [2]

(d) A radioactive substance decays at an exponential rate of 2% per day.
The initial mass is 80 g.

(i) Find the mass at the end of 5 days.

..... g [2]

(ii) Find how many **more** whole days, after day 5, it takes for the mass to reduce to less than 67 g.

..... [3]

3 **(a)** Geeta buys x apples, $(x+7)$ oranges and $(2x-1)$ bananas.
The total number of pieces of fruit Geeta buys is 30.

(i) Find the number of apples Geeta buys.

..... [3]

(ii) The cost of one apple is 15 cents.
The cost of one orange is 18 cents.
The total cost of all the fruit is \$5.55 .

Find the cost, in cents, of one banana.

..... cents [3]

(b) **(i)** Solve.

$$\frac{3w}{16} - 1 = \frac{1}{2}$$

$w =$ ..... [2]

(ii) $$\frac{3(2^{-y})}{16} - 1 = \frac{1}{2}$$

Find the value of y.

$y =$ ..... [2]

(c) **(i)** Solve the simultaneous equations.

$$2p + q = 2$$
$$p - q = -\frac{1}{2}$$

$p =$ .....

$q =$ ..... [2]

(ii) Hence, for $0° \leqslant u \leqslant 360°$ and $0° \leqslant v \leqslant 360°$, solve the simultaneous equations.

$$2\sin u + \cos v = 2$$
$$\sin u - \cos v = -\frac{1}{2}$$

$u =$ ..... or $u =$ .....

$v =$ ..... or $v =$ ..... [4]

4 $f(x) = 2x - 1$ $g(x) = 3x - 2$ $h(x) = \frac{1}{x},\ x \neq 0$ $j(x) = 5^x$

(a) Find

(i) $f(2)$,

..... [1]

(ii) $gf(2)$.

..... [1]

(b) Find $g^{-1}(x)$.

$g^{-1}(x) =$ ..... [2]

(c) Find x when $h(x) = j(-2)$.

$x =$ ..... [2]

(d) Write $f(x) - h(x)$ as a single fraction.

..... [2]

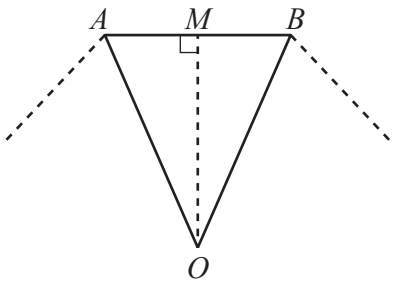
(e) Find the value of $\mathrm{jj}(2)$.

..... [1]

(f) Find x when $\mathrm{j}^{-1}(x) = 4$.

$x =$ ..... [2]

5 **(a)** *ABCDEFGH* is a regular octagon with sides of length 6 cm.
The diagram shows part of the octagon.
O is the centre of the octagon and *M* is the midpoint of *AB*.



NOT TO SCALE

(i) **(a)** Show that angle *OAM* is 67.5°.

[2]

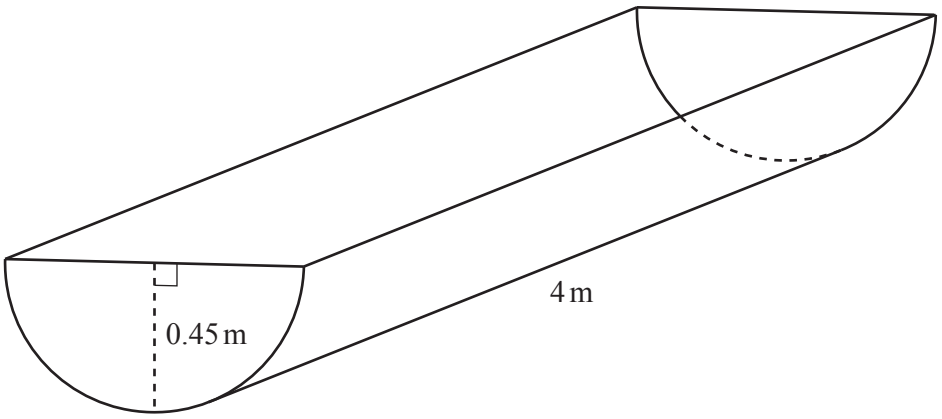
(b) Calculate the area of the octagon.

..... cm^2 [4]

(ii) Find the area of the circle that passes through the vertices of the octagon.

..... cm^2 [3]

(b)



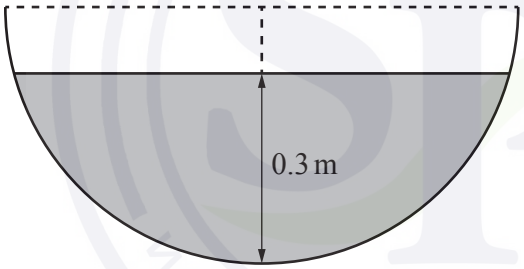
NOT TO SCALE

The diagram shows a horizontal container for water with a uniform cross-section.
The cross-section is a semicircle.
The radius of the semicircle is 0.45 m and the length of the container is 4 m.

(i) Calculate the volume of the container.

..... m^3 [2]

(ii)



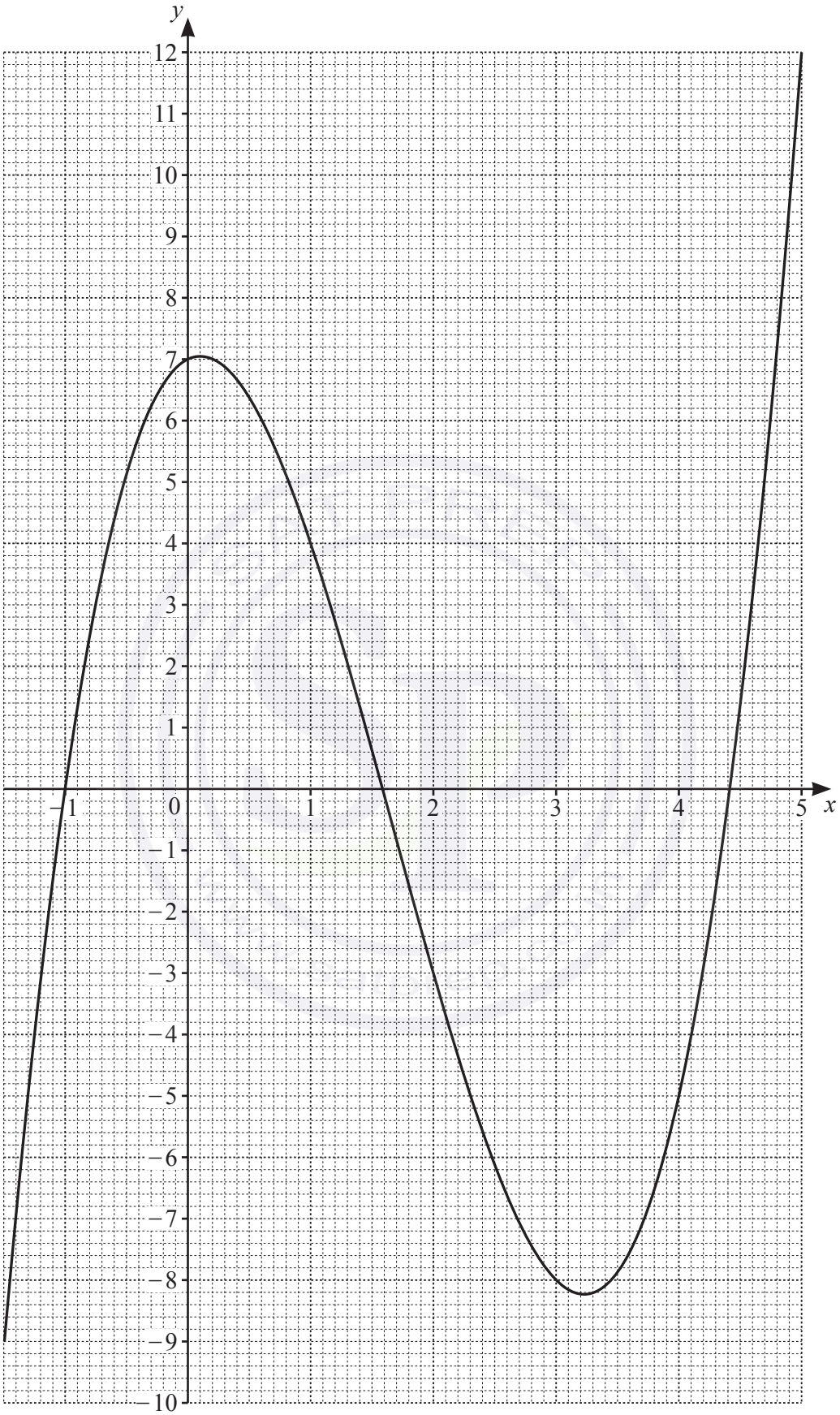
NOT TO SCALE

The greatest depth of the water in the container is 0.3 m.
The diagram shows the cross-section.

Calculate the number of litres of water in the container.
Give your answer correct to the nearest integer.

..... litres [6]

6 (a)



The diagram shows the graph of $y = f(x)$ for $-1.5 \leqslant x \leqslant 5$.

(i) Find $f(2)$.

..... [1]

(ii) Solve the equation $f(x) = 0$ for $-1.5 \leqslant x \leqslant 5$.

$x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(iii) $f(x) = k$ has three solutions for $-1.5 \leqslant x \leqslant 5$ where k is an integer.

Find the smallest possible value of k.

$k =$ ..... [1]

(iv) On the grid, draw a line $y = mx$ so that $f(x) = mx$ has exactly one solution for $-1.5 \leqslant x \leqslant 5$. [2]

(b) $y = 3x^2 - 12x + 7$

(i) Find the value of $\frac{dy}{dx}$ when $x = 5$.

..... [3]

(ii) Find the coordinates of the point on the graph of $y = 3x^2 - 12x + 7$ where the gradient is 0.

(..... , ...) [2]

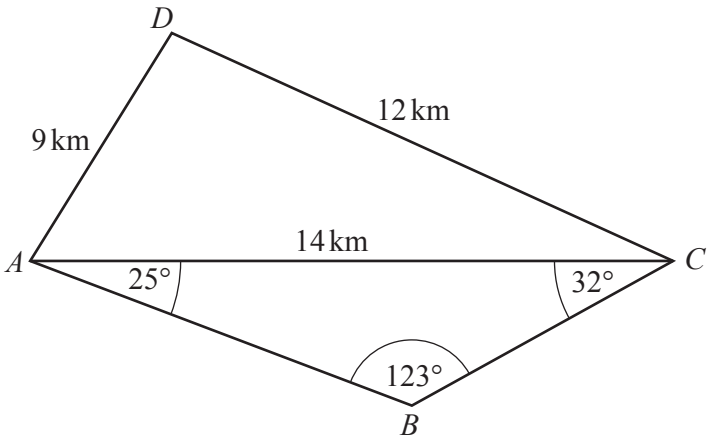
(c) When $y = 2x^p + qx^2$, $\frac{dy}{dx} = 14x^6 + 6x$.

Find the value of p and the value of q.

$p =$ .....

$q =$ ..... [2]

7



NOT TO SCALE

(a) Calculate angle ACD.

Angle ACD = ... [4]

(b) Show that $BC = 7.05\,\text{km}$, correct to 2 decimal places.

[3]

(c) Calculate the shortest distance from B to AC.

..... km [3]

(d) Calculate the length of the straight line BD.

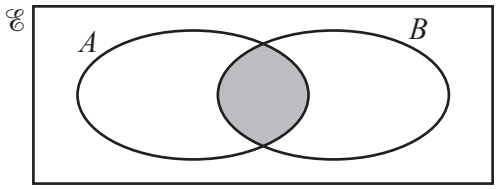
$BD =$ ..... km [4]

(e) C is due east of A.

Find the bearing of D from C.

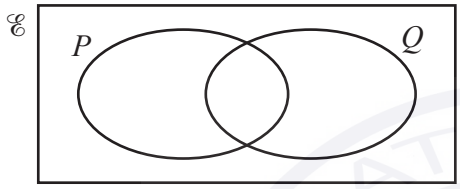
..... [2]

8 **(a)** **(i)** Use set notation to describe the shaded region in the Venn diagram.

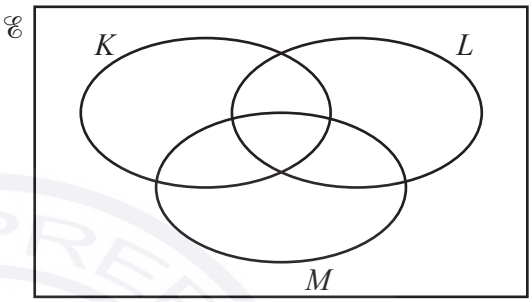


..... [1]

(ii) Shade the correct region in each Venn diagram.



$Q \cup P'$



$(K \cup L) \cap M'$

[2]

(b)

V	E	N	N	D	I	A	G	R	A	M

The diagram shows 11 cards.

(i) One of these cards is chosen at random.

Write down the probability that the letter on the card is **not** A.

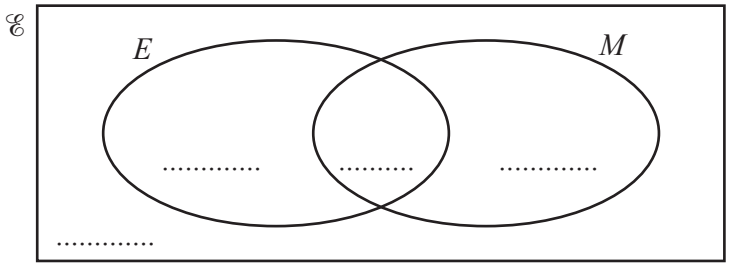
..... [1]

(ii) A card is chosen at random from these 11 cards and then replaced.
A second card is then chosen at random.

Find the probability that exactly one card has the letter N.

..... [3]

(c)



50 students are asked if they like English (E) and if they like mathematics (M).
3 say they do not like English and do not like mathematics.
33 say they like English.
42 say they like mathematics.

(i) Complete the Venn diagram. [2]

(ii) A student is chosen at random.

Find the probability that this student likes English and likes mathematics.

..... [1]

(iii) Two students are chosen at random.

Find the probability that they both like mathematics.

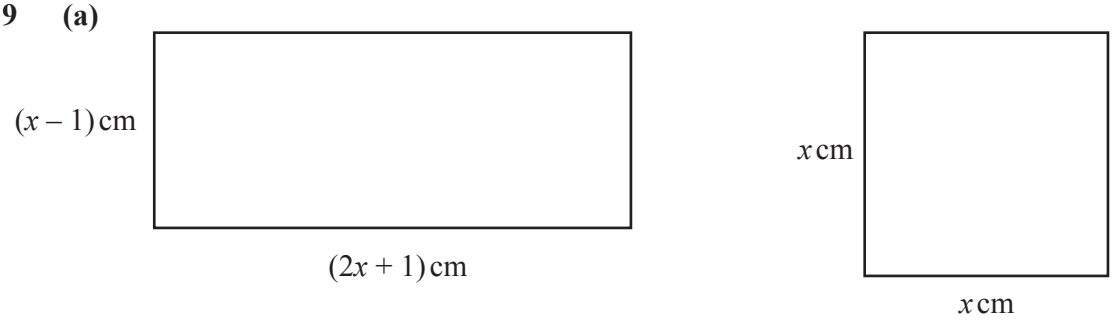
..... [2]

(iv) Two students who like English are chosen at random.

Find the probability that they both also like mathematics.

..... [2]

9 (a)

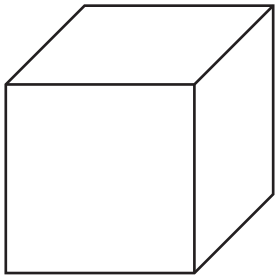


The area of the rectangle is $29\,cm^2$ greater than the area of the square.
The difference between the perimeters of the two shapes is k cm.

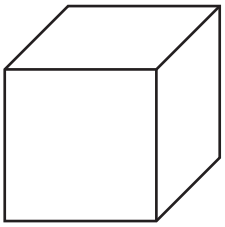
Find the value of k.
You must show all your working.

$k =$ ..... [6]

(b)



$(y + 1)$ cm



y cm

NOT TO SCALE

The volume of the larger cube is $5\,\text{cm}^3$ greater than the volume of the smaller cube.

(i) Show that $3y^2 + 3y - 4 = 0$.

[4]

(ii) Find the volume of the smaller cube.
Show all your working and give your answer correct to 2 decimal places.

..... cm^3 [4]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

9543516975

MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2022**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

1 **(a)** Find the lowest common multiple (LCM) of 30 and 75.

..... [2]

(b) Share \$608 in the ratio 4 : 5 : 7.

\$ .....

\$ .....

\$ ..... [3]

(c) Work out $\frac{6.39 \times 10^4}{2.45 \times 10^6}$.

Give your answer in standard form.

..... [2]

(d) Write $0.\dot{2}\dot{7}$ as a fraction.

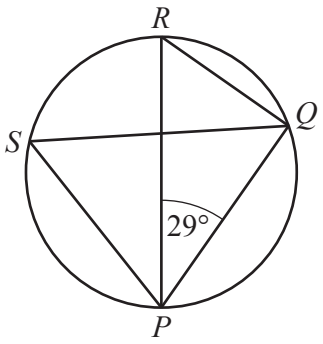
..... [1]

(e) A stone has volume 45 cm^3 and mass 126 g.
Find the density of the stone, giving the units of your answer.

[Density = mass ÷ volume]

.... [2]

2 **(a)**



NOT TO SCALE

The points P, Q, R and S lie on a circle with diameter PR.

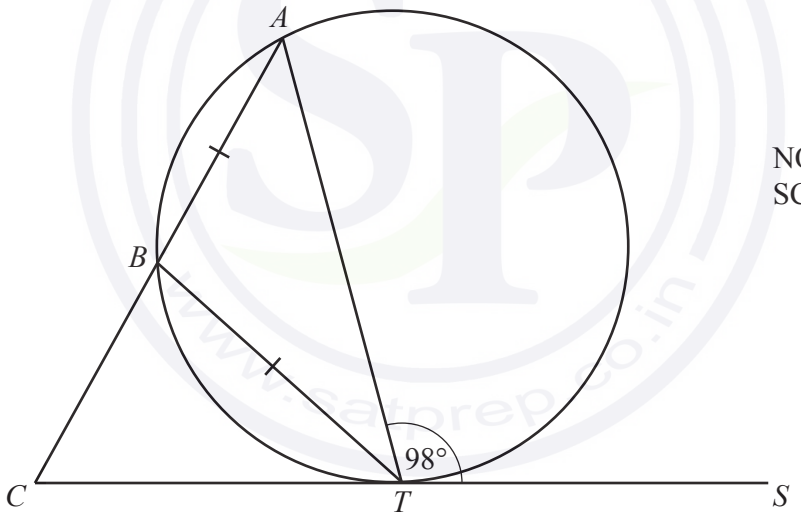
Work out the size of angle PSQ, giving a geometrical reason for each step of your working.

.....

.....

..... [3]

(b)



NOT TO SCALE

The points A, B and T lie on a circle and CTS is a tangent to the circle at T.
ABC is a straight line and $AB = BT$.
Angle $ATS = 98°$.

Work out the size of angle ACT.

Angle $ACT =$ ..... [4]

3 A line, l, joins point F (3, 2) and point G ($-$ 5, 4).

(a) Calculate the length of line l.

..... [3]

(b) Find the equation of the perpendicular bisector of line l in the form $y = mx + c$.

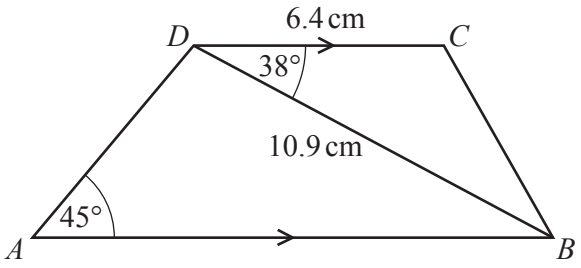
$y =$ ..... [5]

(c) A point H lies on the y-axis such that the distance $GH = 13$ units.

Find the coordinates of the two possible positions of H.

(....., ...) and (....., ...) [4]

4



NOT TO SCALE

ABCD is a trapezium with *DC* parallel to *AB*.
DC = 6.4 cm, *DB* = 10.9 cm, angle *CDB* = 38° and angle *DAB* = 45°.

(a) Find *CB*.

CB = ... cm [3]

(b) **(i)** Find angle *ADB*.

Angle *ADB* = ... [1]

(ii) Find *AB*.

AB = ... cm [3]

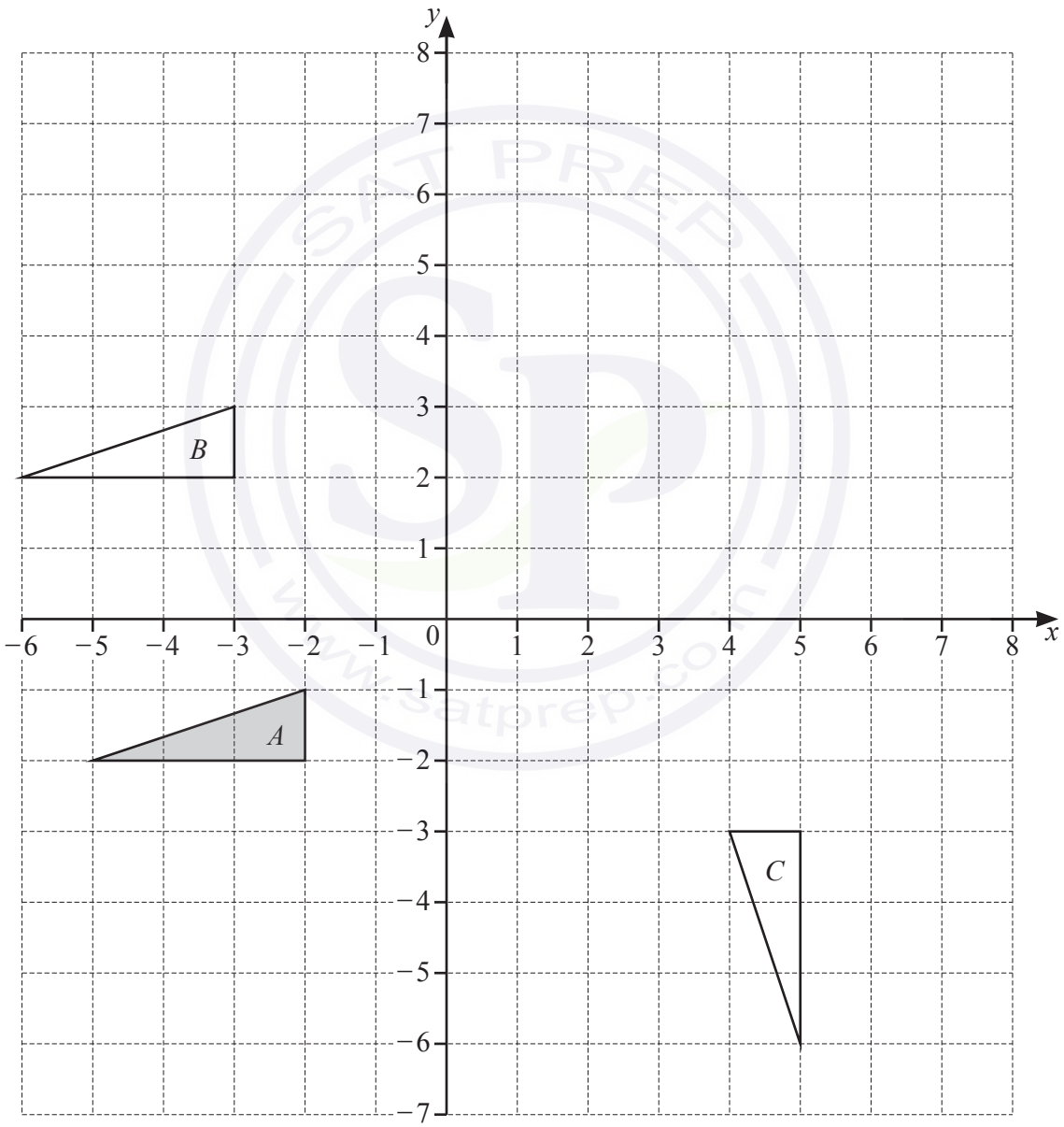
(c) Calculate the area of the trapezium.

..... cm^2 [3]

5 **(a)** Draw the lines of symmetry of the rectangle.

[2]

(b)



(i) Describe fully the **single** transformation that maps

(a) triangle A onto triangle B,

.....

..... [2]

(b) triangle A onto triangle C.

.....

..... [3]

(ii) **(a)** Draw the image of triangle A after reflection in $y = 2$. [2]

(b) Draw the image of triangle A after enlargement by scale factor -2, centre $(-1, 1)$. [2]

6 **(a)** At a festival, 380 people out of 500 people questioned say that they are camping.
There are 55 300 people at the festival.

Calculate an estimate of the total number of people camping at the festival.

..... [2]

(b) 12 friends travel to the festival.
5 travel by car, 4 travel by bus and 3 travel by train.
Two people are chosen at random from the 12 friends.

Calculate the probability that they travel by different types of transport.

..... [4]

(c) Arno buys a student ticket for $43.68 .
This is a saving of 16% on the full price of a ticket.

Calculate the full price of a ticket.

$ ..... [2]

(d) At a football match, there are 29 800 people, correct to the nearest 100.

(i) At the end of the football match, the people leave at a rate of 400 people per minute, correct to the nearest 50 people.

Calculate the lower bound for the number of minutes it takes for all the people to leave.

..... min [3]

(ii) At a cricket match there are 27 500 people, correct to the nearest 100.
Calculate the upper bound for the difference between the number of people at the football match and at the cricket match.

..... [2]

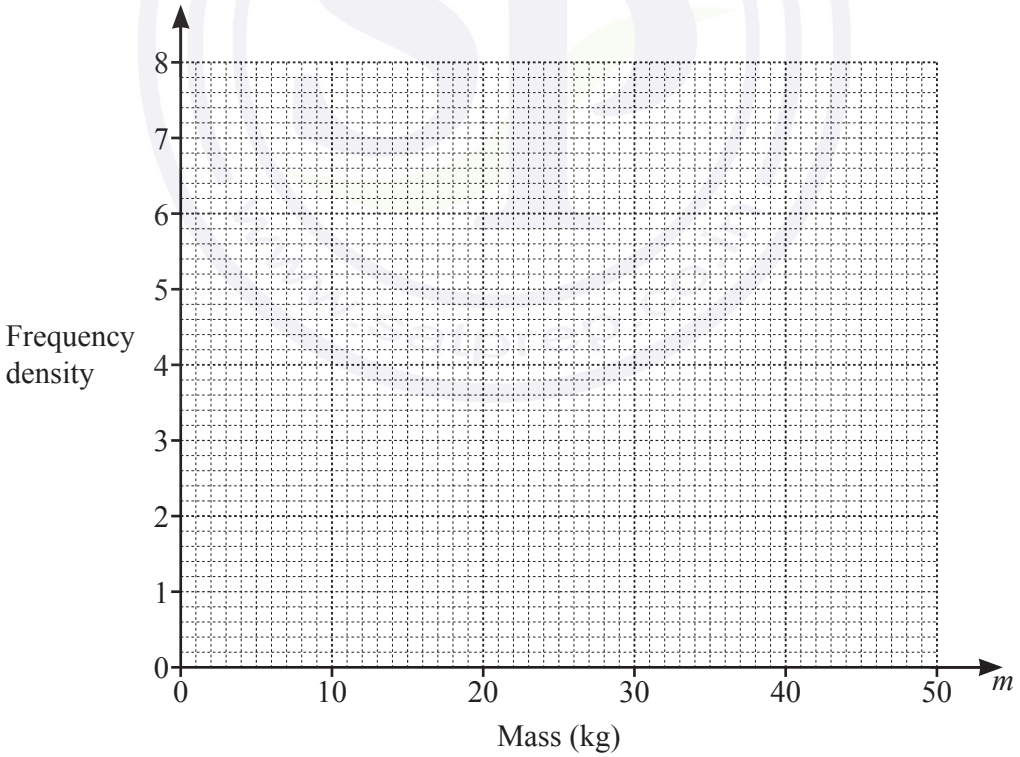
7 Information about the mass, m kg, of each of 150 children is recorded in the frequency table.

Mass (m kg)	$0 < m \leqslant 10$	$10 < m \leqslant 20$	$20 < m \leqslant 25$	$25 < m \leqslant 40$	$40 < m \leqslant 50$
Frequency	12	38	32	50	18

(a) Calculate an estimate of the mean mass.

..... kg [4]

(b) Draw a histogram to show the information in the table.



[4]

(c) (i) Use the frequency table to complete this cumulative frequency table.

Mass (m kg)	$m \leqslant 10$	$m \leqslant 20$	$m \leqslant 25$	$m \leqslant 40$	$m \leqslant 50$
Cumulative frequency					

[2]

(ii) Calculate the percentage of children with a mass greater than 10 kg.

..... % [2]

8 **(a)** Solve.

$$10 - 3p = 3 + 11p$$

$p =$ ..... [2]

(b) Make m the subject of the formula.

$$mc^2 - 2k = mg$$

$m =$ ..... [3]

(c) Solve.

$$\frac{1}{x-3} + \frac{4}{2x+3} = 1$$

$x =$ ..... or $x =$ ..... [5]

(d) Solve the simultaneous equations.
You must show all your working.

$$x + 2y = 12$$
$$5x + y^2 = 39$$

$x =$ ..... $y =$ .....

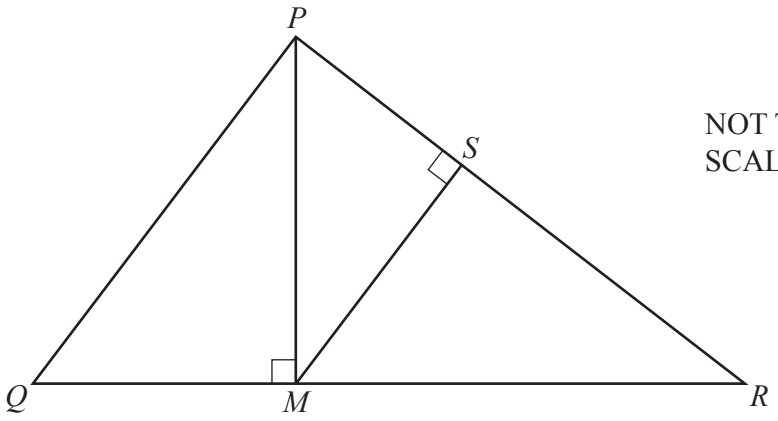
$x =$ ..... $y =$ ..... [5]

(e) Expand and simplify.

$$(2x - 3)(x + 6)(x - 4)$$

..... [3]

9 (a)



NOT TO SCALE

In triangle PQR, M lies on QR and S lies on PR.

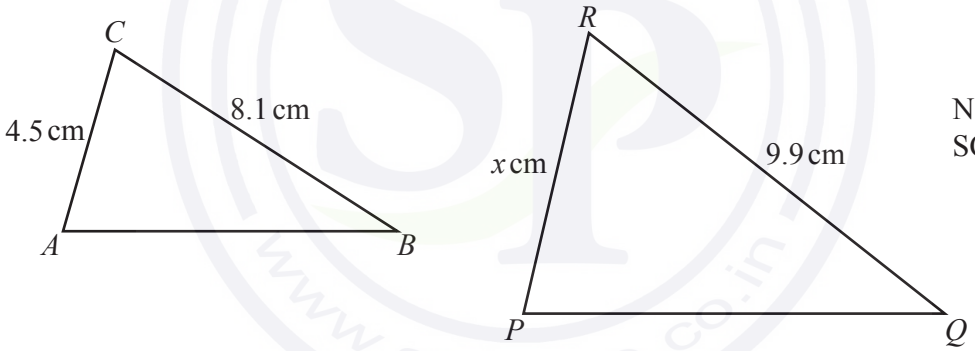
Explain, giving reasons, why triangle PMR is similar to triangle MSR.

.....

.....

..... [3]

(b)



NOT TO SCALE

Triangle ABC is similar to triangle PQR.

(i) Find the value of x.

$x =$ ..... [2]

(ii) The area of triangle PQR is $25\,\text{cm}^2$.

Calculate the area of triangle ABC.

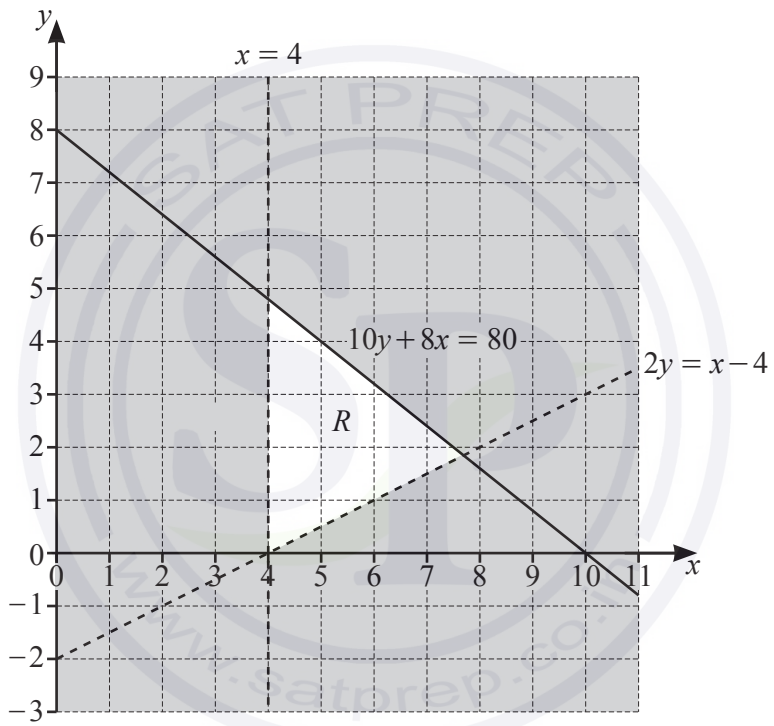
..... cm^2 [2]

10 **(a)** Find all the positive integers which satisfy the inequality.

$$3n - 8 > 5n - 15$$

..... [2]

(b)



The region marked R is defined by three inequalities.

(i) Find these three inequalities.

.....

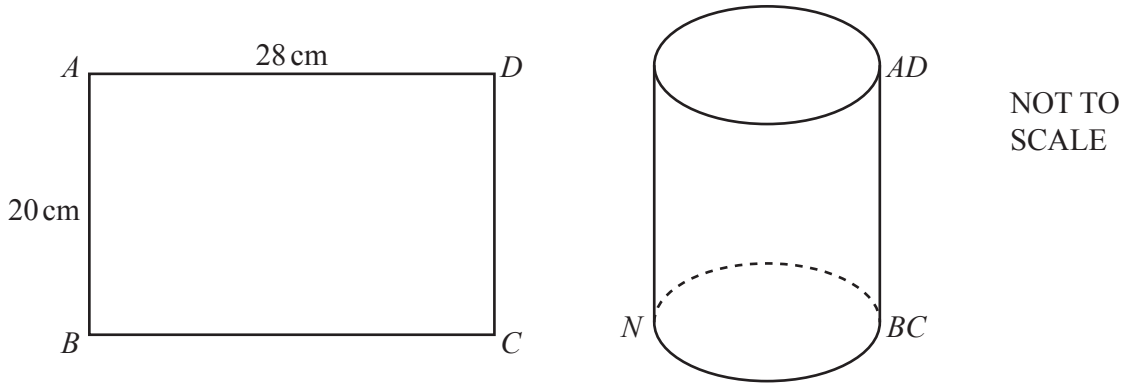
.....

..... [3]

(ii) Write down the largest value of $3x + y$ in the region R for integers x and y.

..... [2]

11 (a)



A rectangular sheet of paper $ABCD$ is made into an open cylinder with the edge AB meeting the edge DC.
$AD = 28$ cm and $AB = 20$ cm.

(i) Show that the radius of the cylinder is 4.46 cm, correct to 3 significant figures.

[2]

(ii) Calculate the volume of the cylinder.

..... cm^3 [2]

(iii) N is a point on the base of the cylinder, such that BN is a diameter.

Calculate the angle between AN and the base of the cylinder.

..... [3]

(b) The volume of a solid cone is $310\,\text{cm}^3$.
The height of the cone is twice the radius of its base.

Calculate the slant height of the cone.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm [5]

12 A curve has equation $y = x^3 - kx^2 + 1$.
When $x = 2$, the gradient of the curve is 6.

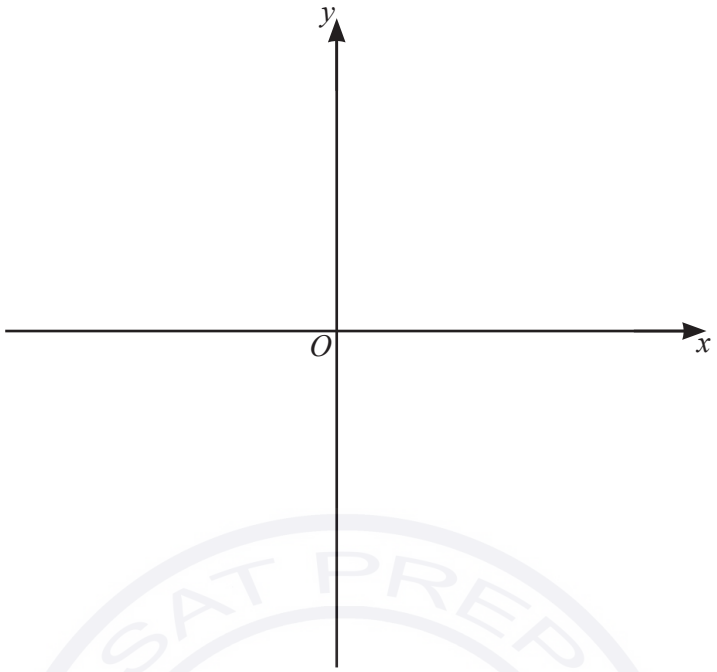
(a) Show that $k = 1.5$.

[5]

(b) Find the coordinates of the two stationary points of $y = x^3 - 1.5x^2 + 1$.
You must show all your working.

(.....,.....) and (.....,.....) [4]

(c) Sketch the curve $y = x^3 - 1.5x^2 + 1$.



[2]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

9407370374

MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2022**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

DC (CJ/SW) 303994/2

[Turn over

1 Here is part of a bus timetable.

Abbots	06 50	08 25	09 20
Callet	07 12	08 47	09 42
North Moor	07 30	09 05	10 00
South Moor	07 37	09 12	10 07
Centre Point	08 00	09 35	10 30

(a) Rashid catches the 09 20 bus at Abbots.

Find the time the bus arrives at South Moor.

..... [1]

(b) Annisa leaves home at 8.27 am and takes 25 minutes to walk to the bus stop at Callet.
She catches the next bus to Centre Point.

Find the total time, in minutes, for her journey from leaving home to arriving at Centre Point.

..... min [2]

(c) The distance from Abbots to Centre Point is 29.4 km.
Each bus takes the same time for the journey.

Calculate the average speed of a bus for this journey.
Give your answer in kilometres per hour.

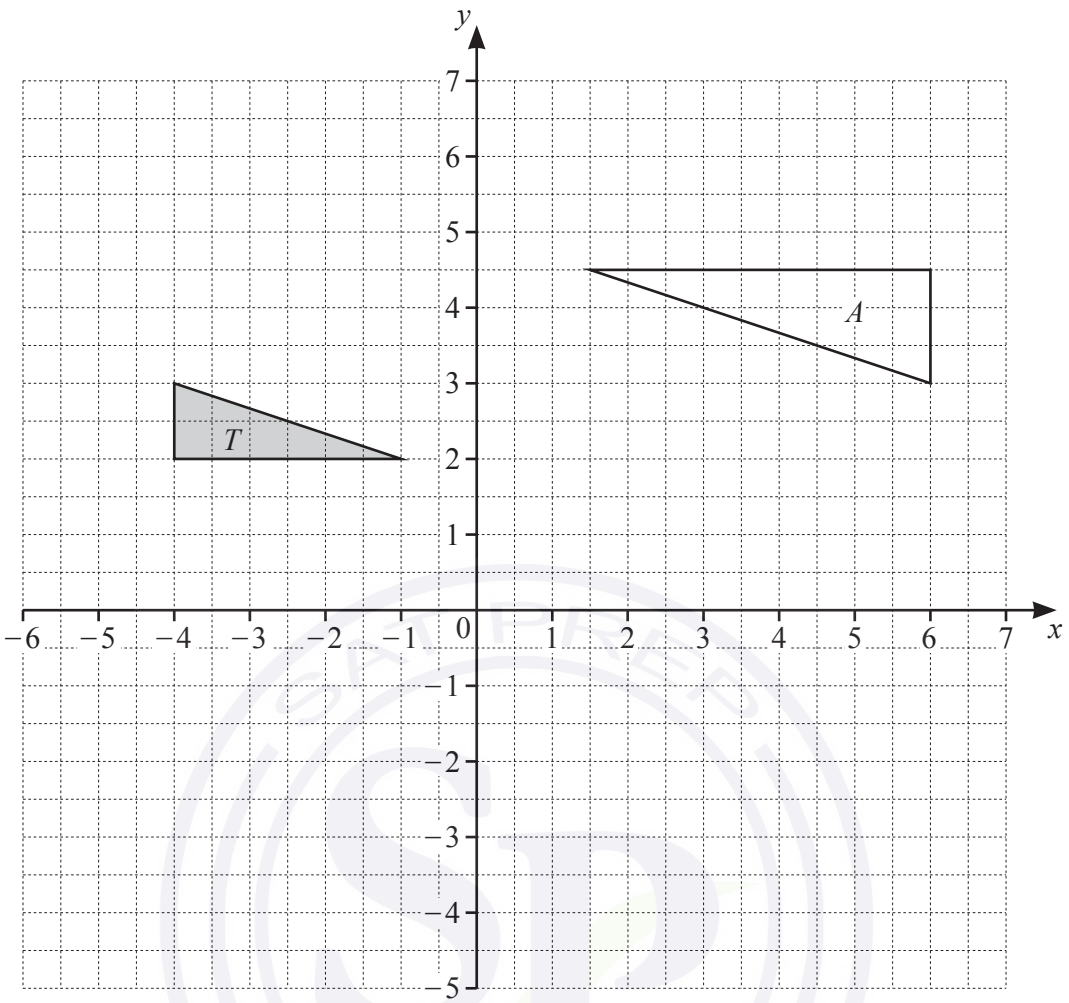
..... km/h [2]

(d) On one journey, all 56 seats on the bus are filled.
The ratio of adults to children on this journey is adults : children = 5 : 3.
The cost for an adult ticket is $2.80 .
The cost for a child ticket is $\frac{3}{4}$ of the adult cost.

Work out the total cost of the tickets for this journey.

$ ..... [4]

2 (a)



(i) Draw the image of triangle T after a reflection in the line $y = x$. [2]

(ii) Draw the image of triangle T after a translation by the vector $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$. [2]

(iii) Describe fully the **single** transformation that maps triangle T onto triangle A.

.....

..... [3]

(b) A quadrilateral P is enlarged by a scale factor of 1.2 to give quadrilateral Q.
The area of quadrilateral P is $20\,\text{cm}^2$.

Calculate the area of quadrilateral Q.

..... cm^2 [2]

3 **(a)** The table shows the numbers of tigers reported to be living in the wild in the year 2014 in some countries.

Country	Number
India	2226
Indonesia	371
Nepal	198
Bangladesh	106

(i) Using the table,

(a) find the number of tigers in Nepal as a percentage of the number of tigers in Bangladesh,

..... % [1]

(b) find the ratio tigers in Bangladesh : tigers in Indonesia : tigers in India, giving your answer in its simplest form.

..... : ..... : ..... [2]

(ii) Five years later, the number of tigers reported in India was 2967.

Find the percentage increase in the population of tigers in India.

..... % [2]

(iii) The number of tigers in India in the year 2014 is approximately 30.48% greater than in the year 2010.

Find the number of tigers in India in the year 2010.
Give your answer correct to the nearest integer.

..... [3]

(b) At the start of June, a hive has a population of 2000 bees.
Three months after the start of June the hive has a population of 2662 bees.

The population of this hive can be calculated using the formula

$$P = ab^x,$$

where P is the population of the hive x months after the start of June.

By finding the value of a and the value of b, calculate the population of the hive 7 months after the start of June.
Give your answer correct to the nearest integer.

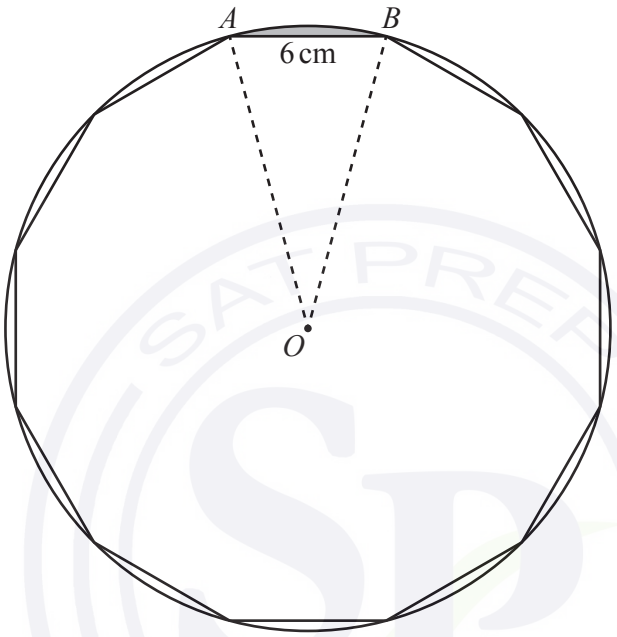
..... [5]

4 A regular 12-sided polygon has side length 6 cm.

(a) Show that one interior angle of the polygon is 150°.

[1]

(b) The polygon is enclosed by a circle, centre O, so that each vertex touches the circumference of the circle.



NOT TO SCALE

(i) Show that the radius, AO, of the circle is 11.6 cm, correct to 1 decimal place.

[3]

(ii) Calculate

(a) the circumference of the circle,

..... cm [2]

(b) the perimeter of the shaded **minor** segment formed by the chord AB.

..... cm [2]

(c) The regular 12-sided polygon is the cross-section of a prism of length 2 cm.

Calculate the volume of the prism.

..... cm^3 [3]

5 The time, t minutes, taken by each of 80 people to travel to work is recorded.
The table shows information about these times.

Time (t minutes)	$0 < t \leqslant 5$	$5 < t \leqslant 10$	$10 < t \leqslant 20$	$20 < t \leqslant 35$	$35 < t \leqslant 60$
Frequency	3	7	18	28	24

(a) (i) Write down the class interval containing the median time.

..... $< t \leqslant$ ..... [1]

(ii) Calculate an estimate of the mean time.

..... min [4]

(b) (i) One of these 80 people is chosen at random.

Find the probability that this person took longer than 10 minutes to travel to work.
Give your answer as a fraction in its simplest form.

..... [2]

(ii) Two people are chosen at random from those taking 20 minutes or less to travel to work.

Calculate the probability that one of these people took 5 minutes or less and the other took more than 5 minutes.

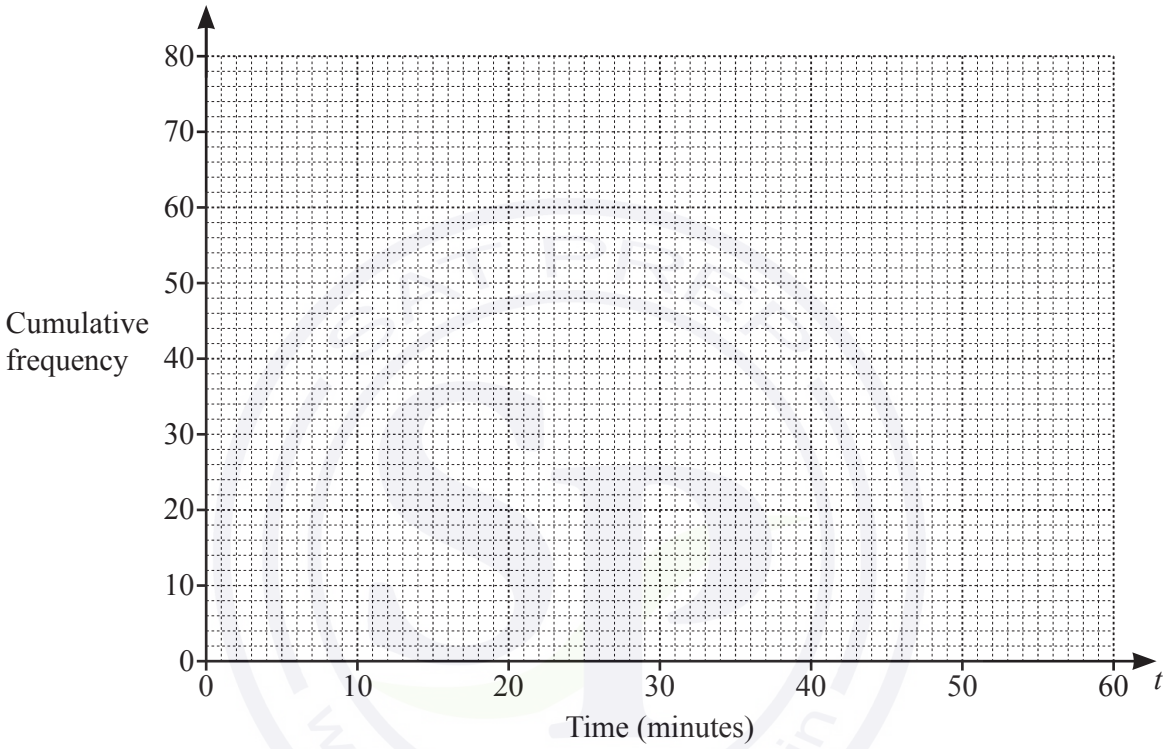
..... [3]

(c) (i) Use the frequency table on page 8 to complete the cumulative frequency table.

Time (t minutes)	$t \leqslant 5$	$t \leqslant 10$	$t \leqslant 20$	$t \leqslant 35$	$t \leqslant 60$
Cumulative frequency	3	10			80

[1]

(ii) On the grid, draw a cumulative frequency diagram to show this information.



[3]

(iii) Find an estimate for the 80th percentile.

..... min [2]

(iv) Find an estimate for the percentage of people who took longer than 45 minutes to travel to work.
Show all your working.

..... % [3]

6 **(a)** Simplify.

$$a-2b-3a+7b$$

..... [2]

(b) Expand and simplify.

$$4(x-5)-(3-2x)$$

..... [2]

(c) Write as a single fraction in its simplest form.

$$\frac{3}{x-5}-\frac{7}{2x}$$

..... [3]

(d) Solve.

$$\frac{13-4x}{3}=6-x$$

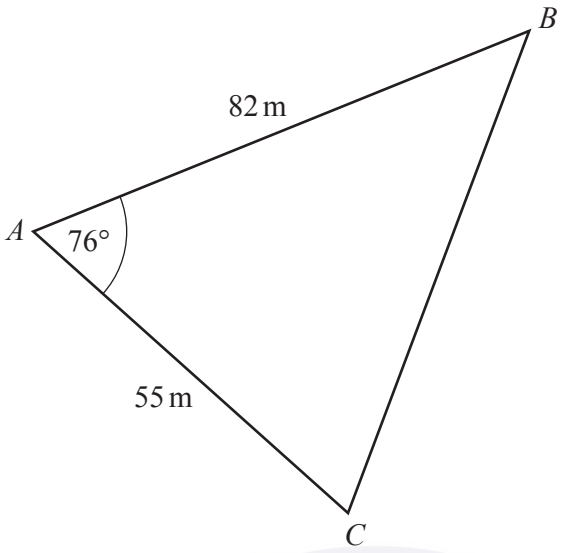
$x =$ ..... [3]

(e) Make x the subject of the formula.

$$y = \frac{5(p-2x)}{x}$$

$x =$ ..... [4]

7



NOT TO SCALE

The diagram shows a field ABC.

(a) Calculate BC.

$BC =$ ..... m [3]

(b) Calculate angle ACB.

Angle $ACB =$ ..... [3]

(c) A gate, G, lies on AB at the shortest distance from C.

Calculate AG.

$AG =$ ..... m [3]

(d) A different triangular field PQR has the same area as ABC.
$PQ = 90$ m and $QR = 60$ m.

Work out the two possible values of angle PQR.

Angle $PQR =$ ..... or ..... [5]

8 **(a)** A has coordinates $(-2,7)$, B has coordinates $(1,-5)$ and C has coordinates $(5,4)$.

(i) Find the coordinates of the midpoint of the line AB.

(..... , ...) [2]

(ii) Find $\overrightarrow{AC}$.

$\overrightarrow{AC} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(iii) Find $\left|\overrightarrow{AC}\right|$.

..... [2]

(iv) Find the equation of the line AB.
Give your answer in the form $y = mx + c$.

$y =$ ..... [3]

(v) Find the equation of the line perpendicular to AB that passes through C.
Give your answer in the form $y = mx + c$.

$y =$ ..... [3]

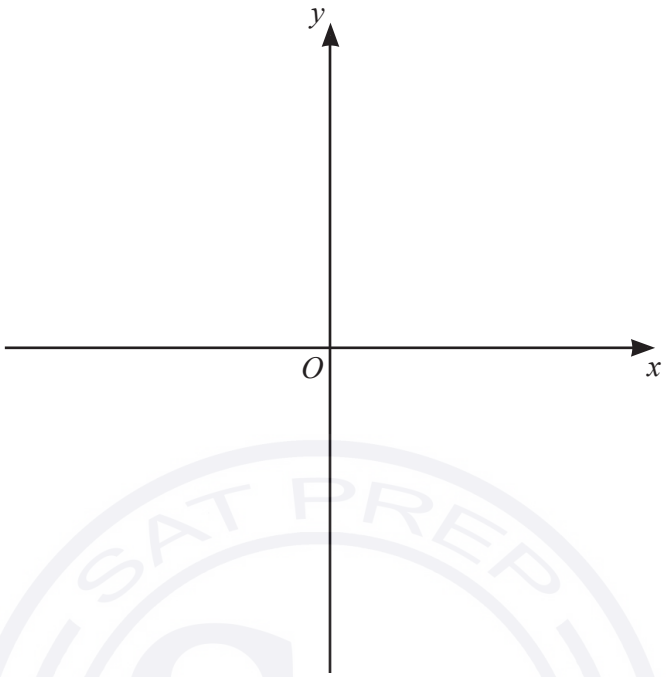
(b) The graphs of $y + 5x = 8$ and $y = 2x^2 + 6x - 13$ intersect at the points P and Q.

Find the coordinates of P and the coordinates of Q.
Show all your working.

P (..... , ...)

Q (..... , ...) [6]

9 **(a)** Sketch the graph of $y = (x+1)(3-x)(3+x)$, indicating the coordinates of the points where the graph crosses the x-axis and the y-axis.



[4]

(b) **(i)** Show that $y = (x+1)(3-x)(3+x)$ can be written as $y = 9+9x-x^2-x^3$.

[2]

(ii) Calculate the x–values of the turning points of $y = 9 + 9x - x^2 - x^3$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ....., $x =$ ..... [7]

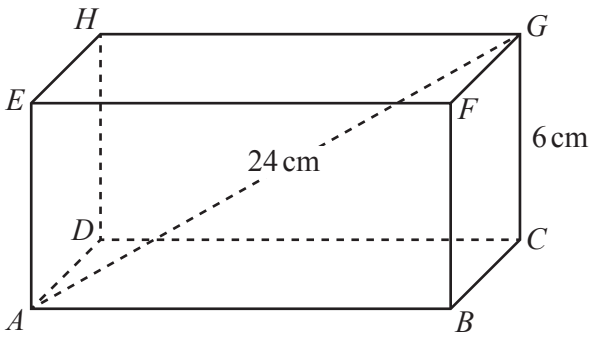
(iii) The equation $9 + 9x - x^2 - x^3 = k$ has one solution only when $k < a$ and when $k > b$, where a and b are integers.

Find the maximum value of a and the minimum value of b.

$a =$ .....

$b =$ ..... [3]

10



NOT TO SCALE

The diagram shows a cuboid $ABCDEFGH$.
$CG = 6$ cm, $AG = 24$ cm and $AB = 2BC$.

(a) Calculate AB.

$AB =$ ..... cm [4]

(b) Calculate the angle between AG and the base $ABCD$.

..... [3]

BLANK PAGE

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

5678253985

MATHEMATICS **0580/42**

Paper 4 (Extended) **February/March 2022**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

DC (CE/FC) 301926/4

[Turn over

1 A company employed 300 workers when it started and now employs 852 workers.

(a) Calculate the percentage increase in the number of workers.

..... % [2]

(b) Of the 852 workers, the ratio part-time workers : full-time workers = 5 : 7.

Calculate the number of full-time workers.

..... [2]

(c) The company makes 40 600 headphones in one year.

Write this number

(i) in words,

..... [1]

(ii) in standard form.

..... [1]

(d) In one month, the company sells 3 000 headphones.
Of these, 48% are exported, $\frac{3}{8}$ are sold to shops and the rest are sold online.

Calculate the number of headphones that are sold online.

..... [3]

(e) One year, sales increased by 15%.
The following year sales increased by 18%.

Calculate the overall percentage increase in sales.

..... % [3]

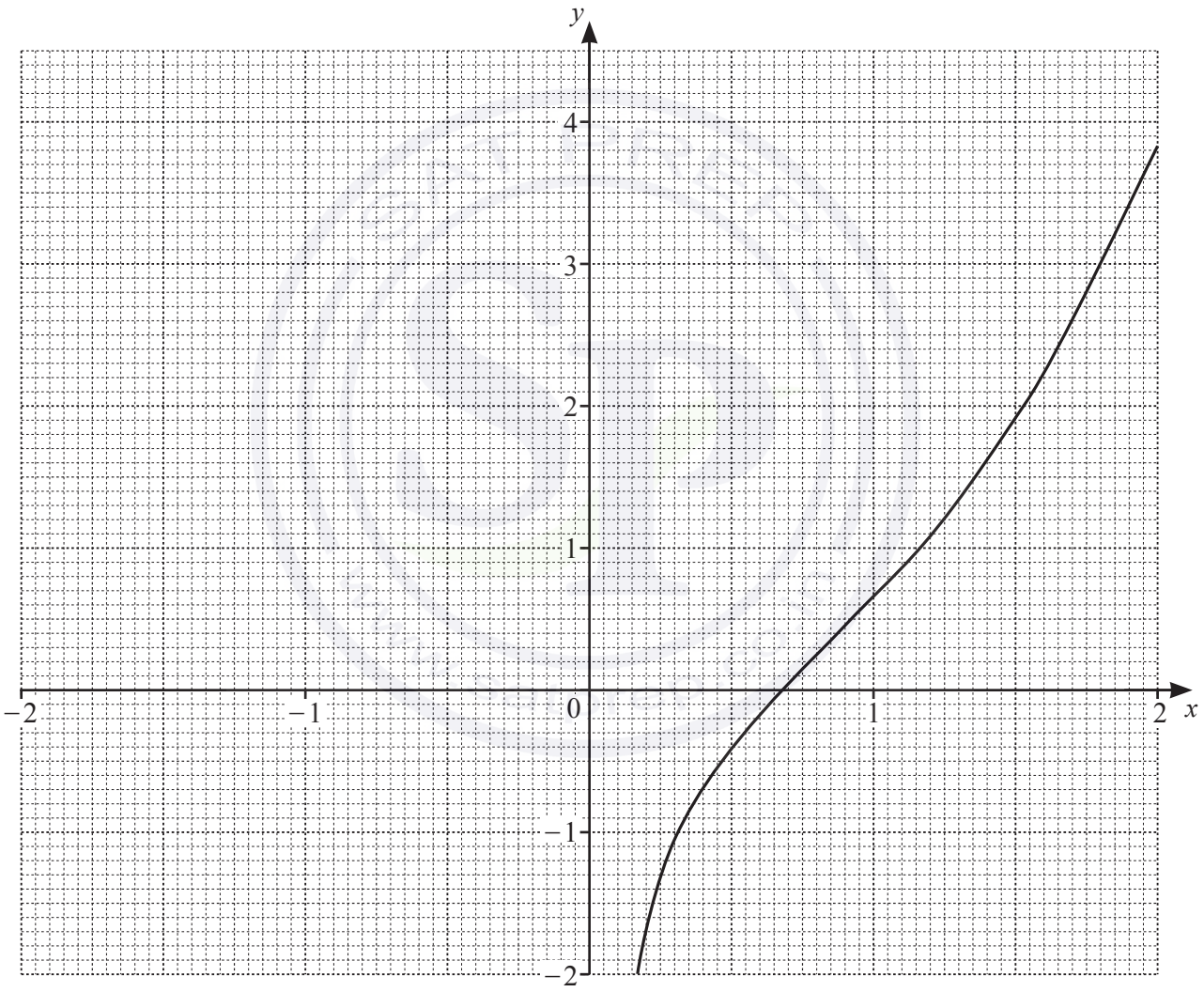
2 The table shows some values for $y = x^2 - \frac{1}{3x}$, $x \neq 0$.
The y-values are rounded to 1 decimal place.

x	-2	-1.5	-1	-0.75	-0.5	-0.25	-0.1
y	4.2	2.5	1.3			1.4	3.3

(a) Complete the table. [2]

(b) On the grid, draw the graph of $y = x^2 - \frac{1}{3x}$ for $-2 \leqslant x \leqslant -0.1$.

The graph of $y = x^2 - \frac{1}{3x}$ for $x > 0$ has been drawn for you.



[4]

(c) By drawing a suitable line on the grid, solve the equation $x^2 - \frac{1}{3x} + 1 = 0$.

$x =$ ..... [2]

3 $f(x) = 1 + 4x$ $g(x) = x^2$

(a) Find

(i) gf(3),

..... [2]

(ii) fg(x),

..... [1]

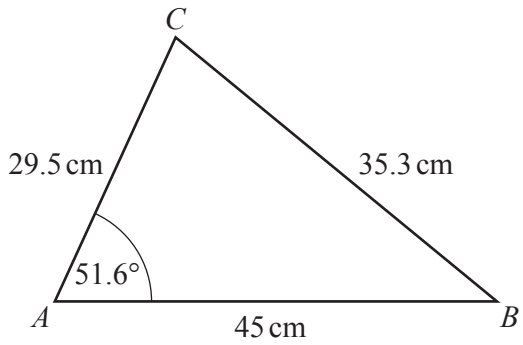
(iii) $f^{-1}f(x)$.

..... [1]

(b) Find the value of x when $f(x) = 15$.

$x =$ ..... [2]

4 (a)



NOT TO SCALE

In triangle ABC, $AB = 45$ cm, $AC = 29.5$ cm, $BC = 35.3$ cm and angle $CAB = 51.6°$.

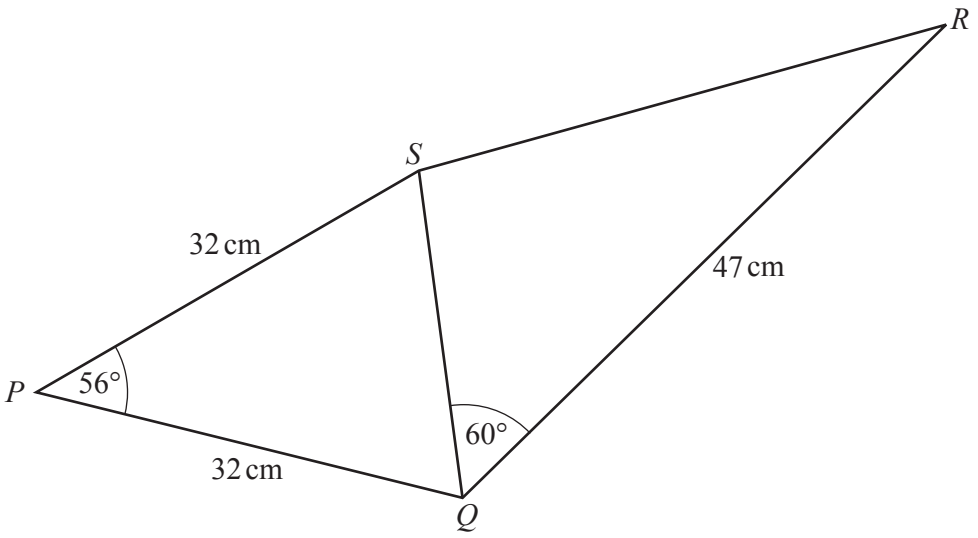
(i) Calculate angle ABC.

Angle ABC = ... [3]

(ii) Calculate the area of triangle ABC.

..... cm^2 [2]

(b)



NOT TO SCALE

The diagram shows a quadrilateral $PQRS$ formed from two triangles, PQS and QRS.
Triangle PQS is isosceles, with $PQ = PS = 32$ cm and angle $SPQ = 56°$.
$QR = 47$ cm and angle $SQR = 60°$.

(i) Calculate SR.

$SR =$ ..... cm [4]

(ii) Calculate the shortest distance from P to SQ.

..... cm [3]

5 The table shows information about the mass, m grams, of each of 120 letters.

Mass (m grams)	$0 < m \leqslant 50$	$50 < m \leqslant 100$	$100 < m \leqslant 200$	$200 < m \leqslant 500$
Frequency	43	31	25	21

(a) Calculate an estimate of the mean mass.

..... g [4]

(b) Iraj draws a histogram to show this information.
He makes the height of the first bar 17.2 cm.

Calculate the height of each of the remaining bars.

height of bar for $50 < m \leqslant 100$ ..... cm

height of bar for $100 < m \leqslant 200$ ..... cm

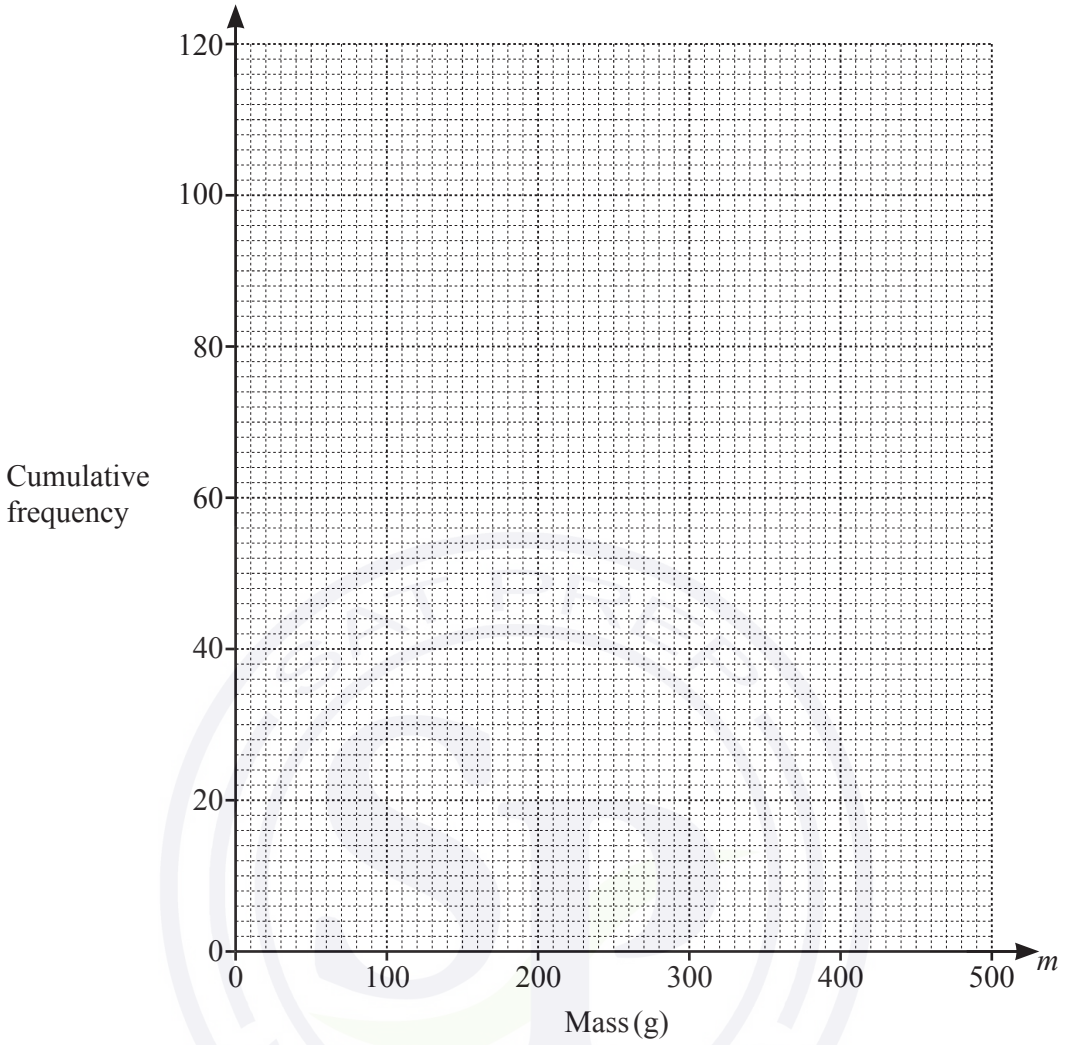
height of bar for $200 < m \leqslant 500$ ..... cm [3]

(c) Complete the cumulative frequency table.

Mass (m grams)	$m \leqslant 50$	$m \leqslant 100$	$m \leqslant 200$	$m \leqslant 500$
Cumulative frequency				

[2]

(d) Draw a cumulative frequency diagram.



[3]

(e) Use the cumulative frequency diagram to find an estimate for

(i) the median,

..... g [1]

(ii) the upper quartile,

..... g [1]

(iii) the 40th percentile,

..... g [2]

(iv) the number of letters with a mass m where $250 < m \leqslant 400$.

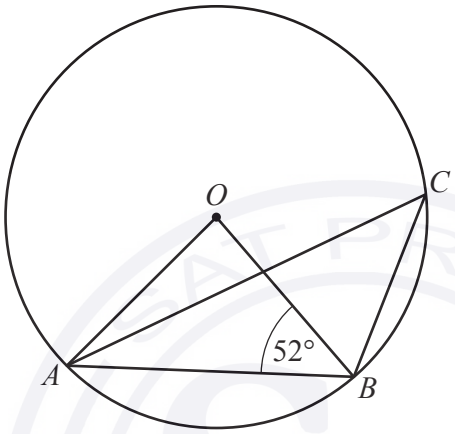
..... [2]

6 **(a)** The interior angle of a regular polygon is 156°.

Calculate the number of sides of this polygon.

..... [2]

(b)



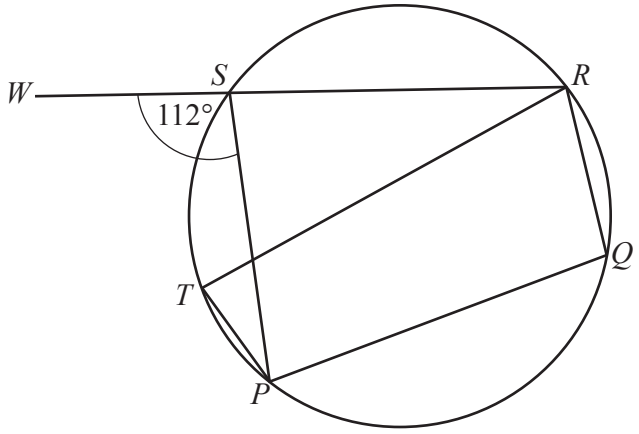
NOT TO SCALE

A, *B* and *C* lie on a circle, centre *O*.
Angle *OBA* = 52°.

Calculate angle *ACB*.

Angle *ACB* = ... [2]

(c)



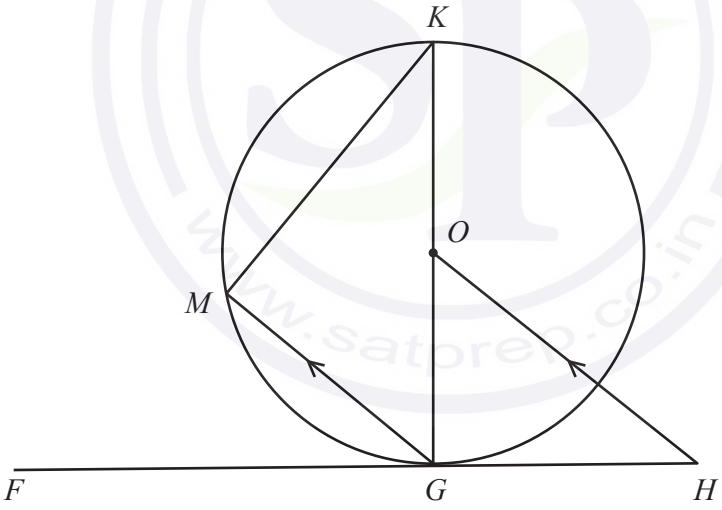
NOT TO SCALE

P, Q, R, S and T lie on a circle.
WSR is a straight line and angle $WSP = 112°$.

Calculate angle PTR.

Angle PTR = ... [2]

(d)



NOT TO SCALE

G, K and M lie on a circle, centre O.
FGH is a tangent to the circle at G and MG is parallel to OH.

Show that triangle GKM is mathematically similar to triangle OHG.
Give a geometrical reason for each statement you make.

.....

.....

.....

.....

..... [4]

7 Two rectangular picture frames are mathematically similar.

(a) The areas of the frames are 350 cm^2 and 1134 cm^2.
The width of the smaller frame is 17.5 cm.

Calculate the width of the larger frame.

..... cm [3]

(b) A picture in the smaller frame has length 15 cm and width 10.5 cm, both correct to the nearest 5 mm.

Calculate the upper bound for the area of this picture.

..... cm^2 [2]

(c) In a sale, the price of a large frame is reduced by 18%.
Parthi pays $166.05 for 5 large frames in the sale.

Calculate the original price of one large frame.

$ ..... [2]

(d) Parthi advertises a large frame for a price of $57 or 48.20 euros.
The exchange rate is $1 = 0.88 euros.

Calculate the difference between these prices, in dollars and cents, correct to the nearest cent.

$ ..... [3]

8 Darpan runs a distance of 12 km and then cycles a distance of 26 km.
His running speed is x km / h and his cycling speed is 10 km / h faster than his running speed.
He takes a total time of 2 hours 48 minutes.

(a) An expression for the time, in hours, Darpan takes to run the 12 km is $\frac{12}{x}$.

Write an equation, in terms of x, for the total time he takes in hours.

..... [3]

(b) Show that this equation simplifies to $7x^2 - 25x - 300 = 0$.

[4]

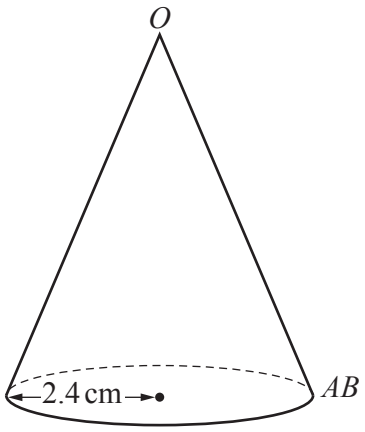
(c) Use the quadratic formula to solve $7x^2 - 25x - 300 = 0$.
You must show all your working.

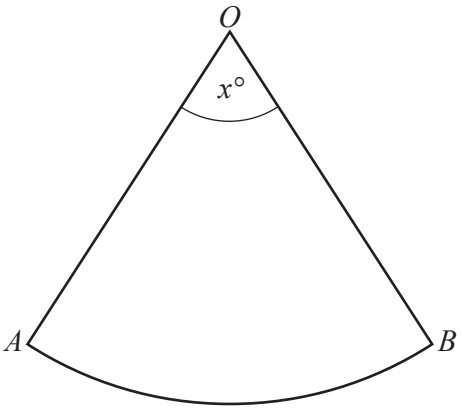
$x =$ ..... or $x =$ ..... [4]

(d) Calculate the number of minutes Darpan takes to run the 12 km.

..... min [2]

9 (a)





NOT TO SCALE

The volume of a paper cone of radius 2.4 cm is 95.4 cm^3.
The paper is cut along the slant height from O to AB.
The cone is opened to form a sector OAB of a circle with centre O.

Calculate the sector angle $x°$.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... [6]

(b) An empty fuel tank is filled using a cylindrical pipe with diameter 8 cm.
Fuel flows along this pipe at a rate of 2 metres per second.
It takes 24 minutes to fill the tank.

Calculate the capacity of the tank.
Give your answer in litres.

..... litres [4]

10 **(a)** Expand and simplify.

$$(x+1)(x-2)(x+3)$$

..... [3]

(b) Make g the subject of the formula.

$$M = \frac{2fg}{g-c}$$

$g =$ ..... [4]

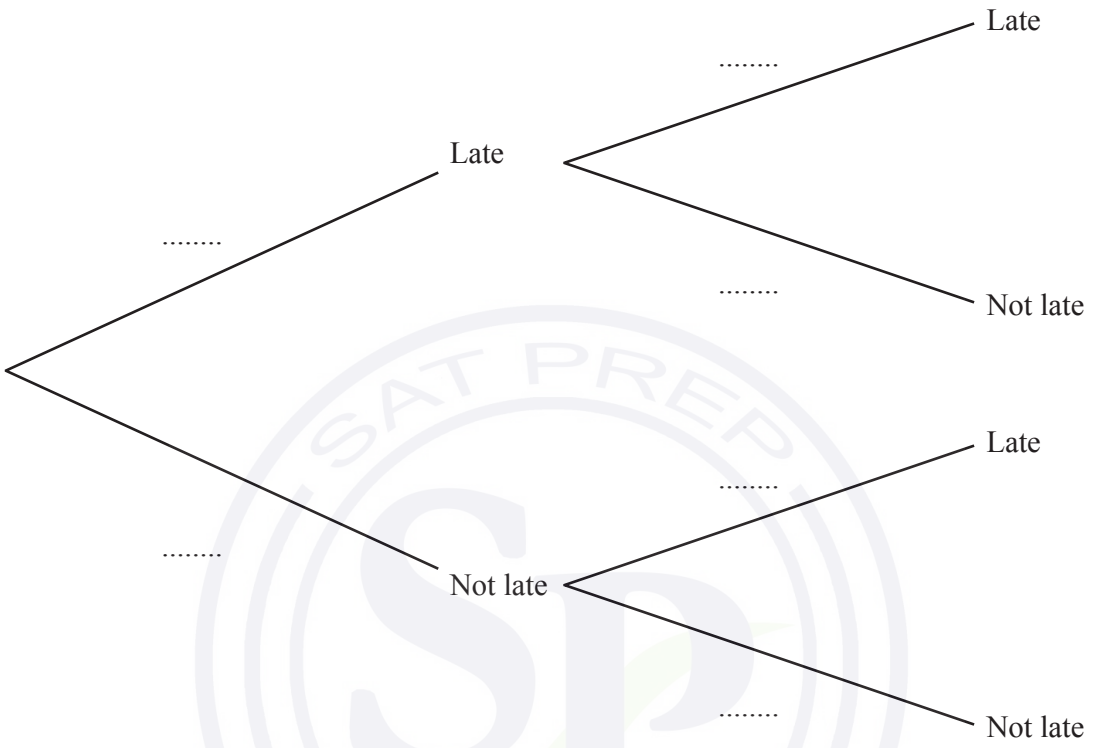
(c) Simplify.

$$\frac{4x^2-16x}{x^2-16}$$

..... [3]

11 **(a)** The probability that Shalini is late for school on any day is $\frac{1}{6}$.

(i) Complete the tree diagram for Monday and Tuesday.

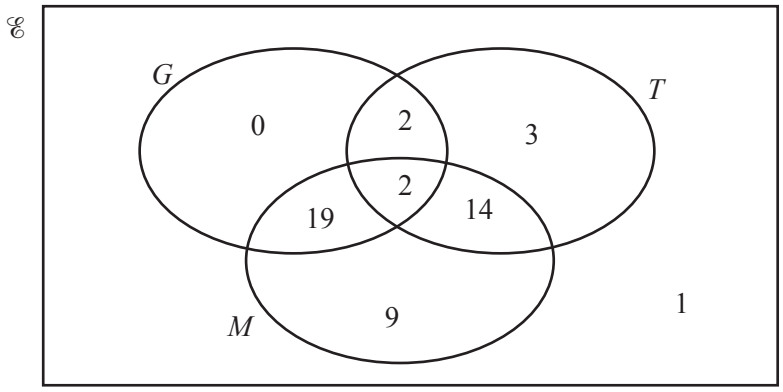


[2]

(ii) Calculate the probability that Shalini is late on Monday but is not late on Tuesday.

..... [2]

(b) The Venn diagram shows the number of students in a group of 50 students who wear glasses (G), who wear trainers (T) and who have a mobile phone (M).



(i) Use set notation to describe the region that contains only one student.

..... [1]

(ii) Find $n\left(T' \cap \left(G \cup M\right)\right)$.

..... [1]

(iii) One student is picked at random from the 50 students.

Find the probability that this student wears trainers but does not wear glasses.

..... [1]

(iv) Two students are picked at random from those wearing trainers.

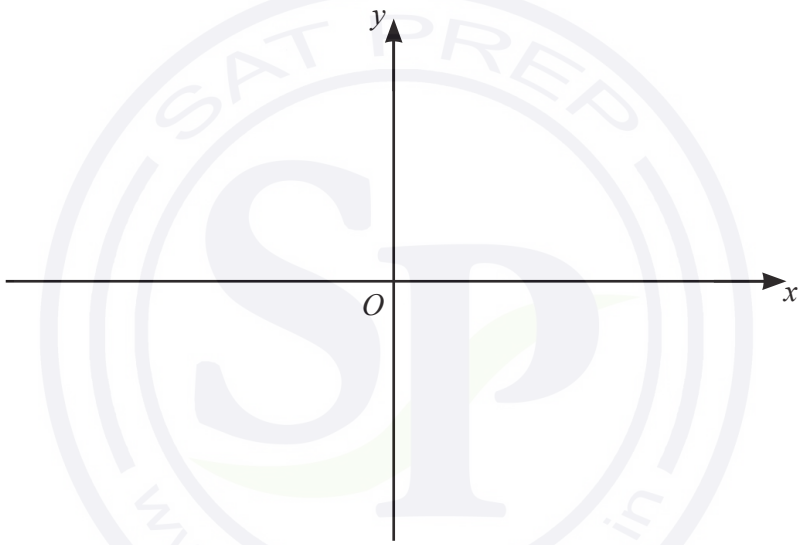
Find the probability that both students have mobile phones.

..... [3]

12 **(a)** Solve the equation $\tan x = 11.43$ for $0° \leqslant x \leqslant 360°$.

$x =$ ..... or $x =$ ..... [2]

(b) Sketch the curve $y = x^3 - 4x$.



[3]

(c) A curve has equation $y = x^3 + ax + b$.
The stationary points of the curve have coordinates $(2, k)$ and $(-2, 10 - k)$.

Work out the value of a, the value of b and the value of k.

$a =$ ....., $b =$ ....., $k =$ ..... [6]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

MATHEMATICS **0580/41**

Paper 4 (Extended) **October/November 2021**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

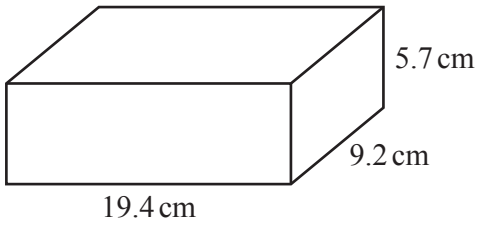
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

1 (a)



NOT TO SCALE

The diagram shows a brick in the shape of a cuboid.

(i) Calculate the total surface area of the brick.

..... cm^2 [3]

(ii) The density of the brick is $1.9\,g/cm^3$.

Work out the mass of the brick.
Give your answer in kilograms.
[Density = mass ÷ volume]

..... kg [3]

(b) 9000 bricks are needed to build a house.
200 bricks cost $175.

Work out the cost of the bricks needed to build 5 houses.

$ ..... [3]

(c) Saskia builds a wall using 1500 bricks.
She can build at the rate of 40 bricks each hour.
She works for 9 hours each day.
Saskia starts work on 6 July and works every day until the wall is completed.

Find the date when she completes the wall.

..... [3]

(d) Rafa has a cylindrical tank.
The cylinder has a height of 105 cm and a diameter of 45 cm.

Calculate the capacity of the tank in litres.

..... litres [3]

2 Bob, Chao and Mei take part in a run for charity.

(a) Their times to complete the run are in the ratio Bob : Chao : Mei = 4 : 5 : 7.

(i) Find Chao's time as a percentage of Mei's time.

..... % [1]

(ii) Bob's time for the run is 55 minutes 40 seconds.

Find Mei's time for the run.
Give your answer in minutes and seconds.

..... min ..... s [3]

(b) Chao collects $47.50 for charity.

(i) Bob collects 28% more than Chao.

Find the amount Bob collects.

$ ..... [2]

(ii) Chao collects 60% less than Mei.

Find how much more money Mei collects than Chao.

$ ..... [3]

(c) When running, Chao has a stride length of 70 cm, correct to the nearest 5 cm.
Chao runs a distance of 11.2 km, correct to the nearest 0.1 km.

Work out the minimum number of strides that Chao could take to complete this distance.

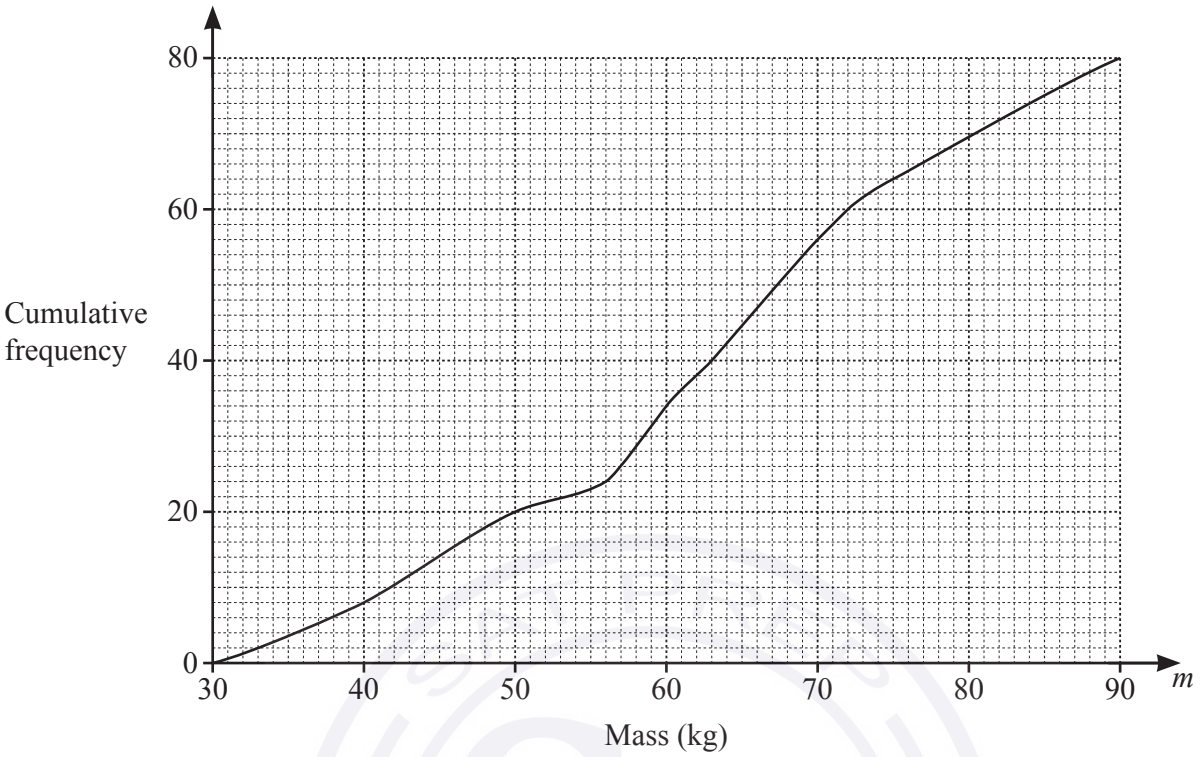
..... [4]

(d) In 2015, a charity raised a total of $1.6 million.
After 2015, this amount increased exponentially by 2.4% each year for the next 5 years.

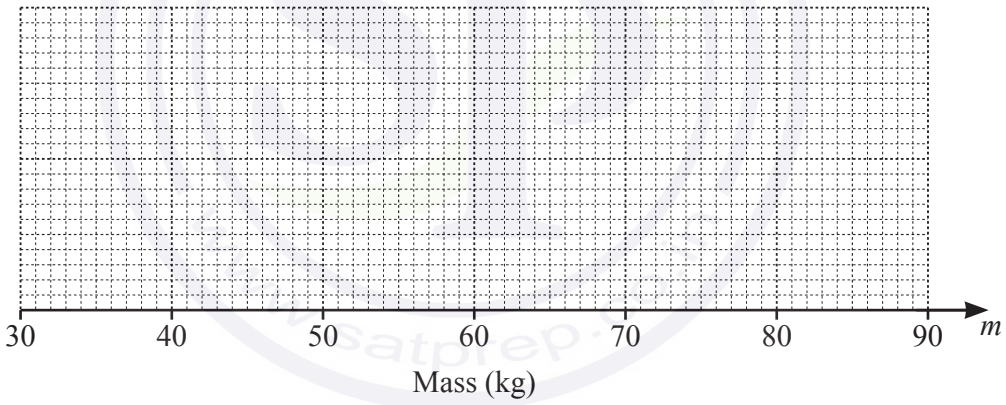
Work out the amount raised by the charity in 2020.

$ ..... million [2]

3 The cumulative frequency diagram shows information about the mass, m kg, of each of 80 boys.



(a)



On the grid, draw a box-and-whisker plot to show the information in the cumulative frequency diagram. [4]

(b) Use the cumulative frequency diagram to find an estimate of

(i) the 30th percentile,

..... kg [2]

(ii) the number of boys with a mass greater than 75 kg.

..... [2]

(c) (i) Use the cumulative frequency diagram to complete this frequency table.

Mass (m kg)	$30 < m \leqslant 40$	$40 < m \leqslant 50$	$50 < m \leqslant 60$	$60 < m \leqslant 70$	$70 < m \leqslant 80$	$80 < m \leqslant 90$
Frequency	8	12			14	10

[1]

(ii) Calculate an estimate of the mean mass of the boys.

..... kg [4]

(iii) Two boys are chosen at random from those with a mass greater than 70 kg.

Find the probability that one of them has a mass greater than 80 kg and the other has a mass of 80 kg or less.

..... [3]

4 **(a)** Solve.

(i) $6(7-2x) = 3x-8$

$x =$ ..... [3]

(ii) $\frac{2x}{x-5} = \frac{2}{3}$

$x =$ ..... [3]

(b) Factorise completely.

(i) $2x^2 - 288y^2$

..... [3]

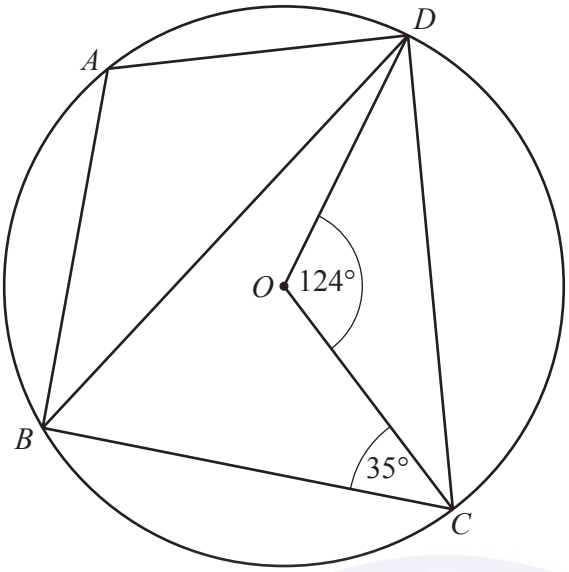
(ii) $5x^2 + 17x - 40$

..... [2]

(c) Solve $x^3 + 4x^2 - 17x = x^3 - 9$.
You must show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [5]

5 (a)



NOT TO SCALE

A, B, C and D are points on a circle, centre O.
Angle $COD = 124°$ and angle $BCO = 35°$.

(i) Work out angle CBD.
Give a geometrical reason for your answer.

Angle CBD = ... because .....

..... [2]

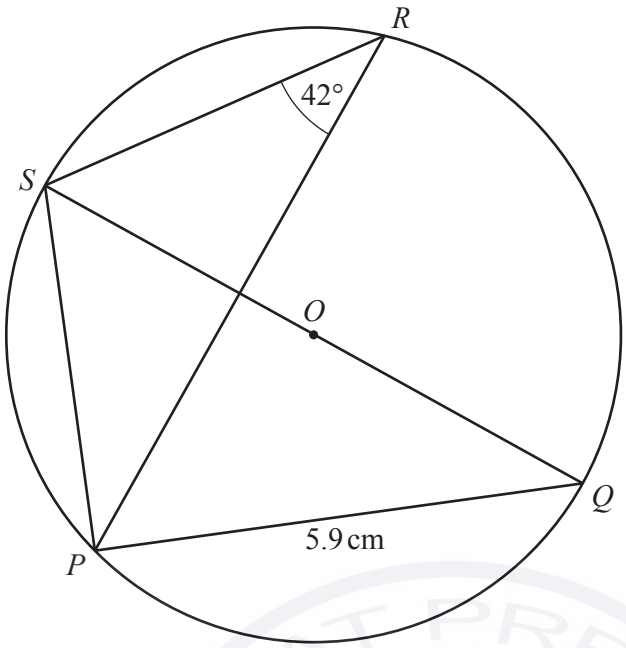
(ii) Work out angle BAD.
Give a geometrical reason for each step of your working.

Angle BAD = ... because .....

.....

..... [4]

(b)



NOT TO SCALE

P, Q, R and S are points on a circle, centre O.
QS is a diameter.
Angle $PRS = 42°$ and $PQ = 5.9$ cm.

Calculate the circumference of the circle.

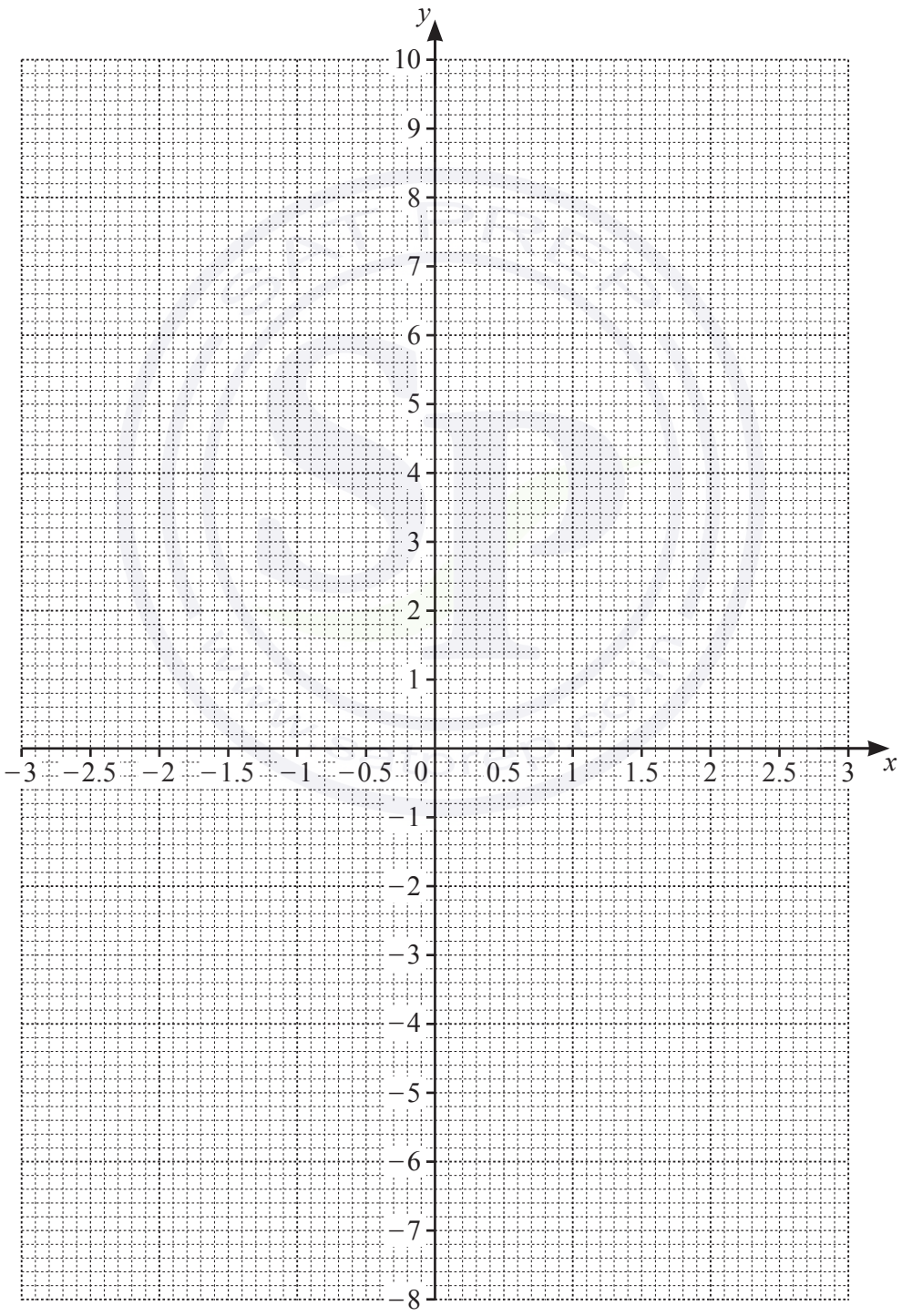
..... cm [5]

6 The table shows some values for $y = x^2 - \frac{3}{2x}$, $x \neq 0$, given correct to 1 decimal place.

x	−3	−2	−1	−0.5	−0.2		0.2	0.5	1	2	3
y			2.5	3.3	7.5		−7.5	−2.8	−0.5	3.3	

(a) (i) Complete the table. [3]

(ii) On the grid, draw the graph of $y = x^2 - \frac{3}{2x}$ for $-3 \leqslant x \leqslant -0.2$ and $0.2 \leqslant x \leqslant 3$.



[5]

(b) By drawing a suitable straight line on the grid, solve the equation $x^2 - \frac{3}{2x} = \frac{24}{5} - 2x$ for $-3 \leqslant x \leqslant -0.2$ and $0.2 \leqslant x \leqslant 3$.

$x =$ ..... or $x =$ ..... [4]

(c) The solutions to the equation $x^2 - \frac{3}{2x} = \frac{24}{5} - 2x$ are also the solutions to an equation of the form $ax^3 + bx^2 + cx - 15 = 0$ where a, b and c are integers.

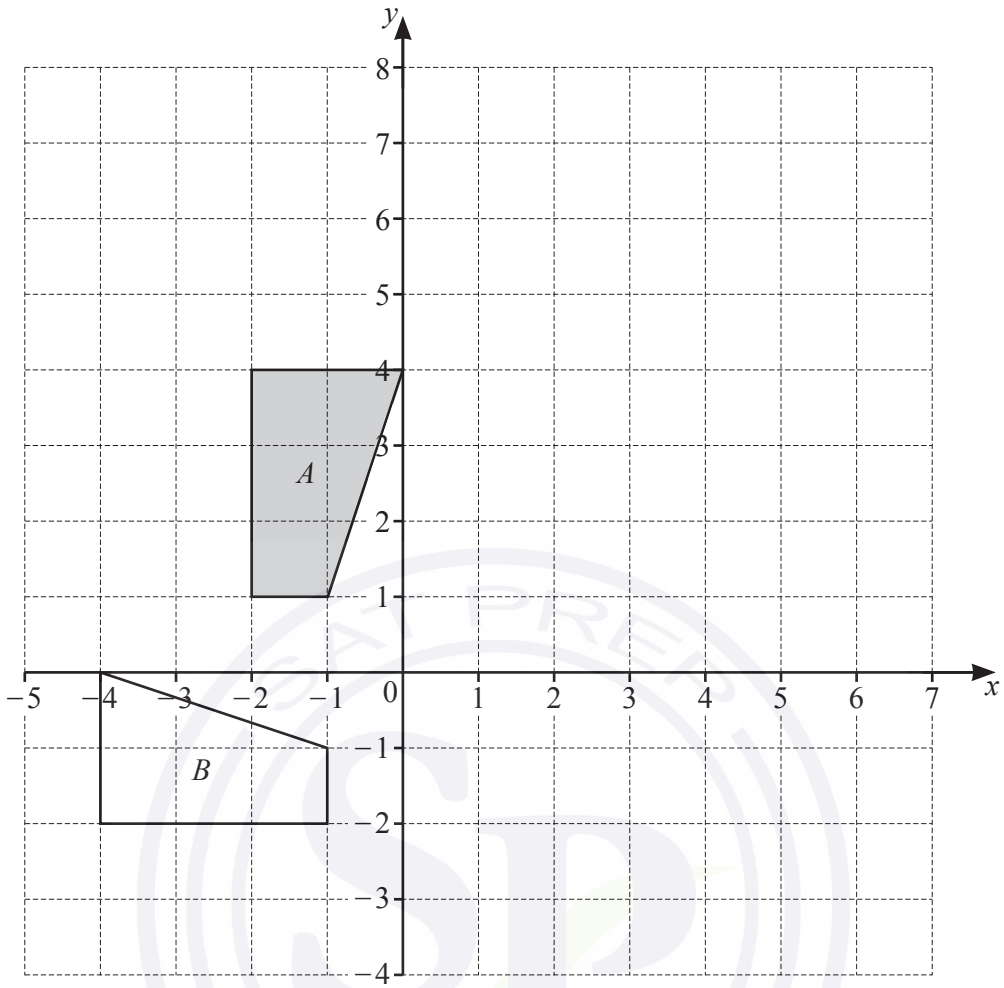
Find the values of a, b and c.

$a =$ .....

$b =$ .....

$c =$ ..... [4]

7 (a)



(i) On the grid, draw the image of

(a) shape A after an enlargement, scale factor 2, centre (0, 1), [2]

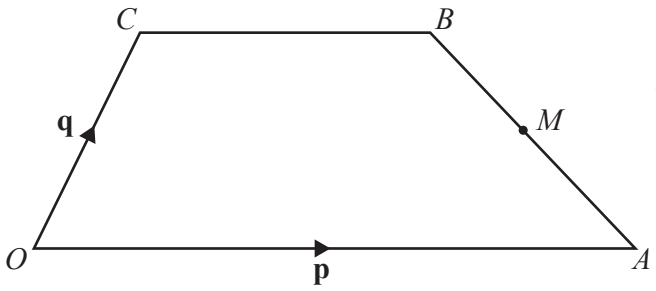
(b) shape A after a reflection in the line $y = x - 1$. [3]

(ii) Describe fully the **single** transformation that maps shape A onto shape B.

.....

..... [3]

(b)



NOT TO SCALE

$OABC$ is a trapezium and O is the origin.
M is the midpoint of AB.
$\overrightarrow{OA} = \mathbf{p}$, $\overrightarrow{OC} = \mathbf{q}$ and $OA = 2CB$.

Find, in terms of **p** and **q**, the position vector of M.
Give your answer in its simplest form.

..... [3]

8 **(a)** $f(x) = 3 - 5x$

(i) Find x when $f(x) = -5$.

$x =$ ..... [2]

(ii) Find $f^{-1}(x)$.

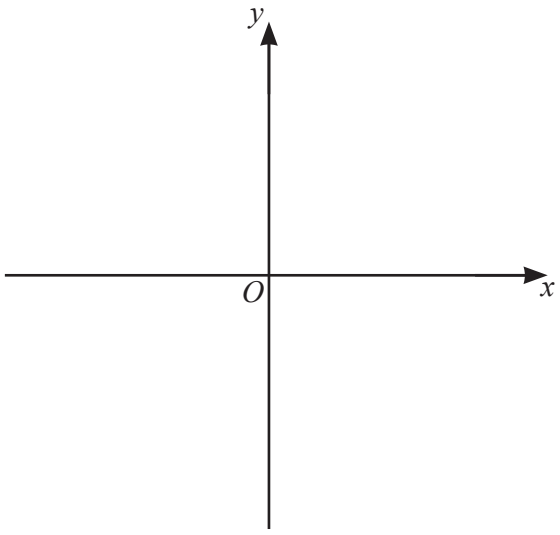
$f^{-1}(x) =$ ..... [2]

(b) $g(x) = 18 - 3x - x^2$

(i) Write $g(x)$ in the form $b - (a + x)^2$.

..... [3]

(ii) Sketch the graph of $y = g(x)$.
On your sketch, show the coordinates of the turning point.

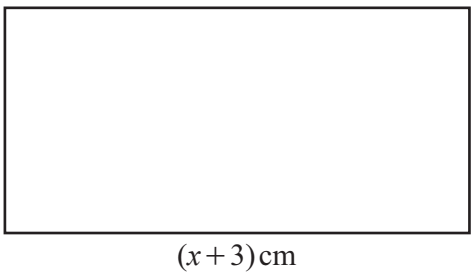


[3]

(iii) Find the equation of the tangent to the graph of $y = 18 - 3x - x^2$ at $x = 4$.
Give your answer in the form $y = mx + c$.

$y =$ ..... [6]

9 (a)



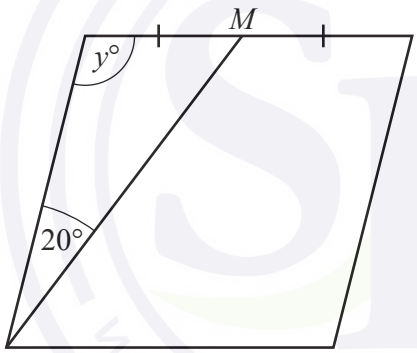
NOT TO SCALE

This rectangle has perimeter 20 cm.

Find the value of x.

$x =$ ..... [3]

(b)



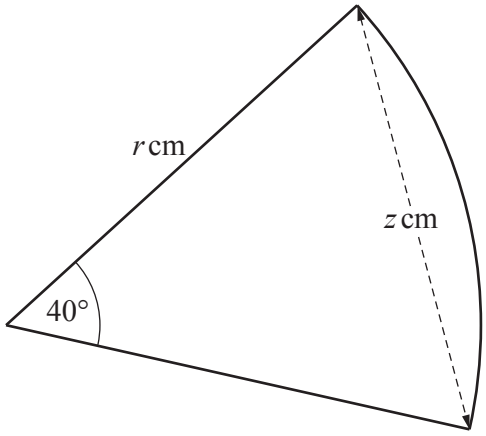
NOT TO SCALE

This rhombus has perimeter 20 cm and angle y is obtuse.
M is the midpoint of one of the sides.

Find the value of y.

$y =$ ..... [5]

(c)



NOT TO SCALE

This sector of a circle has radius r and perimeter 20 cm.

Find the value of z.

$z =$ ..... [6]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

8048931246

MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2021**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

DC (PQ/SG) 212506/3

[Turn over

1 **(a)** Malena has 450 fruit trees.
The fruit trees are in the ratio apple : pear : plum = 8 : 7 : 3.

(i) Show that Malena has 200 apple trees.

[2]

(ii) Find the number of plum trees.

..... [1]

(iii) Malena wants to increase the number of pear trees by 32%.

Calculate the number of extra pear trees she needs.

..... [2]

(iv) Each apple tree produces 48.5 kg of apples.
The apples have an average mass of 165 g each.

Calculate the total number of apples produced by the 200 trees.
Give your answer correct to the nearest 1000 apples.

..... [3]

(b) Malena's land is valued at three million and seventy-five thousand dollars.

(i) Write this number in figures.

..... [1]

(ii) Write your answer to **part (b)(i)** in standard form.

..... [1]

(c) In 2020, each plum tree produced 37.7 kg of plums.
This was 16% more than in 2019.

Calculate the mass of plums produced by each plum tree in 2019.

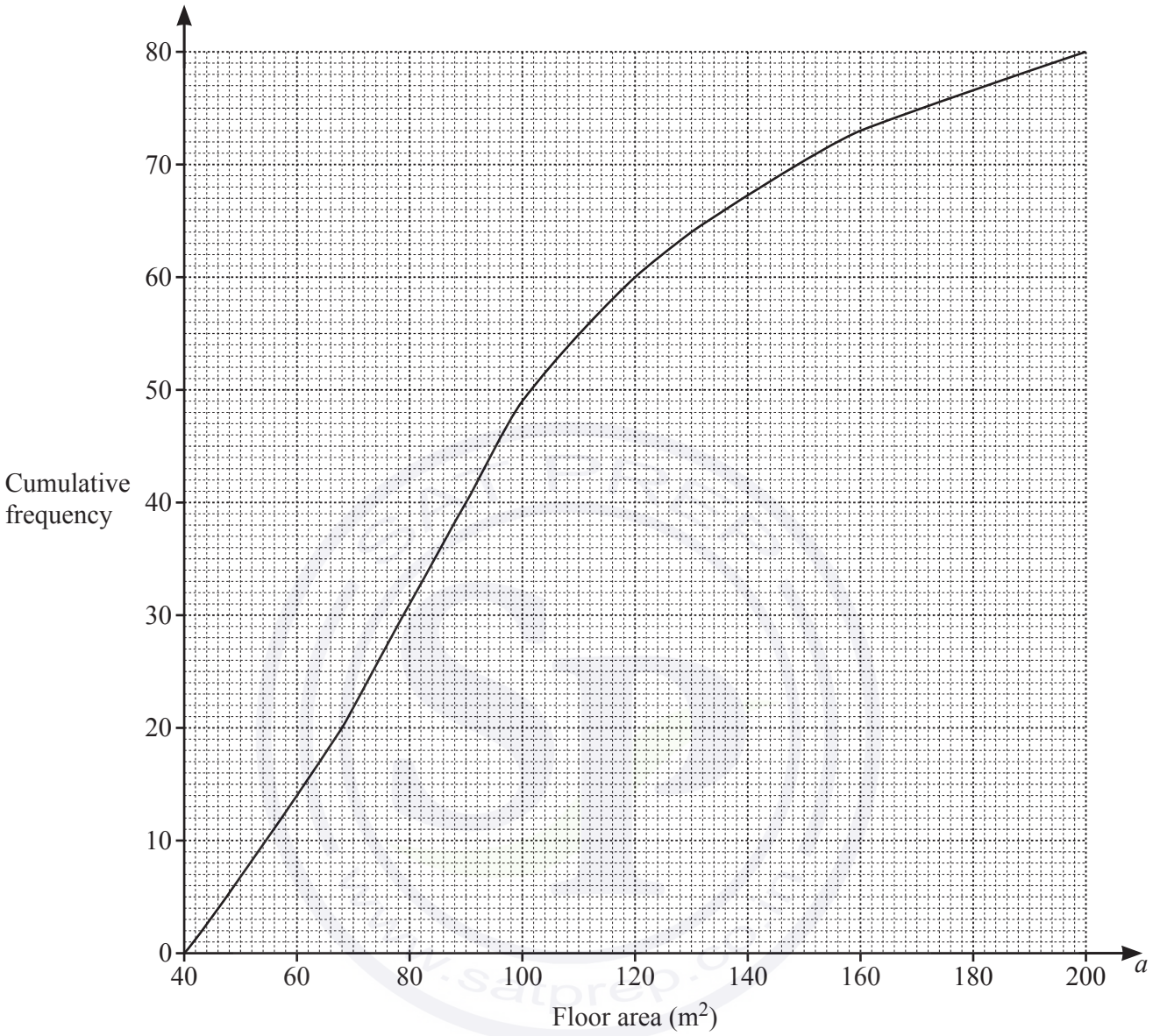
..... kg [2]

(d) Malena invests $1800 at a rate of 2.1% per year compound interest.

Calculate the value of her investment at the end of 15 years.

$ ..... [2]

2 **(a)** The cumulative frequency diagram shows information about the floor area, $a\,m^2$, of each of 80 houses.



Use the diagram to find an estimate of

(i) the median,

..... m^2 [1]

(ii) the lower quartile,

..... m^2 [1]

(iii) the interquartile range,

..... m^2 [1]

(iv) the number of houses with a floor area greater than $120\,m^2$.

..... [2]

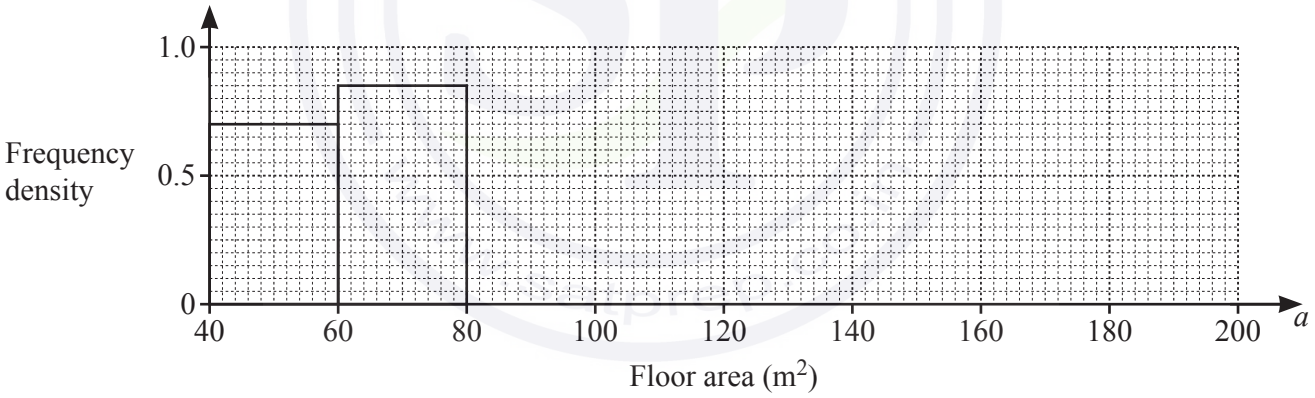
(b) The information about the 80 floor areas is shown in this frequency table.

Floor area ($a\,m^2$)	$40 < a \leqslant 60$	$60 < a \leqslant 80$	$80 < a \leqslant 100$	$100 < a \leqslant 130$	$130 < a \leqslant 160$	$160 < a \leqslant 200$
Frequency	14	17	18	15	9	7

(i) Calculate an estimate of the mean floor area.

..... m^2 [4]

(ii) Complete the histogram to show the information in the frequency table.



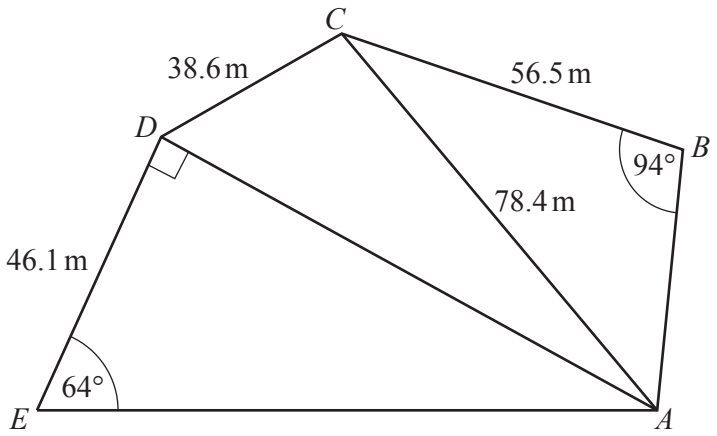
[4]

(iii) Two of the houses are picked at random.

Find the probability that one of the houses has a floor area greater than $130\,m^2$ and the other has a floor area $60\,m^2$ or less.

..... [3]

3 (a)



NOT TO SCALE

ABCDE is a pentagon.

(i) Calculate *AD* and show that it rounds to 94.5 m, correct to 1 decimal place.

[2]

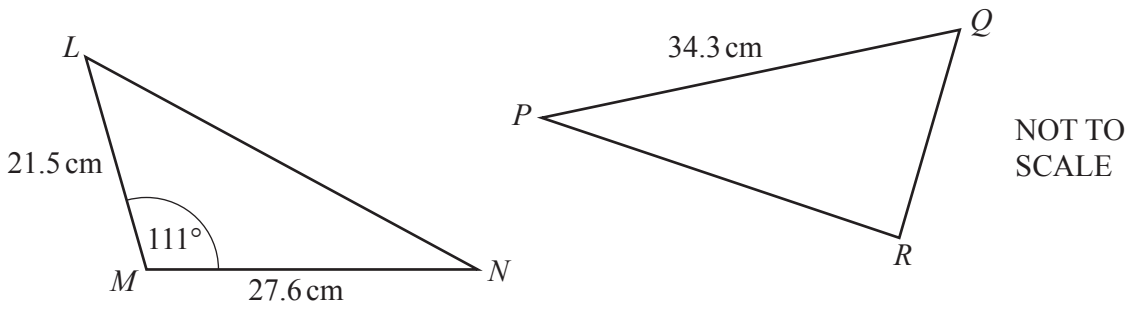
(ii) Calculate angle *BAC*.

Angle *BAC* = ... [3]

(iii) Calculate the largest angle in triangle *CAD*.

..... [4]

(b)

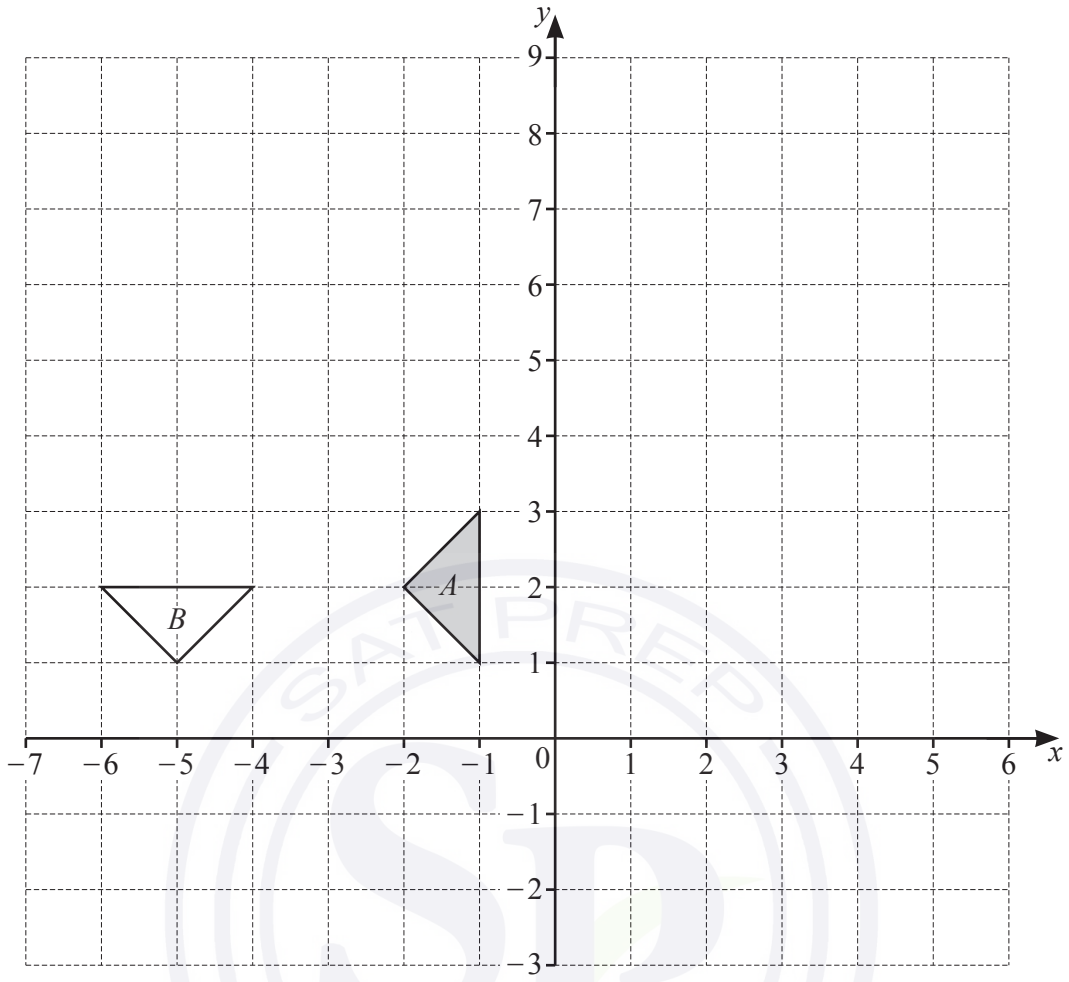


Triangle *PQR* has the same area as triangle *LMN*.

Calculate the shortest distance from *R* to the line *PQ*.

..... cm [3]

4



(a) On the grid, draw the image of triangle A after

(i) a translation by the vector $\begin{pmatrix} -4 \\ 5 \end{pmatrix}$, [2]

(ii) a reflection in the line $x = 1$, [2]

(iii) an enlargement, scale factor 2 and centre $(-5, -2)$. [2]

(b) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

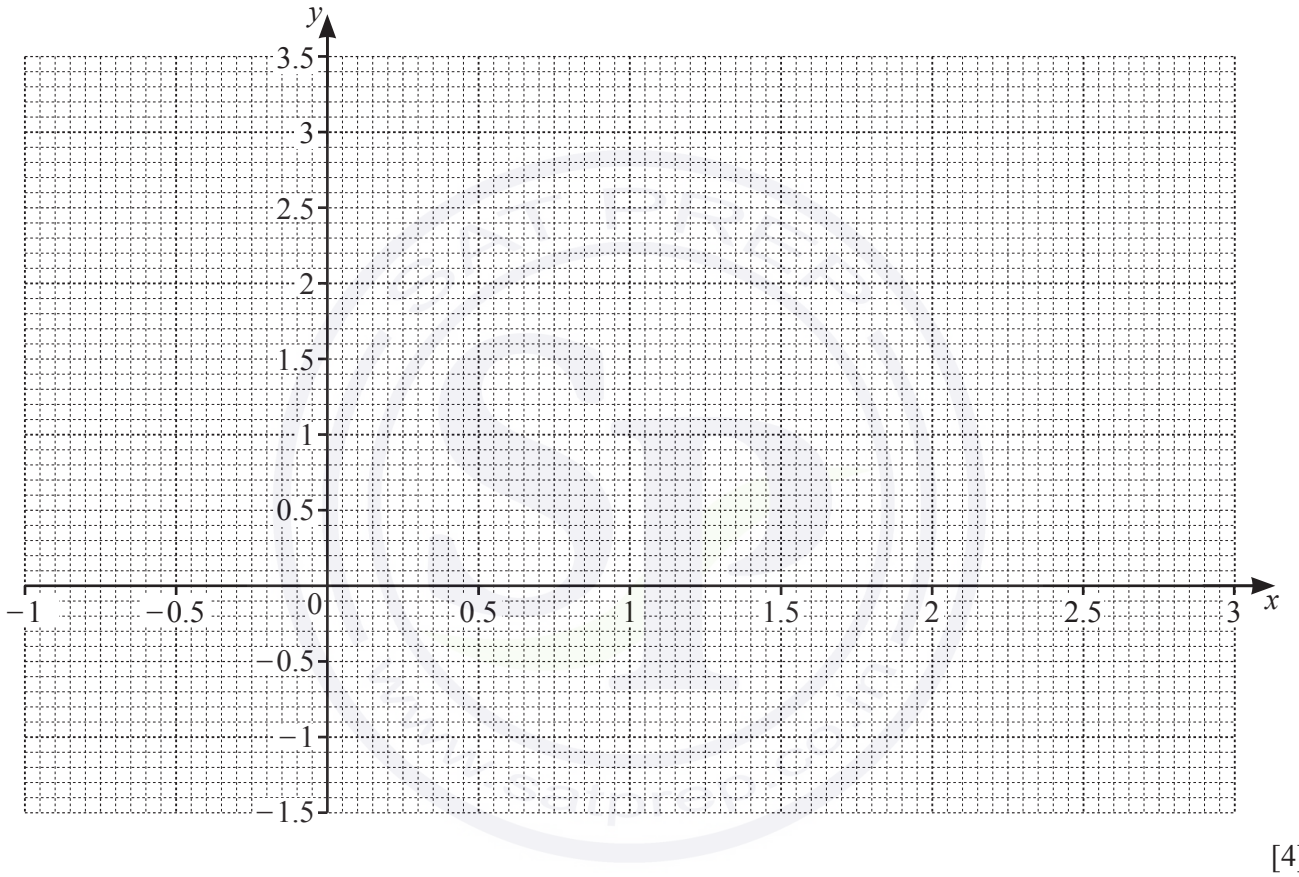
..... [3]

5 The table shows some values for $y = x^3 - 3x^2 + 3$.

x	-1	-0.5	0	0.5	1	1.5	2	2.5	3
y		2.125	3	2.375	1		-1	-0.125	

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = x^3 - 3x^2 + 3$ for $-1 \leqslant x \leqslant 3$.



[4]

(c) By drawing a suitable straight line on the grid, solve the equation $x^3 - 3x^2 + x + 1 = 0$.

$x =$ ..... or $x =$ ..... or $x =$ ..... [4]

6 **(a)** Solve.

(i) $4(2x-3)=24$

$x =$ ..... [3]

(ii) $6x+14>6$

..... [2]

(b) Rearrange the formula $V=2x^3-3y^3$ to make y the subject.

$y =$ ..... [3]

(c) Show that $(2n-5)^2-13$ is a multiple of 4 for all integer values of n.

[3]

(d) The expression $5+12x-2x^2$ can be written in the form $q-2(x+p)^2$.

(i) Find the value of p and the value of q.

$p =$ ..... , $q =$ ..... [3]

(ii) Write down the coordinates of the maximum point of the curve $y = 5+12x-2x^2$.

(..... , ...) [1]

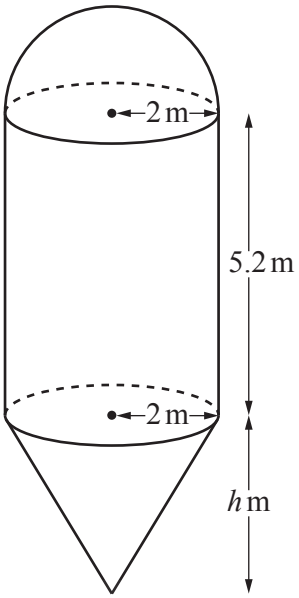
(e) The energy of a moving object is directly proportional to the square of its speed.
The speed of the object is increased by 30%.

Calculate the percentage increase in the energy of the object.

..... % [2]

7 **(a)** The diagram shows a container for storing grain.

The container is made from a hemisphere, a cylinder and a cone, each with radius 2 m. The height of the cylinder is 5.2 m and the height of the cone is h m.



NOT TO SCALE

(i) Calculate the volume of the hemisphere.
Give your answer as a multiple of π.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... m^3 [2]

(ii) The total volume of the container is $\frac{88\pi}{3}$ m^3.

Calculate the value of h.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

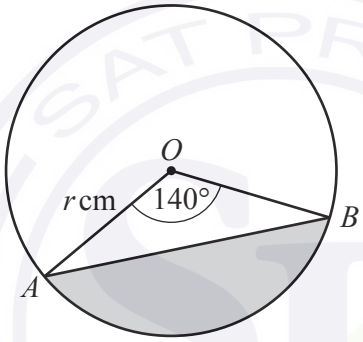
$h =$ ..... [4]

(iii) The container is full of grain.
Grain is removed from the container at a rate of 35 000 kg per hour.
$1\,m^3$ of grain has a mass of 620 kg.

Calculate the time taken to empty the container.
Give your answer in hours and minutes.

..... h ..... min [3]

(b)



NOT TO SCALE

A and B are points on a circle, centre O, radius r cm.
The area of the shaded segment is $65\,cm^2$.

Calculate the value of r.

$r =$ ..... [4]

8 **(a)** Kaito runs along a 12 km path at an average speed of x km/h.

(i) Write down an expression, in terms of x, for the number of hours he takes.

..... hours [1]

(ii) Yuki takes 1.5 hours longer to walk along the same path as Kaito.
She walks at an average speed of $(x-4)$ km/h.

Write down an equation, in terms of x, and show that it simplifies to $x^2-4x-32=0$.

[4]

(iii) Solve by factorisation.

$$x^2-4x-32=0$$

$x =$ ..... or $x =$ ..... [3]

(iv) Find the number of hours it takes Yuki to walk along the 12 km path.

..... hours [2]

(b) A bus travels 440 km, correct to the nearest 10 km.
The time taken to complete the journey is 6 hours, correct to the nearest half hour.

Calculate the lower bound of the speed of the bus.

..... km/h [3]

9 **(a)** F is the point $(5, -2)$ and $\overrightarrow{FG} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$.

Find

(i) the coordinates of point G,

(..... , ...) [1]

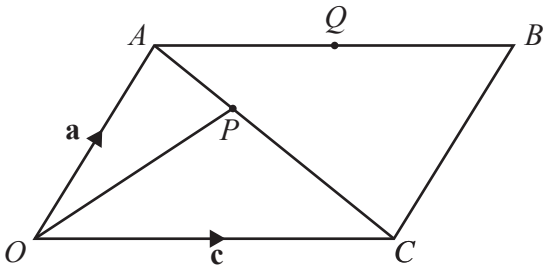
(ii) $5\overrightarrow{FG}$,

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(iii) $\left|\overrightarrow{FG}\right|$.

..... [2]

(b)



NOT TO SCALE

$OABC$ is a parallelogram.
P is a point on AC and Q is the midpoint of AB.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$.

(i) Find, in terms of **a** and/or **c**

(a) $\overrightarrow{AQ}$,

$\overrightarrow{AQ} =$ ..... [1]

(b) $\overrightarrow{OQ}$.

$\overrightarrow{OQ} =$ ..... [1]

(ii) $\overrightarrow{OP} = \frac{2}{3}\mathbf{a} + \frac{1}{3}\mathbf{c}$

(a) Show that O, P and Q lie on a straight line.

[2]

(b) Write down the ratio OP : OQ.
Give your answer in the form 1 : n.

1 : ..... [1]

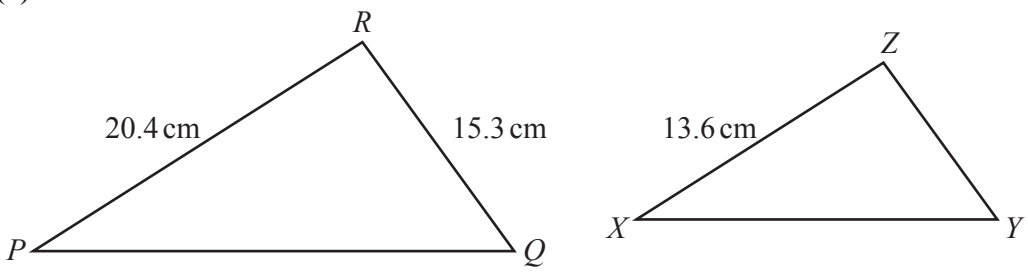
10 **(a)** Find the coordinates of the turning points of the graph of $y = x^3 - 12x + 6$.
You must show all your working.

(..... , ...) and (..... , ...) [5]

(b) Determine whether each turning point is a maximum or a minimum.
Show how you decide.

[3]

11 (a)



NOT TO SCALE

Triangle PQR is mathematically similar to triangle XYZ.

(i) Find YZ.

$YZ =$ ..... cm [2]

(ii) The area of triangle XYZ is $63.6\,\text{cm}^2$.

Calculate the area of triangle PQR.

..... cm^2 [3]

(b) Two containers are mathematically similar.
The larger container has a capacity of 64.8 litres and a surface area of $0.792\,\text{m}^2$.
The smaller container has a capacity of 37.5 litres.

Calculate the surface area of the smaller container.

..... m^2 [3]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

4724588545

MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2021**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

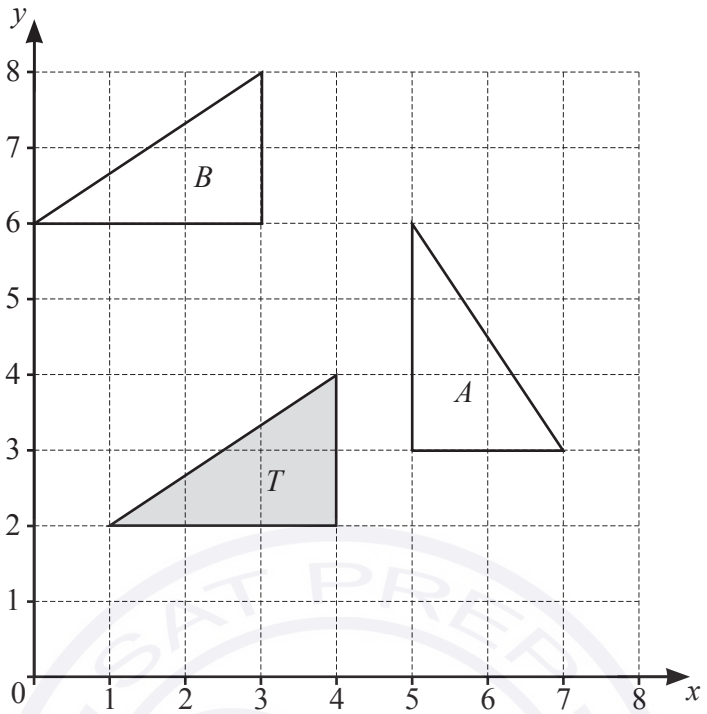
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

1 The diagram shows three triangles, T, A, and B, drawn on a 1 cm^2 grid.



(a) Describe fully the **single** transformation that maps triangle T onto triangle A.

.....

..... [3]

(b) **(i)** Describe fully the **single** transformation that maps triangle T onto triangle B.

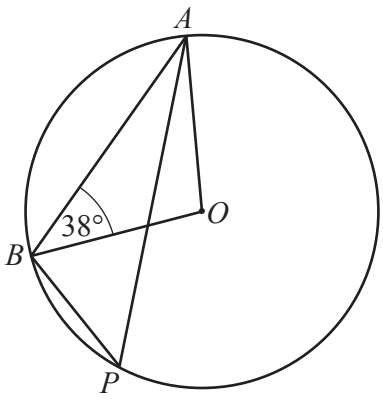
.....

..... [2]

(ii) Calculate the distance that each point of triangle T moves when it is mapped onto triangle B.

..... cm [2]

2 (a)



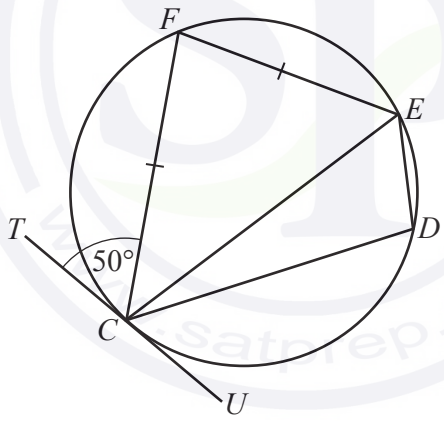
NOT TO SCALE

A, B and P are points on a circle, centre O and angle $OBA = 38°$.

Find angle APB.

Angle APB = ... [3]

(b)



NOT TO SCALE

$CDEF$ is a cyclic quadrilateral and $FC = FE$.
TU is a tangent to the circle at C and angle $TCF = 50°$.

Find

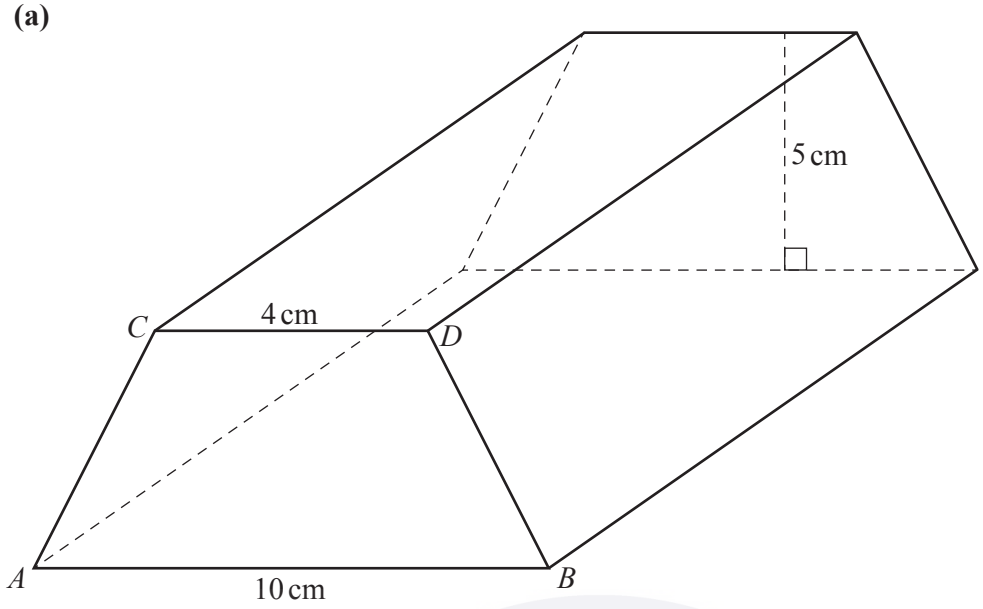
(i) angle EFC,

Angle EFC = ... [2]

(ii) angle CDE.

Angle CDE = ... [1]

3 (a)



NOT TO SCALE

The diagram shows a prism.
The cross-section of the prism is a trapezium with CD parallel to AB and $AC = BD$.

$AB = 10$ cm, $CD = 4$ cm and the height of the trapezium is 5 cm.
The volume of the prism is 525 cm^3.

(i) The prism is made of iron.
1 cm^3 of iron has a mass of 7.8 g.

Calculate the mass of the prism.
Give your answer in kilograms.

..... kg [2]

(ii) Calculate the length of the prism.

..... cm [3]

(iii) Calculate the total surface area of the prism.

..... cm^2 [6]

(iv) In a mathematically similar prism, the height of the trapezium is 10 cm.

Calculate the volume of this prism.

..... cm^3 [3]

(b) A cuboid measures 10 cm by 4 cm by 6 cm.
Each side is measured correct to the nearest centimetre.

Complete the inequality for the volume, V, of this cuboid.

..... $cm^3 \leqslant V <$ ..... cm^3 [3]

4 **(a)** Solve the simultaneous equations.
You must show all your working.

$$2p - q = 7$$
$$3p + 2q = 7$$

$p =$ .....

$q =$ ..... [3]

(b) Solve the equation.

$$\frac{x}{4} + \frac{2x}{3} = 1$$

$x =$ ..... [2]

(c) $-8 < 3x - 2 \leqslant 7$

(i) Solve the inequality.

..... [3]

(ii) Find the integer values of x that satisfy the inequality.

..... [1]

(d) Factorise completely.

$$16a - 4a^2$$

..... [2]

(e) Write each of the following as a single fraction, in its simplest form.

(i) $\frac{1}{2a} \div \frac{3}{4b}$

..... [2]

(ii) $2 - \frac{x}{x-1}$

..... [2]

5 **(a)** $500 is invested at a rate of 3% per year.

Calculate the total interest earned at the end of 7 years when

(i) simple interest is paid,

$ ..... [2]

(ii) compound interest is paid.

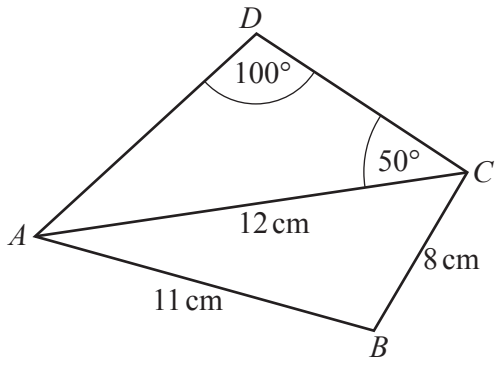
$ ..... [3]

(b) The value of a car decreases exponentially by 10% each year.
The value now is $6269.40 .

Calculate the value of the car 3 years ago.

$ ..... [3]

6



NOT TO SCALE

(a) Calculate AD.

$AD =$ ..... cm [3]

(b) Calculate angle BAC and show that it rounds to 40.42°, correct to 2 decimal places.

[4]

(c) Calculate the area of the quadrilateral $ABCD$.

..... cm^2 [3]

(d) Calculate the shortest distance from B to AC.

..... cm [3]

7 **(a)** Amir buys 3 cakes that cost c cents each and 2 loaves of bread that cost $(2c - 11)$ cents each.
He spends a total of \$5.87 .

Find the value of c.

$c =$ ..... [3]

(b) A bottle of water costs \$$w$.
A bottle of juice costs \$$(w + 1)$.

Alex spends \$22 on bottles of water and \$42 on bottles of juice.
The number of bottles of water is equal to the number of bottles of juice.

Find the value of w.

$w =$ ..... [3]

(c) Alicia walks a distance of 9 km at a speed of x km/h.
She then runs a distance of 5 km at a speed of $(2x + 1)$ km/h.

The total time Alicia takes is 2.5 hours.

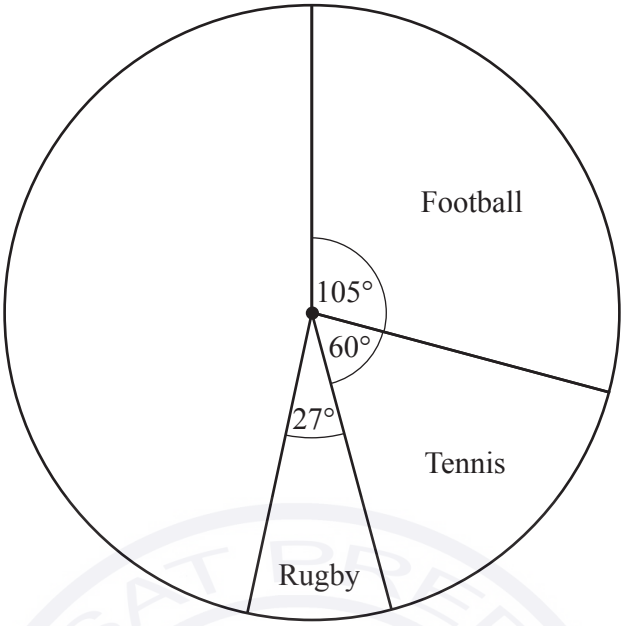
(i) Show that $10x^2 - 41x - 18 = 0$.

[4]

(ii) Work out Alicia's running speed.
You must show all your working.

..... km/h [4]

8 **(a)** Jean asks 600 people to choose their favourite sport.
The pie chart shows some of this information.



(i) Show that 100 people choose tennis.

[1]

(ii) Work out how many people choose rugby.

..... [2]

(iii) 125 people choose cricket and the rest choose swimming.

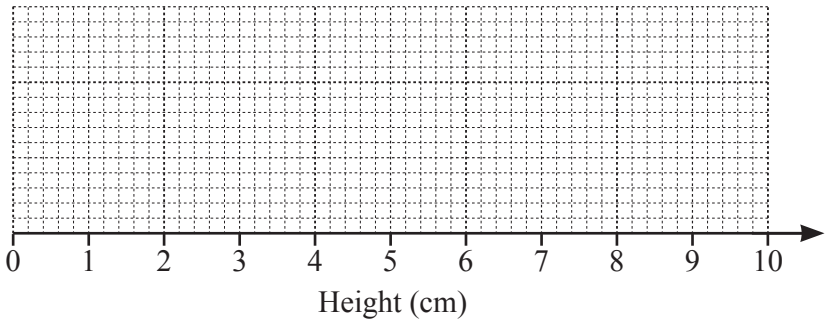
Complete the pie chart to show this information.

[2]

(b) The heights of some plants are measured:

- smallest height = 0.6 cm
- range = 8.1 cm
- median = 5.2 cm
- lower quartile = 3.4 cm
- interquartile range = 4.1 cm.

On the grid, draw a box-and-whisker plot to show this information.



[3]

(c) A dice is rolled 100 times.
The frequency table shows the results.

Score	1	2	3	4	5	6
Frequency	16	25	17	19	8	15

Find

(i) the range,

..... [1]

(ii) the mode,

..... [1]

(iii) the median.

..... [1]

(d) 50 students answer a mathematics question.
The table shows the time, t seconds, taken by each student to answer the question.

Time (t seconds)	$10 < t \leqslant 20$	$20 < t \leqslant 25$	$25 < t \leqslant 30$	$30 < t \leqslant 50$	$50 < t \leqslant 80$
Frequency	2	8	12	16	12

Calculate an estimate of the mean.

..... s [4]

9 $f(x) = x(x-1)(x-2)$

(a) Find the coordinates of the points where the graph of $y = f(x)$ crosses the x-axis.

(..... , ...)

(..... , ...)

(..... , ...) [2]

(b) Show that $f(x) = x^3 - 3x^2 + 2x$.

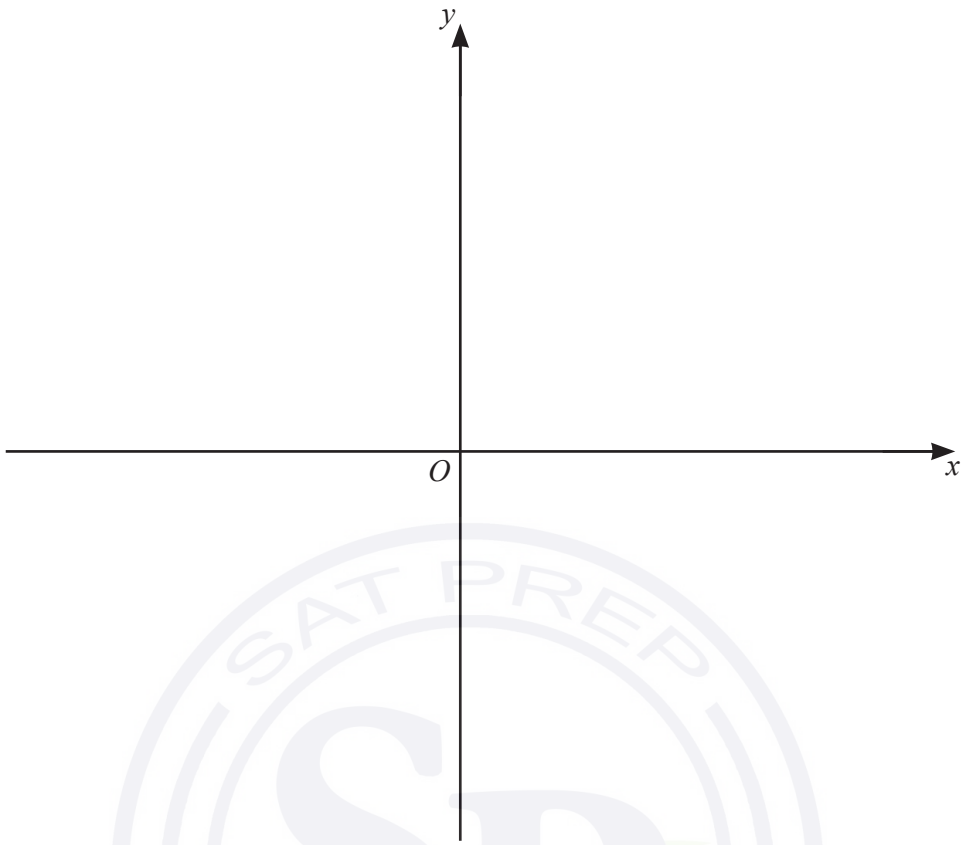
[2]

(c) Find the coordinates of the turning points of the graph of $y = f(x)$.
Show all your working and give your answers correct to 1 decimal place.

(..... , ...)

(..... , ...) [8]

(d) Sketch the graph of $y = f(x)$.



[2]

10 (a) Sarah spins a fair four-sided spinner numbered 0, 1, 1 and 3.

(i) What number is the spinner most likely to land on?

..... [1]

(ii) Sarah spins the spinner twice.

Find the probability that it lands on the number 1 both times.

..... [2]

(iii) Sarah spins the spinner until it lands on the number 3.

The probability that this happens on the nth spin is $\frac{729}{16384}$.

Find the value of n.

$n =$ ..... [2]

(b) Scott takes an examination.
The examination is in two parts, a theory test and a practical test.
Both parts must be passed to pass the examination.

The probability that Scott passes the theory test is 0.9 .
The probability that Scott passes the practical test is 0.8 .

Find the probability that

(i) Scott passes the examination,

..... [2]

(ii) Scott passes the theory test or the practical test but not both.

..... [3]

11 $f(x) = 2x - 1$ $g(x) = x^2 + 2x$ $h(x) = 4^x$ $j(x) = 2^x$

(a) Find the value of

(i) h(3),

..... [1]

(ii) fh(3).

..... [1]

(b) Solve the equation $gf(x) = 0$.

$x =$ ..... or $x =$ ..... [4]

(c) $p^{-1}(x) = f(x)$

Find $p(x)$.

..... [2]

(d) $\mathrm{h}(x)\mathrm{j}(x) = \dfrac{1}{\sqrt{2}}$

Find the value of x.

$x =$ ..... [3]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

113508389

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2021**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

1 **(a)** The total cost of a taxi journey is calculated as

- \$0.50 per kilometre

plus

- \$0.40 per minute.

(i) Calculate the total cost of a journey of 32 km that takes 30 minutes.

\$ ..... [2]

(ii) The total cost of a journey of 100 km is \$98.

Show that the time taken is 2 hours.

[3]

(b) Three taxi drivers travel a total of 8190 km in the ratio 5 : 2 : 7.

Calculate the distance each driver travels.

Driver 1 ..... km

Driver 2 ..... km

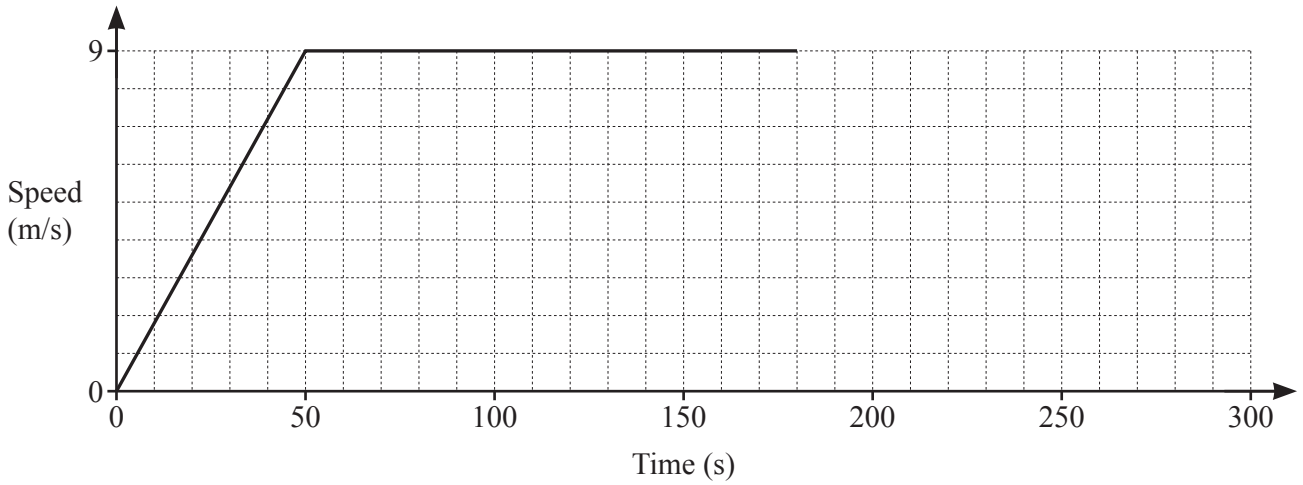
Driver 3 ..... km [3]

(c) After midnight, the cost of any taxi journey increases by 45%.
One journey costs \$84.10 after midnight.

Calculate the cost of the same journey before midnight.

\$ ..... [2]

2 The diagram shows the speed−time graph for the first 180 seconds of a train journey.



(a) Find the acceleration, in m/s^2, of the train during the first 50 seconds.

..... m/s^2 [1]

(b) After 180 seconds, the train decelerates at a constant rate of 1944 **km/h^2**.

Show that the train decelerates for 60 seconds until it stops.

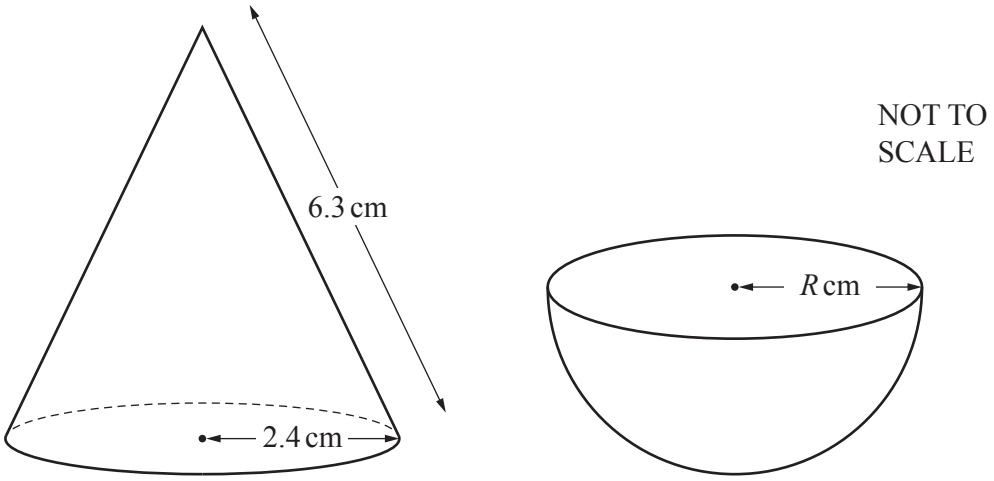
[2]

(c) Complete the speed−time graph. [1]

(d) Calculate the average speed of the train for the whole journey.

..... m/s [4]

3 (a)



NOT TO SCALE

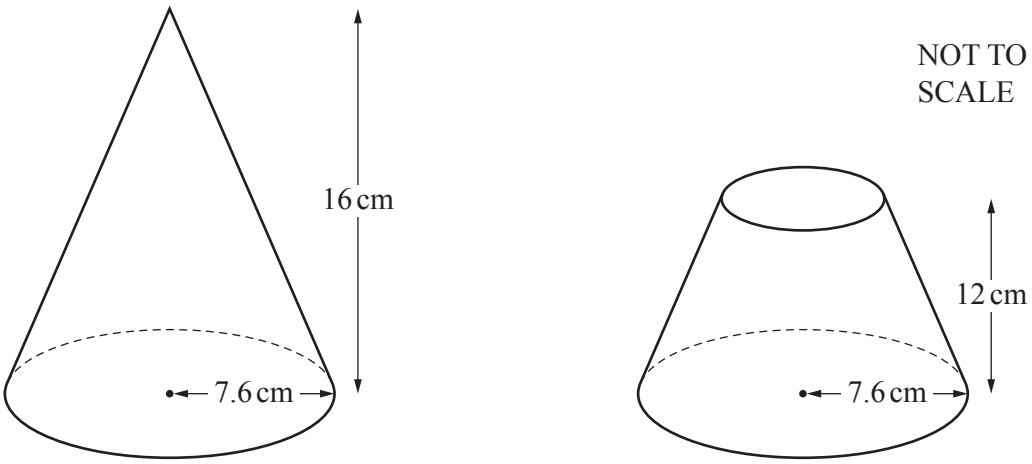
The diagram shows a solid cone and a solid hemisphere.
The cone has radius 2.4 cm and slant height 6.3 cm.
The hemisphere has radius R cm.
The **total** surface area of the cone is equal to the **total** surface area of the hemisphere.

Calculate the value of R.

[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]
[The curved surface area, A, of a sphere with radius r is $A = 4\pi r^2$.]

$R =$ ..... [4]

(b)



The diagram shows a solid cone with radius 7.6 cm and height 16 cm.
A cut is made parallel to the base of the cone and the top section is removed.
The remaining solid has height 12 cm, as shown in the diagram.

Calculate the volume of the remaining solid.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [4]

4 **(a)** The exchange rate is 1 euro = \$1.142 .

(i) Johann changes \$500 into euros.

Calculate the number of euros Johann receives.
Give your answer correct to the nearest euro.

..... euros [2]

(ii) Johann buys a computer for \$329.
The same computer costs 275 euros.

Calculate the difference in cost in dollars.

\$ ..... [2]

(b) Lucy spends $\frac{3}{8}$ of the money she has saved this month on a book that costs \$5.25 .

Calculate how much money Lucy has saved this month.

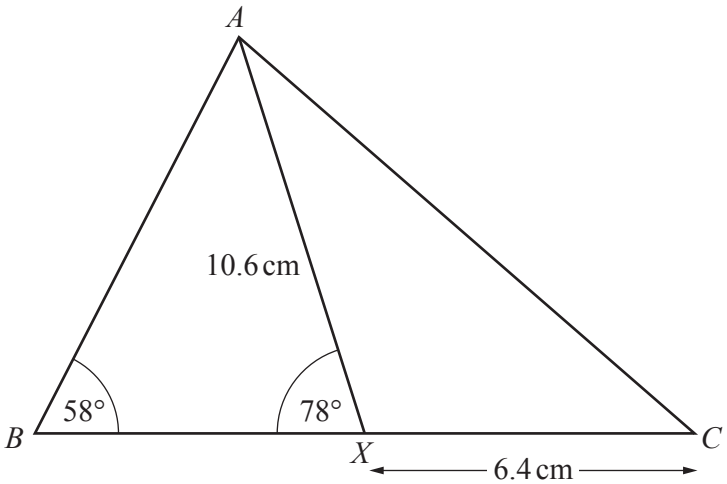
\$ ..... [2]

(c) Kamal invests \$6130 at a rate of r% per year compound interest.
The value of his investment at the end of 5 years is \$6669.

Calculate the value of r.

$r =$ ..... [3]

5



NOT TO SCALE

The diagram shows triangle ABC.
X is a point on BC.
$AX = 10.6$ cm, $XC = 6.4$ cm, angle $ABC = 58°$ and angle $AXB = 78°$.

(a) Calculate AC.

$AC =$ ..... cm [4]

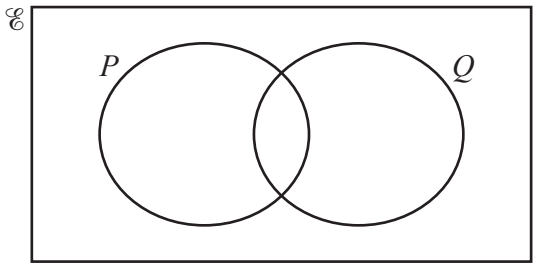
(b) Calculate BX.

$BX =$ ..... cm [4]

(c) Calculate the area of triangle ABC.

..... cm^2 [3]

6 **(a)** In the Venn diagram, shade the region $P' \cup Q$.

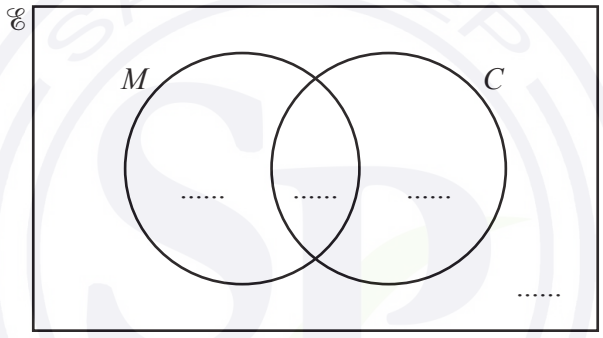


[1]

(b) There are 50 students in a group.

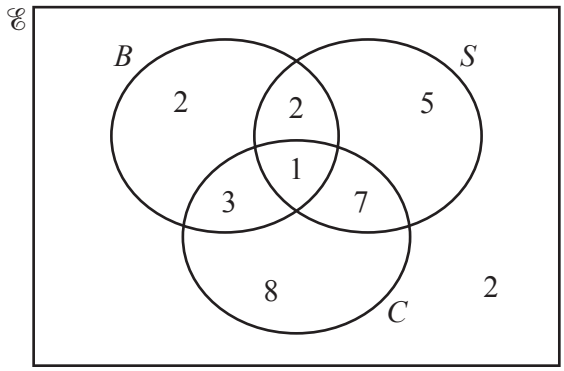
34 have a mobile phone (M).
39 have a computer (C).
5 have no mobile phone and no computer.

Complete the Venn diagram to show this information.



[2]

(c) The Venn diagram shows the number of students in a group of 30 who have brothers (B), sisters (S) or cousins (C).



(i) Write down the number of students who have brothers.

..... [1]

(ii) Write down the number of students who have cousins but do not have sisters.

..... [1]

(iii) Find $\mathrm{n}(B \cup S \cup C)'$.

..... [1]

(iv) Use set notation to describe the set of students who have both cousins and sisters but do not have brothers.

..... [1]

(v) One student is picked at random from the 30 students.

Find the probability that this student has cousins.

..... [1]

(vi) Two students are picked at random from the students who have cousins.

Calculate the probability that both these students have brothers.

..... [3]

(vii) One student is picked at random from the 30 students.

Event A This student has sisters.
Event B This student has cousins but does not have brothers.

Explain why event A and event B are equally likely.

.....

..... [1]

7 **(a)** Simplify.

$$\frac{x^2-25}{x^2-x-20}$$

..... [3]

(b) Write as a single fraction in its simplest form.

$$\frac{x+5}{x}+\frac{x+8}{x-1}$$

..... [3]

(c) A curve has equation $y = 2x^3 - 4x^2 + 6$.

(i) Find $\frac{dy}{dx}$, the derived function of y.

..... [2]

(ii) Calculate the gradient of the curve $y = 2x^3 - 4x^2 + 6$ at $x = 4$.

..... [2]

(iii) Find the coordinates of the two stationary points on the curve.

(..... , ...) and (..... , ...) [4]

8 **(a)** The table shows information about the mass, in kilograms, of each of 50 children.

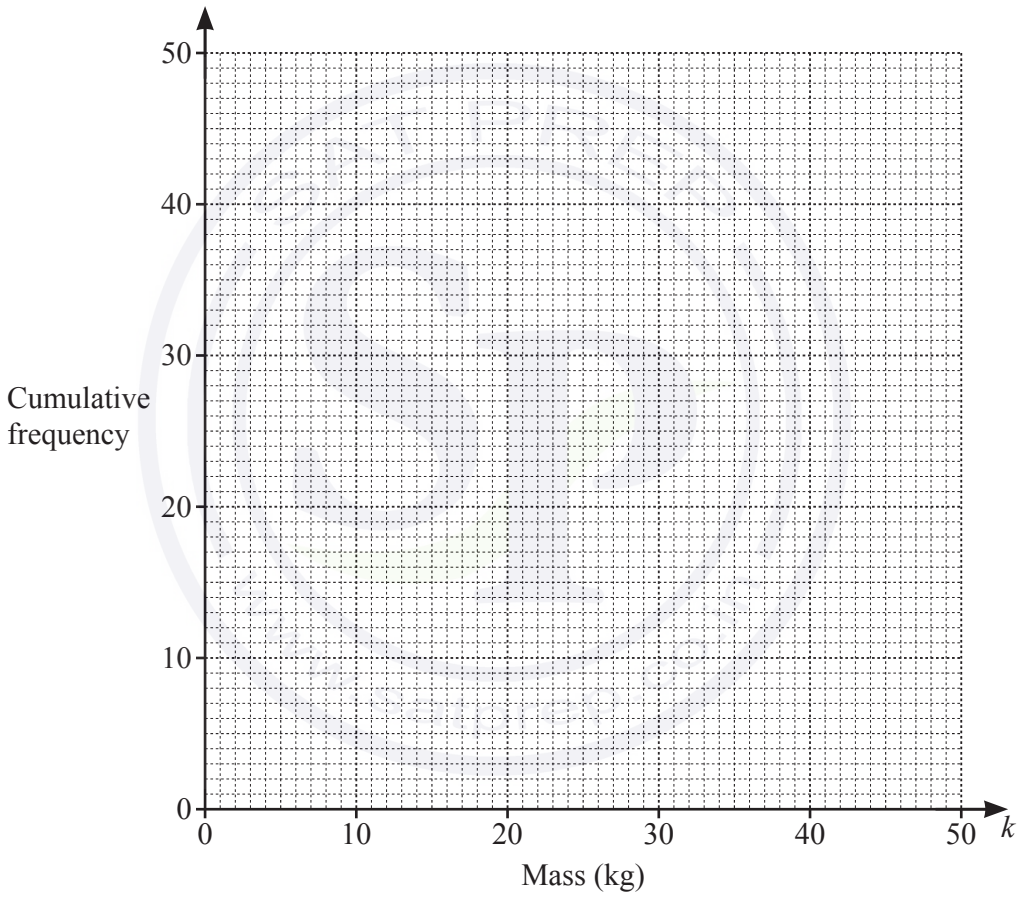
Mass (k kg)	$0 < k \leqslant 10$	$10 < k \leqslant 25$	$25 < k \leqslant 35$	$35 < k \leqslant 40$	$40 < k \leqslant 50$
Frequency	3	19	21	5	2

(i) Complete the cumulative frequency table.

Mass (k kg)	$k \leqslant 10$	$k \leqslant 25$	$k \leqslant 35$	$k \leqslant 40$	$k \leqslant 50$
Cumulative frequency					

[2]

(ii) On the grid, draw a cumulative frequency diagram to show this information.

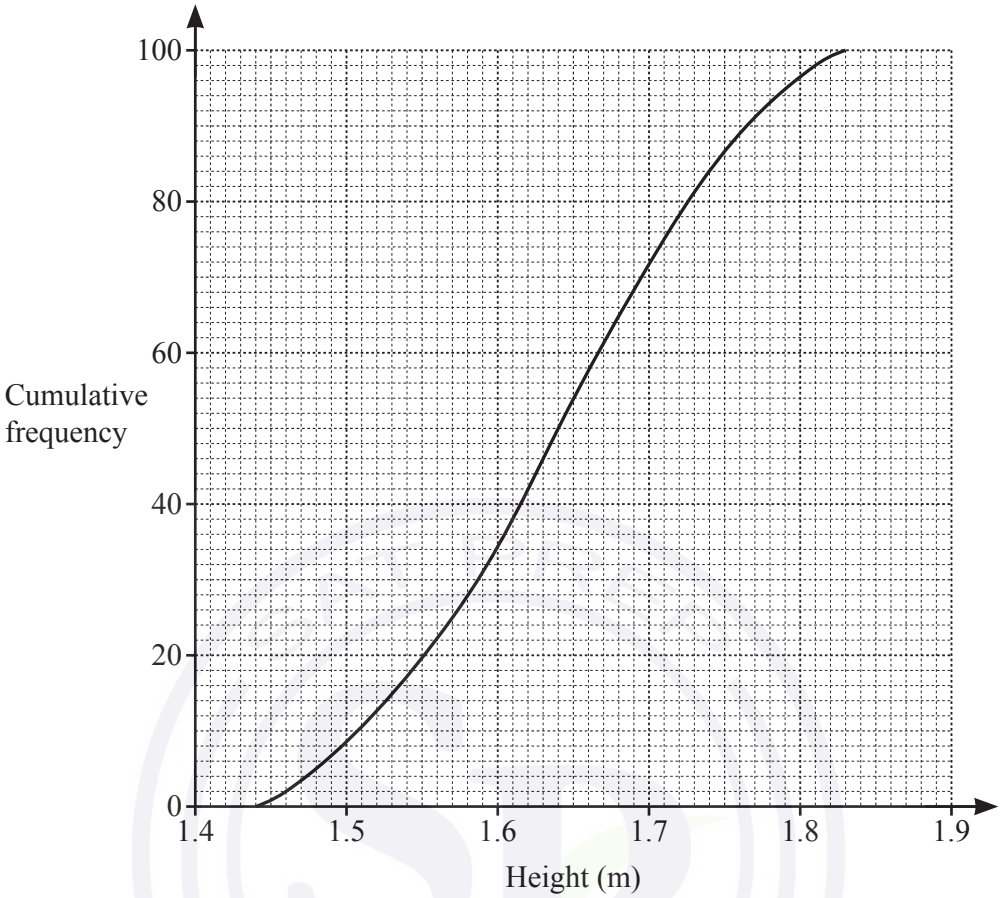


[3]

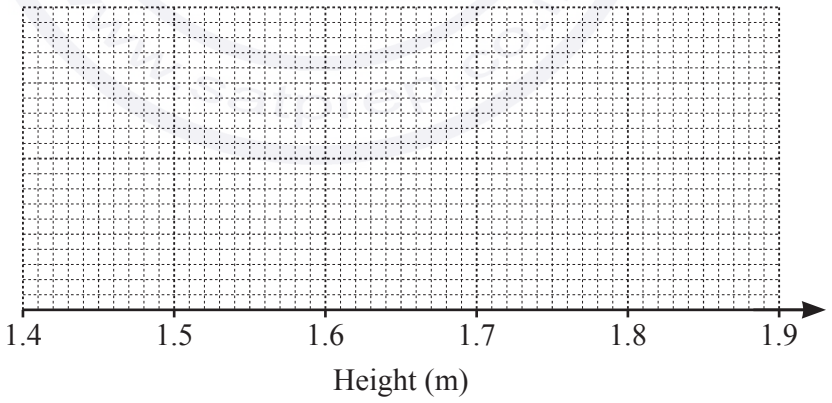
(iii) Use your diagram to find an estimate of the number of children with a mass of 32 kg or less.

..... [1]

(b) This cumulative frequency diagram shows information about the height, in metres, of each of 100 students.

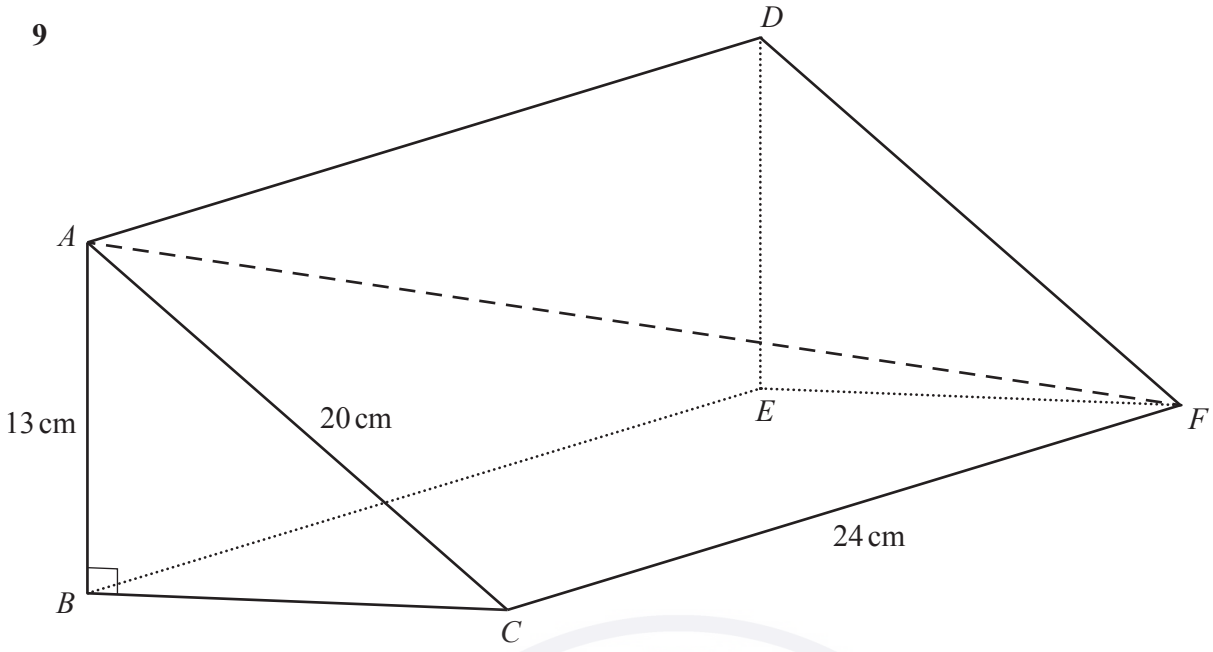


The height of the tallest student is 1.83 metres.
The height of the shortest student is 1.45 metres.



On this grid, draw a box-and-whisker plot for the heights of the 100 students. [4]

9



NOT TO SCALE

The diagram shows a prism, *ABCDEF*.
AB = 13 cm, *AC* = 20 cm, *CF* = 24 cm and angle *ABC* = 90°.

(a) Calculate the total surface area of the prism.

..... cm^2 [6]

(b) Calculate the volume of the prism.

..... cm^3 [1]

(c) Calculate the angle that *AF* makes with the base *BCFE*.

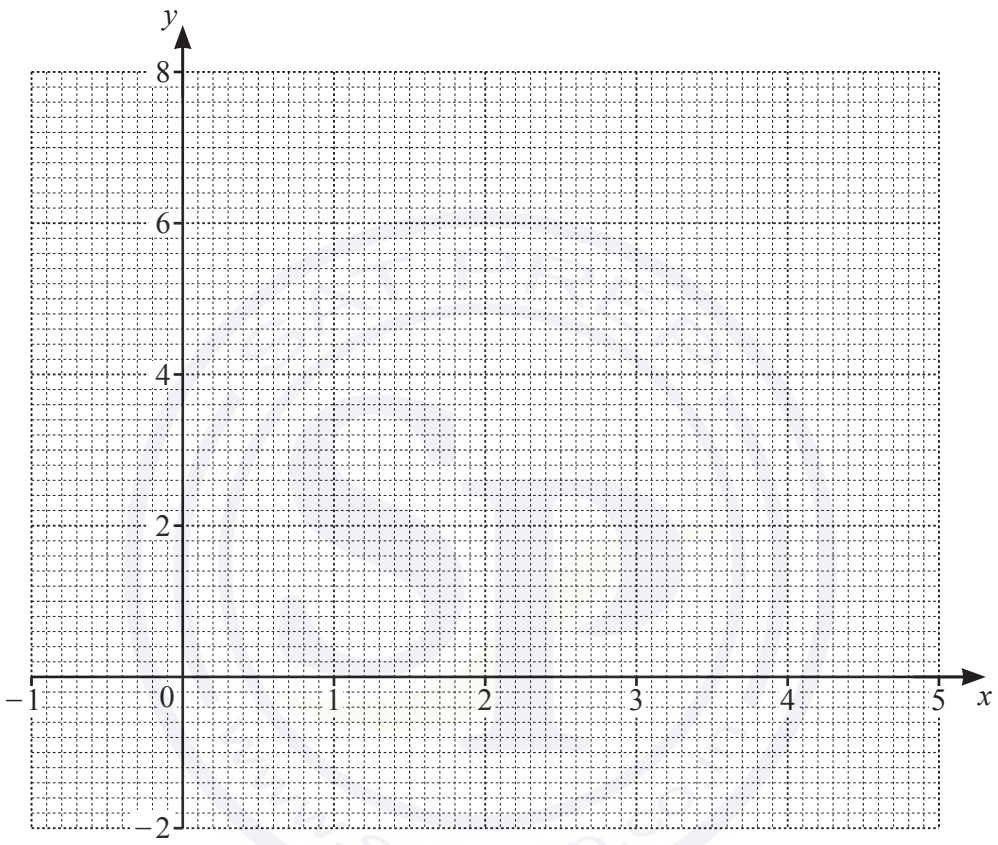
..... [4]

10 The table shows some values of $y = 3 + 4x - x^2$ for $-1 \leqslant x \leqslant 5$.

x	-1	-0.5	0	1	2	3	4	4.5	5
y	-2			6		6			-2

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = 3 + 4x - x^2$ for $-1 \leqslant x \leqslant 5$.



[4]

(c) Write down an **integer** value of k for which the equation $3 + 4x - x^2 = k$ has no solutions.

..... [1]

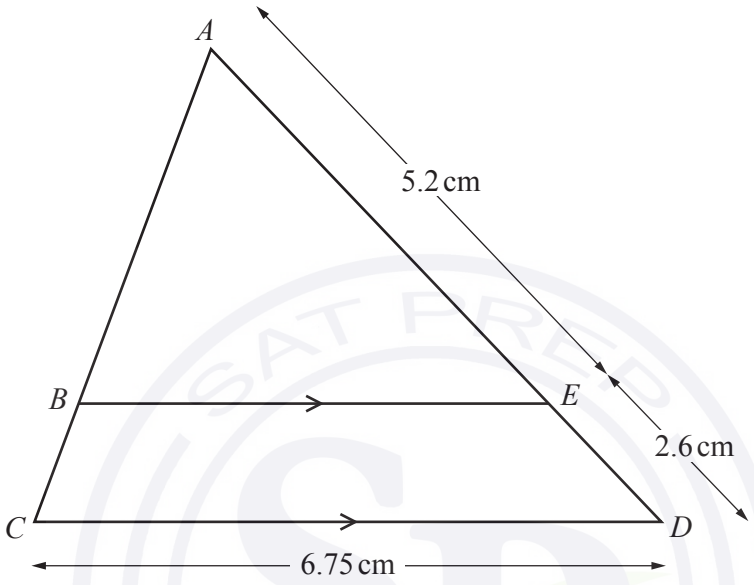
(d) By drawing a suitable straight line on the grid, solve the equation $-1 + \frac{9}{2}x - x^2 = 0$.

$x =$ ..... or $x =$ ..... [4]

11 (a) Find the size of an exterior angle of a regular polygon with 18 sides.

..... [2]

(b)



NOT TO SCALE

In triangle ACD, B lies on AC and E lies on AD such that BE is parallel to CD.
$AE = 5.2$ cm and $ED = 2.6$ cm.

Calculate BE.

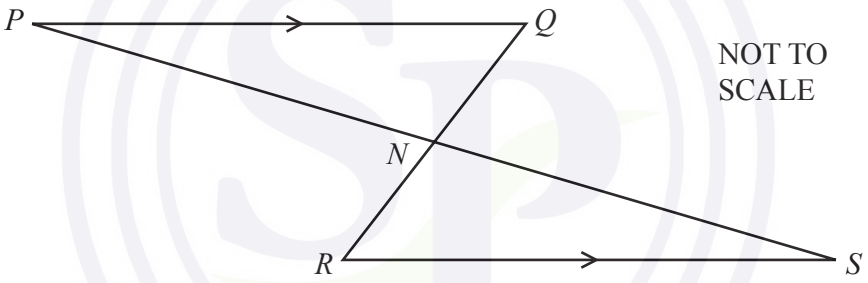
$BE =$ ..... cm [2]

(c) Two solids are mathematically similar.
The smaller solid has height 2 cm and volume 32 cm^3.
The larger solid has volume 780 cm^3.

Calculate the height of the larger solid.

..... cm [3]

(d)



PQ is parallel to *RS*, *PNS* is a straight line and *N* is the midpoint of *RQ*.

Explain, giving reasons, why triangle *PQN* is congruent to triangle *SRN*.

.....

.....

.....

..... [4]

12 $f(x) = 3 - 2x$ $g(x) = x^2 + 5$ $h(x) = x^3$

(a) Find $f(-5)$.

..... [1]

(b) Find $ff(x)$.
Give your answer in its simplest form.

..... [2]

(c) Solve $g(x) = f(x) + 37$.

$x =$ ..... or $x =$ ..... [4]

(d) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(e) Find $hf(x) + g(x)$.
Give your answer in its simplest form.

..... [5]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

8362605305

MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2021**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

DC (CE/CB) 200347/3

[Turn over

1 **(a)** A 2.5-litre tin of paint costs \$13.50 .
In a sale, the cost is reduced by 14%.

(i) Work out the sale price of this tin of paint.

\$ ..... [2]

(ii) Work out the cost of buying 42.5 litres of paint at this sale price.

\$ ..... [2]

(b) Henri buys some paint in the ratio red paint : white paint : green paint = 2 : 8 : 5.

(i) Find the percentage of this paint that is white.

..... % [1]

(ii) Henri buys a total of 22.5 litres of paint.

Find the number of litres of green paint he buys.

..... litres [2]

(c) Maria paints a rectangular wall.
The length of the wall is 20.5 m and the height is 2.4 m, both correct to 1 decimal place.

One litre of paint covers an area of exactly 10 m^2.

Calculate the smallest number of 2.5-litre tins of paint she will need to be sure all the wall is painted.
Show all your working.

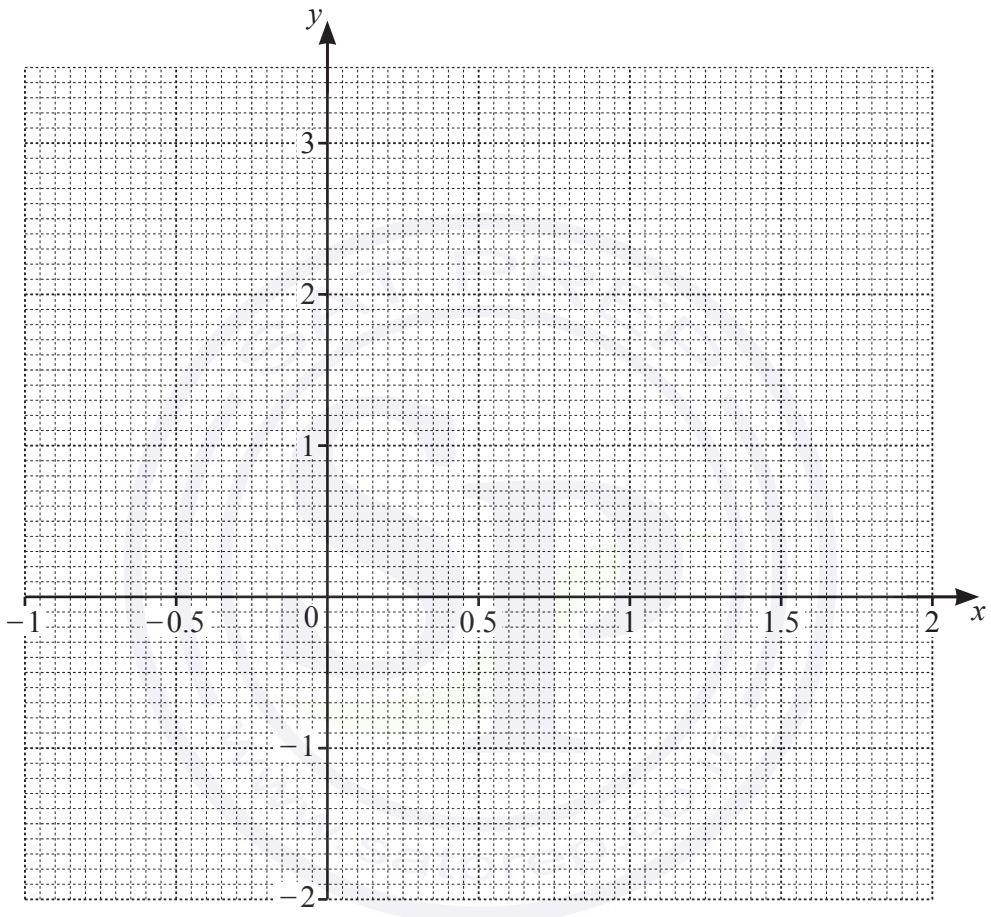
..... [4]

2 The table shows some values for $y = 2 \times 0.5^x - 1$.

x	-1	-0.5	0	0.5	1	1.5	2
y	3	1.83		0.41	0	-0.29	

(a) (i) Complete the table. [2]

(ii) On the grid, draw the graph of $y = 2 \times 0.5^x - 1$ for $-1 \leqslant x \leqslant 2$.



[4]

(b) By drawing a suitable straight line, solve the equation $2 \times 0.5^x + 2x - 3.5 = 0$ for $-1 \leqslant x \leqslant 2$.

$x =$ ..... [3]

(c) There are no solutions to the equation $2 \times 0.5^x - 1 = k$ where k is an integer.

Complete the following statements.

The highest possible value of k is .....

The equation of the asymptote to the graph of $y = 2 \times 0.5^x - 1$ is ..... [2]

3 **(a)** Simplify, giving your answer as a single power of 7.

(i) $7^5 \times 7^6$

..... [1]

(ii) $7^{15} \div 7^5$

..... [1]

(iii) $42 + 7$

..... [1]

(b) Simplify.

$(5x^2 \times 2xy^4)^3$

..... [3]

(c) $P = 2^5 \times 3^3 \times 7$ $Q = 540$

(i) Find the highest common factor (HCF) of P and Q.

..... [2]

(ii) Find the lowest common multiple (LCM) of P and Q.

..... [2]

(iii) $P \times R$ is a cube number, where R is an integer.

Find the smallest possible value of R.

..... [2]

(d) Factorise the following completely.

(i) $x^2 - 3x - 28$

..... [2]

(ii) $7(a+2b)^2 + 4a(a+2b)$

..... [2]

(e) $3^{2x-1} = \frac{1}{9^x} \times 3^{2y-x}$

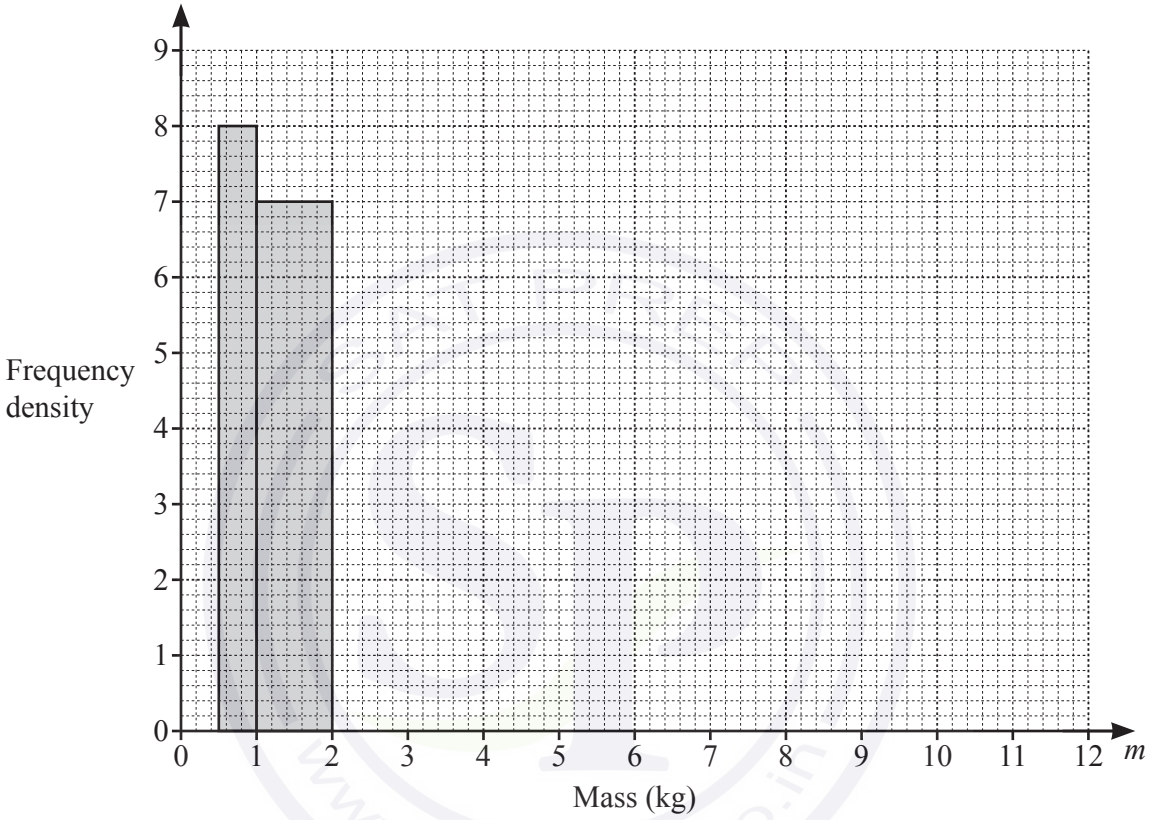
Find an expression for y in terms of x.

$y =$ ..... [4]

4 **(a)** The mass, m kg, of each of 40 parcels in a warehouse is recorded.
The table shows information about the masses of these parcels.

Mass (m kg)	$0.5 < m \leqslant 1$	$1 < m \leqslant 2$	$2 < m \leqslant 4$	$4 < m \leqslant 7$	$7 < m \leqslant 12$
Frequency	4	7	15	10	4

(i) Complete the histogram to show this information.



[3]

(ii) Calculate an estimate of the mean mass of the parcels.

..... kg [4]

(iii) A parcel is picked at random from the 40 parcels.

Find the probability that this parcel has a mass of 2 kg or less.

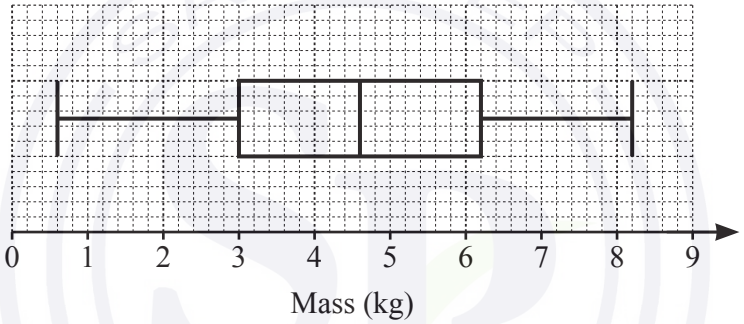
..... [1]

(iv) Two parcels are picked at random without replacement from those with a mass **greater than** 2 kg.

Work out the probability that one of them has a mass greater than 7 kg and the other has a mass of 4 kg or less.

..... [3]

(b) A van delivers parcels from a different warehouse.
The box-and-whisker plot shows information about the masses of the parcels in the van.



(i) Find the median.

..... kg [1]

(ii) Find the interquartile range.

..... kg [1]

(iii) Two parcels are removed from the van at the first delivery.
The masses of these parcels are 2.4 kg and 5.8 kg.

Describe the effect that removing these parcels has on the median mass of the remaining parcels.
Give a reason for your answer.

.....

..... [2]

5 **(a)** $\mathbf{a} = \begin{pmatrix} -3 \\ 8 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 2 \\ -5 \end{pmatrix}$

(i) Find

(a) $\mathbf{b} - \mathbf{a}$,

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(b) $2\mathbf{a} + \mathbf{b}$,

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(c) $|\mathbf{b}|$.

..... [2]

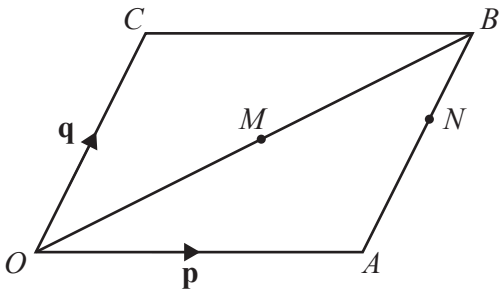
(ii) $\mathbf{a} + k\mathbf{b} = \begin{pmatrix} 13 \\ m \end{pmatrix}$, where k and m are integers.

Find the value of k and the value of m.

$k =$ .....

$m =$ ..... [3]

(b)



NOT TO SCALE

$OABC$ is a parallelogram and O is the origin.
M is the midpoint of OB.
N is the point on AB such that $AN : NB = 3 : 2$.
$\overrightarrow{OA} = \mathbf{p}$ and $\overrightarrow{OC} = \mathbf{q}$.

(i) Find, in terms of **p** and **q**, in its simplest form.

(a) $\overrightarrow{OB}$

$\overrightarrow{OB} =$ ..... [1]

(b) $\overrightarrow{CM}$

$\overrightarrow{CM} =$ ..... [2]

(c) $\overrightarrow{MN}$

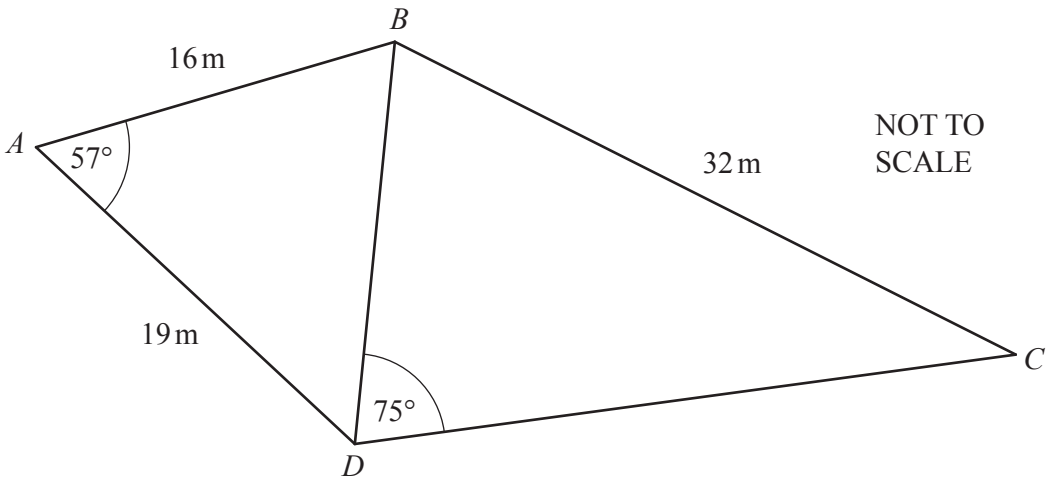
$\overrightarrow{MN} =$ ..... [2]

(ii) CB and ON are extended to meet at D.

Find the position vector of D in terms of **p** and **q**.
Give your answer in its simplest form.

..... [3]

6



The diagram shows a quadrilateral *ABCD* made from two triangles, *ABD* and *BCD*.

(a) Show that $BD = 16.9$ m, correct to 1 decimal place.

[3]

(b) Calculate angle *CBD*.

Angle *CBD* = ... [4]

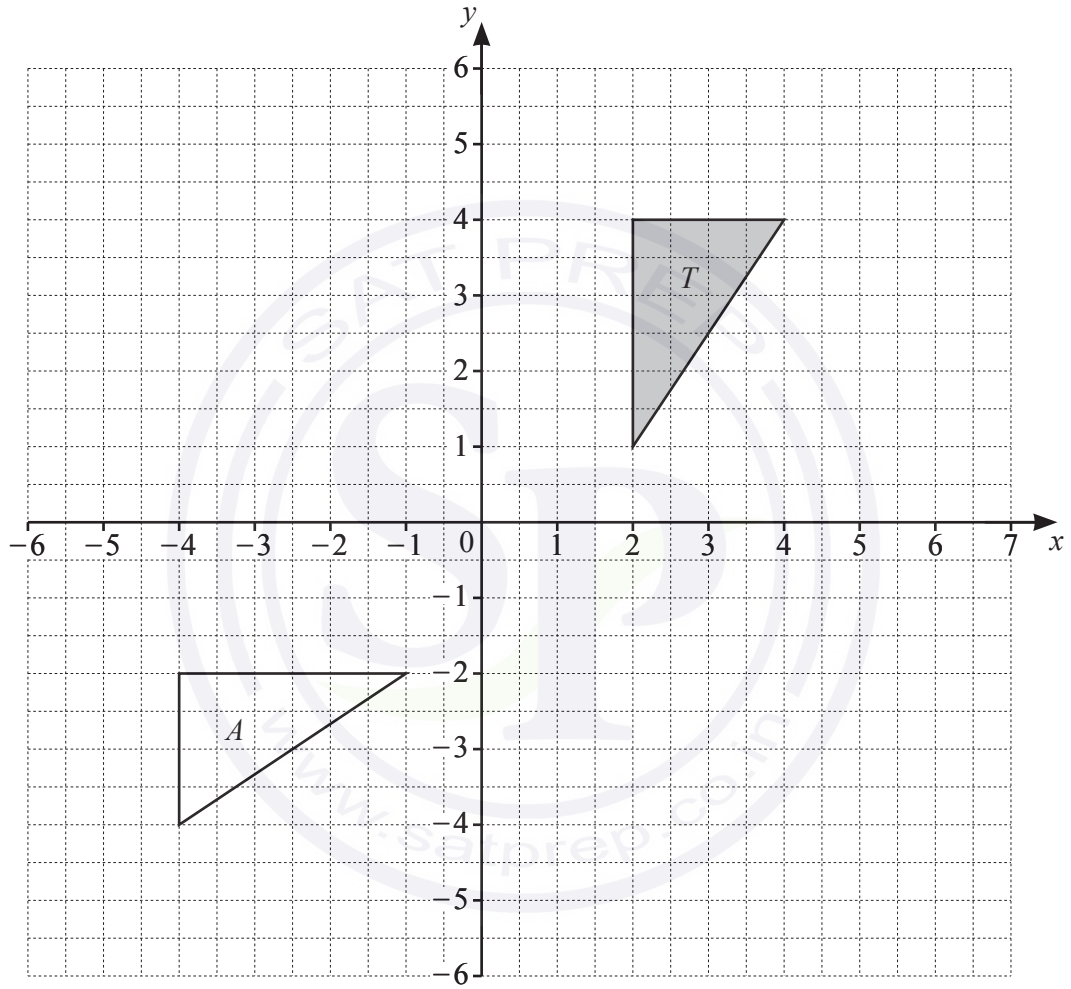
(c) Find the area of the quadrilateral *ABCD*.

..... m^2 [3]

(d) Find the shortest distance from B to AD.

..... m [3]

7



(a) On the grid, draw the image of

(i) triangle T after a translation by the vector $\begin{pmatrix} 2 \\ -1 \end{pmatrix}$, [2]

(ii) triangle T after a rotation, 90° clockwise, about the origin, [2]

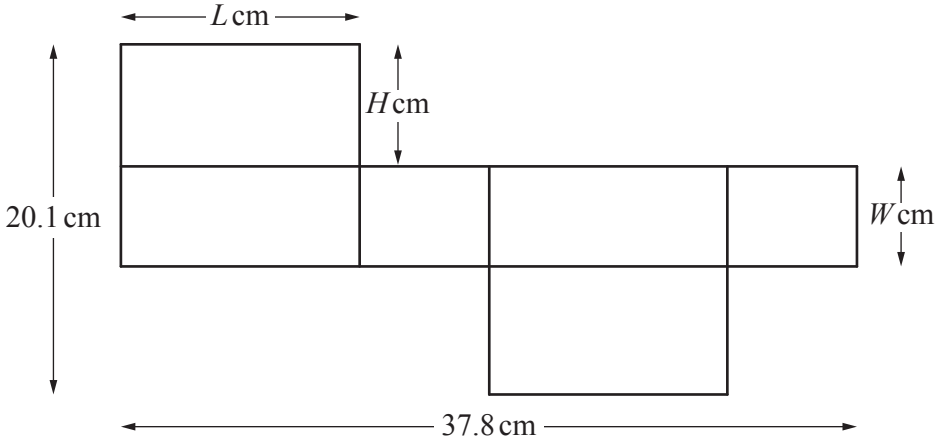
(iii) triangle T after an enlargement, scale factor $-\frac{1}{2}$, centre $(-2, 3)$. [2]

(b) Describe fully the **single** transformation that maps triangle T onto triangle A.

.....

..... [2]

8 **(a)** A cuboid has length L cm, width W cm and height H cm.



NOT TO SCALE

The diagram shows the net of this cuboid.
The ratio $W : L = 1 : 2$.

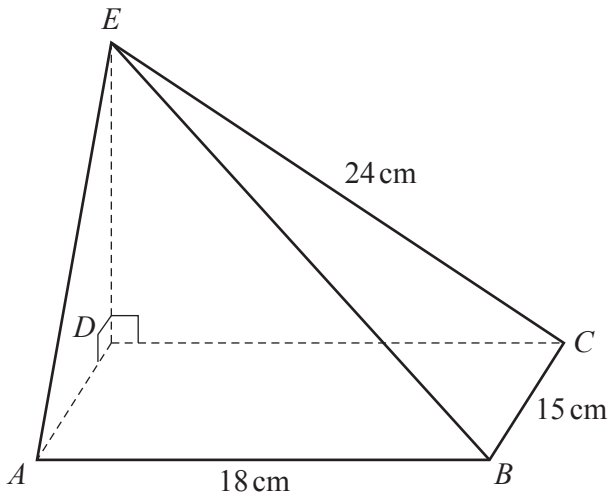
Find the value of L, the value of W and the value of H.

$L =$ .....

$W =$ .....

$H =$ ..... [5]

(b)



NOT TO SCALE

The diagram shows a solid pyramid with a rectangular base $ABCD$.
E is vertically above D.
Angle EDC = angle EDA = 90°.
AB = 18 cm, BC = 15 cm and EC = 24 cm.

(i) The pyramid is made of wood and has a mass of 800 g.

Calculate the density of the wood.
Give the units of your answer.

[The volume, V, of a pyramid is $V = \frac{1}{3} \times$ area of base $\times$ height.]
[Density = mass ÷ volume]

.... [5]

(ii) Calculate the angle between BE and the base of the pyramid.

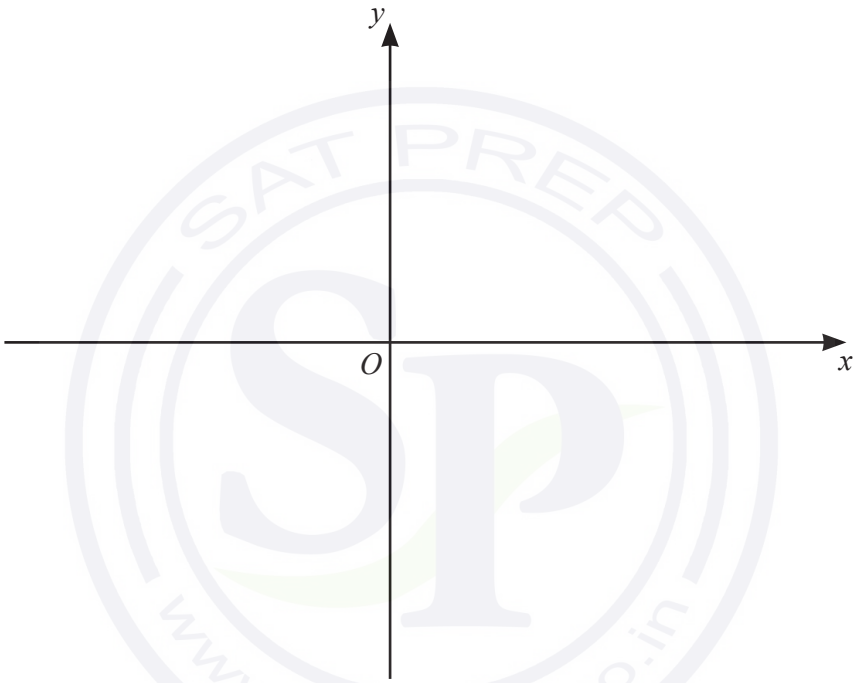
..... [4]

9 **(a)** **(i)** The equation $y = x^3 - 4x^2 + 4x$ can be written as $y = x(x-a)^2$.

Find the value of a.

$a =$ ..... [2]

(ii) On the axes, sketch the graph of $y = x^3 - 4x^2 + 4x$, indicating the values where the graph meets the axes.



[4]

(b) Find the equation of the tangent to the graph of $y = x^3 - 4x^2 + 4x$ at $x = 4$.
Give your answer in the form $y = mx + c$.

$y =$ ..... [7]

Question 10 is printed on the next page.

10 The table shows four sequences A, B, C and D.

Sequence	1st term	2nd term	3rd term	4th term	5th term		nth term
A	1	8	27	64			
B	5	11	17	23			
C	0.25	0.5	1	2	4		
D	4.75	10.5	16	21			

Complete the table.

[9]

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

6180184614

MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2021**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

DC (LK/CB) 200398/2

[Turn over

1 **(a)** **(i)** Yasmin and Zak share an amount of money in the ratio 21 : 19.
Yasmin receives $6 more than Zak.

Calculate the total amount of money shared by Yasmin and Zak.

$ ..... [2]

(ii) In a sale, all prices are reduced by 15%.

(a) Yasmin buys a blouse with an original price of $40.

Calculate the sale price of the blouse.

$ ..... [2]

(b) Zak buys a shirt with a sale price of $29.75 .

Calculate the original price of the shirt.

$ ..... [2]

(b) Xavier's salary increases by 2% each year.
In 2010, his salary was $40 100.

(i) Calculate his salary in 2015.
Give your answer correct to the nearest dollar.

$ ..... [3]

(ii) In which year is Xavier's salary first greater than $47 500?

..... [3]

(c) In January 2020, the population of a town was 5% **more** than its population in January 2018.
In January 2021, the population of this town was 2% **less** than its population in January 2020.

Calculate the overall percentage increase in the population from January 2018 to January 2021.

..... % [2]

[Turn over

2 **(a)** $y = px^2 + t$

(i) Find the value of y when $p = 3$, $x = 2$ and $t = -13$.

$y =$ ..... [2]

(ii) Rearrange the formula to write x in terms of p, t and y.

$x =$ ..... [3]

(b) **(i)** Factorise.

$$15x^2 - 2x - 8$$

..... [2]

(ii) Solve the equation.

$$15x^2 - 2x - 8 = 0$$

$x =$ ..... or $x =$ ..... [1]

(c) Factorise completely.

$$x^3 - 16xy^2$$

..... [3]

(d) Simplify. $\dfrac{2x-1-4ax+2a}{2x^2-x}$

..... [4]

3 **(a)** Zoe's test scores last term were 6 7 7 7 8 9 9 10 10.

Find

(i) the range,

..... [1]

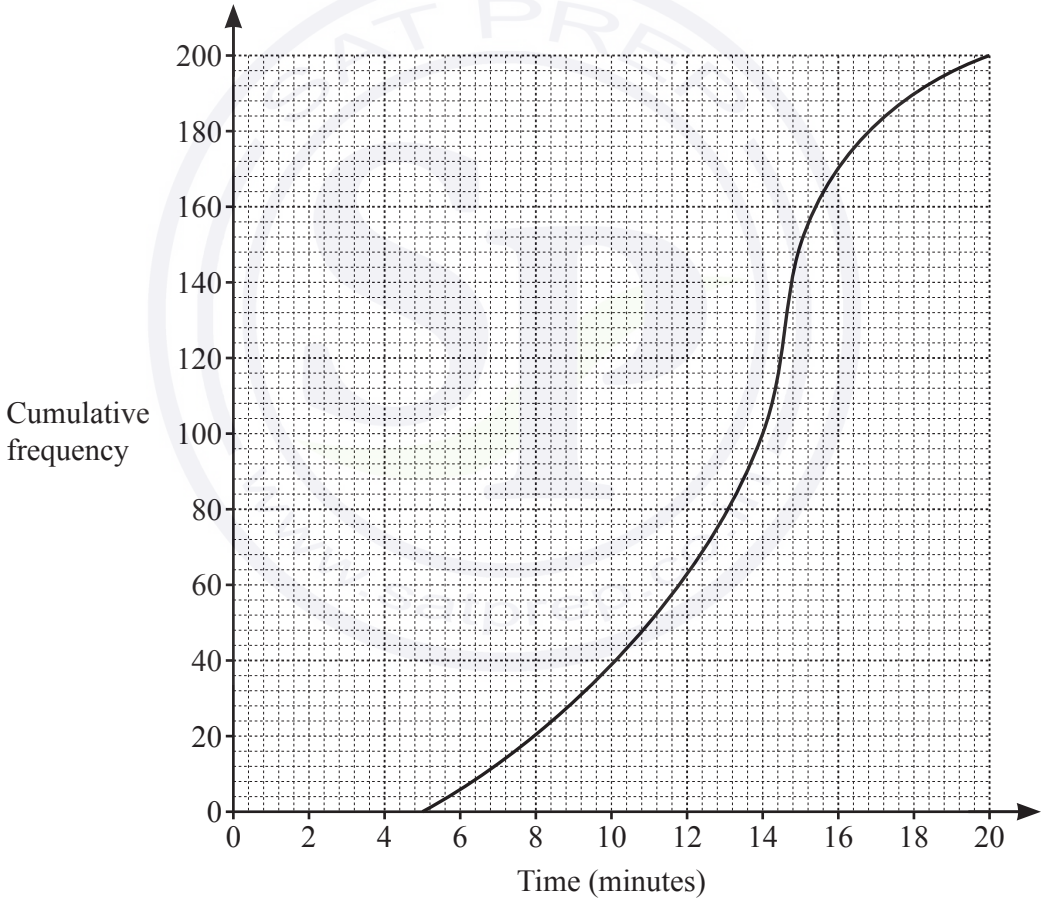
(ii) the mode,

..... [1]

(iii) the median.

..... [1]

(b) The cumulative frequency diagram shows information about the time taken by each of 200 students to solve a problem.



Use the diagram to find an estimate of

(i) the median,

..... min [1]

(ii) the interquartile range.

..... min [2]

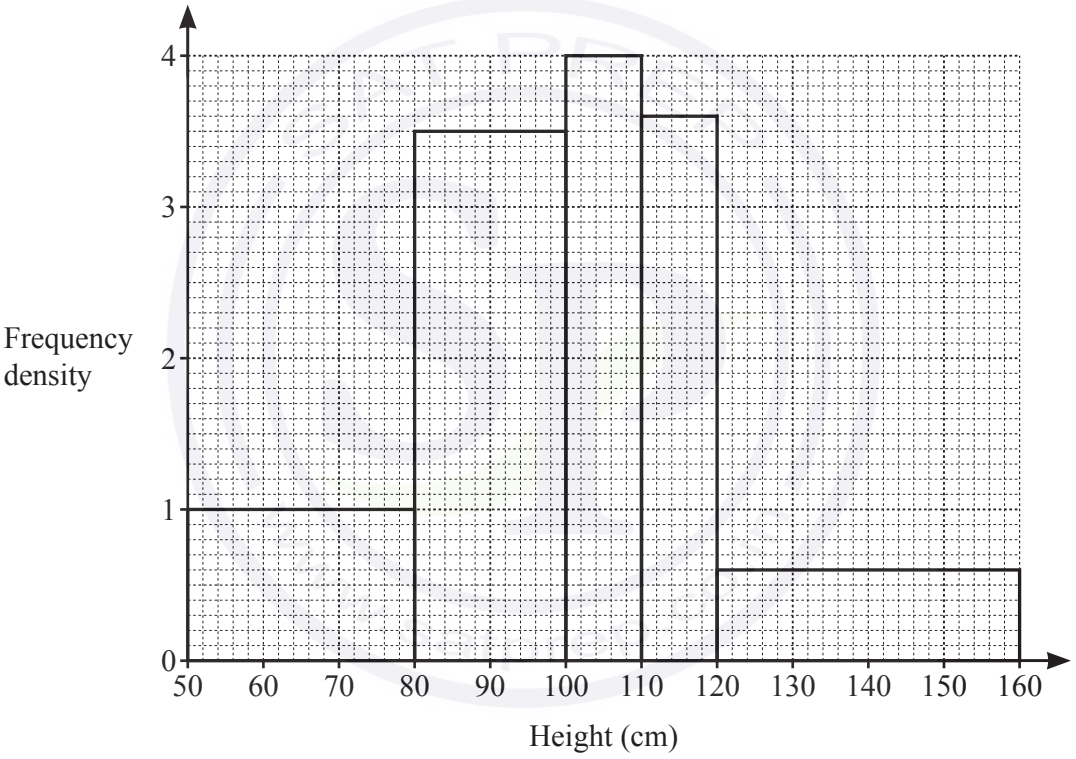
(c) The test scores of 200 students are shown in the table.

Score	5	6	7	8	9	10
Frequency	3	10	43	75	48	21

Calculate the mean.

..... [3]

(d) The height, in cm, of each of 200 plants is measured.
The histogram shows the results.



Calculate an estimate of the mean height.
You must show all your working.

..... cm [6]

4 **(a)** A is the point (1, 5) and B is the point (3, 9).
M is the midpoint of AB.

(i) Find the coordinates of M.

(..... , ...) [2]

(ii) Find the equation of the line that is perpendicular to AB and passes through M.
Give your answer in the form $y = mx + c$.

$y =$ ..... [4]

(b) The position vector of P is $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$ and the position vector of Q is $\begin{pmatrix} -2 \\ 5 \end{pmatrix}$.

(i) Find the vector $\overrightarrow{PQ}$.

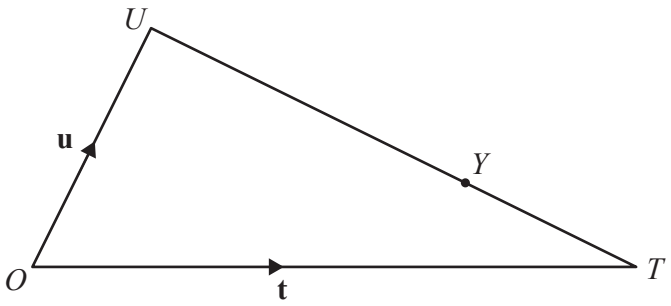
$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(ii) R is the point such that $\overrightarrow{PR} = 3\overrightarrow{PQ}$.

Find the position vector of R.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(c)



NOT TO SCALE

$\overrightarrow{OT} = \mathbf{t}$, $\overrightarrow{OU} = \mathbf{u}$ and $UY = 2YT$.

(i) Find $\overrightarrow{OY}$ in terms of **t** and **u**.
Give your answer in its simplest form.

$\overrightarrow{OY} =$ ..... [2]

(ii) Z is on OT and YZ is parallel to UO.

Find $\overrightarrow{OZ}$ in terms of **t** and/or **u**.
Give your answer in its simplest form.

$\overrightarrow{OZ} =$ ..... [1]

5 Solve the simultaneous equations.

(a) $x + 2y = 13$
$x + 5y = 22$

$x =$ .....

$y =$ ..... [2]

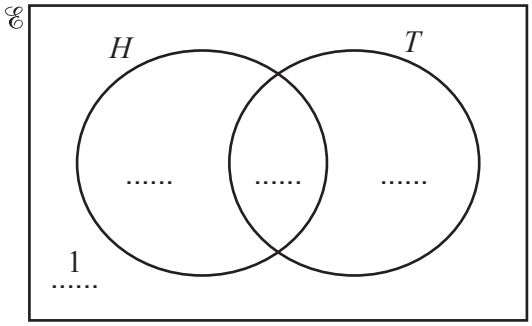
(b) $y = 2 - x$
$y = x^2 + 2x + 2$

$x =$ ..... $y =$ .....

$x =$ ..... $y =$ ..... [4]

6 In a class of 24 students, 18 students like homework (H), 15 students like tests (T) and 1 student does not like homework and does not like tests.

(a) Complete the Venn diagram to show this information.



[2]

(b) Write down the number of students who like both homework and tests.

..... [1]

(c) Find $n(H' \cap T)$.

..... [1]

(d) A student is picked at random from the class.

Write down the probability that this student likes tests but does not like homework.

..... [1]

(e) Two students are picked at random from the class.

Find the probability that both students do not like homework and do not like tests.

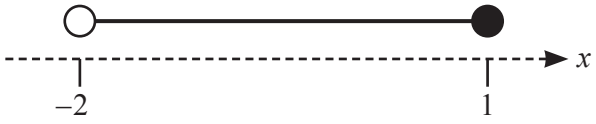
..... [1]

(f) Two of the students who like homework are picked at random.

Find the probability that both students also like tests.

..... [3]

7 (a)



Write down the inequality in x shown by the number line.

..... [2]

(b) (i) Write $x^2 + 4x + 1$ in the form $(x+p)^2 + q$.

..... [2]

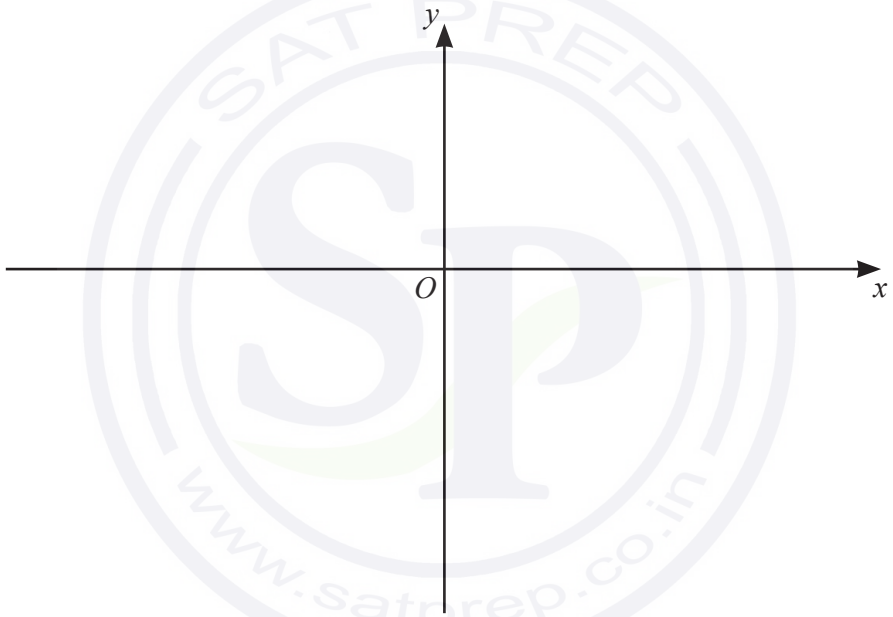
(ii) Use your answer to **part (b)(i)** to solve the equation $x^2 + 4x + 1 = 0$.

$x =$ ..... or $x =$ ..... [2]

(iii) Use your answer to **part (b)(i)** to write down the coordinates of the minimum point on the graph of $y = x^2 + 4x + 1$.

(..... , ...) [2]

(iv) On the diagram, sketch the graph of $y = x^2 + 4x + 1$.



[2]

8 **(a)** A solid cuboid measures 20 cm by 12 cm by 5 cm.

(i) Calculate the volume of the cuboid.

..... cm^3 [1]

(ii) **(a)** Calculate the total surface area of the cuboid.

..... cm^2 [3]

(b) The surface of the cuboid is painted.
The cost of the paint used is \$1.52 .

Find the cost to paint $1 cm^2$ of the cuboid.
Give your answer in cents.

..... cents [1]

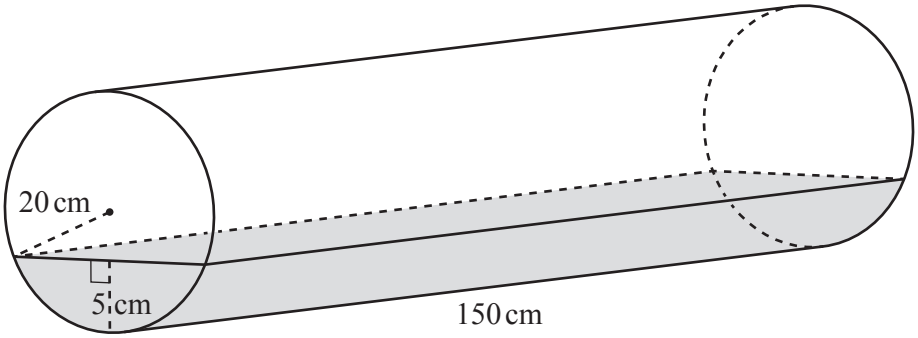
(b) A solid metal cylinder with radius x and height $\frac{9x}{2}$ is melted.
All the metal is used to make a sphere with radius r.

Find r in terms of x.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$r =$ ..... [3]

(c)



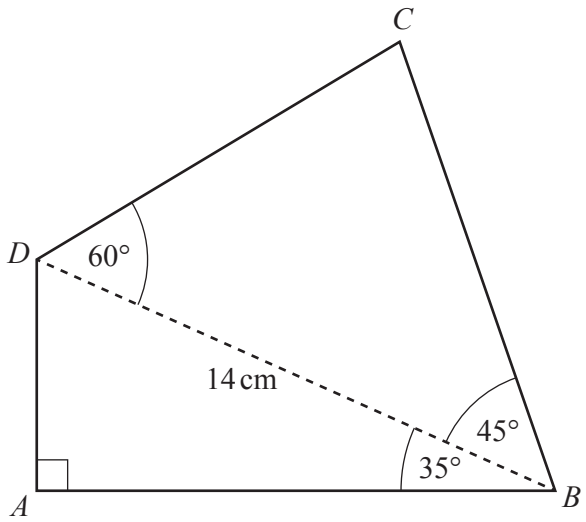
NOT TO SCALE

The diagram shows a cylinder of length 150 cm on horizontal ground.
The cylinder has radius 20 cm.
The cylinder contains water to a depth of 5 cm, as shown in the diagram.

Calculate the volume of water in the cylinder.
Give your answer in litres.

..... litres [7]

9 (a)

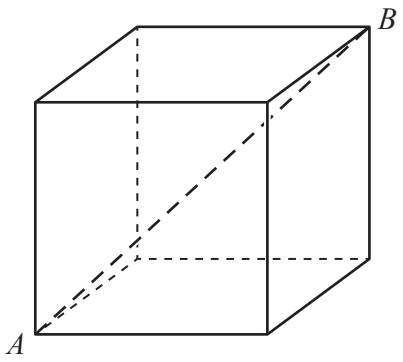


NOT TO SCALE

Calculate the perimeter of the quadrilateral *ABCD*.

..... cm [7]

(b)



NOT TO SCALE

The diagram shows a cube.
The length of the diagonal AB is 8.5 cm.

(i) Calculate the length of an edge of the cube.

..... cm [3]

(ii) Calculate the angle between AB and the base of the cube.

..... [3]

10 $f(x) = 3x - 2$ $g(x) = 5x - 7$ $h(x) = x^2 + x$ $j(x) = 3^x$

(a) Find

(i) f(2),

..... [1]

(ii) g(2),

..... [1]

(iii) gf(2).

..... [1]

(b) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(c) Find hf(x), giving your answer in the form $ax^2 + bx + c$.

..... [3]

(d) Find the derivative of $h(x)$.

..... [1]

(e) **(i)** Find x when $j^{-1}(x) = 4$.

$x =$ ..... [1]

(ii) Simplify $j^{-1}j(x)$.

..... [1]

11 **(a)** These are the first four terms of a sequence.

$$11 \qquad 7 \qquad 3 \qquad -1$$

(i) Write down the next term.

..... [1]

(ii) Write down the term to term rule for this sequence.

..... [1]

(iii) Find the nth term of this sequence.

..... [2]

(b) The nth term of a different sequence is $\frac{2n}{n+1}$.

(i) Find the difference between the 5th term and the 6th term of this sequence.
Give your answer as a fraction.

..... [2]

(ii) Is $\frac{3}{4}$ a term in this sequence?
Show how you decide.

[3]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

7036525531

MATHEMATICS **0580/42**

Paper 4 (Extended) **February/March 2021**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

1

Painter	Plumber	Electrician
$35 per hour	Fixed charge $40 plus $26.50 per hour	$48 per hour for the first 2 hours then $32 per hour

These are the rates charged by a painter, a plumber and an electrician who do some work for Mr Sharma.

(a) The painter works for 7 hours.

Calculate the amount Mr Sharma pays the painter.

$ ..... [1]

(b) Mr Sharma pays the plumber $252.

Calculate how many hours the plumber works.

..... hours [2]

(c) Mr Sharma pays the electrician $224.

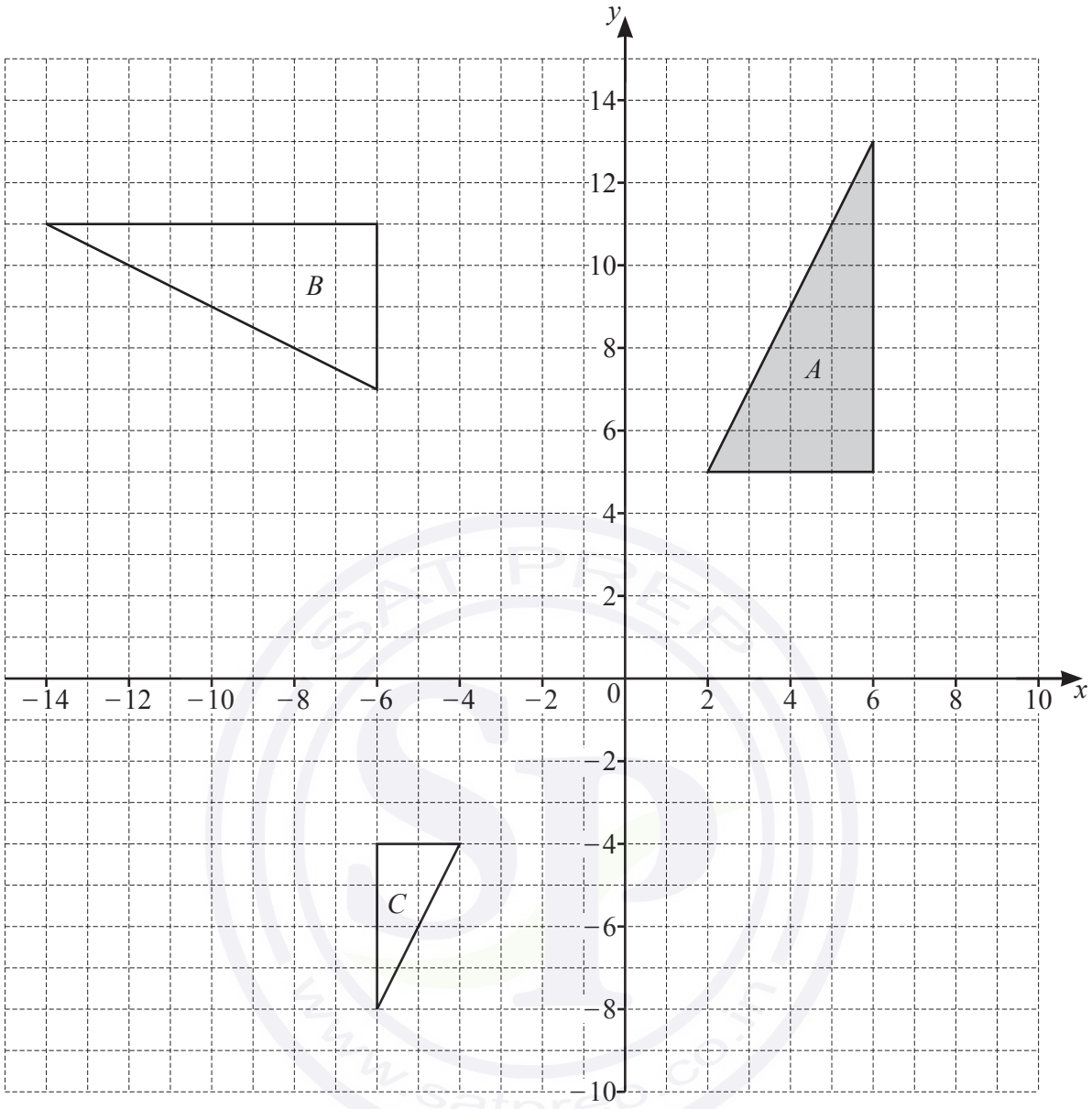
Calculate how many hours the electrician works.

..... hours [2]

(d) Write down the ratio of the amount Mr Sharma pays to the painter, the plumber and the electrician. Give your answer in its lowest terms.

painter : plumber : electrician = ... : ..... : ..... [2]

2



(a) Describe fully the **single** transformation that maps

(i) triangle A onto triangle B,

.....

..... [3]

(ii) triangle A onto triangle C.

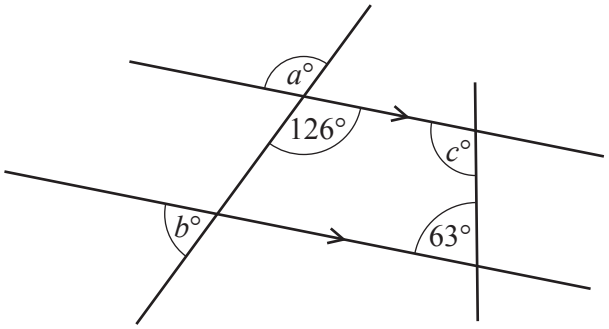
.....

..... [3]

(b) Draw the image of triangle A after a translation by the vector $\begin{pmatrix} -5 \\ -10 \end{pmatrix}$. [2]

(c) Draw the image of triangle A after a reflection in the line $y = 4$. [2]

3 (a)



NOT TO SCALE

The diagram shows two straight lines intersecting two parallel lines.

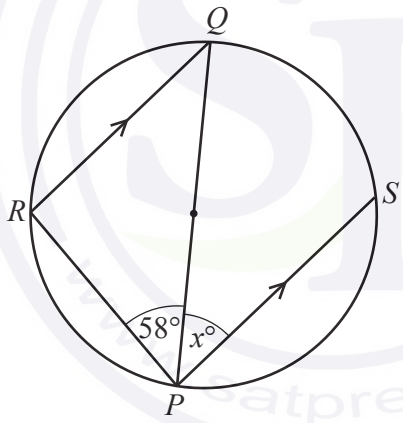
Find the values of a, b and c.

$a =$ .....

$b =$ .....

$c =$ ..... [3]

(b)



NOT TO SCALE

Points R and S lie on a circle with diameter PQ.
RQ is parallel to PS.
Angle $RPQ = 58°$.

Find the value of x, giving a geometrical reason for each stage of your working.

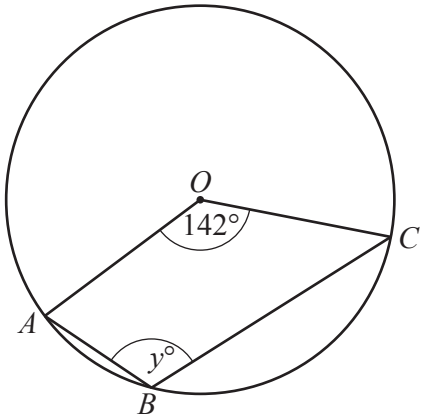
.....

.....

.....

$x =$ ..... [3]

(c)



NOT TO SCALE

Points A, B and C lie on a circle, centre O.
Angle $AOC = 142°$.

Find the value of y.

$y =$ ..... [2]

4 **(a)** A shop gives each of 1000 people a voucher.
28 people use their voucher.
The shop now gives each of 16 500 people a voucher.

Calculate how many of these 16 500 people are expected to use their voucher.

..... [1]

(b) In a class activity, all the 15 students wear hats.
7 students wear red hats, 6 students wear green hats and 2 students wear white hats.

(i) One of these students is picked at random.

Find the probability that this student wears a red hat.

..... [1]

(ii) Two of the 15 students are picked at random.

Show that the probability that these two students wear hats of the same colour is $\frac{37}{105}$.

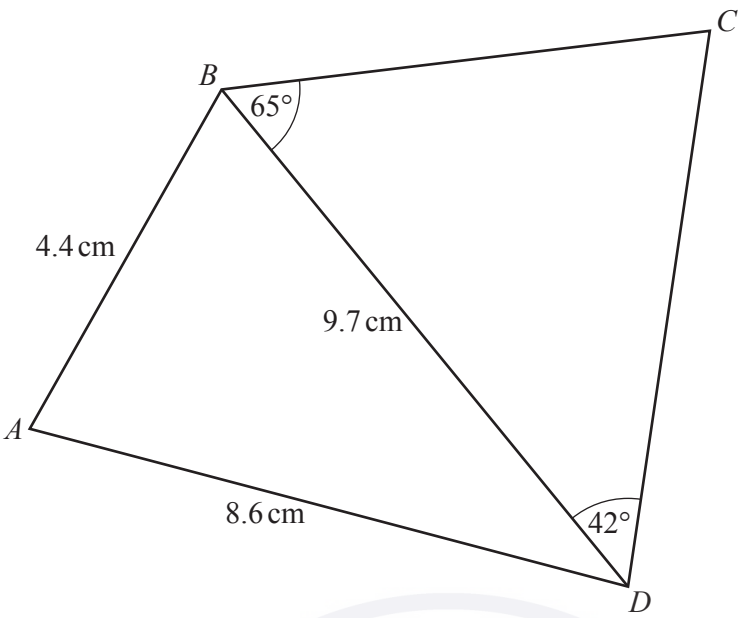
[3]

(iii) Three of the 15 students are picked at random.

Find the probability that at least two of these three students wear red hats.

..... [4]

5



NOT TO SCALE

(a) Calculate angle *ADB*.

Angle *ADB* = ... [3]

(b) Calculate *DC*.

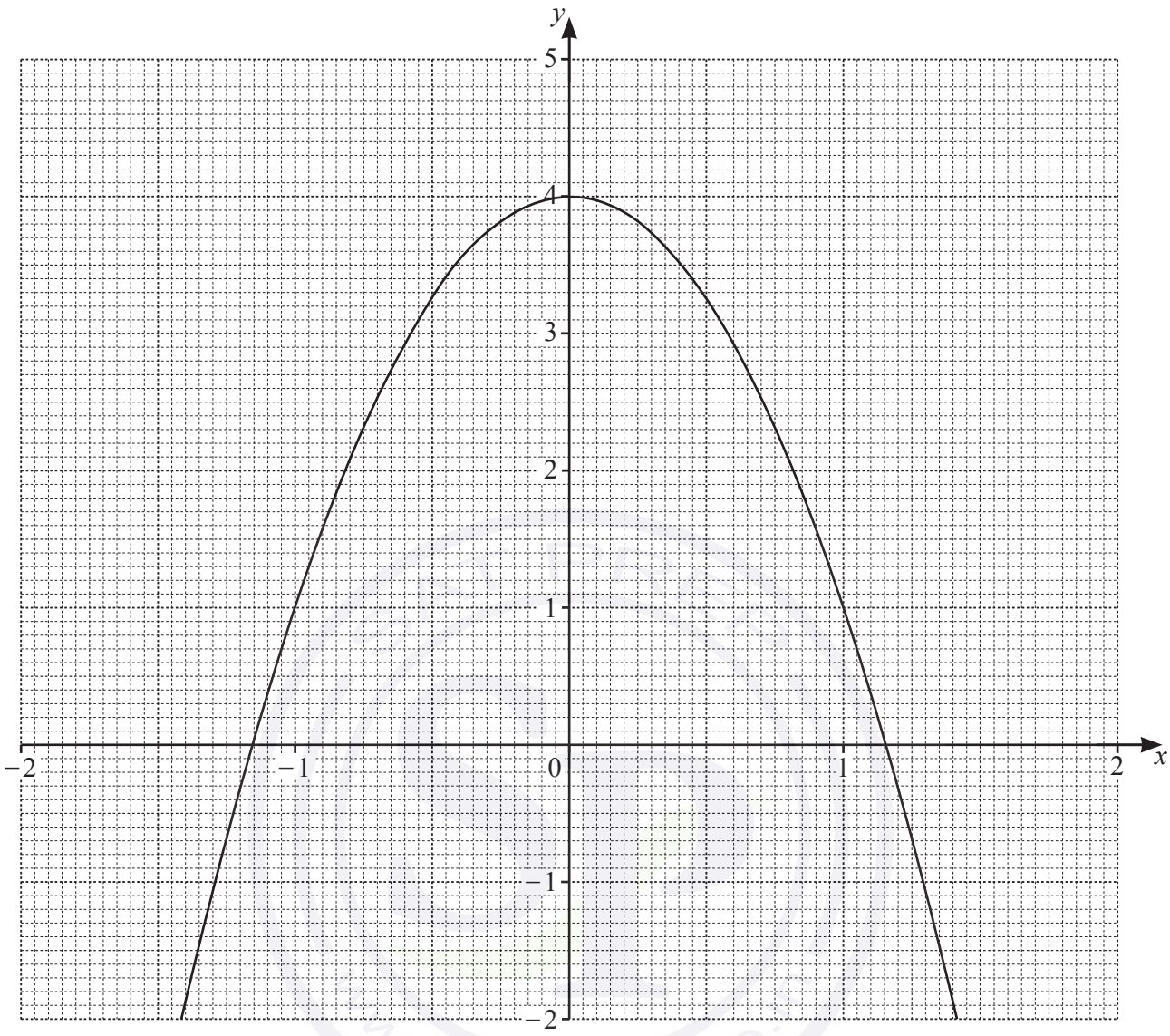
DC = ... cm [4]

(c) Calculate the shortest distance from *C* to *BD*.

..... cm [3]

[Turn over

6



(a) The grid shows the graph of $y = a + bx^2$.

The graph passes through the points with coordinates (0, 4) and (1, 1).

(i) Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [2]

(ii) Write down the equation of the tangent to the graph at (0, 4).

..... [1]

(iii) The equation of the tangent to the graph at $x = -1$ is $y = 6x + 7$.

Find the equation of the tangent to the graph at $x = 1$.

..... [2]

(b) The table shows some values for $y = 1 + \frac{5}{3-x}$ for $-2 \leqslant x \leqslant 1.5$.

x	-2	-1.5	-1	-0.5	0	0.5	1	1.5
y	2	2.11		2.43		3		4.33

(i) Complete the table. [3]

(ii) On the grid, draw the graph of $y = 1 + \frac{5}{3-x}$ for $-2 \leqslant x \leqslant 1.5$. [4]

(c) (i) Write down the values of x where the two graphs intersect.

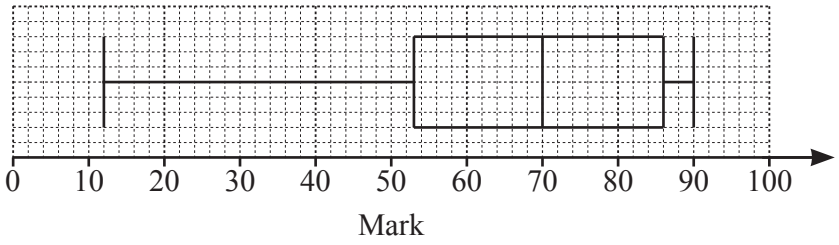
$x =$ ..... or $x =$ ..... [2]

(ii) The answers to **part(c)(i)** are two solutions of a cubic equation in terms of x.

Find this equation in the form $ax^3 + bx^2 + cx + d = 0$, where a, b, c and d are integers.

..... [4]

7 **(a)** The box-and-whisker plot shows information about the marks scored by some students in a test.



(i) Write down the median mark. ..... [1]

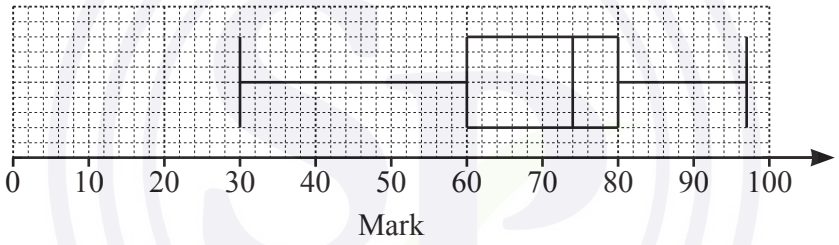
(ii) Work out the range.

..... [1]

(iii) Jais scored a mark in the test that was higher than the marks scored by 75% of the students.

Write down a possible mark for Jais. ..... [1]

(iv) This box-and-whisker plot shows information about the marks scored by the same students in a second test.



Make one comparison between the distributions of marks in the two tests.

.....

..... [1]

(b) The table shows information about the height, h cm, of each of 50 plants.

Height (h cm)	$0 < h \leqslant 20$	$20 < h \leqslant 30$	$30 < h \leqslant 34$	$34 < h \leqslant 40$	$40 < h \leqslant 60$
Frequency	4	9	20	15	2

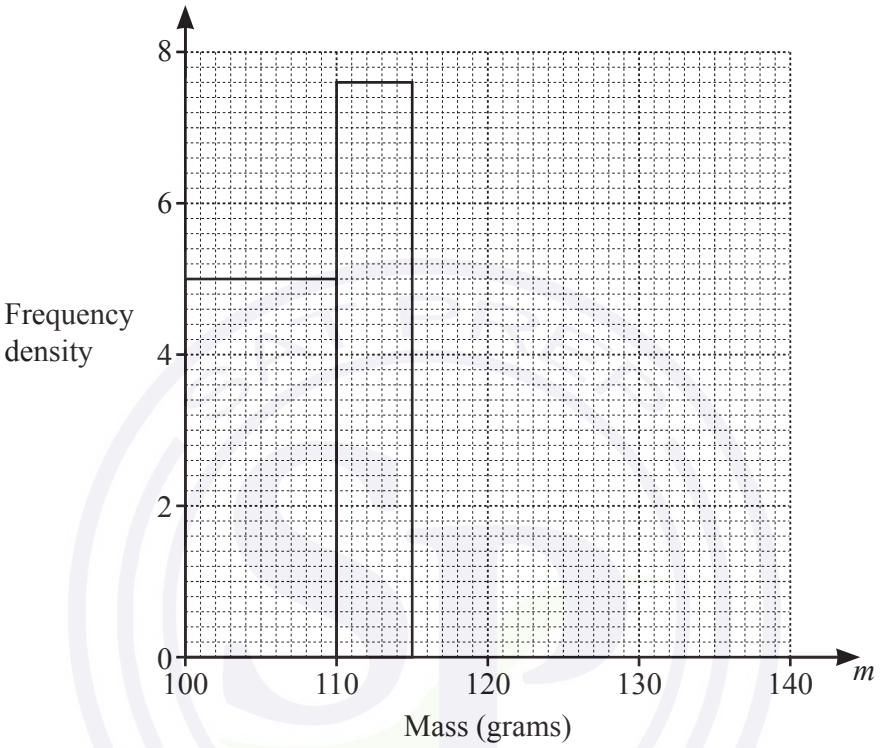
Calculate an estimate of the mean.

..... cm [4]

(c) Some apples are weighed and the mass, m grams, of each apple is recorded.
The table shows the results.

Mass (m grams)	$100 < m \leqslant 110$	$110 < m \leqslant 115$	$115 < m \leqslant 125$	$125 < m \leqslant 140$
Frequency	50	x	44	51

The histogram shows some of the information from the table.



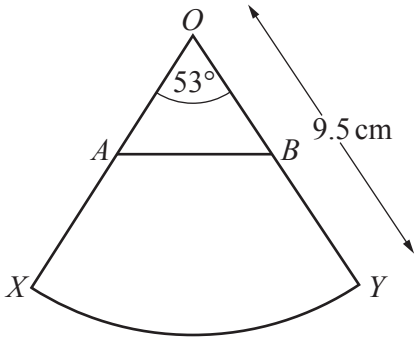
(i) Work out the value of x.

$x =$ ..... [1]

(ii) Complete the histogram.

[2]

8 (a)



NOT TO SCALE

The diagram shows a sector OXY of a circle with centre O and radius 9.5 cm.
The sector angle is 53°.
A lies on OX, B lies on OY and $OA = OB$.

(i) Show that the area of the sector is $41.7\,\text{cm}^2$, correct to 1 decimal place.

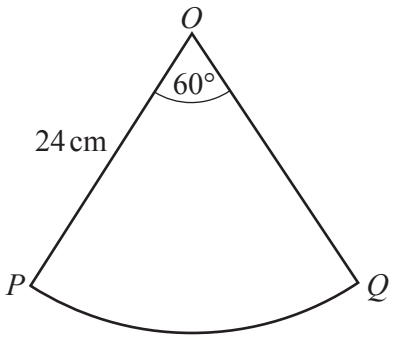
[2]

(ii) The area of triangle OAB is $\frac{1}{3}$ of the area of sector OXY.

Calculate OA.

$OA =$ ..... cm [4]

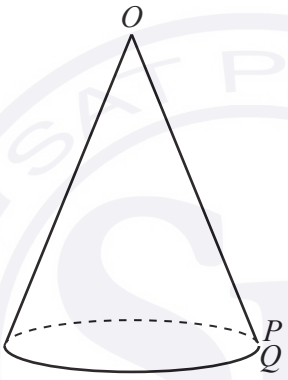
(b)



NOT TO SCALE

The diagram shows a sector OPQ of a circle with centre O and radius 24 cm. The sector angle is 60°.

A cone is made from this sector by joining OP to OQ.



NOT TO SCALE

Calculate the volume of the cone.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [6]

9 **(a)** Factorise.

(i) $5am + 10ap - bm - 2bp$

..... [2]

(ii) $15(k+g)^2 - 20(k+g)$

..... [2]

(iii) $4x^2 - y^4$

..... [2]

(b) Expand and simplify.

$$(x-3)(x+1)(3x-4)$$

..... [3]

(c) $(x+a)^2 = x^2 + 22x + b$

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [2]

10 **(a)** A box is a cuboid with length 45 cm, width 30 cm and height 42 cm.
The box is completely filled with 90.72 kg of sand.

Calculate the density of this sand in kg/m^3.
[Density = mass ÷ volume]

..... kg/m^3 [3]

(b) A bag contains 15000 cm^3 of sand.
Some of this sand is used to completely fill a hole in the shape of a cylinder.
The hole is 30 cm deep and has radius 10 cm.

Calculate the percentage of the sand from the bag that is used.

..... % [3]

(c) Sand costs $98.90 per tonne.
This cost includes a tax of 15%.

Calculate the amount of tax paid per tonne of sand.

$ ..... [3]

(d) Raj buys some sand for 3540 rupees.

Calculate the cost in dollars when the exchange rate is $1 = 70.8 rupees.

$ ..... [2]

11 Gaya spends \$48 to buy books that cost \$$x$ each.

(a) Write down an expression, in terms of x, for the number of books Gaya buys.

..... [1]

(b) Myra spends \$60 to buy books that cost \$$(x+2)$ each.
Gaya buys 4 more books than Myra.

Show that $x^2 + 5x - 24 = 0$.

[4]

(c) Solve by factorisation.

$$x^2 + 5x - 24 = 0$$

$x =$ ..... or $x =$ ..... [3]

(d) Find the number of books Myra buys.

..... [1]

12 **(a)** Find the gradient of the curve $y = 2x^3 - 7x + 4$ when $x = -2$.

..... [3]

(b) A is the point (7, 2) and B is the point (−5, 8).

(i) Calculate the length of AB.

..... [3]

(ii) Find the equation of the line that is perpendicular to AB and that passes through the point (−1, 3).
Give your answer in the form $y = mx + c$.

$y =$ ..... [4]

(iii) AB is one side of the parallelogram $ABCD$ and

- $\overrightarrow{BC} = \begin{pmatrix} -a \\ -b \end{pmatrix}$ where $a > 0$ and $b > 0$
- the gradient of BC is 1
- $\left|\overrightarrow{BC}\right| = \sqrt{8}$.

Find the coordinates of D.

(..... , ...) [4]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

8580661249

MATHEMATICS **0580/41**

Paper 4 (Extended) **October/November 2020**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

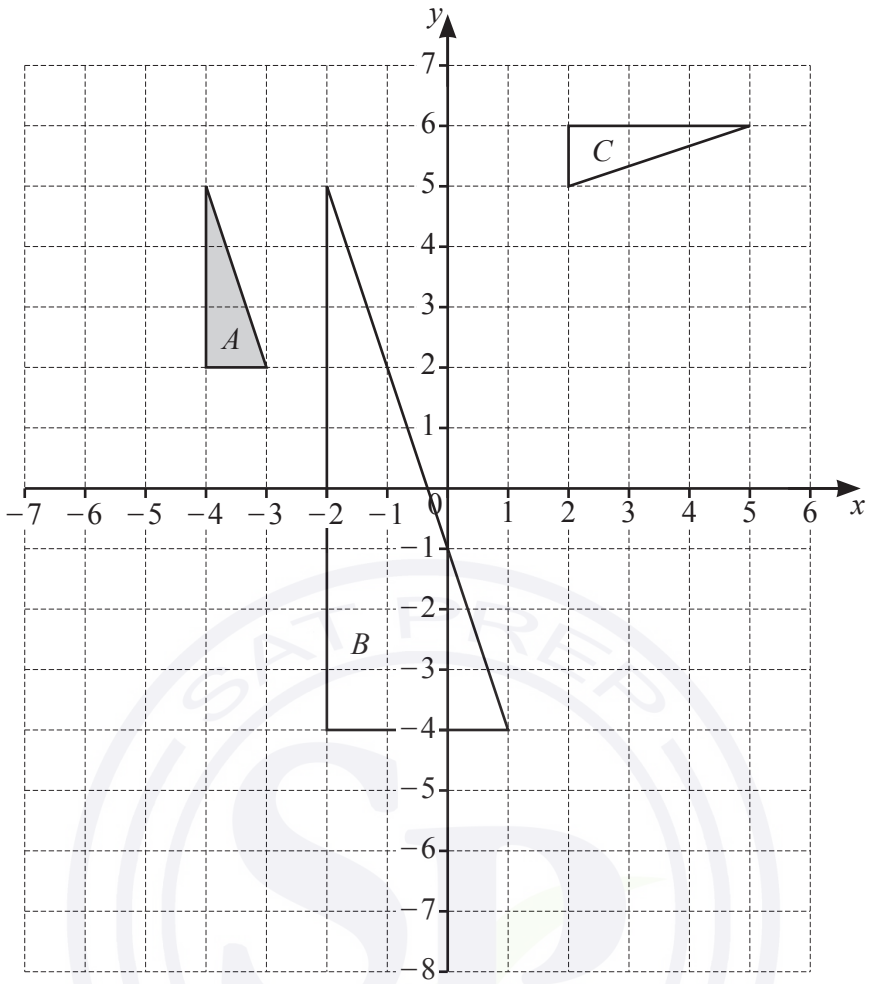
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Blank pages are indicated.

1



(a) Draw the image of shape A after a translation by the vector $\begin{pmatrix} 8 \\ -6 \end{pmatrix}$. [2]

(b) Draw the image of shape A after a reflection in the line $y = -1$. [2]

(c) Describe fully the **single** transformation that maps shape A onto shape B.

.....

..... [3]

(d) Describe fully the **single** transformation that maps shape A onto shape C.

.....

..... [3]

2 **(a)** A plane has 14 First Class seats, 70 Premium seats and 168 Economy seats.

Find the ratio First Class seats : Premium seats : Economy seats.
Give your answer in its simplest form.

..... : ..... : ..... [2]

(b) **(i)** For a morning flight, the costs of tickets are in the ratio

First Class : Premium : Economy = 14 : 6 : 5.

The cost of a Premium ticket is $114.

Calculate the cost of a First Class ticket and the cost of an Economy ticket.

First Class $ .....

Economy $ ..... [3]

(ii) For an afternoon flight, the cost of a Premium ticket is reduced from $114 to $96.90 .

Calculate the percentage reduction in the cost of a ticket.

..... % [2]

(c) When the local time in Athens is 09 00, the local time in Berlin is 08 00.
A plane leaves Athens at 13 15.
It arrives in Berlin at 15 05 local time.

(i) Find the flight time from Athens to Berlin.

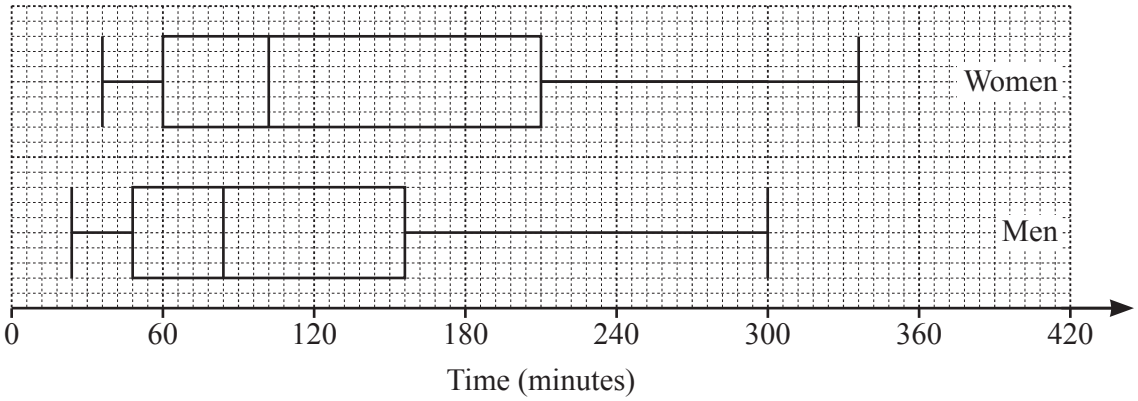
..... h ..... min [1]

(ii) The distance the plane flies from Athens to Berlin is 1802 km.

Calculate the average speed of the plane.
Give your answer in kilometres per hour.

..... km/h [2]

3 (a)



The box-and-whisker plots show the times spent exercising in one week by a group of women and a group of men.

Below are two statements comparing these times.
For each one, write down whether you agree or disagree, giving a reason for your answer.

Statement	Agree or disagree	Reason
On average, the women spent less time exercising than the men.		
The times for the women show less variation than the times for the men.		

[2]

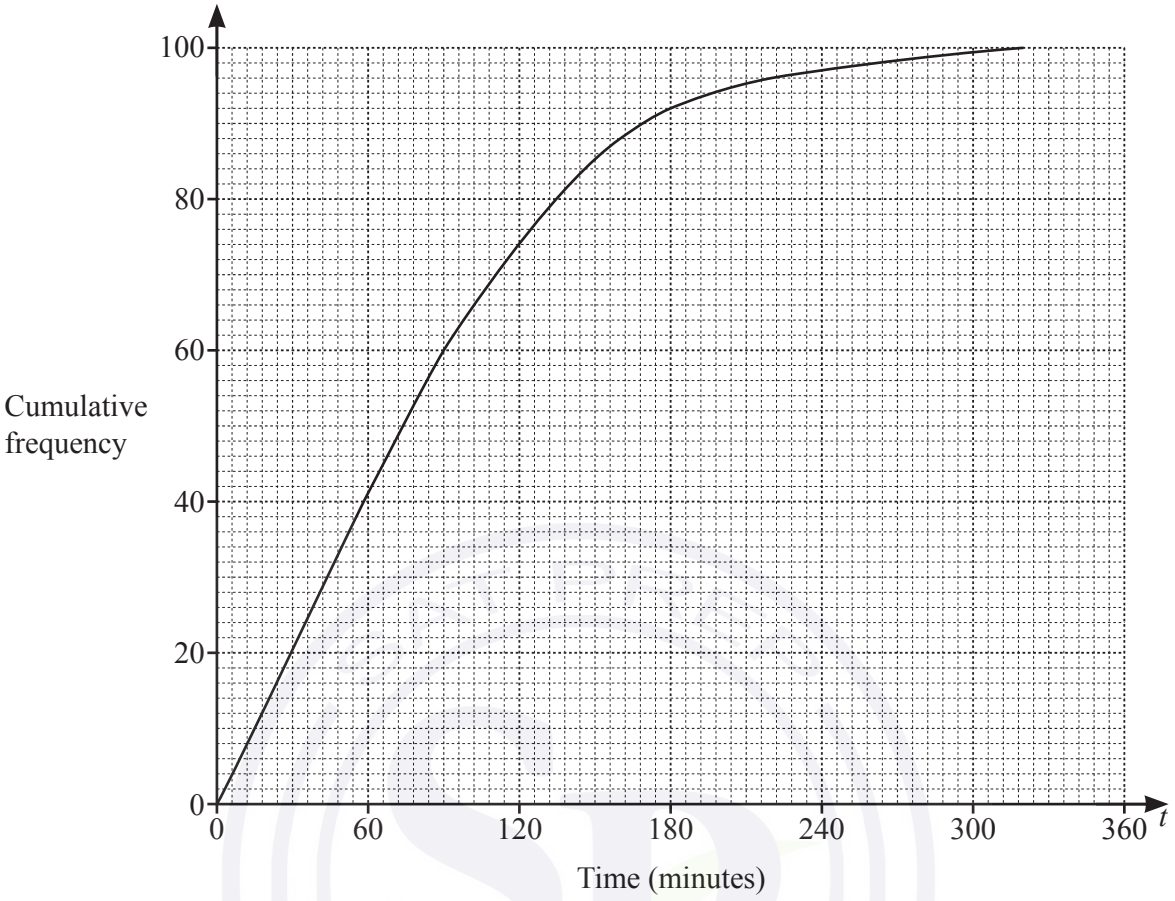
(b) The frequency table shows the times, t minutes, each of 100 children spent exercising in one week.

Time (t minutes)	$0 < t \leqslant 60$	$60 < t \leqslant 100$	$100 < t \leqslant 160$	$160 < t \leqslant 220$	$220 < t \leqslant 320$
Frequency	41	24	23	8	4

(i) Calculate an estimate of the mean time.

..... min [4]

(ii) The information in the frequency table is shown in this cumulative frequency diagram.



Use the cumulative frequency diagram to find an estimate of

(a) the 60th percentile,

..... min [1]

(b) the number of children who spent more than 3 hours exercising.

..... [2]

(iii) A histogram is drawn to show the information in the frequency table.
The height of the bar for the interval $60 < t \leqslant 100$ is 10.8 cm.

Calculate the height of the bar for the interval $160 < t \leqslant 220$.

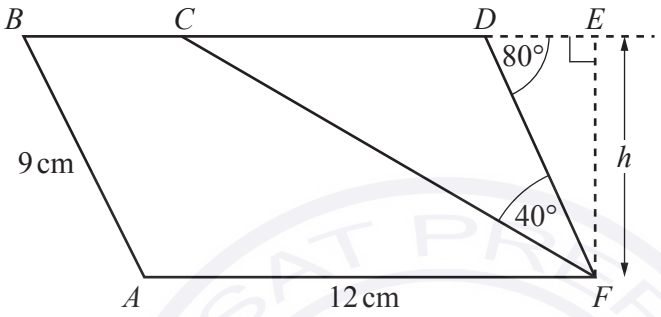
..... cm [2]

4 **(a)** A rectangle measures 8.5 cm by 10.7 cm, both correct to 1 decimal place.

Calculate the upper bound of the perimeter of the rectangle.

..... cm [3]

(b)



NOT TO SCALE

ABDF is a parallelogram and *BCDE* is a straight line.
$AF = 12$ cm, $AB = 9$ cm, angle $CFD = 40°$ and angle $FDE = 80°$.

(i) Calculate the height, h, of the parallelogram.

$h =$ ..... cm [2]

(ii) Explain why triangle *CDF* is isosceles.

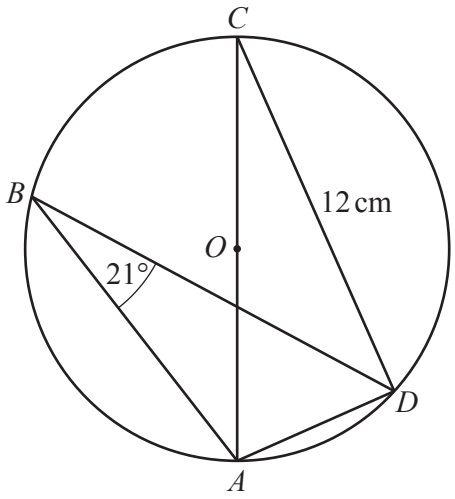
.....

..... [2]

(iii) Calculate the area of the **trapezium** *ABCF*.

..... cm^2 [3]

(c)



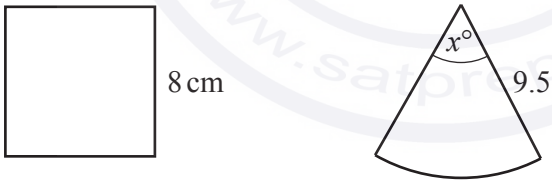
NOT TO SCALE

A, B, C and D are points on the circle, centre O.
Angle $ABD = 21°$ and $CD = 12$ cm.

Calculate the area of the circle.

..... cm^2 [5]

(d)



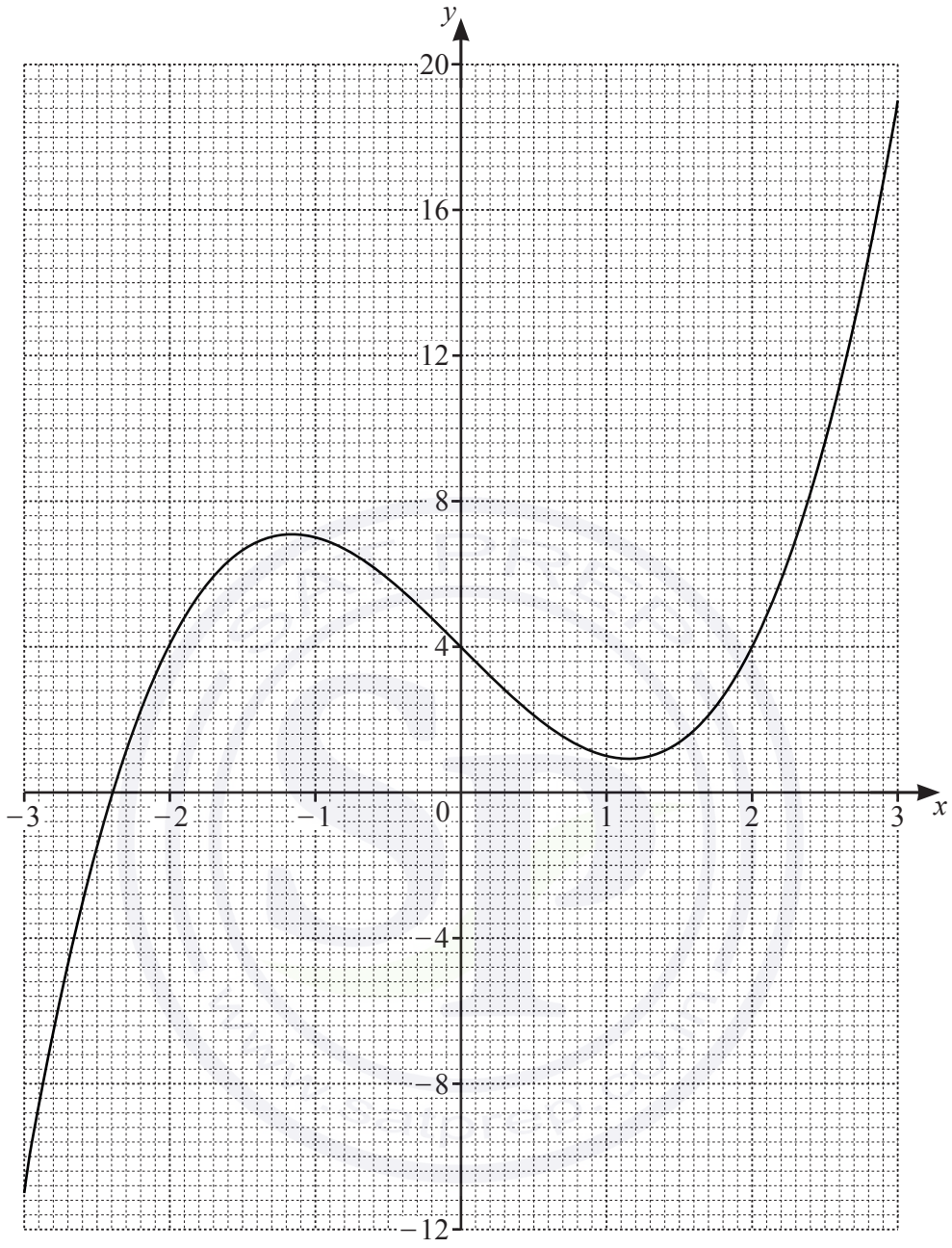
NOT TO SCALE

The diagram shows a square with side length 8 cm and a sector of a circle with radius 9.5 cm and sector angle $x°$.
The perimeter of the square is equal to the perimeter of the sector.

Calculate the value of x.

$x =$ ..... [3]

5 **(a)** The diagram shows the graph of $y = f(x)$ for $-3 \leqslant x \leqslant 3$.



(i) Solve $f(x) = 14$.

$x =$ ..... [1]

(ii) By drawing a suitable tangent, find an estimate of the gradient of the graph at the point $(-2, 4)$.

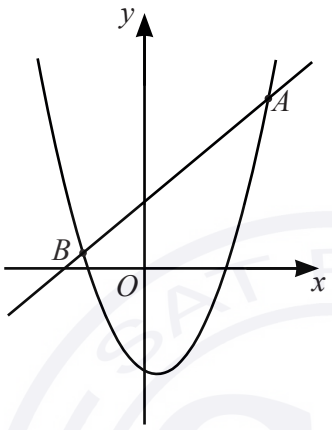
..... [3]

(iii) By drawing a suitable straight line on the grid, solve $f(x) = 2x - 2$ for $-3 \leqslant x \leqslant 3$.

.

$x =$ ..... [3]

(b)



NOT TO SCALE

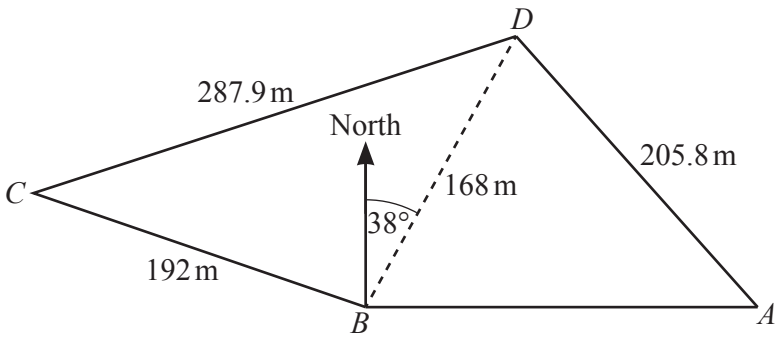
The diagram shows a curve with equation $y = 2x^2 - 2x - 7$.
The straight line with equation $y = 3x + 5$ intersects the curve at the points A and B.

Find the coordinates of the points A and B.

A (..... , ...)

B (..... , ...) [5]

6



NOT TO SCALE

The diagram shows a field, *ABCD*, on horizontal ground.
$BC = 192$ m, $CD = 287.9$ m, $BD = 168$ m and $AD = 205.8$ m.

(a) (i) Calculate angle *CBD* and show that it rounds to 106.0°, correct to 1 decimal place.

[4]

(ii) The bearing of *D* from *B* is 038°.

Find the bearing of *C* from *B*.

..... [1]

(iii) *A* is **due east** of *B*.

Calculate the bearing of *D* from *A*.

..... [5]

(b) (i) Calculate the area of triangle *BCD*.

..... m^2 [2]

(ii) Tomas buys the triangular part of the field, *BCD*.
The cost is \$35 750 per hectare.

Calculate the amount he pays.
Give your answer correct to the nearest \$100.
[1 hectare = 10 000 m^2]

\$ ..... [2]

7

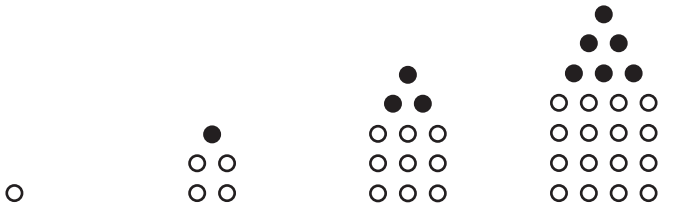


Diagram 1 Diagram 2 Diagram 3 Diagram 4

These are the first four diagrams of a sequence.
The diagrams are made from white dots and black dots.

(a) Complete the table for Diagram 5 and Diagram 6.

Diagram	1	2	3	4	5	6
Number of white dots	1	4	9	16		
Number of black dots	0	1	3	6		
Total number of dots	1	5	12	22		

[2]

(b) Write an expression, in terms of n, for the number of white dots in Diagram n.

..... [1]

(c) The expression for the total number of dots in Diagram n is $\frac{1}{2}(3n^2 - n)$.

(i) Find the total number of dots in Diagram 8.

..... [1]

(ii) Find an expression for the number of black dots in Diagram n.
Give your answer in its simplest form.

..... [2]

(d) T is the total number of dots used to make **all** of the first n diagrams.

$$T = an^3 + bn^2$$

Find the value of a and the value of b.
You must show all your working.

$a =$ .....

$b =$ ..... [5]

8 **(a)** Factorise completely.

$$3a^2b - ab^2$$

..... [2]

(b) Solve the inequality.

$$3x + 12 < 5x - 3$$

..... [2]

(c) Simplify.

$$\left(3x^2y^4\right)^3$$

..... [2]

(d) Solve.

$$\frac{2}{x} = \frac{6}{2-x}$$

$x =$ ..... [3]

(e) Expand and simplify.

$$(x-2)(x+5)(2x-1)$$

..... [3]

(f) Alan invests \$200 at a rate of r% per year compound interest.
After 2 years the value of his investment is \$206.46 .

(i) Show that $r^2 + 200r - 323 = 0$.

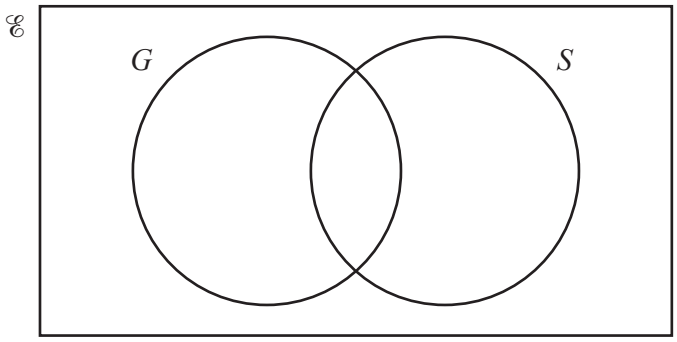
[3]

(ii) Solve the equation $r^2 + 200r - 323 = 0$ to find the rate of interest.
Show all your working and give your answer correct to 2 decimal places.

$r =$ ..... [3]

9 **(a)** There are 32 students in a class.

5 do not study any languages.
15 study German (G).
18 study Spanish (S).



(i) Complete the Venn diagram to show this information. [2]

(ii) A student is chosen at random.

Find the probability that the student studies Spanish but not German.

..... [1]

(iii) A student who studies German is chosen at random.

Find the probability that this student also studies Spanish.

..... [1]

(b) A bag contains 54 red marbles and some blue marbles.
36% of the marbles in the bag are red.

Find the number of blue marbles in the bag.

..... [2]

(c) Another bag contains 15 red beads and 10 yellow beads.
Ariana picks a bead at random, records its colour and replaces it in the bag.
She then picks another bead at random.

(i) Find the probability that she picks two red beads.

..... [2]

(ii) Find the probability that she does not pick two red beads.

..... [1]

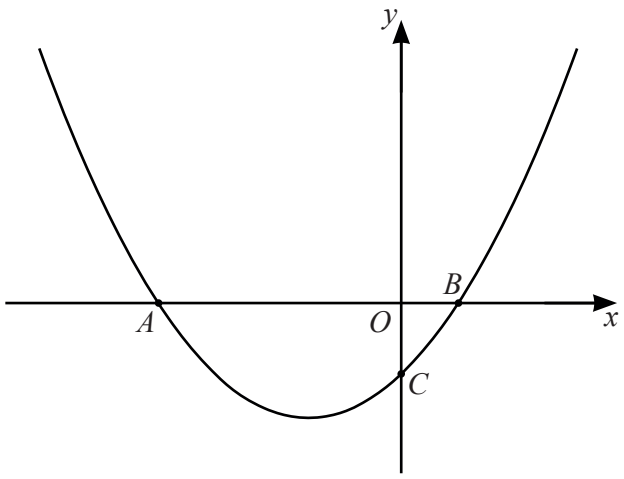
(d) A box contains 15 red pencils, 8 yellow pencils and 2 green pencils.
Two pencils are picked at random without replacement.

Find the probability that at least one pencil is red.

..... [3]

[Turn over

10 (a)



NOT TO SCALE

The diagram shows a sketch of the curve $y = x^2 + 3x - 4$.

(i) Find the coordinates of the points A, B and C.

A (..... , ...)

B (..... , ...)

C (..... , ...) [4]

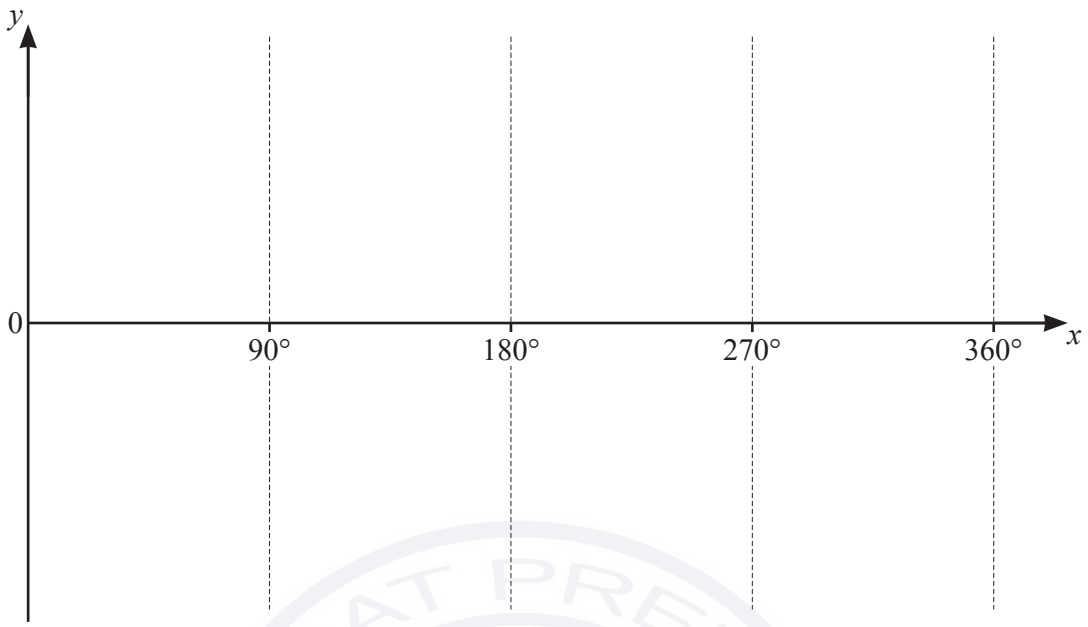
(ii) Differentiate $x^2 + 3x - 4$.

..... [2]

(iii) Find the equation of the tangent to the curve at the point (2, 6).

..... [3]

(b)



(i) On the diagram, sketch the graph of $y = \tan x$ for $0° \leqslant x \leqslant 360°$. [2]

(ii) Solve the equation $5\tan x = -7$ for $0° \leqslant x \leqslant 360°$.

$x =$ ..... or $x =$ ..... [3]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

7475979509

MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2020**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Blank pages are indicated.

DC (LK/SG) 189256/2

[Turn over

1 Karel travelled from London to Johannesburg and then from Johannesburg to Windhoek.

(a) The flight from London to Johannesburg took 11 hours 10 minutes.
The average speed was 813 km/h.

Calculate the distance travelled from London to Johannesburg.
Give your answer correct to the nearest 10 km.

..... km [3]

(b) The total time for Karel's journey from London to Windhoek was 15 hours 42 minutes.
The total distance travelled from London to Windhoek was 10 260 km.

(i) Calculate the average speed for this journey.

..... km/h [2]

(ii) The cost of Karel's journey from London to Windhoek was $470.

(a) Calculate the distance travelled per dollar.

..... km per dollar [1]

(b) Calculate the cost per 100 km of this journey.
Give your answer correct to the nearest cent.

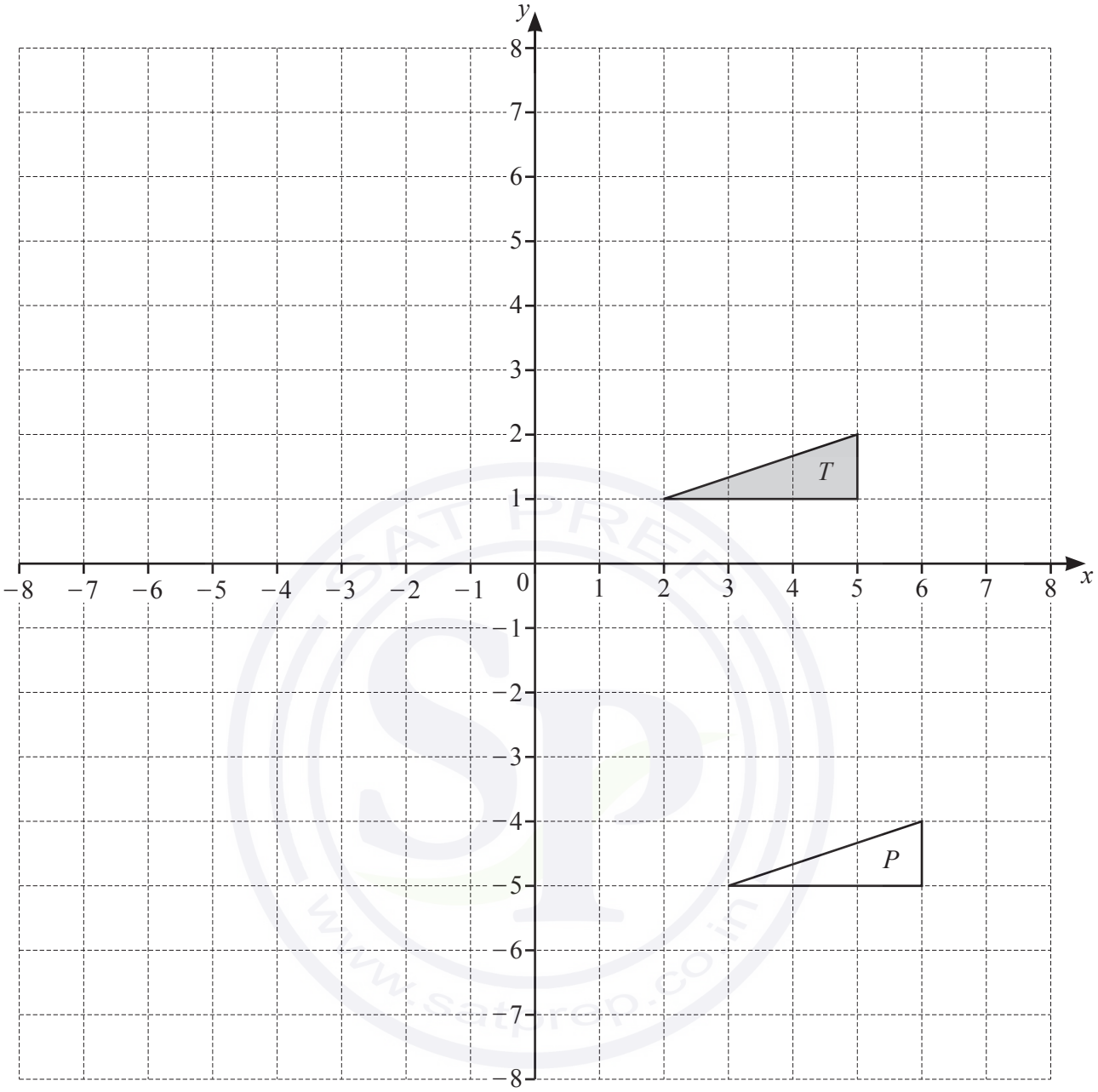
$ ..... per 100 km [2]

(c) Karel changed $300 into 3891 Namibian dollars.

Complete the statement.

$1 = ... Namibian dollars [1]

2



(a) Describe fully the **single** transformation that maps triangle T onto triangle P.

.....

..... [2]

(b) (i) Reflect triangle T in the line $x = 1$. [2]

(ii) Rotate triangle T through 90° anticlockwise about (6, 0). [2]

(iii) Enlarge triangle T by a scale factor of -2, centre (1, 0). [2]

3 **(a)** Beth invests \$2000 at a rate of 2% per year compound interest.

(i) Calculate the value of this investment at the end of 5 years.

\$ ..... [2]

(ii) Calculate the overall percentage increase in the value of Beth's investment at the end of 5 years.

..... % [2]

(iii) Calculate the minimum number of complete years it takes for the value of Beth's investment to increase from \$2000 to more than \$2500.

..... [3]

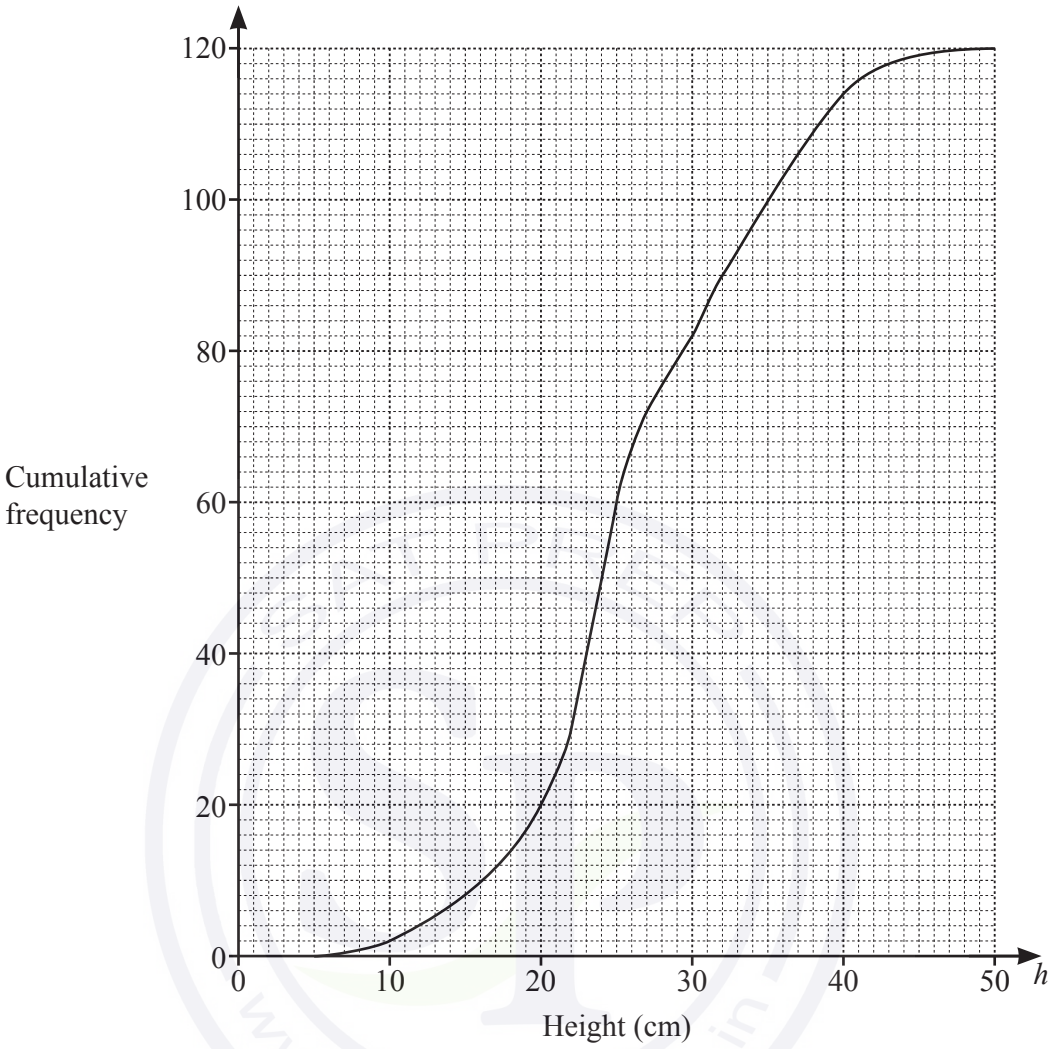
(b) The population of a village decreases exponentially at a rate of 4% each year.
The population is now 255.

Calculate the population 16 years ago.

..... [3]

[Turn over

4 The height, h cm, of each of 120 plants is measured.
The cumulative frequency diagram shows this information.



(a) Use the cumulative frequency diagram to find an estimate of

(i) the median,

..... cm [1]

(ii) the interquartile range,

..... cm [2]

(iii) the 60th percentile,

..... cm [1]

(iv) the number of plants with a height greater than 40 cm.

..... [2]

(b) The information in the cumulative frequency diagram is shown in this frequency table.

Height, h cm	$0 < h \leqslant 10$	$10 < h \leqslant 20$	$20 < h \leqslant 30$	$30 < h \leqslant 50$
Frequency	2	18	62	38

(i) Calculate an estimate of the mean height.

..... cm [4]

(ii) A histogram is drawn to show the information in the frequency table.
The height of the bar representing the interval $10 < h \leqslant 20$ is 7.2 cm.

Calculate the height of the bar representing the interval $30 < h \leqslant 50$.

..... cm [2]

5 Ahmed sells different types of cake in his shop.
The cost of each cake depends on its type and its size.

Every small cake costs $\$x$ and every large cake costs $\$(2x + 1)$.

(a) The total cost of 3 small lemon cakes and 2 large lemon cakes is \$12.36 .

Find the cost of a small lemon cake.

$ ..... [3]

(b) The cost of 18 small chocolate cakes is the same as the cost of 7 large chocolate cakes.

Find the cost of a small chocolate cake.

$ ..... [3]

(c) The number of small cherry cakes that can be bought for \$4 is the same as the number of large cherry cakes that can be bought for \$13.

Find the cost of a small cherry cake.

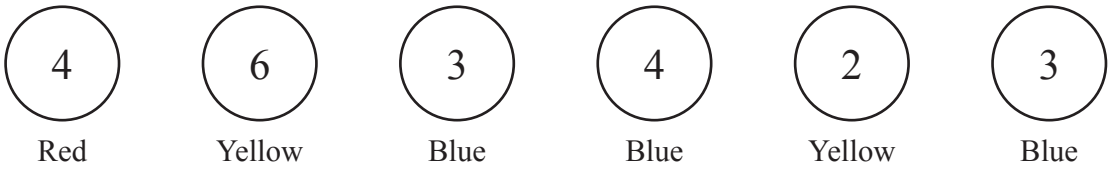
$ ..... [3]

(d) Petra spends \$20 on small coffee cakes and \$10 on large coffee cakes.
The total number of cakes is 45.

Write an equation in terms of x.
Solve this equation to find the cost of a small coffee cake.
Show all your working.

\$ ..... [7]

6



The diagram shows six discs.
Each disc has a colour and a number.

(a) One disc is picked at random.

Write down the probability that

(i) the disc has the number 4,

..... [1]

(ii) the disc is red and has the number 3,

..... [1]

(iii) the disc is blue and has the number 4.

..... [1]

(b) Two of the six discs are picked at random **without** replacement.

Find the probability that

(i) both discs have the number 3,

..... [2]

(ii) both discs have the same colour.

..... [3]

(c) Two of the six discs are picked at random **with** replacement.

Find the probability that both discs have the same colour.

..... [3]

7 $y = x^2 + \frac{1}{x},\ x \neq 0$

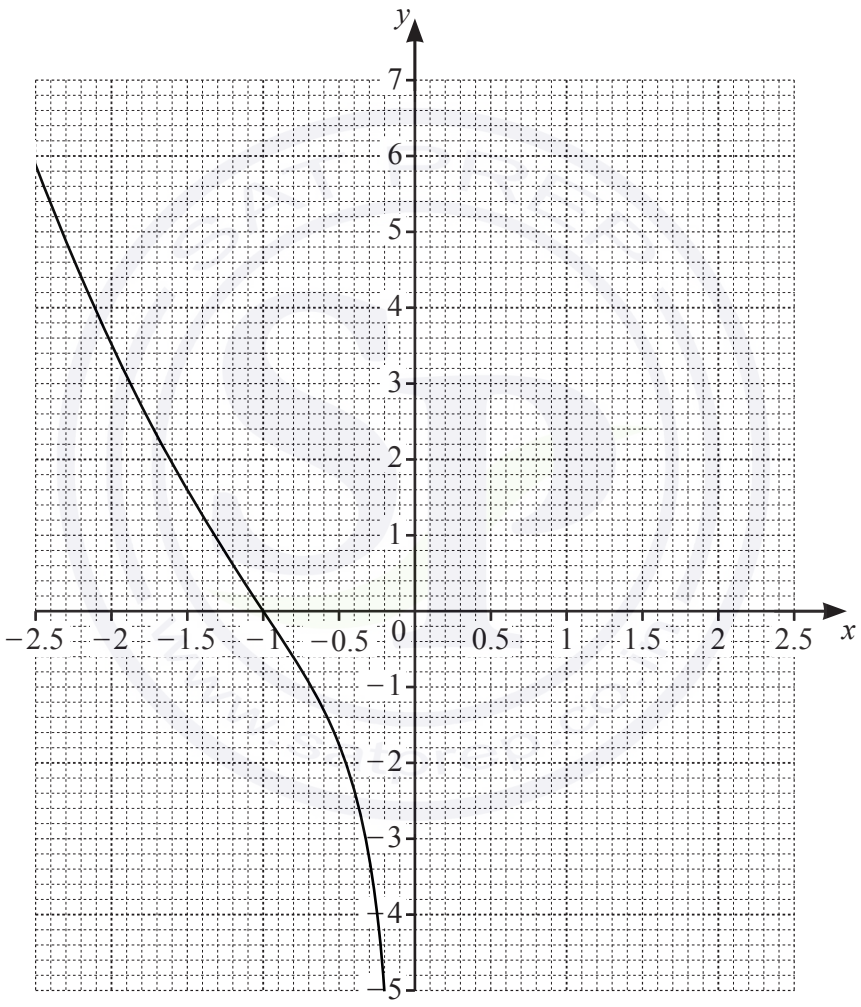
(a) Complete the table.

x	0.2	0.3	0.5	1	1.5	2	2.5
y	5.0	3.4	2.3		2.9		6.7

[2]

(b) On the grid, draw the graph of $y = x^2 + \frac{1}{x}$ for $0.2 \leqslant x \leqslant 2.5$.

The graph of $y = x^2 + \frac{1}{x}$ for $-2.5 \leqslant x \leqslant -0.2$ has been drawn for you.



[4]

(c) By drawing suitable straight lines on the grid, solve the following equations.

(i) $x^2 + \frac{1}{x} = -2$

$x =$ ..... [1]

(ii) $x^2 + \frac{1}{x} + x - 1 = 0$

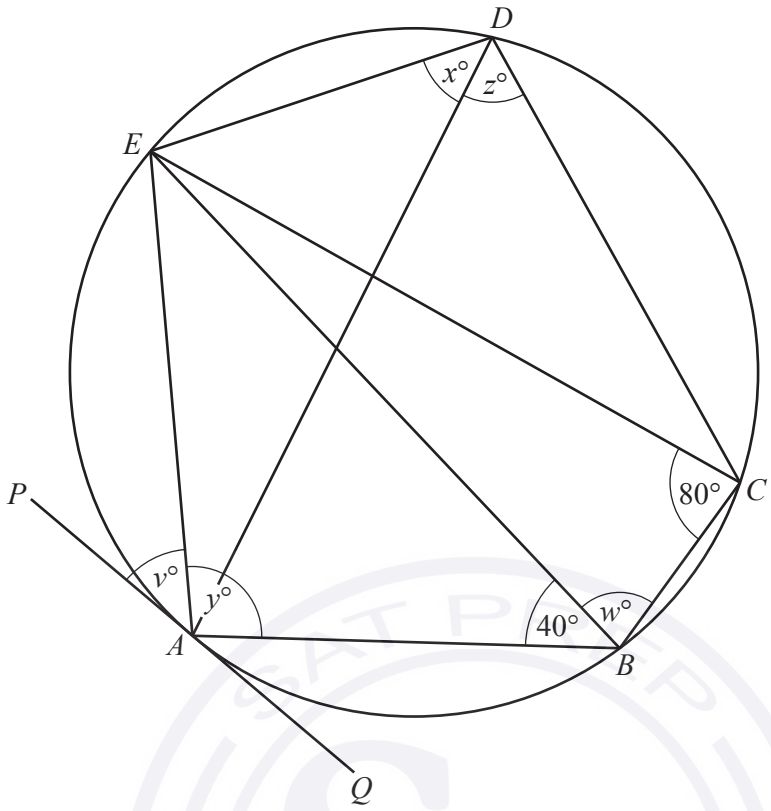
$x =$ ..... [2]

(d) k is an integer and the equation $x^2 + \frac{1}{x} = k$ has three solutions.

Write down a possible value of k.

$k =$ ..... [1]

8 (a)

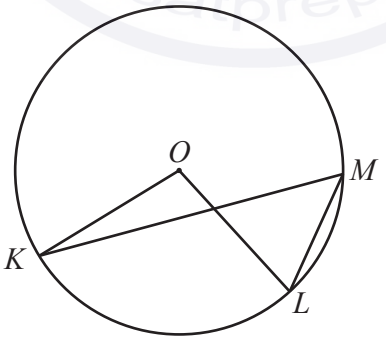


The points A, B, C, D and E lie on the circle.
PAQ is a tangent to the circle at A and $EC = EB$.
Angle $ECB = 80°$ and angle $ABE = 40°$.

Find the values of v, w, x, y and z.

$v =$ ..... $w =$ ..... $x =$ ..... $y =$ ..... $z =$ ..... [5]

(b)

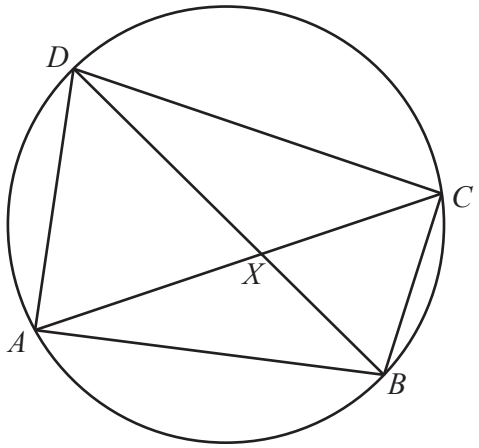


In the diagram, K, L and M lie on the circle, centre O.
Angle $KML = 2x°$ and reflex angle $KOL = 11x°$.

Find the value of x.

$x =$ ..... [3]

(c)



NOT TO SCALE

The diagonals of the cyclic quadrilateral $ABCD$ intersect at X.

(i) Explain why triangle ADX is similar to triangle BCX.
Give a reason for each statement you make.

.....

.....

.....

..... [3]

(ii) $AD = 10\,\text{cm}$, $BC = 8\,\text{cm}$, $BX = 5\,\text{cm}$ and $CX = 7\,\text{cm}$.

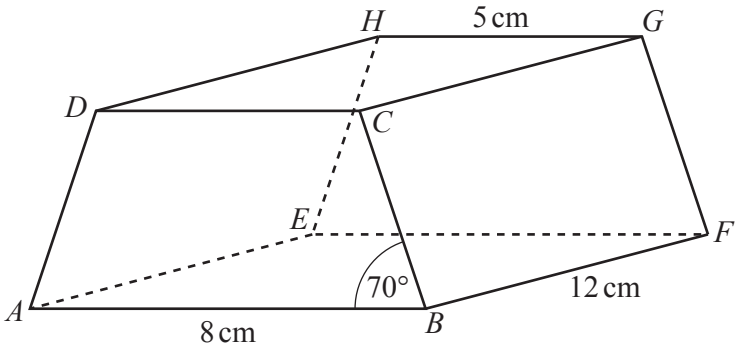
(a) Calculate DX.

$DX =$ ..... cm [2]

(b) Calculate angle BXC.

Angle $BXC =$ ..... [4]

9



NOT TO SCALE

The diagram shows a prism with a rectangular base, *ABFE*.
The cross-section, *ABCD*, is a trapezium with $AD = BC$.
$AB = 8$ cm, $GH = 5$ cm, $BF = 12$ cm and angle $ABC = 70°$.

(a) Calculate the total surface area of the prism.

..... cm^2 [6]

(b) The perpendicular from G onto EF meets EF at X.

(i) Show that $EX = 6.5$ cm.

[1]

(ii) Calculate AX.

$AX =$ ..... cm [2]

(iii) Calculate the angle between the diagonal AG and the base $ABFE$.

..... [2]

10 $f(x) = x^2 + 1$ $g(x) = 1 - 2x$ $h(x) = \frac{1}{x},\ x \neq 0$ $j(x) = 5^x$

(a) Find the value of

(i) f(3),

..... [1]

(ii) gf(3).

..... [1]

(b) Find $g^{-1}(x)$.

$g^{-1}(x) =$ ..... [2]

(c) Find x when $h(x) = 2$.

$x =$ ..... [1]

(d) Find $g(x)g(x) - gg(x)$, giving your answer in the form $ax^2 + bx + c$.

..... [4]

(e) Find hh(x), giving your answer in its simplest form.

..... [1]

(f) Find j(5).

..... [1]

(g) Find x when $\mathrm{j}^{-1}(x) = 2$.

$x =$ ..... [1]

(h) $\mathrm{j}(x) = \mathrm{hg}(-12)$

Find the value of x.

$x =$ ..... [2]

Question 11 is printed on the next page.

11

Sequence	1st term	2nd term	3rd term	4th term	5th term		*n*th term
A	13	9	5	1			
B	0	7	26	63			
C	$\frac{7}{8}$	$\frac{8}{16}$	$\frac{9}{32}$	$\frac{10}{64}$			

(a) Complete the table for the three sequences.

[10]

(b) One term in Sequence C is $\frac{p}{q}$.

Write down the next term in Sequence C in terms of p and q.

..... [2]

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2020**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Blank pages are indicated.

[Turn over

1 **(a)** The Earth has a surface area of approximately 510 100 000 km^2.

(i) Write this surface area in standard form.

..... km^2 [1]

(ii) Water covers 70.8% of the Earth's surface.

Work out the area of the Earth's surface covered by water.

..... km^2 [2]

(b) The table shows the surface area of some countries and their estimated population in 2017.

Country	Surface area (km^2)	Estimated population in 2017
Brunei	5.77×10^3	433 100
China	9.60×10^6	1 388 000 000
France	6.41×10^5	67 000 000
Maldives	3.00×10^2	374 600

(i) Find the total surface area of Brunei and the Maldives.

..... km^2 [1]

(ii) The ratio surface area of the Maldives : surface area of China can be written in the form 1 : n.

Find the value of n.

$n =$ ..... [2]

(iii) Find the surface area of France as a percentage of the surface area of China.

..... % [2]

(iv) Find the population density of the Maldives.
[Population density = population ÷ surface area]

..... people/km^2 [2]

(c) The population of the Earth in 2017 was estimated to be 7.53×10^9.

The population of the Earth in 2000 was estimated to be 6.02×10^9.

(i) Work out the percentage increase in the Earth's estimated population from 2000 to 2017.

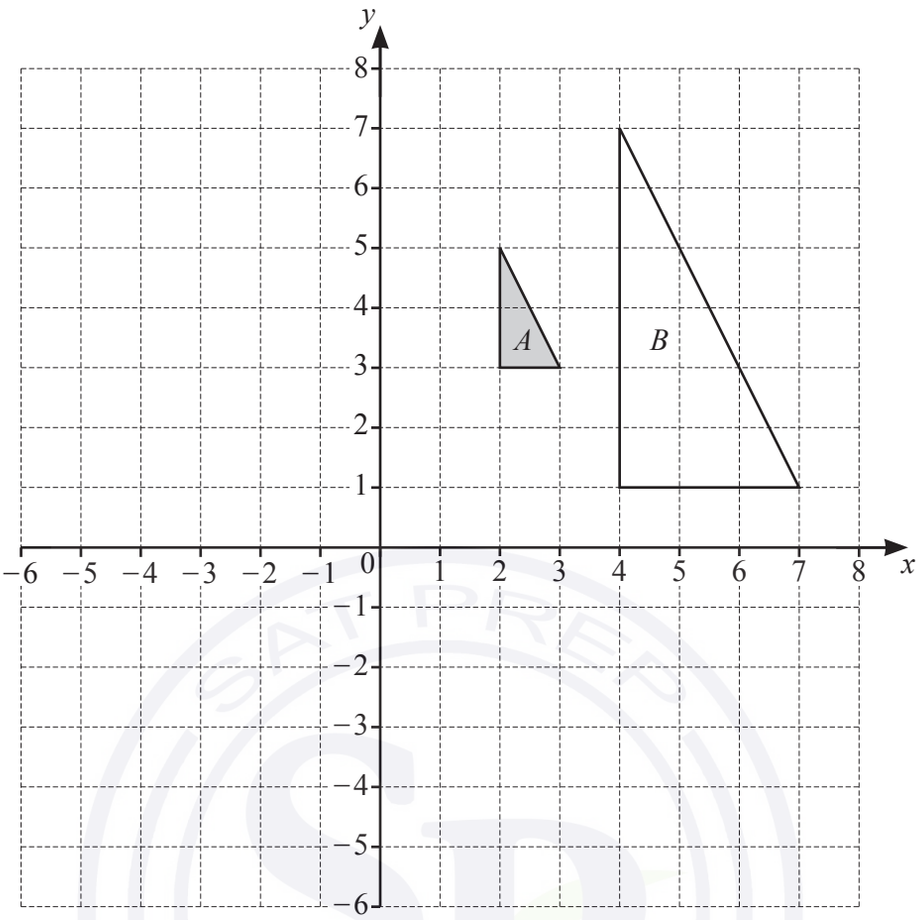
..... % [2]

(ii) Assume that the population of the Earth increased exponentially by y% each year for these 17 years.

Find the value of y.

$y =$ ..... [3]

2



(a) On the grid, draw the image of

(i) triangle A after a rotation of 90° anticlockwise about (0, 0), [2]

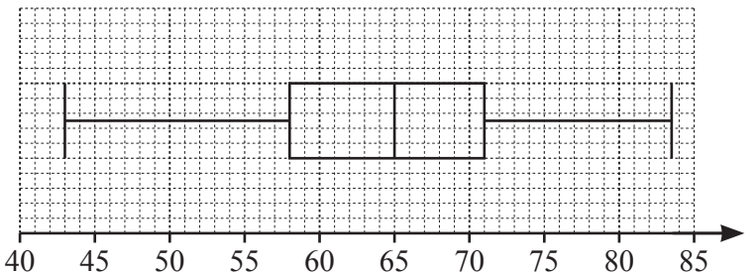
(ii) triangle A after a translation by the vector $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$. [2]

(b) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

3 **(a)** The average speeds, in km/h, of cars travelling along a road are recorded.
The box-and-whisker plot shows this information.



Find

(i) the lowest speed recorded,

..... km/h [1]

(ii) the median,

..... km/h [1]

(iii) the interquartile range.

..... km/h [1]

(b) Another car takes 18 seconds to travel 400 m along this road.

Calculate the average speed of this car in km/h.

..... km/h [3]

[Turn over

4

P	O	S	S	I	B	I	L	I	T	Y

Morgan picks two of these letters, at random, **without** replacement.

(a) Find the probability that he picks

(i) the letter Y first,

..... [1]

(ii) the letter B then the letter Y,

..... [2]

(iii) two letters that are the same.

..... [3]

(b) Morgan now picks a third letter at random.

Find the probability that

(i) all three letters are the same,

..... [2]

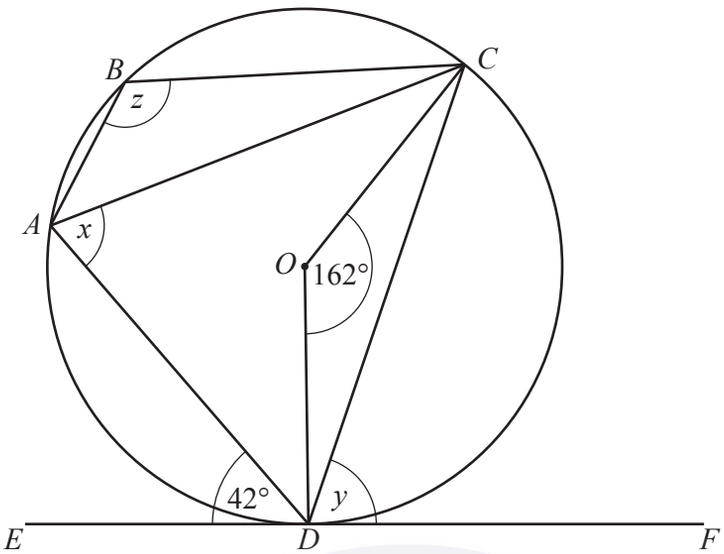
(ii) exactly two of the three letters are the same,

..... [5]

(iii) all three letters are different.

..... [2]

5 (a)



NOT TO SCALE

A, B, C and D are points on the circle, centre O.
EF is a tangent to the circle at D.
Angle $ADE = 42°$ and angle $COD = 162°$.

Find the following angles, giving reasons for each of your answers.

(i) Angle x

$x =$ ..... because .....

..... [2]

(ii) Angle y

$y =$ ..... because .....

..... [2]

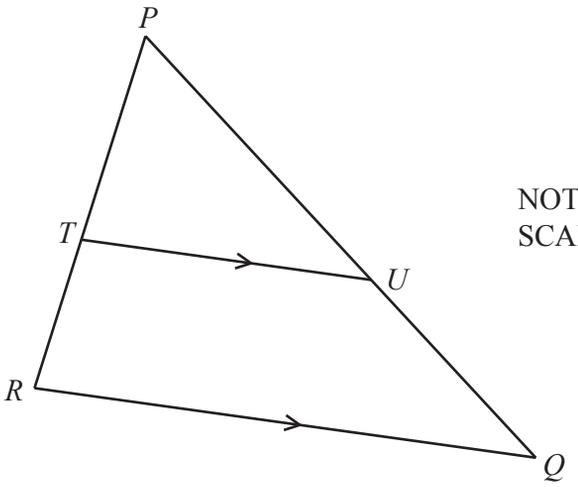
(iii) Angle z

$z =$ ..... because .....

.....

..... [3]

(b)



NOT TO SCALE

PQR is a triangle.
T is a point on *PR* and *U* is a point on *PQ*.
RQ is parallel to *TU*.

(i) Explain why triangle *PQR* is similar to triangle *PUT*.
Give a reason for each statement you make.

.....

.....

.....

..... [3]

(ii) $PT : TR = 4 : 3$

(a) Find the ratio $PU : PQ$.

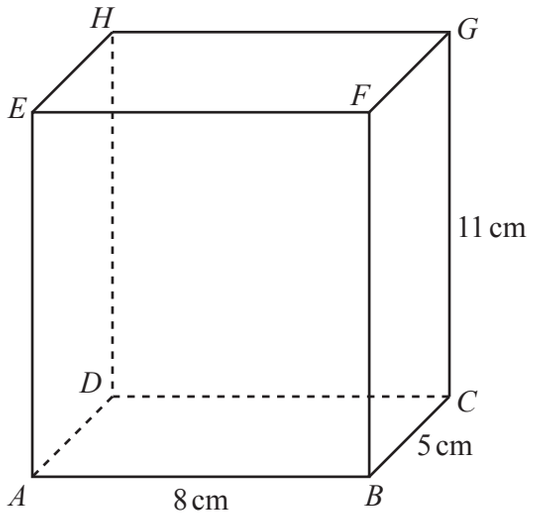
..... : ..... [1]

(b) The area of triangle *PUT* is $20\,\text{cm}^2$.

Find the area of the quadrilateral *QRTU*.

..... cm^2 [3]

6



NOT TO SCALE

ABCDEFGH is a cuboid.
$AB = 8$ cm, $BC = 5$ cm and $CG = 11$ cm.

(a) Work out the volume of the cuboid.

..... cm^3 [2]

(b) Ivana has a pencil of length 13 cm.

Does this pencil fit completely inside the cuboid?
Show how you decide.

[4]

(c) (i) Calculate angle *CAB*.

Angle *CAB* = ... [2]

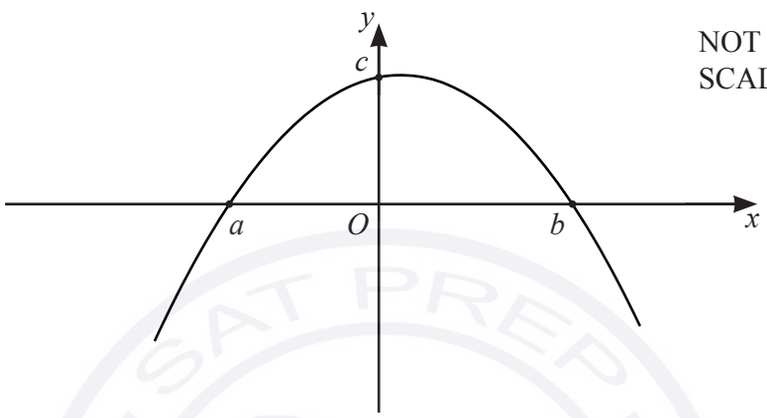
(ii) Calculate angle *GAC*.

Angle *GAC* = ... [2]

7 **(a)** **(i)** Factorise $24+5x-x^2$.

..... [2]

(ii) The diagram shows a sketch of $y=24+5x-x^2$.



Work out the values of a, b and c.

$a =$ .....

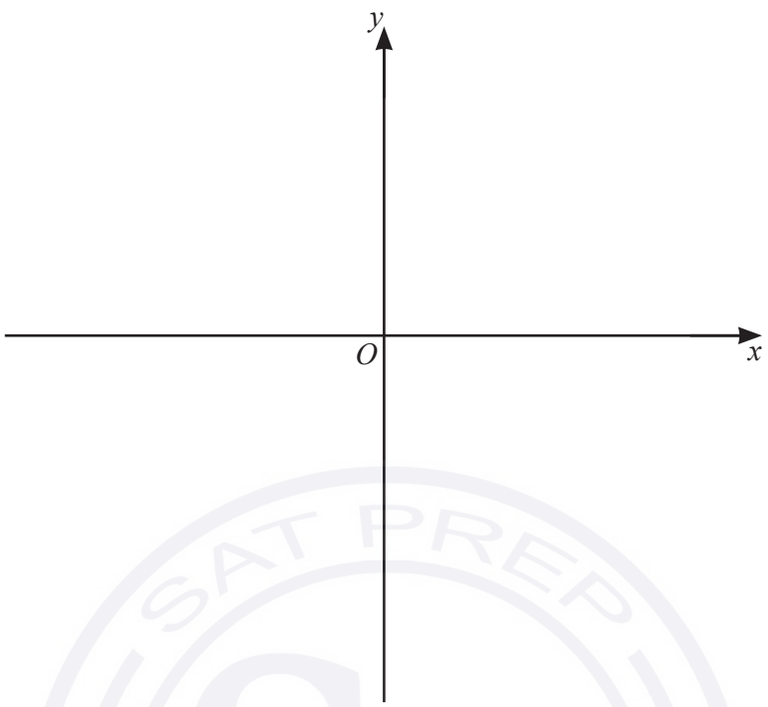
$b =$ .....

$c =$ ..... [3]

(iii) Calculate the gradient of $y=24+5x-x^2$ at $x=-1.5$.

..... [3]

(b) (i) On the diagram, sketch the graph of $y = (x+1)(x-3)^2$.
Label the values where the graph meets the x-axis and the y-axis.



[4]

(ii) Write $(x+1)(x-3)^2$ in the form ax^3+bx^2+cx+d.

..... [3]

8 **(a)** $\overrightarrow{AB} = \begin{pmatrix} 6 \\ -1 \end{pmatrix}$ $\overrightarrow{BC} = \begin{pmatrix} -2 \\ 5 \end{pmatrix}$ $\overrightarrow{DC} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$

Find

(i) $\overrightarrow{AC}$,

$\overrightarrow{AC} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

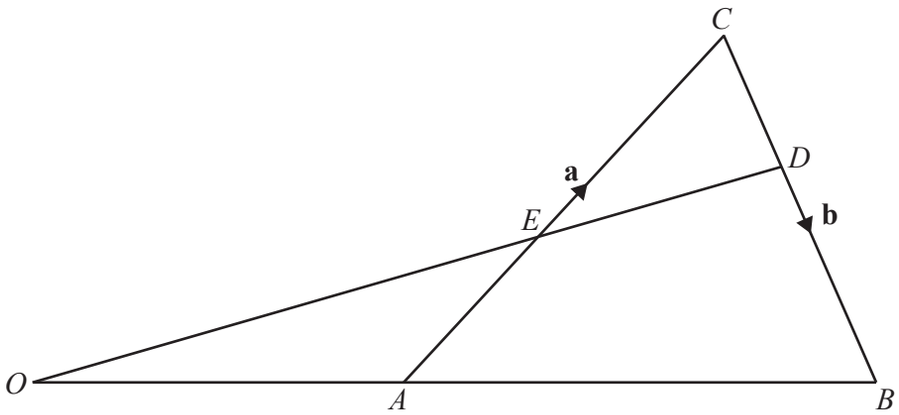
(ii) $\overrightarrow{BD}$,

$\overrightarrow{BD} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(iii) $\left|\overrightarrow{BC}\right|$.

..... [2]

(b)



NOT TO SCALE

In the diagram, OAB and OED are straight lines.
O is the origin, A is the midpoint of OB and E is the midpoint of AC.
$\overrightarrow{AC} = \mathbf{a}$ and $\overrightarrow{CB} = \mathbf{b}$.

Find, in terms of **a** and **b**, in its simplest form

(i) $\overrightarrow{AB}$,

$\overrightarrow{AB} =$ ..... [1]

(ii) $\overrightarrow{OE}$,

$\overrightarrow{OE} =$ ..... [2]

(iii) the position vector of D.

..... [3]

9 **(a)** Find the integer values that satisfy the inequality $2 < 2x \leqslant 10$.

..... [2]

(b) Factorise completely.

(i) $6y^2 - 15xy$

..... [2]

(ii) $y^2 - 9x^2$

..... [2]

(c) Simplify.

$$\frac{3}{x-1} - \frac{2}{2x+1}$$

..... [3]

(d) The straight line $y = 3x + 2$ intersects the curve $y = 2x^2 + 7x - 11$ at two points.

Find the coordinates of these two points.
Give your answers correct to 2 decimal places.

(..... , ...)

(..... , ...) [6]

10 $f(x) = 4 - 3x$ $g(x) = x^2 + x$ $h(x) = 3^x$

(a) Find $fh(2)$.

..... [2]

(b) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(c) Simplify.

(i) $f(1 - 2x)$

..... [2]

(ii) $gf(x) - 9g(x)$

..... [4]

(d) $\frac{1}{h(x)} = 9^{kx}$

Find the value of k.

$k =$ ..... [2]

11 The table shows the first four terms in sequences A, B, and C.

Sequence	1st term	2nd term	3rd term	4th term	5th term		nth term
A	4	9	14	19			
B	3	10	29	66			
C	1	4	16	64			

Complete the table.

[9]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

4295575799

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2020**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Blank pages are indicated.

1 **(a)** In 2018, Gretal earned $32 000.

(i) She paid tax of 24% on these earnings.

Work out the amount she paid in tax in 2018.

$ ..... [2]

(ii) In 2019, Gretal's earnings increased by 7%.

Work out her earnings in 2019.

$ ..... [2]

(b) Gretal invests $5000 at a rate of 2% per year compound interest.

Calculate the value of her investment at the end of 3 years.

$ ..... [2]

(c) One month, Gretal spent a total of $360 on presents.
She spent $\frac{1}{5}$ of this total on presents for her parents.
She spent $\frac{2}{3}$ of the remaining money on presents for her friends.
She spent the rest of the money on presents for her sisters.

Calculate the percentage of the $360 that she spent on presents for her sisters.

..... % [4]

(d) Arjun earned $36 515 in 2019.
This was an increase of 9% on his earnings in 2018.

Work out his earnings in 2018.

$ ..... [2]

(e) Arjun and Gretal each pay rent.

In 2018, the ratio of the amount each paid in rent was Arjun : Gretal = 5 : 7.
In 2019, the ratio of the amount each paid in rent was Arjun : Gretal = 9 : 13.

Arjun paid the same amount of rent in both 2018 and 2019.
Gretal paid $290 more rent in 2019 than she did in 2018.

Work out the amount Arjun paid in rent in 2019.

$ ..... [4]

2 The heights, h metres, of the 120 boys in an athletics club are recorded.
The table shows information about the heights of the boys.

Height (h metres)	$1.3 < h \leqslant 1.4$	$1.4 < h \leqslant 1.5$	$1.5 < h \leqslant 1.6$	$1.6 < h \leqslant 1.7$	$1.7 < h \leqslant 1.8$	$1.8 < h \leqslant 1.9$
Frequency	7	18	30	24	27	14

(a) (i) Write down the modal class.

..... $< h \leqslant$ ..... [1]

(ii) Calculate an estimate of the mean height.

..... m [4]

(b) (i) One boy is chosen at random from the club.

Find the probability that this boy has a height greater than 1.8 m.

..... [1]

(ii) Three boys are chosen at random from the club.

Calculate the probability that one of the boys has a height greater than 1.8 m and the other two boys each have a height of 1.4 m or less.

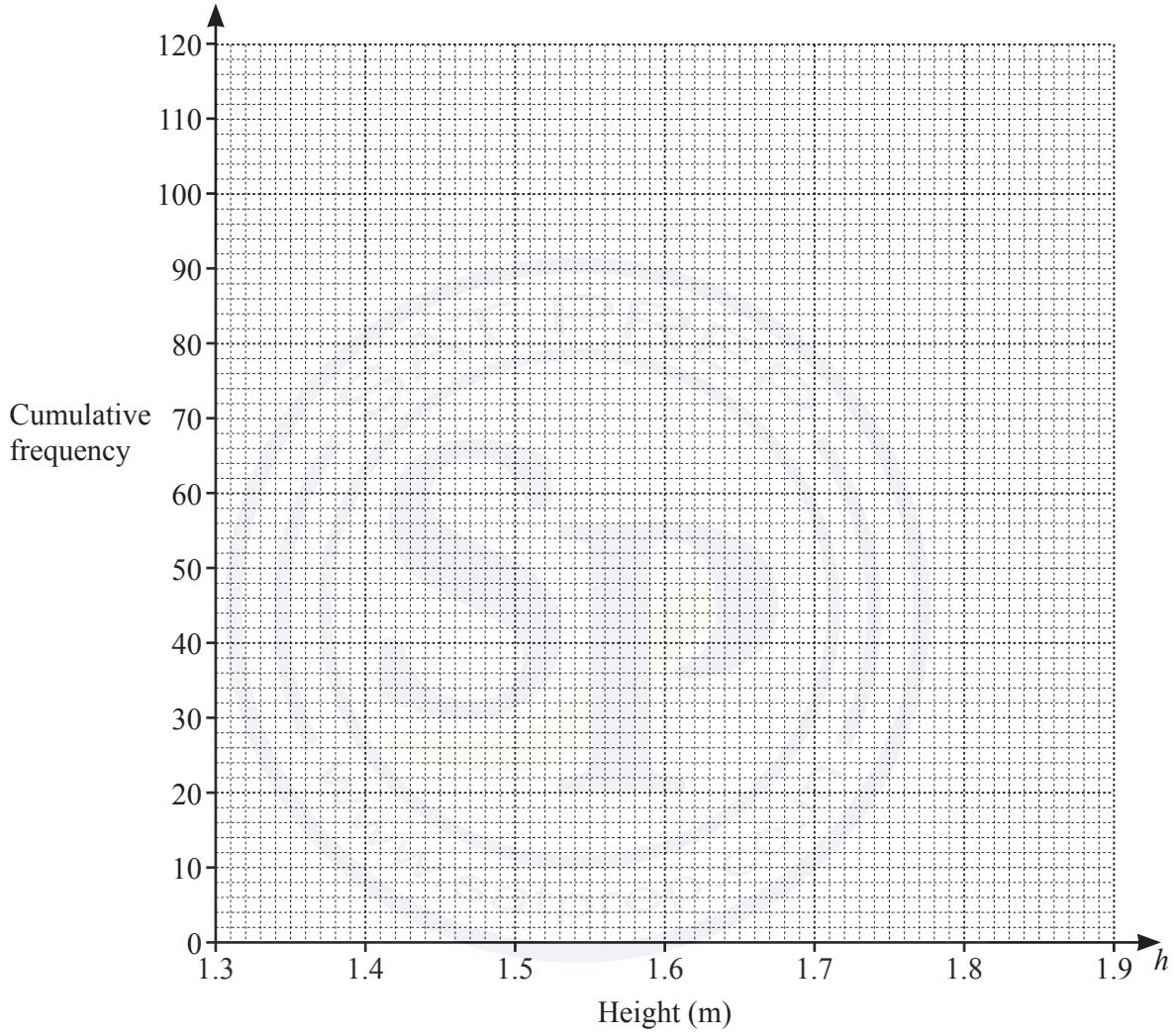
..... [4]

(c) (i) Use the frequency table on page 4 to complete the cumulative frequency table.

Height (h metres)	$h \leqslant 1.4$	$h \leqslant 1.5$	$h \leqslant 1.6$	$h \leqslant 1.7$	$h \leqslant 1.8$	$h \leqslant 1.9$
Cumulative frequency	7	25				

[2]

(ii) On the grid, draw a cumulative frequency diagram to show this information.



[3]

(d) Use your diagram to find an estimate for

(i) the median height,

..... m [1]

(ii) the 40th percentile.

..... m [2]

3 **(a)** $s = ut + \frac{1}{2}at^2$

Find the value of s when $u = 5.2$, $t = 7$ and $a = 1.6$.

$s =$ ..... [2]

(b) Simplify.

(i) $3a - 5b - a + 2b$

..... [2]

(ii) $\frac{5}{3x} \times \frac{9x}{20}$

..... [2]

(c) Solve.

(i) $\frac{15}{x} = -3$

$x =$ ..... [1]

(ii) $4(5 - 3x) = 23$

$x =$ ..... [3]

(d) Simplify.

$$(27x^9)^{\frac{2}{3}}$$

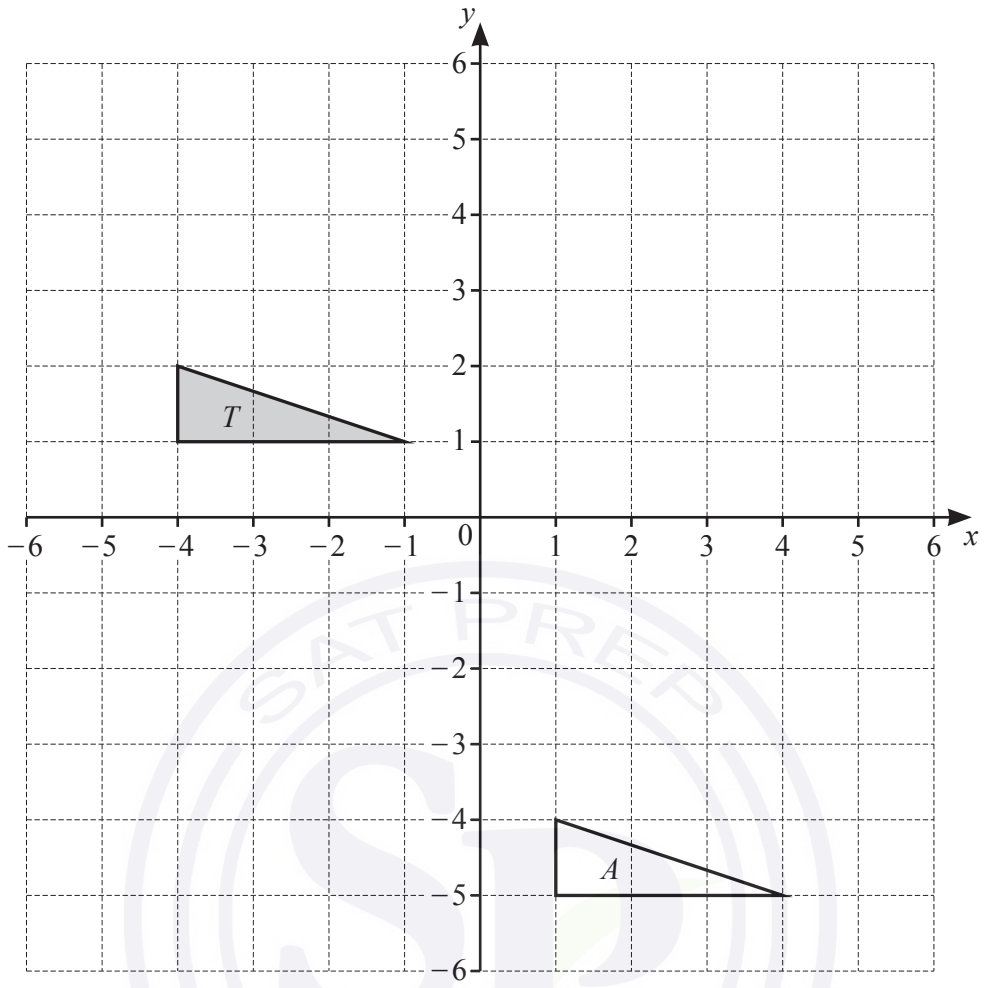
..... [2]

(e) Expand and simplify.

$$(3x - 5y)(2x + y)$$

..... [2]

4



(a) Draw the image of triangle T after a reflection in the line $y = -1$. [2]

(b) Draw the image of triangle T after a rotation through 90° clockwise about (0, 0). [2]

(c) Describe fully the **single** transformation that maps triangle T onto triangle A.

.....

..... [2]

5 x is an integer.

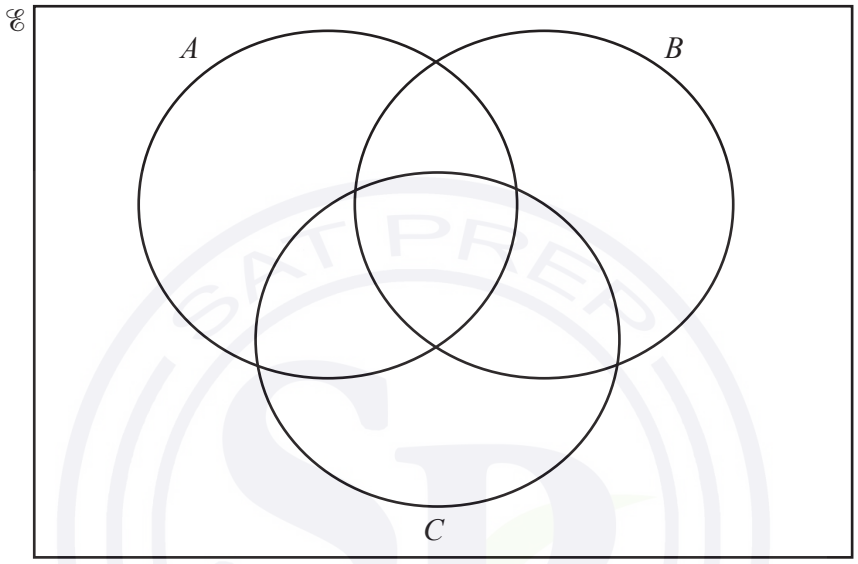
$\mathscr{E} = \{x : 41 \leqslant x \leqslant 50\}$

$A = \{x : x \text{ is an odd number}\}$

$B = \{x : x \text{ is a multiple of } 3\}$

$C = \{x : x \text{ is a prime number}\}$

(a) Complete the Venn diagram to show this information.



[3]

(b) List the elements of

(i) $A \cap C$,

..... [1]

(ii) $(B \cup C)'$.

..... [1]

(c) Find $\text{n}(A \cap B \cap C)$.

..... [1]

6 Raheem makes baskets and mats.
Each week he makes x baskets and y mats.

He makes fewer than 10 mats.
The number of mats he makes is greater than or equal to the number of baskets he makes.

(a) One of the inequalities that shows this information is $y < 10$.

Write down the other inequality.

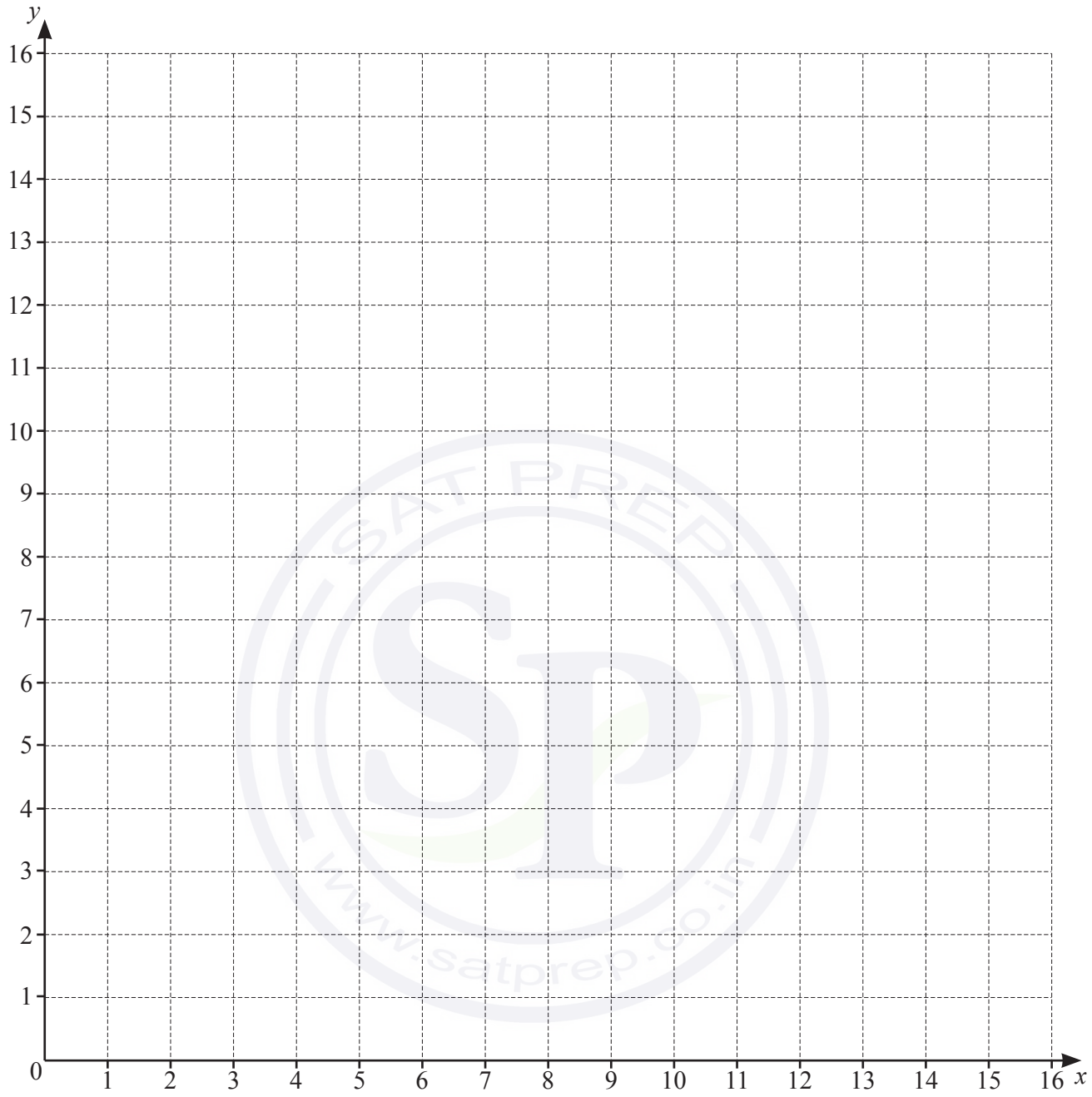
..... [1]

(b) He takes $2\frac{1}{4}$ hours to make a basket and $1\frac{1}{2}$ hours to make a mat.
Each week he works for a maximum of 22.5 hours.

Show that $3x + 2y \leqslant 30$.

[2]

(c) On the grid, draw three straight lines and shade the **unwanted** regions to show these inequalities.



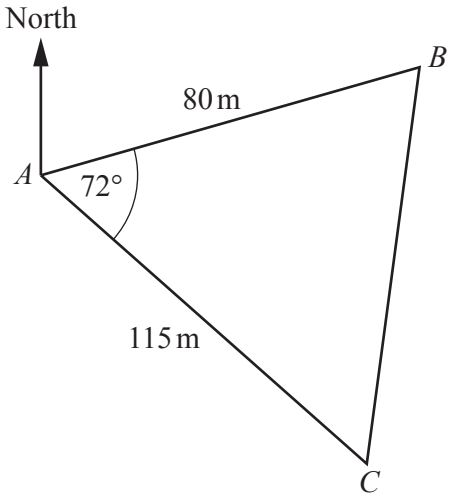
[5]

(d) He makes \$40 profit on each basket he sells and \$28 profit on each mat he sells.

Calculate the maximum profit he can make each week.

\$ ..... [2]

7



NOT TO SCALE

The diagram shows the positions of three points A, B and C in a field.

(a) Show that BC is 118.1 m, correct to 1 decimal place.

[3]

(b) Calculate angle ABC.

Angle ABC = ... [3]

(c) The bearing of C from A is 147°.

Find the bearing of

(i) A from B,

..... [3]

(ii) B from C.

..... [2]

(d) Mitchell takes 35 seconds to run from A to C.

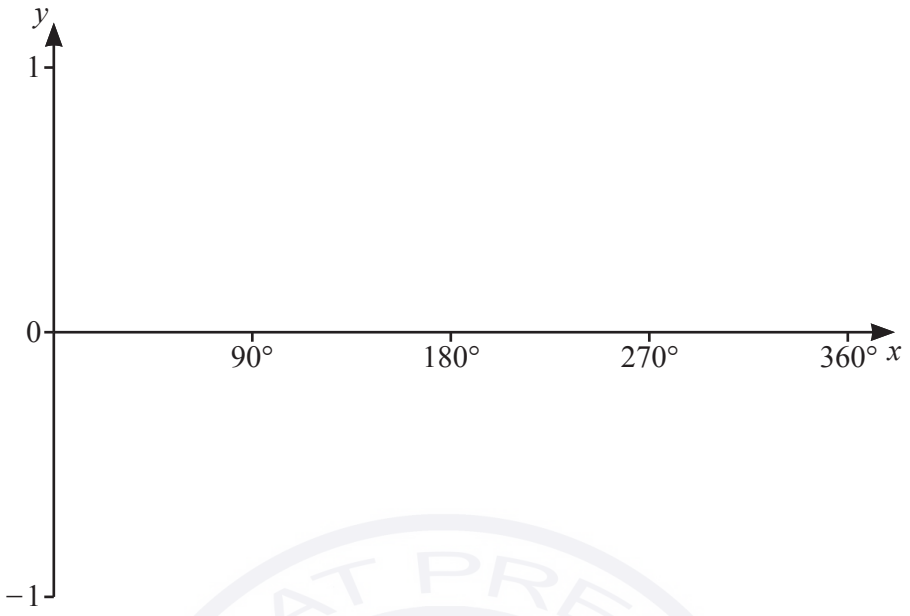
Calculate his average running speed in kilometres per hour.

..... km/h [3]

(e) Calculate the shortest distance from point B to AC.

..... m [3]

8 **(a)** **(i)** On the axes, sketch the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.



[2]

(ii) Describe fully the symmetry of the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.

.....

..... [2]

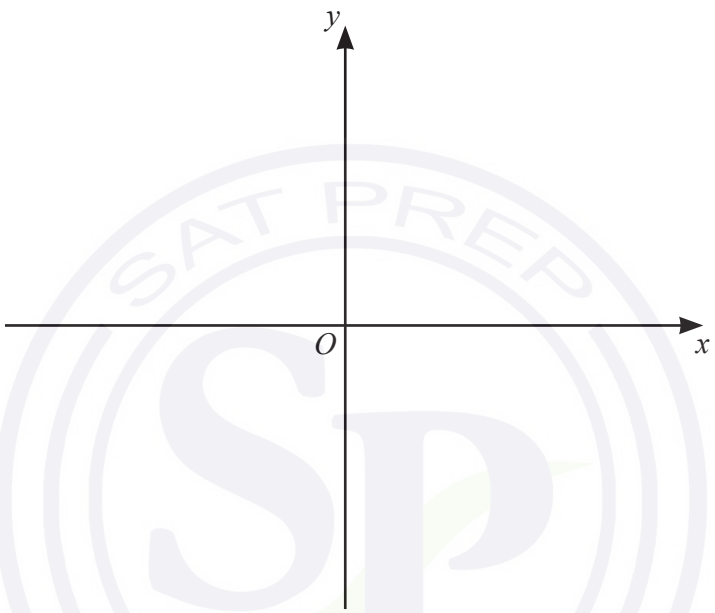
(b) Solve $4\sin x - 1 = 2$ for $0° \leqslant x \leqslant 360°$.

$x =$ ..... and $x =$ ..... [3]

(c) **(i)** Write $x^2 + 10x + 14$ in the form $(x + a)^2 + b$.

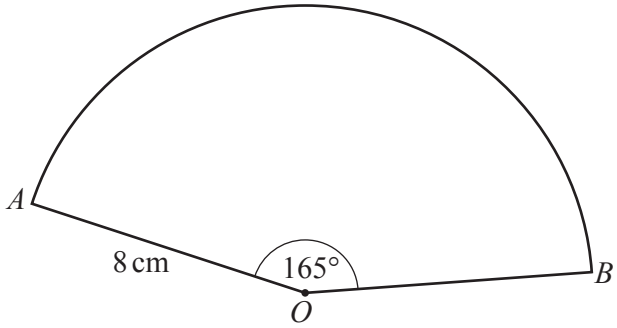
..... [2]

(ii) On the axes, sketch the graph of $y = x^2 + 10x + 14$, indicating the coordinates of the turning point.



[3]

9



NOT TO SCALE

The diagram shows a sector of a circle with centre O, radius 8 cm and sector angle 165°.

(a) Calculate the total perimeter of the sector.

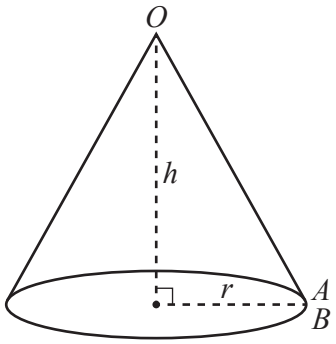
..... cm [3]

(b) The surface area of a sphere is the same as the area of the sector.

Calculate the radius of the sphere.
[The surface area, A, of a sphere with radius r is $A = 4\pi r^2$.]

..... cm [4]

(c)



NOT TO SCALE

A cone is made from the sector by joining OA to OB.

(i) Calculate the radius, r, of the cone.

$r =$ ..... cm [2]

(ii) Calculate the volume of the cone.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [4]

10 **(a)** A rhombus $ABCD$ has a diagonal AC where A is the point $(-3, 10)$ and C is the point $(4, -4)$.

(i) Calculate the length AC.

..... [3]

(ii) Show that the equation of the line AC is $y = -2x + 4$.

[2]

(iii) Find the equation of the line BD.

..... [4]

(b) A curve has the equation $y = x^3 + 8x^2 + 5x$.

(i) Work out the coordinates of the two turning points.

(..... , ...) and (..... , ...) [6]

(ii) Determine whether each of the turning points is a maximum or a minimum.
Give reasons for your answers.

[3]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

3126875001

MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2020**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Blank pages are indicated.

1 **(a)** **(i)** Divide \$24 in the ratio 7 : 5.

\$ ..... , \$ ..... [2]

(ii) Write \$24.60 as a fraction of \$2870.
Give your answer in its lowest terms.

..... [2]

(iii) Write \$1.92 as a percentage of \$1.60 .

..... % [1]

(b) In a sale the original prices are reduced by 15%.

(i) Calculate the sale price of a book that has an original price of \$12.

\$ ..... [2]

(ii) Calculate the original price of a jacket that has a sale price of \$38.25 .

\$ ..... [2]

(c) (i) Dean invests \$500 for 10 years at a rate of 1.7% per year simple interest.

Calculate the total interest earned during the 10 years.

\$ ..... [2]

(ii) Ollie invests \$200 at a rate of 0.0035% **per day** compound interest.

Calculate the value of Ollie's investment at the end of 1 year.
[1 year = 365 days.]

\$ ..... [2]

(iii) Edna invests \$500 at a rate of r% per year compound interest.
At the end of 6 years, the value of Edna's investment is \$559.78 .

Find the value of r.

$r =$ ..... [3]

2 **(a)** $\mathbf{p} = \begin{pmatrix} 4 \\ 5 \end{pmatrix}$ $\mathbf{q} = \begin{pmatrix} -2 \\ 7 \end{pmatrix}$

(i) Find $2\mathbf{p} + \mathbf{q}$.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(ii) Find $|\mathbf{p}|$.

..... [2]

(b) A is the point (4, 1) and $\overrightarrow{AB} = \begin{pmatrix} -3 \\ 1 \end{pmatrix}$.

Find the coordinates of B.

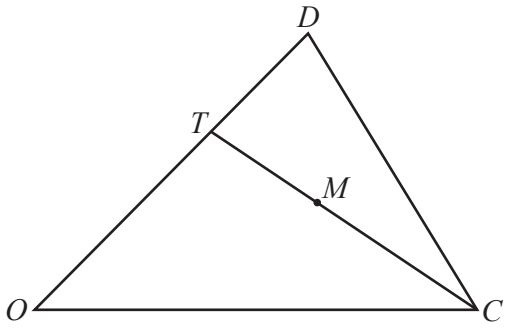
(..... , ...) [1]

(c) The line $y = 3x - 2$ crosses the y-axis at G.

Write down the coordinates of G.

(..... , ...) [1]

(d)



NOT TO SCALE

In the diagram, O is the origin, $OT = 2TD$ and M is the midpoint of TC.
$\overrightarrow{OC} = \mathbf{c}$ and $\overrightarrow{OD} = \mathbf{d}$.

Find the position vector of M.
Give your answer in terms of **c** and **d** in its simplest form.

..... [3]

3 The speed, v km/h, of each of 200 cars passing a building is measured.
The table shows the results.

Speed (v km/h)	$0 < v \leqslant 20$	$20 < v \leqslant 40$	$40 < v \leqslant 45$	$45 < v \leqslant 50$	$50 < v \leqslant 60$	$60 < v \leqslant 80$
Frequency	16	34	62	58	26	4

(a) Calculate an estimate of the mean.

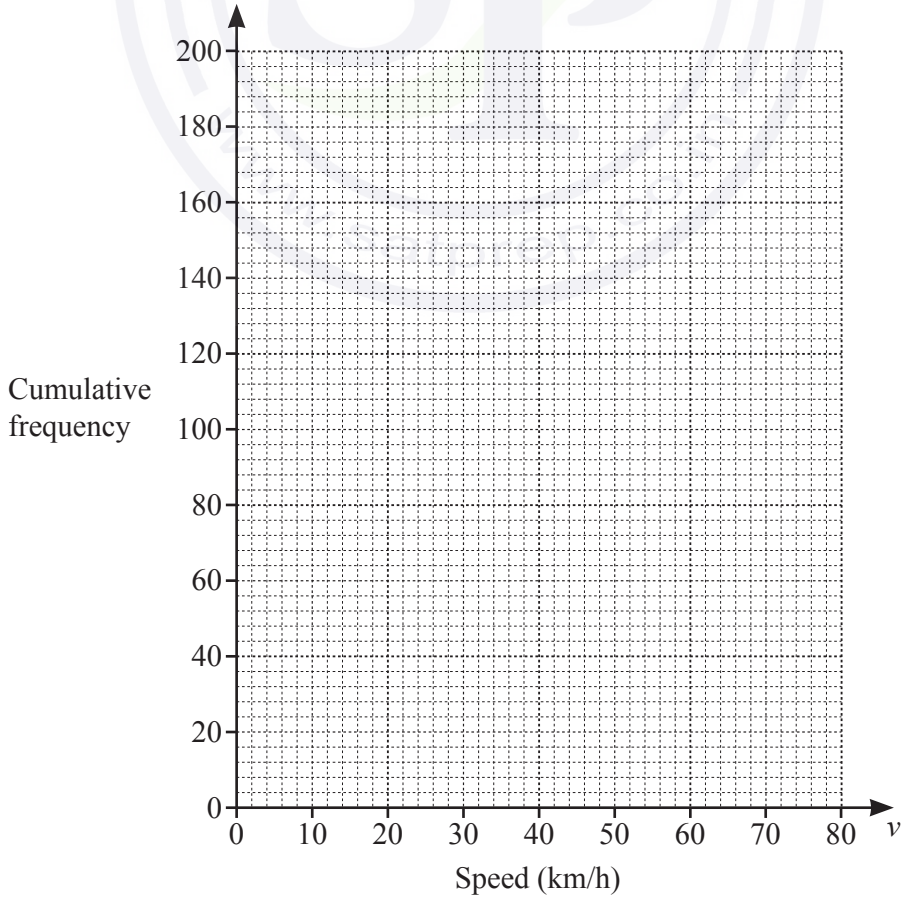
..... km/h [4]

(b) (i) Use the frequency table to complete the cumulative frequency table.

Speed (v km/h)	$v \leqslant 20$	$v \leqslant 40$	$v \leqslant 45$	$v \leqslant 50$	$v \leqslant 60$	$v \leqslant 80$
Cumulative frequency	16	50			196	200

[1]

(ii) On the grid, draw a cumulative frequency diagram.



[3]

(iii) Use your diagram to find an estimate of

(a) the upper quartile,

..... km/h [1]

(b) the number of cars with a speed greater than 35 km/h.

..... [2]

(c) Two of the 200 cars are chosen at random.

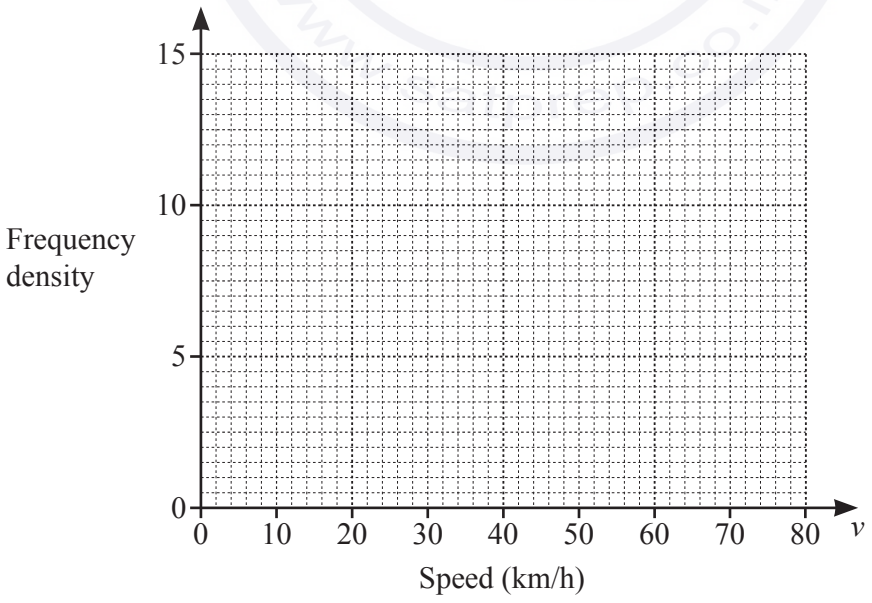
Find the probability that they both have a speed greater than 50 km/h.

..... [2]

(d) A new frequency table is made by combining intervals.

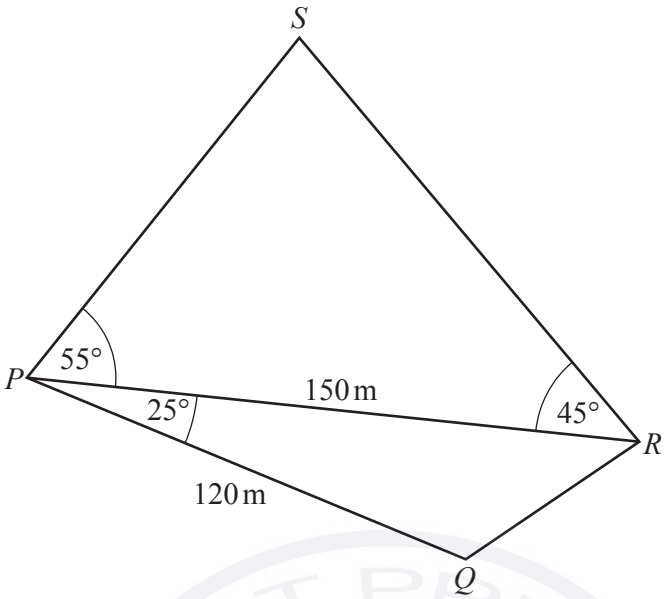
Speed (v km/h)	$0 < v \leqslant 40$	$40 < v \leqslant 50$	$50 < v \leqslant 80$
Frequency	50	120	30

On the grid, draw a histogram to show the information in this table.



[3]

4



NOT TO SCALE

The diagram shows two triangles.

(a) Calculate QR.

$QR =$ ..... m [3]

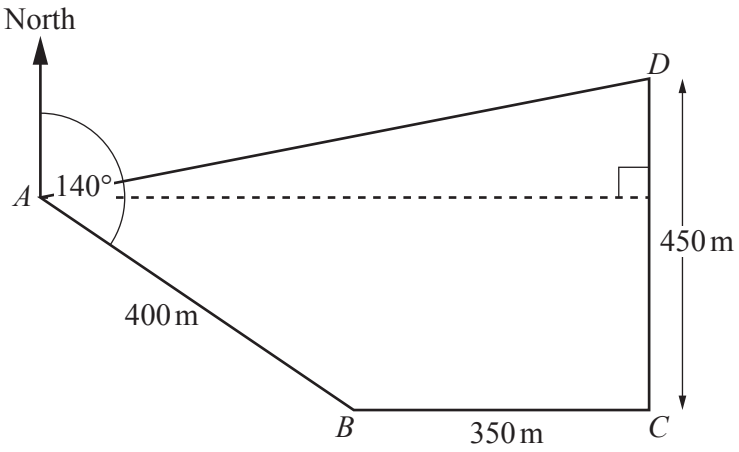
(b) Calculate RS.

$RS =$ ..... m [4]

(c) Calculate the total area of the two triangles.

..... m^2 [3]

5



NOT TO SCALE

The diagram shows a field $ABCD$.
The bearing of B from A is 140°.
C is due east of B and D is due north of C.
$AB = 400$ m, $BC = 350$ m and $CD = 450$ m.

(a) Find the bearing of D from B.

..... [2]

(b) Calculate the distance from D to A.

..... m [6]

(c) Jono runs around the field from A to B, B to C, C to D and D to A.
He runs at a speed of 3 m/s.

Calculate the total time Jono takes to run around the field.
Give your answer in minutes and seconds, correct to the nearest second.

..... min ..... s [4]

6 $f(x) = 3x + 2$ $g(x) = x^2 + 1$ $h(x) = 4^x$

(a) Find h(4).

..... [1]

(b) Find fg(1).

..... [2]

(c) Find gf(x) in the form $ax^2 + bx + c$.

..... [3]

(d) Find x when $f(x) = g(7)$.

$x =$ ..... [2]

(e) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(f) Find $\frac{g(x)}{f(x)} + x$.

Give your answer as a single fraction, in terms of x, in its simplest form.

..... [3]

(g) Find x when $h^{-1}(x) = 2$.

$x =$ ..... [1]

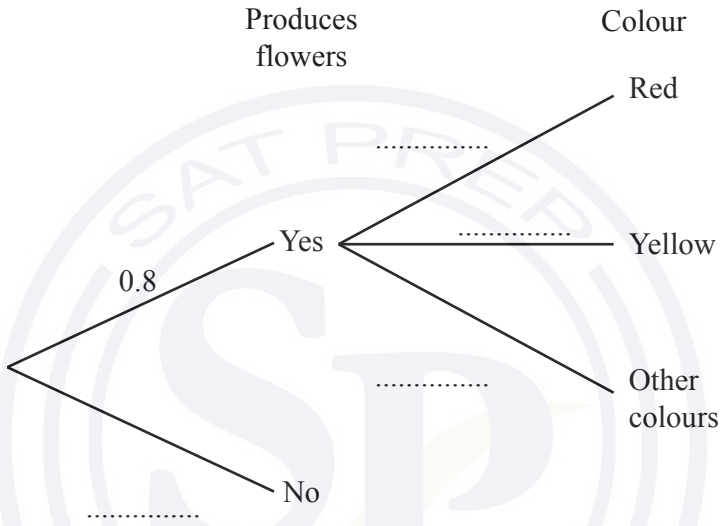
7 Tanya plants some seeds.
The probability that a seed will produce flowers is 0.8 .
When a seed produces flowers, the probability that the flowers are red is 0.6 and the probability that the flowers are yellow is 0.3 .

(a) Tanya has a seed that produces flowers.

Find the probability that the flowers are not red and not yellow.

..... [1]

(b) **(i)** Complete the tree diagram.



[2]

(ii) Find the probability that a seed chosen at random produces red flowers.

..... [2]

(iii) Tanya chooses a seed at random.

Find the probability that this seed does not produce red flowers and does not produce yellow flowers.

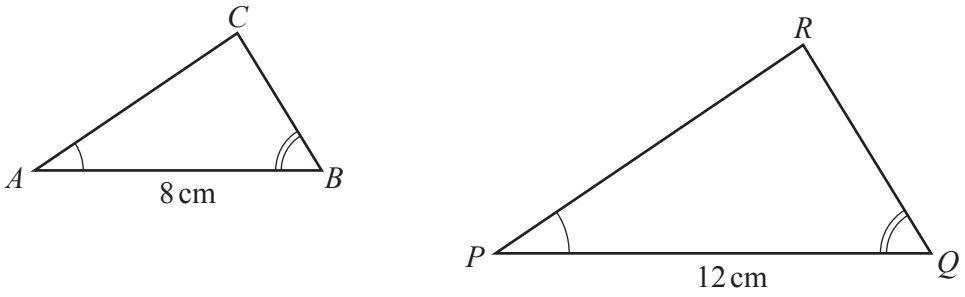
..... [3]

(c) Two of the seeds are chosen at random.

Find the probability that one produces flowers and one does not produce flowers.

..... [3]

8 (a)



NOT TO SCALE

Triangle ABC is mathematically similar to triangle PQR.
The area of triangle ABC is $16\,cm^2$.

(i) Calculate the area of triangle PQR.

..... cm^2 [2]

(ii) The triangles are the cross-sections of prisms which are also mathematically similar.
The volume of the smaller prism is $320\,cm^3$.

Calculate the length of the larger prism.

..... cm [3]

(b) A cylinder with radius 6 cm and height h cm has the same volume as a sphere with radius 4.5 cm.

Find the value of h.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$h =$ ..... [3]

(c) A solid metal cube of side 20 cm is melted down and made into 40 solid spheres, each of radius r cm.

Find the value of r.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$r =$ ..... [3]

(d) A solid cylinder has radius x cm and height $\frac{7x}{2}$ cm.

The surface area of a sphere with radius R cm is equal to the total surface area of the cylinder.

Find an expression for R in terms of x.

[The surface area, A, of a sphere with radius r is $A = 4\pi r^2$.]

$R =$ ..... [3]

9 **(a)** **(i)** Write $x^2 + 8x - 9$ in the form $(x+k)^2 + h$.

..... [2]

(ii) Use your answer to **part (a)(i)** to solve the equation $x^2 + 8x - 9 = 0$.

$x =$ ..... or $x =$ ..... [2]

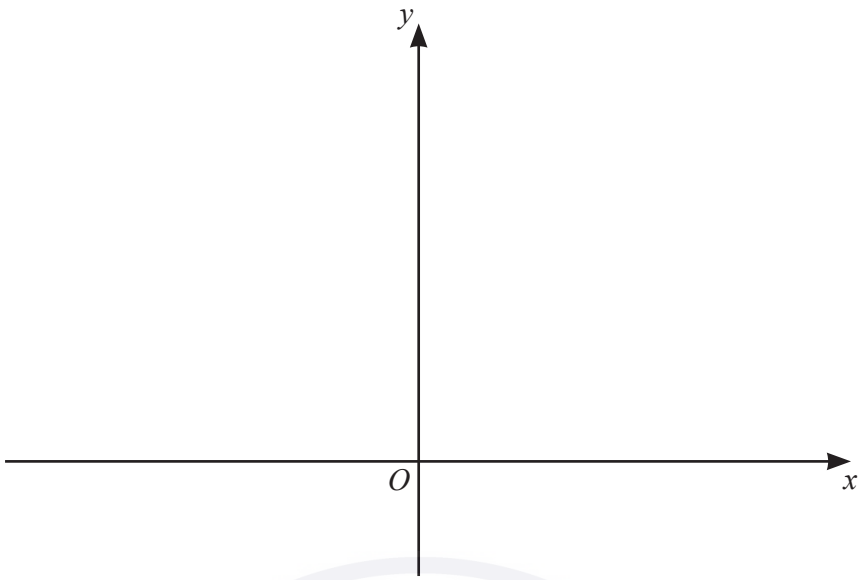
(b) The solutions of the equation $x^2 + bx + c = 0$ are $\frac{-7+\sqrt{61}}{2}$ and $\frac{-7-\sqrt{61}}{2}$.

Find the value of b and the value of c.

$b =$ .....

$c =$ ..... [3]

(c) (i)



On the diagram,

(a) sketch the graph of $y = (x-1)^2$, [2]

(b) sketch the graph of $y = \frac{1}{2}x + 1$. [2]

(ii) The graphs of $y = (x-1)^2$ and $y = \frac{1}{2}x + 1$ intersect at A and B.

Find the length of AB.

$AB =$ ..... [7]

Question 10 is printed on the next page.

10 (a) $y = x^4 - 4x^3$

(i) Find the value of y when $x = -1$.

$y =$ ..... [2]

(ii) Find the two stationary points on the graph of $y = x^4 - 4x^3$.

(..... , ...)

(..... , ...) [6]

(b) $y = x^p + 2x^q$

$\frac{dy}{dx} = 11x^{10} + 10x^4$, where $\frac{dy}{dx}$ is the derived function.

Find the value of p and the value of q.

$p =$ .....

$q =$ ..... [2]

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2071428902

MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2020**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **24** pages. Blank pages are indicated.

1 (a)

Campsite fees (per day)	
Tent	$15.00
Caravan	$25.00

The sign shows the fees charged at a campsite.
Today there are 54 tents and 18 caravans on the site.

Calculate the fees charged today.

$ ..... [2]

(b) In September the total income at the campsite was $37 054.
This was a decrease of 4.5% on the total income in August.

Calculate the total income in August.

$ ..... [2]

(c) The visitors to the campsite today are in the ratio

men : women = 5 : 4 and women : children = 3 : 7.

(i) Calculate the ratio men : women : children in its simplest form.

..... : ..... : ..... [2]

(ii) Today there are 224 children at the campsite.

Calculate the total number of men and women.

..... [3]

(d) The space allowed for each tent is a rectangle measuring 8 m by 6 m, each correct to the nearest metre.

Calculate the upper bound for the area of the space allowed for each tent.

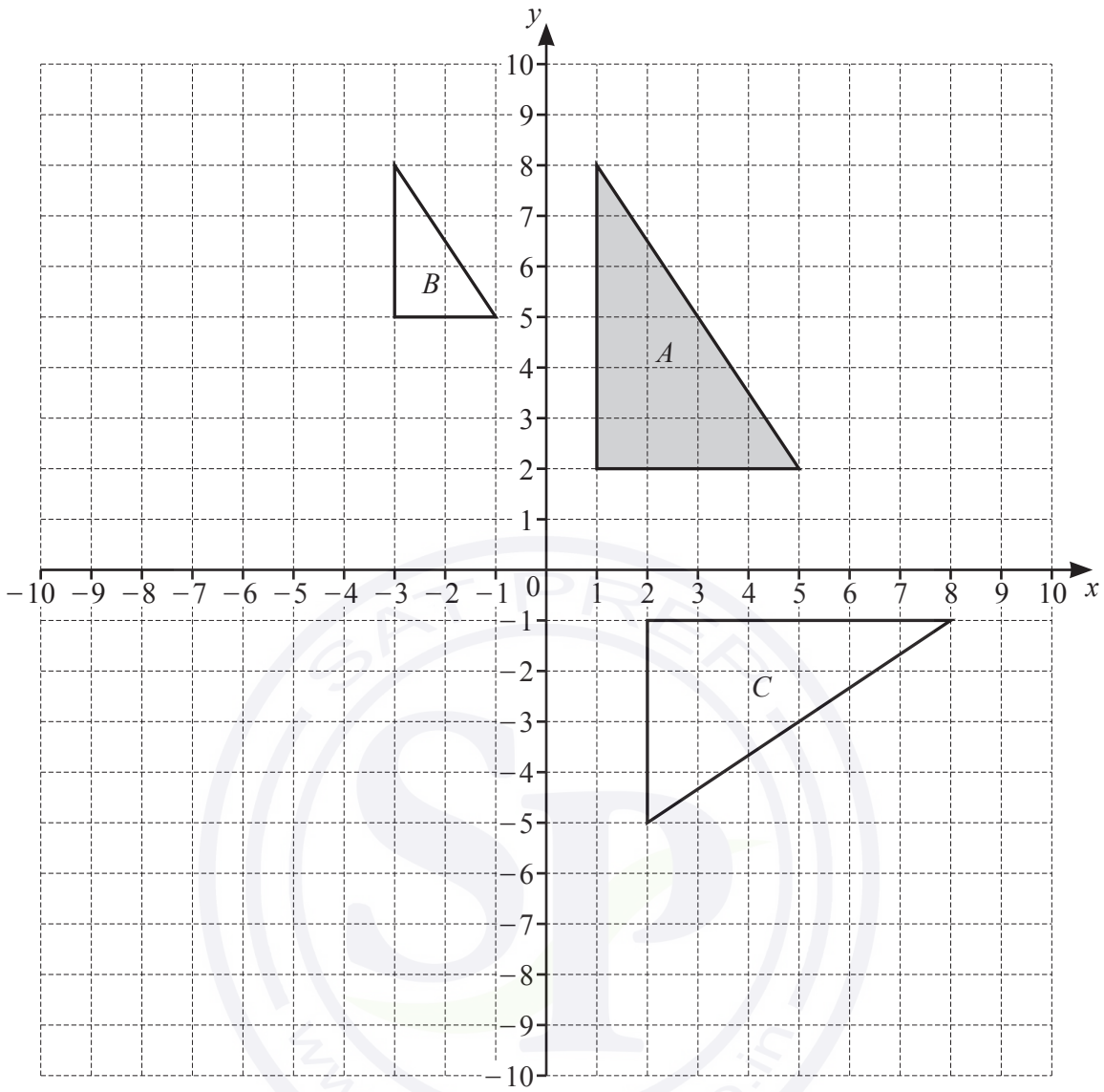
..... m^2 [2]

(e) The value of the campsite has increased exponentially by 1.5% every year since it opened 30 years ago.

Calculate the value of the campsite now as a percentage of its value 30 years ago.

..... % [2]

2



(a) **(i)** Draw the image of triangle A after a reflection in the line $y = -x$. [2]

(ii) Draw the image of triangle A after a translation by the vector $\begin{pmatrix} -2 \\ -9 \end{pmatrix}$. [2]

(b) Describe fully the **single** transformation that maps

(i) triangle A onto triangle B,

.....

..... [3]

(ii) triangle A onto triangle C.

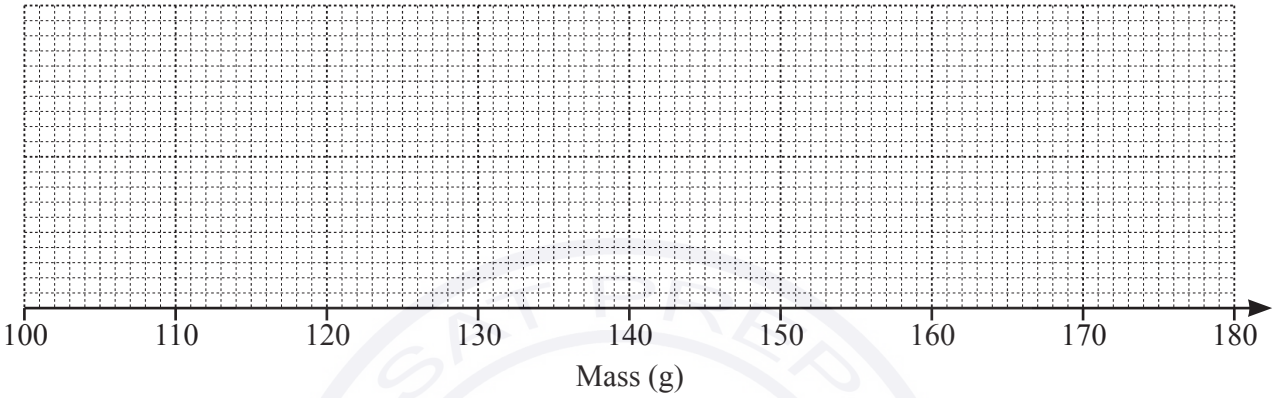
.....

..... [3]

3 **(a)** Here is some information about the masses of potatoes in a sack:

- The largest potato has a mass of 174 g.
- The range is 69 g.
- The median is 148 g.
- The lower quartile is 121 g.
- The interquartile range is 38 g.

On the grid below, draw a box-and-whisker plot to show this information.



[4]

(b) The table shows the marks scored by some students in a test.

Mark	5	6	7	8	9	10
Frequency	8	2	12	2	0	1

Calculate the mean mark.

..... [3]

4 **(a)** Solve the inequality.

$$3m + 12 \leqslant 8m - 5$$

..... [2]

(b) Solve the equation.

$$\frac{2x+5}{3-x} = \frac{14}{15}$$

$x =$ ..... [3]

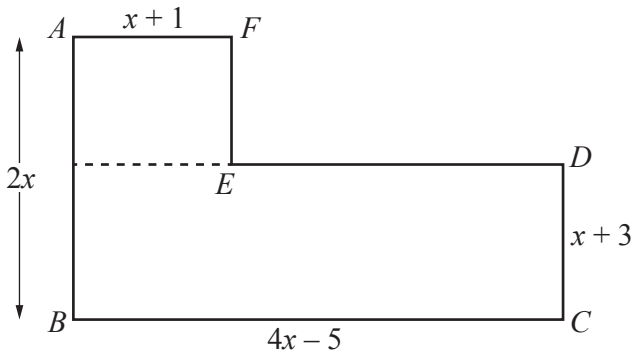
(c) Solve the simultaneous equations.
You must show all your working.

$$y = 4 - x$$
$$x^2 + 2y^2 = 67$$

$x =$ ..... , $y =$ .....

$x =$ ..... , $y =$ ..... [6]

5 All the lengths in this question are in centimetres.



NOT TO SCALE

The diagram shows a shape *ABCDEF* made from two rectangles.
The total area of the shape is 342 cm^2.

(a) Show that $x^2 + x - 72 = 0$.

[5]

(b) Solve by factorisation.

$x^2 + x - 72 = 0$

$x =$ ..... or $x =$ ..... [3]

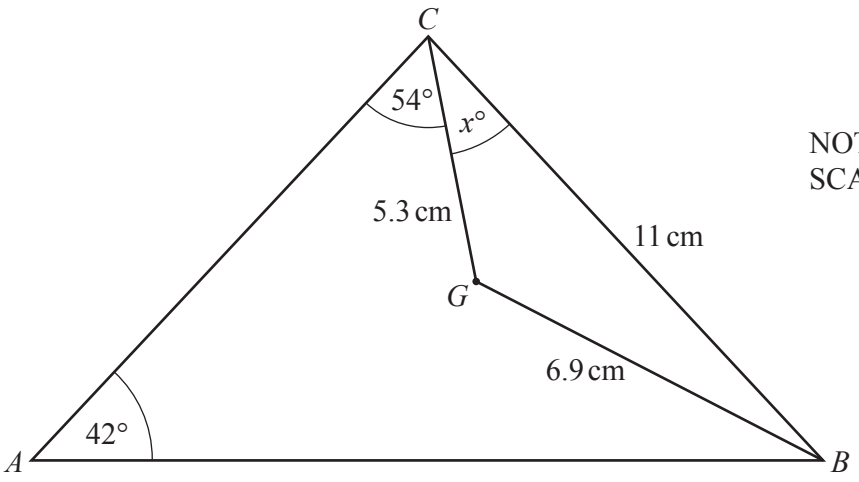
(c) Work out the perimeter of the shape *ABCDEF*.

..... cm [2]

(d) Calculate angle *DBC*.

Angle *DBC* = ... [2]

6 (a)



NOT TO SCALE

The diagram shows triangle ABC with point G inside.
$CB = 11$ cm, $CG = 5.3$ cm and $BG = 6.9$ cm.
Angle $CAB = 42°$ and angle $ACG = 54°$.

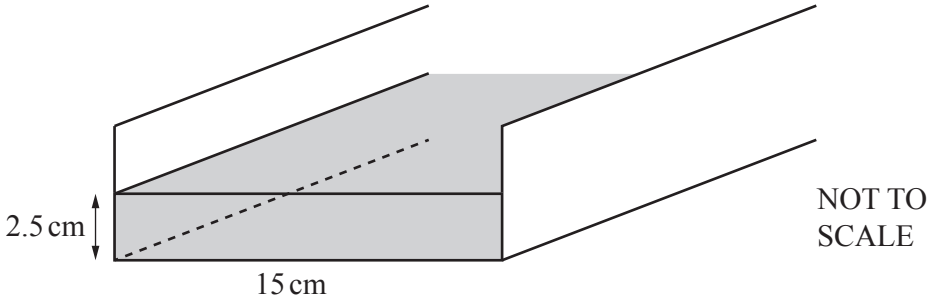
(i) Calculate the value of x.

$x =$ ..... [4]

(ii) Calculate AC.

$AC =$ ..... cm [4]

(b)



Water flows at a speed of 20 cm/s along a rectangular channel into a lake.
The width of the channel is 15 cm.
The depth of the water is 2.5 cm.

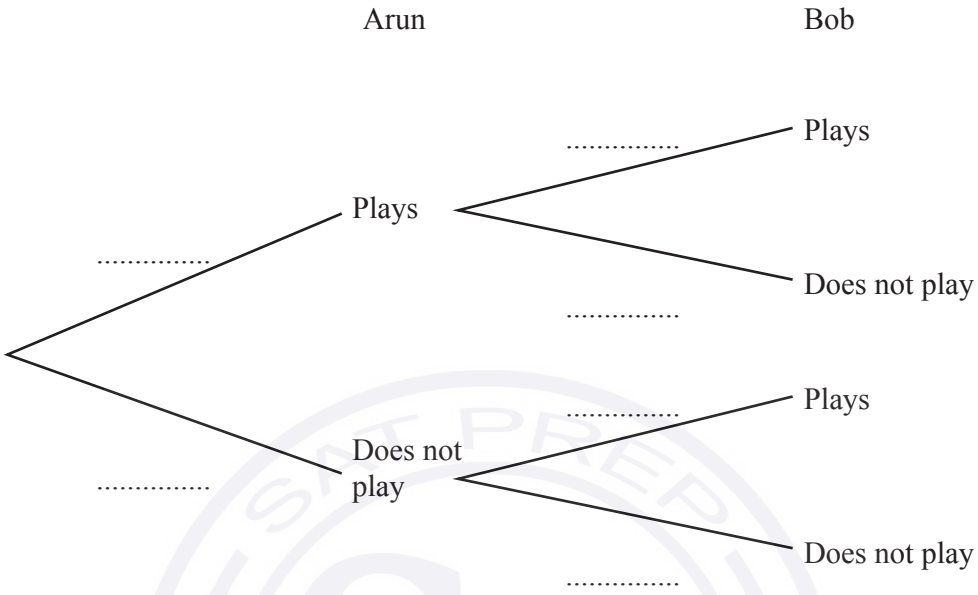
Calculate the amount of water that flows from the channel into the lake in 1 hour.
Give your answer in litres.

..... litres [4]

7 On any Saturday, the probability that Arun plays football is $\frac{3}{4}$.

On any Saturday, the probability that Bob plays football is $\frac{2}{5}$.

(a) (i) Complete the tree diagram.



[2]

(ii) Calculate the probability that, one Saturday, Arun and Bob both play football.

..... [2]

(iii) Calculate the probability that, one Saturday, either Arun plays football or Bob plays football, but not both.

..... [3]

(b) Calculate the probability that Bob plays football for 2 of the next 3 Saturdays.

..... [3]

(c) When Arun plays football, the probability that he scores the winning goal is $\frac{1}{7}$.

Calculate the probability that Arun scores the winning goal one Saturday.

..... [2]

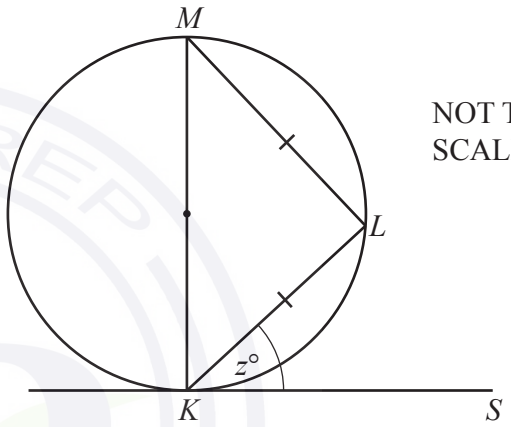
8 **(a)** The interior angle of a regular polygon with n sides is 150°.

Calculate the value of n.

$n =$ ..... [2]

(b) **(i)** K, L and M are points on the circle.
KS is a tangent to the circle at K.
KM is a diameter and
triangle KLM is isosceles.

Find the value of z.

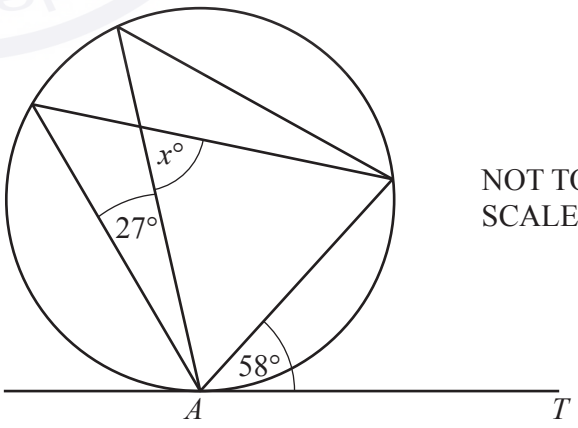


NOT TO SCALE

$z =$ ..... [2]

(ii) AT is a tangent to the circle at A.

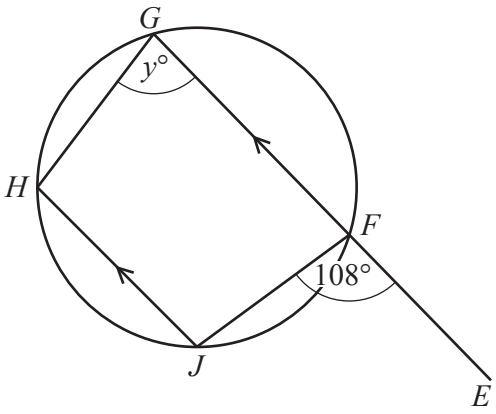
Find the value of x.



NOT TO SCALE

$x =$ ..... [2]

(iii)



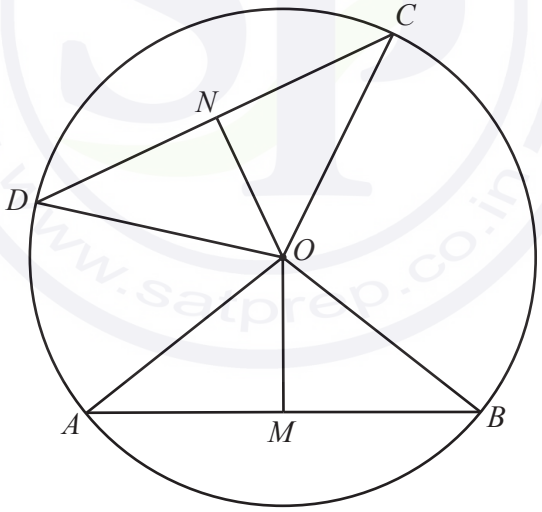
NOT TO SCALE

F, *G*, *H* and *J* are points on the circle.
EFG is a straight line parallel to *JH*.

Find the value of *y*.

y = ... [2]

(c)



NOT TO SCALE

A, *B*, *C* and *D* are points on the circle, centre *O*.
M is the midpoint of *AB* and *N* is the midpoint of *CD*.
OM = *ON*

Explain, giving reasons, why triangle *OAB* is congruent to triangle *OCD*.

.....

.....

.....

..... [3]

9 **(a)** The equation of line L is $3x - 8y + 20 = 0$.

(i) Find the gradient of line L.

..... [2]

(ii) Find the coordinates of the point where line L cuts the y-axis.

(..... , ...) [1]

(b) The coordinates of P are $(-3, 8)$ and the coordinates of Q are $(9, -2)$.

(i) Calculate the length PQ.

..... [3]

(ii) Find the equation of the line parallel to PQ that passes through the point $(6, -1)$.

..... [3]

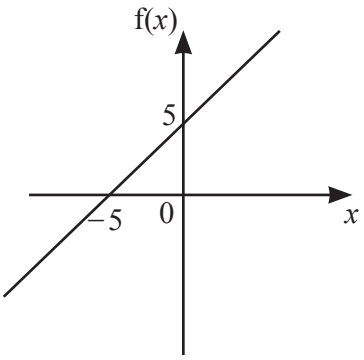
(iii) Find the equation of the perpendicular bisector of PQ.

..... [4]

10 (a) The diagrams show the graphs of two functions.

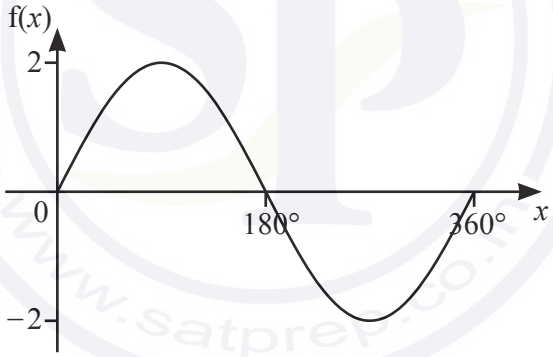
Write down each function.

(i)



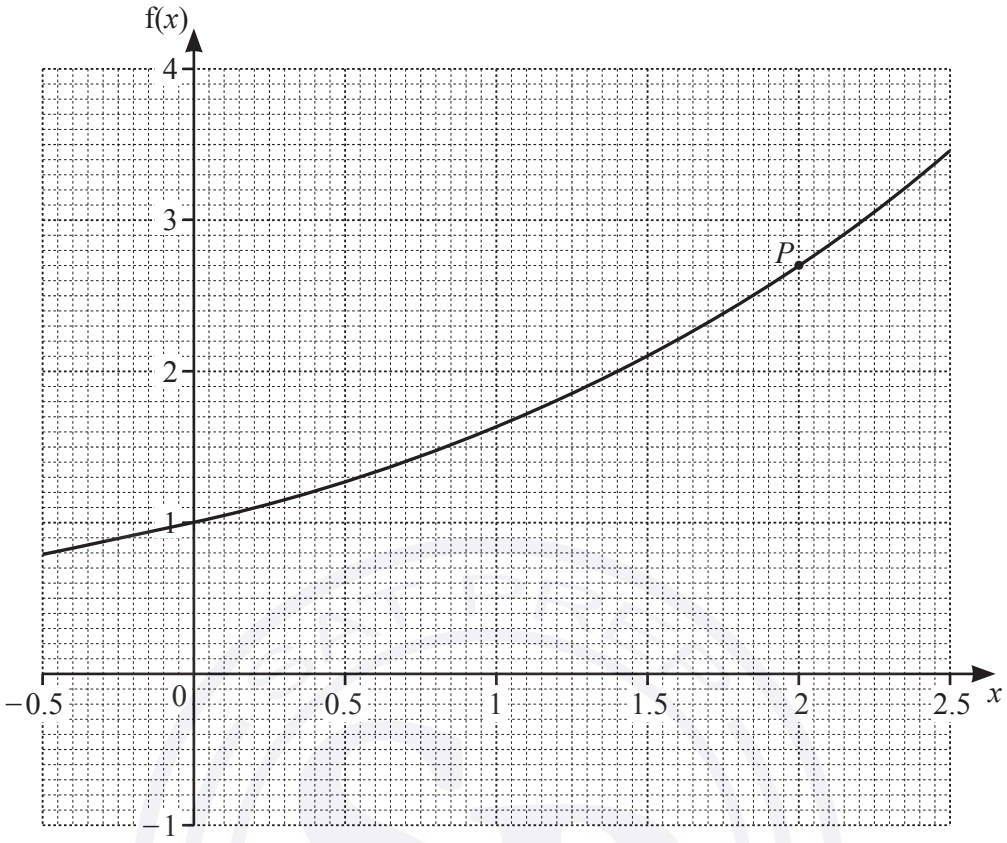
f(x) = ... [2]

(ii)



f(x) = ... [2]

(b)



The diagram shows the graph of another function.

By drawing a suitable tangent, find an estimate for the gradient of the function at the point P.

..... [3]

11 $f(x) = 7x - 4$ $g(x) = \frac{2x}{x-3}$, $x \neq 3$ $h(x) = x^2$

(a) Find $g(6)$.

..... [1]

(b) Find $fg(4)$.

..... [2]

(c) Find $fh(x)$.

..... [1]

(d) Find $\frac{f(x)}{2} + g(x)$.

Give your answer as a single fraction, in terms of x, in its simplest form.

..... [3]

(e) Find the value of x when $f(x+2) = -11$.

$x =$ ..... [2]

(f) Find the values of p that satisfy $h(p) = p$.

..... [2]

12 **(a)** A curve has equation $y = 4x^3 - 3x + 3$.

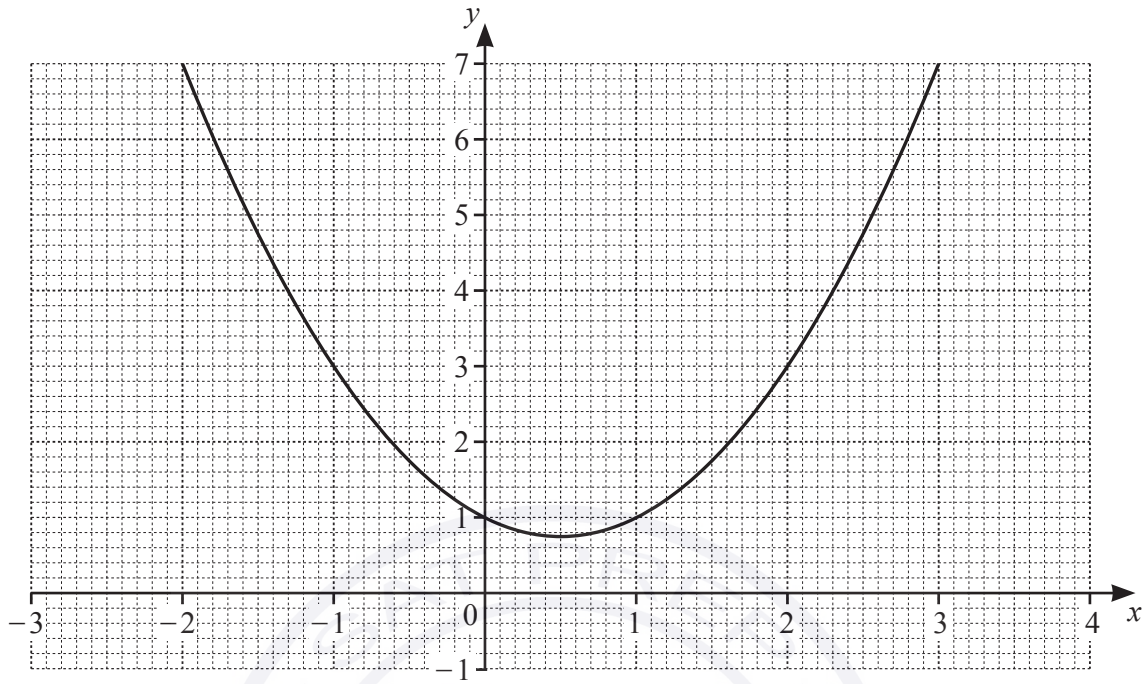
(i) Find the coordinates of the two stationary points.

(..... , ...) and (..... , ...) [5]

(ii) Determine whether each of the stationary points is a maximum or a minimum.
Give reasons for your answers.

[3]

(b) The graph of $y = x^2 - x + 1$ is shown on the grid.



By drawing a suitable line on the grid, solve the equation $x^2 - 2x - 2 = 0$.

$x =$ ..... or $x =$ ..... [3]

BLANK PAGE

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

1257701066

MATHEMATICS **0580/42**

Paper 4 (Extended) **February/March 2020**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Blank pages are indicated.

[Turn over

1 Dhanu has a model railway.

(a) He has a train that consists of a locomotive and 4 coaches.
The mass of the locomotive is 87 g and the mass of each coach is 52 g.

(i) Work out the total mass of the train.

..... g [2]

(ii) Work out the mass of the locomotive as a percentage of the total mass of the train.

..... % [1]

(b) The train is 61 cm long and travels at a speed of 18 cm/s.
It takes 4 seconds for the whole of the train to cross a bridge.

Calculate the length of the bridge.

..... cm [2]

(c) A new locomotive costs $64.

Calculate the cost of the locomotive in rupees when the exchange rate is 1 rupee = $0.0154 .
Give your answer correct to the nearest 10 rupees.

..... rupees [2]

(d) The cost of a railway magazine increases by 12.5% to \$2.70 .

Calculate the cost of the magazine before this increase.

\$ ..... [2]

(e) Dhanu plays with his model railway from 06 50 to 11 15.
He then rides his bicycle for 3 hours.

Find the ratio time playing with model railway : time riding bicycle.
Give your answer in its simplest form.

..... : ..... [3]

(f) The value of Dhanu's model railway is \$550.
This value increases exponentially at a rate of r % per year.
At the end of 5 years the value will be \$736.

Calculate the value of r.

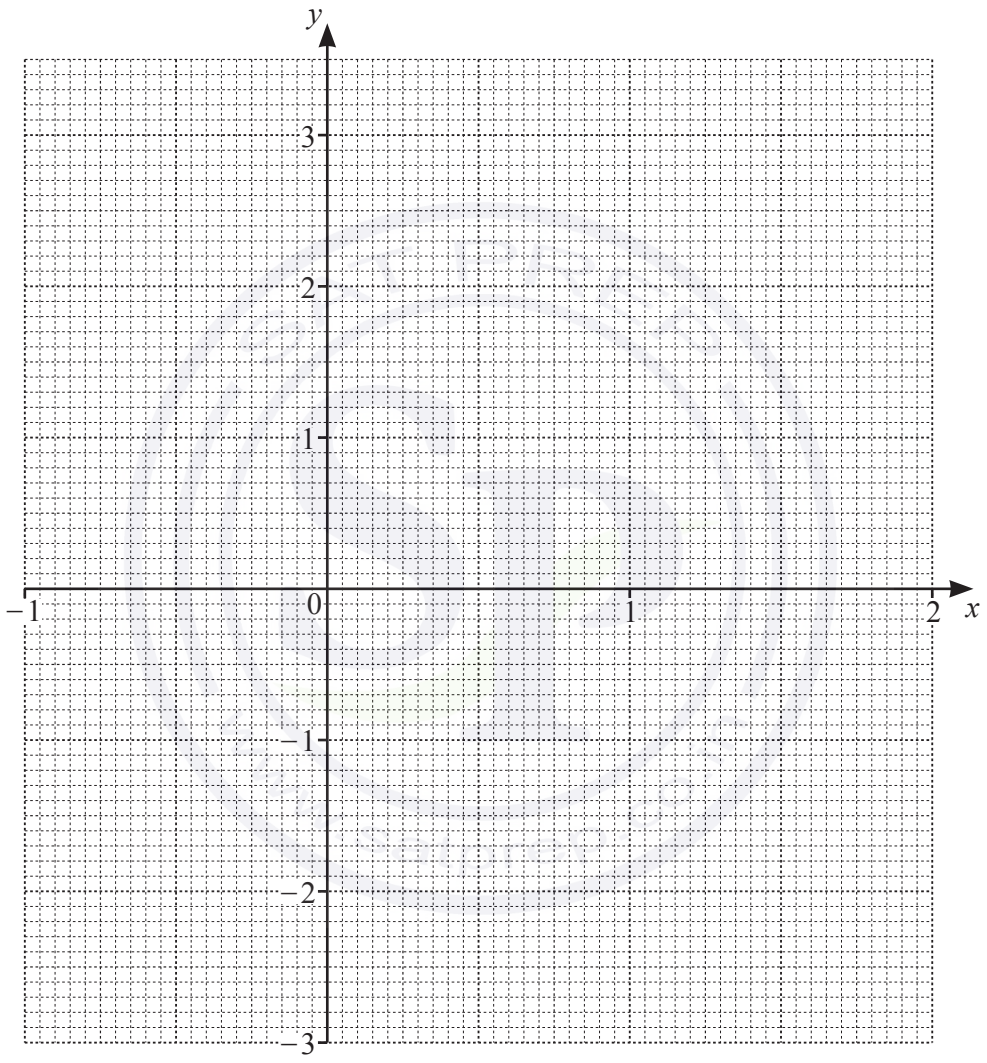
$r =$ ..... [3]

2 **(a)** The table shows some values for $y = 2x^3 - 4x^2 + 3$.

x	-1	-0.5	0	0.5	1	1.5	2
y	-3	1.75				0.75	3

(i) Complete the table. [3]

(ii) On the grid, draw the graph of $y = 2x^3 - 4x^2 + 3$ for $-1 \leqslant x \leqslant 2$.



[4]

(iii) Use your graph to solve the equation $2x^3 - 4x^2 + 3 = 1.5$.

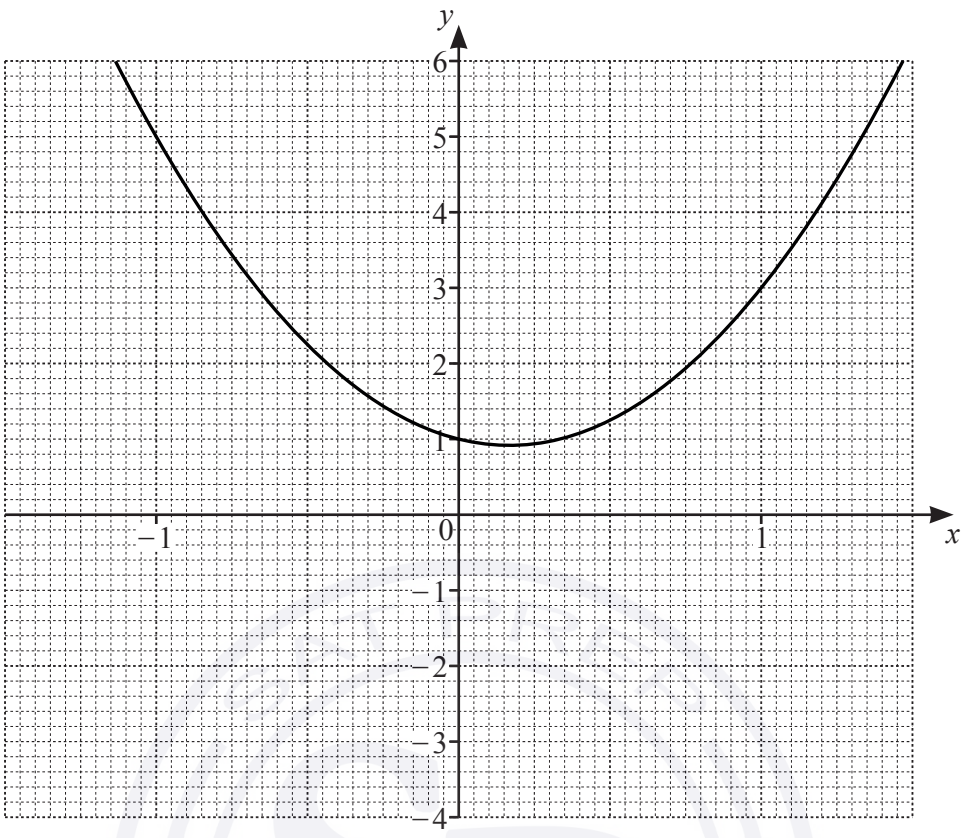
$x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(iv) The equation $2x^3 - 4x^2 + 3 = k$ has only one solution for $-1 \leqslant x \leqslant 2$.

Write down a possible integer value of k.

..... [1]

(b)



(i) On the grid, draw the tangent to the curve at $x = 1$. [1]

(ii) Use your tangent to estimate the gradient of the curve at $x = 1$.

..... [2]

(iii) Write down the equation of your tangent in the form $y = mx + c$.

$y =$ ..... [2]

3 **(a)** Manjeet uses 220 litres of water each day.
She reduces the amount of water she uses by 15%.

Calculate the number of litres of water she now uses each day.

..... litres [2]

(b) Manjeet has two mathematically similar bottles in her bathroom.
The large bottle holds 1.35 litres and is 29.7 cm high.
The small bottle holds 0.4 litres.

Calculate the height of the small bottle.

..... cm [3]

(c) Water from Manjeet's shower flows at a rate of 12 litres per minute.
The water from the shower flows into a tank that is a cuboid of length 90 cm and width 75 cm.

Calculate the increase in the level of water in the tank when the shower is used for 7 minutes.

..... cm [3]

4 A solid metal cone has radius 1.65 cm and slant height 4.70 cm.

(a) Calculate the **total** surface area of the cone.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]

..... cm^2 [2]

(b) Find the angle the slant height makes with the base of the cone.

..... [2]

(c) **(i)** Calculate the volume of the cone.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [4]

(ii) A metal sphere with radius 5 cm is melted down to make cones identical to this one.

Calculate the number of complete identical cones that are made.
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... [4]

[Turn over

5 **(a)** Write as a single fraction in its simplest form.

$$\frac{x+3}{x-3} - \frac{x-2}{x+2}$$

..... [4]

(b) $2^{12} \div 2^{\frac{k}{2}} = 32$

Find the value of k.

$k =$ ..... [2]

(c) Expand and simplify.

$$(y+3)(y-4)(2y-1)$$

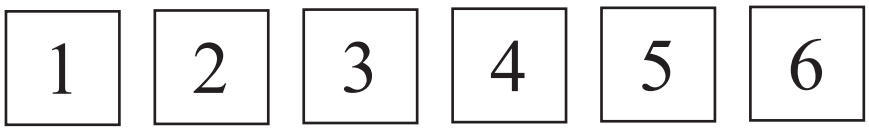
..... [3]

(d) Make x the subject of the formula.

$$x = \frac{3+x}{y}$$

$x =$ ..... [3]

6 Suleika has six cards numbered 1 to 6.



(a) She takes one card at random, records the number and replaces the card.

(i) Write down the probability that the number is 5 or 6.

..... [1]

(ii) Suleika does this 300 times.

Find how many times she expects the number 5 or 6.

..... [1]

(b) Suleika takes two cards at random, without replacement.

(i) Find the probability that the sum of the numbers on the two cards is 5.

..... [3]

(ii) Find the probability that at least one of the numbers on the cards is a square number.

..... [3]

7 **(a)** Naga has n marbles.
Panav has three times as many marbles as Naga.
Naga loses 5 marbles and Panav buys 10 marbles.
Together they now have more than 105 marbles.

Write down and solve an inequality in n.

..... [3]

(b) y is inversely proportional to x^2.
When $x = 4$, $y = 7.5$.

Find y when $x = 5$.

$y =$ ..... [3]

(c) Find the nth term of each sequence.

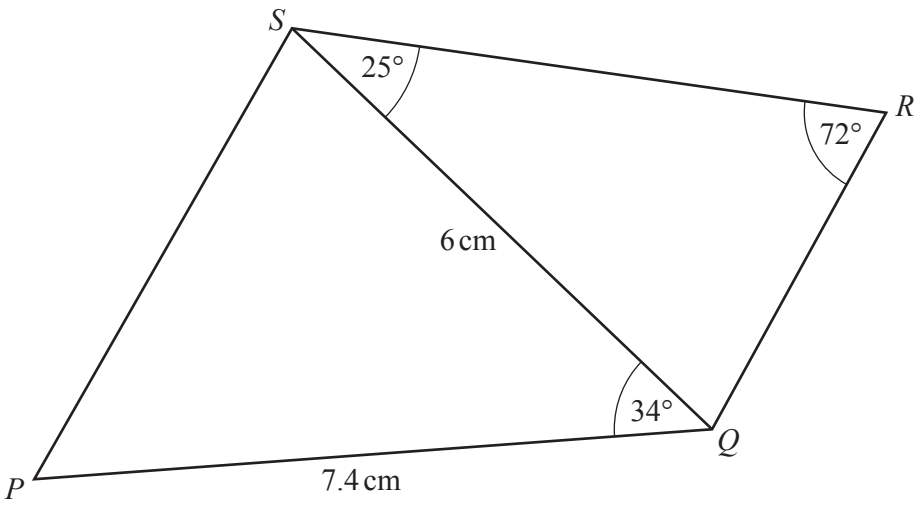
(i) 4 2 0 -2 -4 …

..... [2]

(ii) 1 7 17 31 49 …

..... [2]

8 (a)



NOT TO SCALE

The diagram shows a quadrilateral *PQRS* formed from two triangles, *PQS* and *QRS*.

Calculate

(i) *QR*,

QR = ... cm [3]

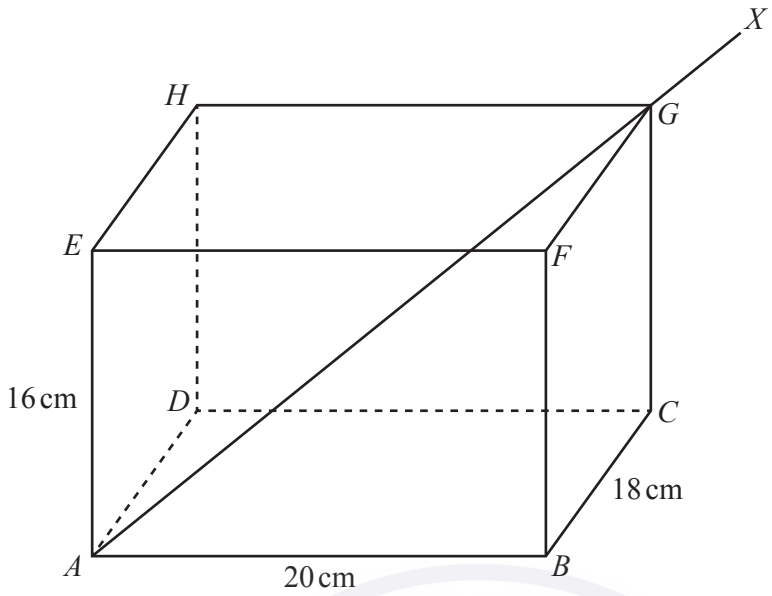
(ii) *PS*,

PS = ... cm [3]

(iii) the area of quadrilateral *PQRS*.

..... cm^2 [4]

(b)



NOT TO SCALE

The diagram shows an open box *ABCDEFGH* in the shape of a cuboid.
$AB = 20$ cm, $BC = 18$ cm and $AE = 16$ cm.
A thin rod *AGX* rests partly in the box as shown.
The rod is 40 cm long.

(i) Calculate *GX*, the length of the rod which is outside the box.

GX = ... cm [4]

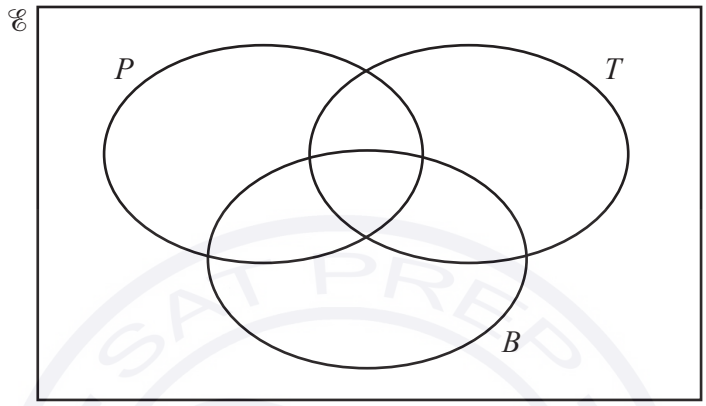
(ii) Calculate the angle the rod makes with the base of the box.

..... [3]

9 This year, 40 students have each travelled by one or more of plane (P), train (T) or boat (B).

7 have travelled only by plane.
11 have travelled only by train.
9 have travelled only by boat.

$n(P \cap T) = 8$
$n(B \cap T) = 3$
$n(B \cap P) = 6$



(a) Complete the Venn diagram. [3]

(b) Find $n\left((P \cup B)'\right)$.

..... [1]

(c) Use set notation to complete the statement.

$(P \cup T \cup B)' =$ ..... [1]

(d) Two students are chosen at random.

Calculate the probability that they both have travelled only by plane.

..... [2]

(e) Two students are chosen at random from those who have travelled by train.

Calculate the probability that they both have also travelled by plane.

..... [2]

10 $f(x) = 4x - 1$ $g(x) = x^2$ $h(x) = 3^{-x}$

(a) Find in its simplest form

(i) $f(x-3)$,

..... [1]

(ii) $g(5x)$.

..... [1]

(b) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(c) Find the value of $hh(1)$, correct to 4 significant figures.

..... [3]

(d) (i) Show that $g(3x-2)-h(-3)$ can be written as $9x^2-12x-23$.

[2]

(ii) Use the quadratic formula to solve $9x^2-12x-23=0$.
Give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

(e) Find x when $f(61) = h(x)$.

$x =$ ..... [2]

11 A curve has equation $y = x^3 - 3x + 4$.

(a) Work out the coordinates of the two stationary points.

(..... , ...)

(..... , ...) [5]

(b) Determine whether each stationary point is a maximum or a minimum.
Give reasons for your answers.

[3]

BLANK PAGE

BLANK PAGE

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

3199992950

MATHEMATICS **0580/41**

Paper 4 (Extended) **October/November 2019**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

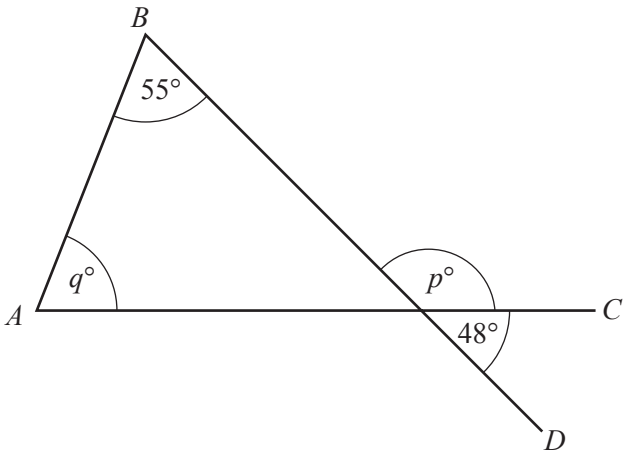
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **16** printed pages.

Cambridge Assessment International Education

[Turn over

1 **(a)**



NOT TO SCALE

In the diagram, AC and BD are straight lines.

Find the value of p and the value of q.

$p =$ .....

$q =$ ..... [3]

(b) The angles of a quadrilateral are $x°$, $(x+5)°$, $(2x-25)°$ and $(x+10)°$.

Find the value of x.

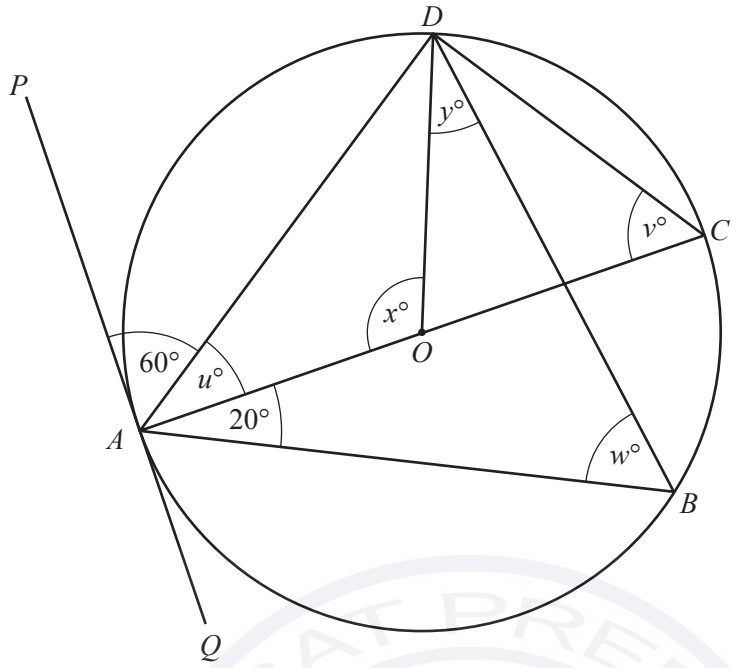
$x =$ ..... [3]

(c) A regular polygon has 72 sides.

Find the size of an interior angle.

..... [3]

(d)



NOT TO SCALE

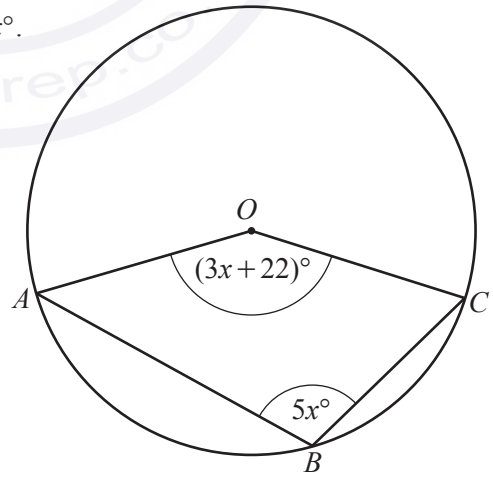
A, B, C and D lie on the circle, centre O, with diameter AC.
PQ is a tangent to the circle at A.
Angle $PAD = 60°$ and angle $BAC = 20°$.

Find the values of u, v, w, x and y.

$u =$ ....., $v =$ ....., $w =$ ....., $x =$ ....., $y =$ ..... [6]

(e) A, B and C lie on the circle, centre O.
Angle $AOC = (3x + 22)°$ and angle $ABC = 5x°$.

Find the value of x.



NOT TO SCALE

$x =$ ..... [4]

2 **(a)** Ali and Mo share a sum of money in the ratio Ali : Mo = 9 : 7.
Ali receives \$600 more than Mo.

Calculate how much each receives.

Ali \$ .....

Mo \$ ..... [3]

(b) In a sale, Ali buys a television for \$195.80 .
The original price was \$220.

Calculate the percentage reduction on the original price.

..... % [3]

(c) In the sale, Mo buys a jacket for \$63.
The original price was reduced by 25%.

Calculate the original price of the jacket.

\$ ..... [3]

3 **(a)** Dina invests \$600 for 5 years at a rate of 2% per year compound interest.

Calculate the value of this investment at the end of the 5 years.

\$ ..... [2]

(b) The value of a gold ring increases exponentially at a rate of 5% per year.
The value is now \$882.

(i) Calculate the value of the ring 2 years ago.

\$ ..... [2]

(ii) Find the number of complete years it takes for the ring's value of \$882 to increase to a value greater than \$1100.

..... [2]

4 **(a)** **(i)** Calculate the **external curved** surface area of a cylinder with radius 8 m and height 19 m.

..... m^2 [2]

(ii) This surface is painted at a cost of \$0.85 per square metre.

Calculate the cost of painting this surface.

\$ ..... [2]

(b) A solid metal sphere with radius 6 cm is melted down and all of the metal is used to make a solid cone with radius 8 cm and height h cm.

(i) Show that $h = 13.5$.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

[2]

(ii) Calculate the slant height of the cone.

..... cm [2]

(iii) Calculate the curved surface area of the cone.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi r l$.]

..... cm^2 [1]

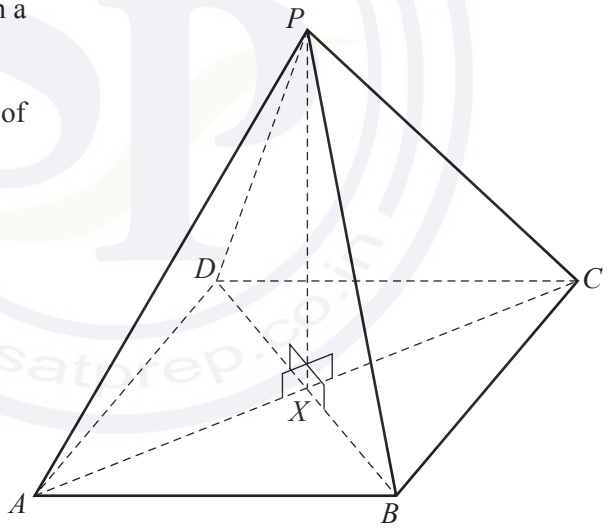
(c) Two cones are mathematically similar.
The total surface area of the smaller cone is $80\,cm^2$.
The total surface area of the larger cone is $180\,cm^2$.
The volume of the smaller cone is $168\,cm^3$.

Calculate the volume of the larger cone.

..... cm^3 [3]

(d) The diagram shows a pyramid with a square base $ABCD$.
$DB = 8\,cm$.
P is vertically above the centre, X, of the base and $PX = 5\,cm$.

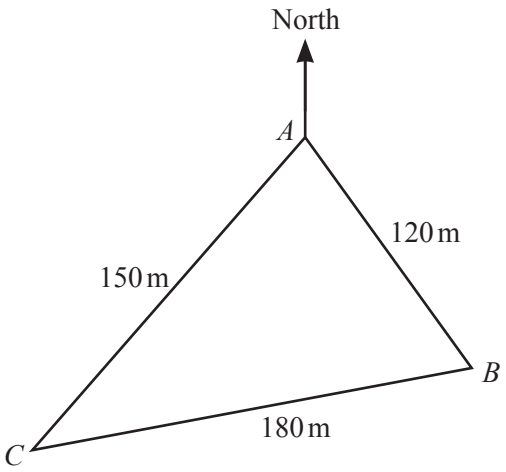
NOT TO SCALE



Calculate the angle between PB and the base $ABCD$.

..... [3]

5



NOT TO SCALE

The diagram shows a triangular field, *ABC*, on horizontal ground.

(a) Olav runs from *A* to *B* at a constant speed of 4 m/s and then from *B* to *C* at a constant speed of 3 m/s. He then runs at a constant speed from *C* to *A*.
His average speed for the whole journey is 3.6 m/s.

Calculate his speed when he runs from *C* to *A*.

..... m/s [3]

(b) Use the cosine rule to find angle *BAC*.

Angle *BAC* = ... [4]

(c) The bearing of C from A is 210°.

(i) Find the bearing of B from A.

..... [1]

(ii) Find the bearing of A from B.

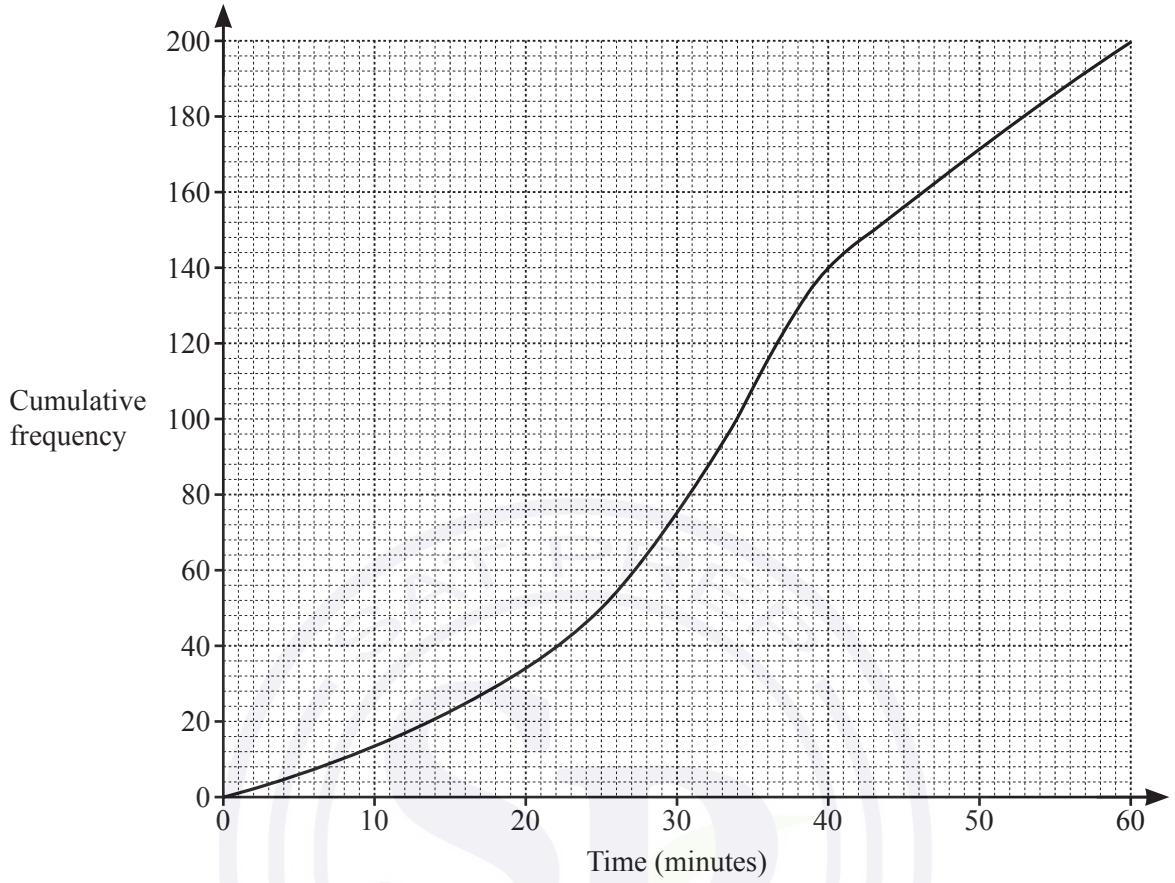
..... [2]

(d) D is the point on AC that is nearest to B.

Calculate the distance from D to A.

..... m [2]

6 **(a)** The cumulative frequency diagram shows information about the times taken by 200 students to solve a problem.



Use the cumulative frequency diagram to find an estimate for

(i) the median, ... min [1]

(ii) the interquartile range,

..... min [2]

(iii) the number of students who took more than 40 minutes.

..... [2]

(b) Roberto records the value of each of the coins he has at home.
The table shows the results.

Value (cents)	1	2	5	10	20	50
Frequency	3	1	3	2	4	2

(i) Find the range. ..... cents [1]

(ii) Find the mode. ..... cents [1]

(iii) Find the median.

..... cents [1]

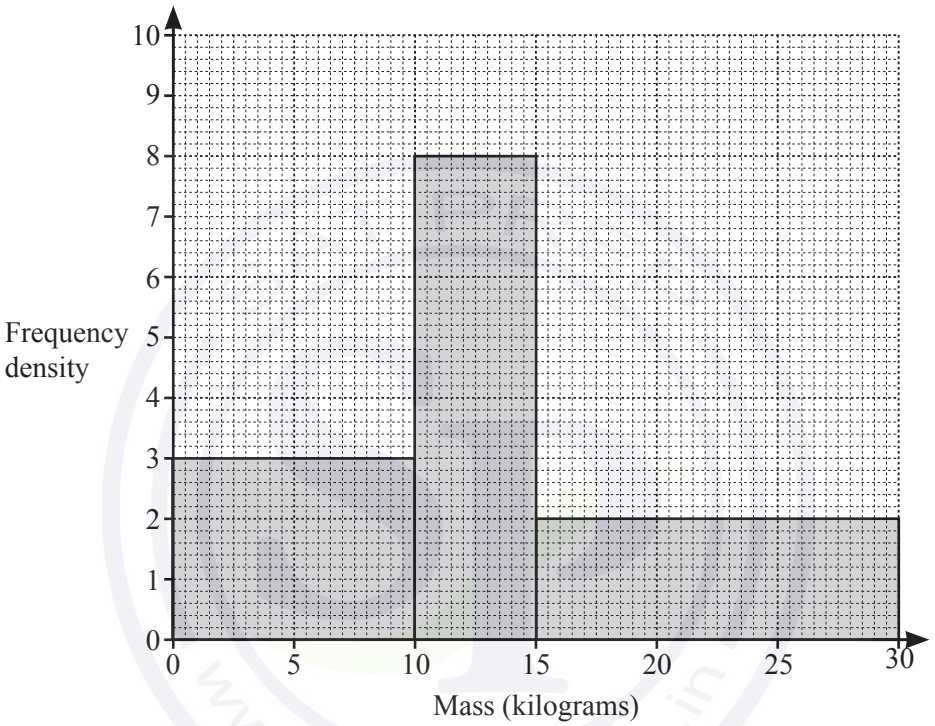
(iv) Work out the total value of Roberto's coins.

..... cents [2]

(v) Work out the mean.

..... cents [1]

(c) The histogram shows information about the masses of 100 boxes.



Calculate an estimate of the mean.

..... kg [6]

7 **(a)** Oranges cost 21 cents each.
Alex buys x oranges and Bobbie buys $(x+2)$ oranges.
The total cost of these oranges is \$4.20 .

Find the value of x.

$x =$ ..... [3]

(b) The cost of one ruler is r cents.
The cost of one protractor is p cents.

The total cost of 5 rulers and 1 protractor is 245 cents.
The total cost of 2 rulers and 3 protractors is 215 cents.

Write down two equations in terms of r and p and solve these equations to find the cost of one protractor.

..... cents [5]

(c) Carol walks 12 km at x km/h and then a further 6 km at $(x-1)$ km/h.
The total time taken is 5 hours.

(i) Write an equation, in terms of x, and show that it simplifies to $5x^2 - 23x + 12 = 0$.

[3]

(ii) Factorise $5x^2 - 23x + 12$.

..... [2]

(iii) Solve the equation $5x^2 - 23x + 12 = 0$.

$x =$ ..... or $x =$ ..... [1]

(iv) Write down Carol's walking speed during the final 6 km.

..... km/h [1]

8

The diagram shows 5 cards.

(a) Donald chooses a card at random.

(i) Write down the probability that the number of dots on this card is an even number.

..... [1]

(ii) Write down the probability that the number of dots on this card is a prime number.

..... [1]

(b) Donald chooses two of the five cards at random, without replacement.
He works out the total number of dots on these two cards.

(i) Find the probability that the total number of dots is 5.

..... [3]

(ii) Find the probability that the total number of dots is an odd number.

..... [3]

9 A car hire company has x small cars and y large cars.
The company has at least 6 cars in total.
The number of large cars is less than or equal to the number of small cars.
The largest number of small cars is 8.

(a) Write down three inequalities, in terms of x and/or y, to show this information.

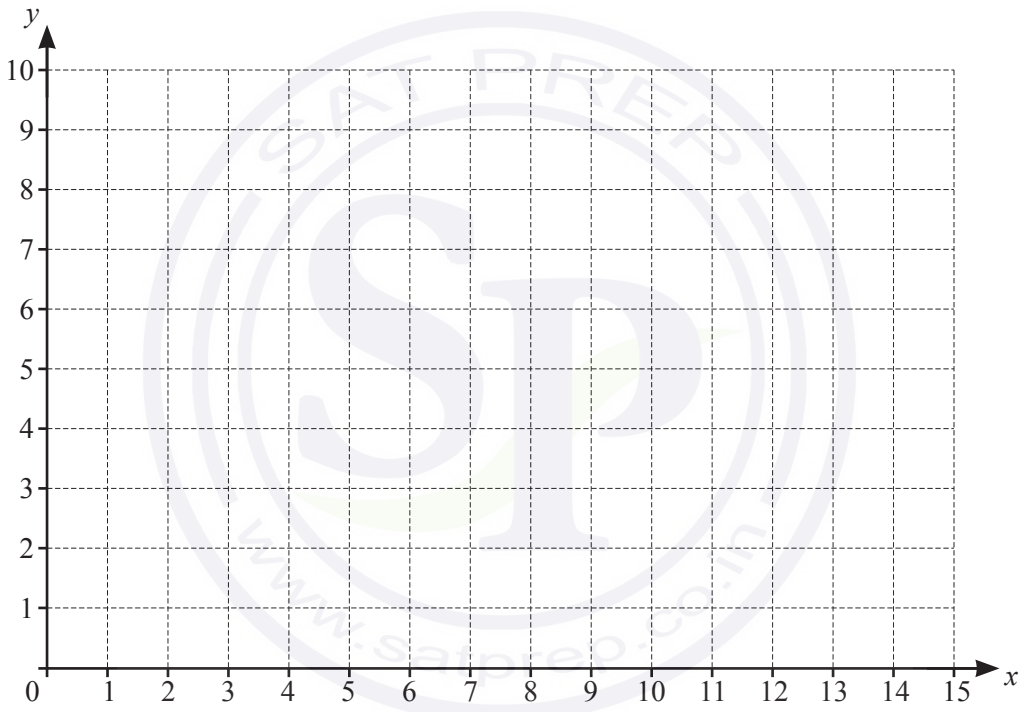
..... , ... , ... [3]

(b) A small car can carry 4 people and a large car can carry 6 people.
One day, the largest number of people to be carried is 60.

Show that $2x + 3y \leqslant 30$.

[1]

(c)



By shading the **unwanted** regions on the grid, show and label the region R that satisfies all four inequalities. [6]

(d) **(i)** Find the number of small cars and the number of large cars needed to carry exactly 60 people.

..... small cars, ... large cars [1]

(ii) When the company uses 7 cars, find the largest number of people that can be carried.

..... [2]

Question 10 is printed on the next page.

10 **(a)** Complete the table for the 5th term and the nth term of each sequence.

1st term	2nd term	3rd term	4th term	5th term		nth term
9	5	1	−3			
4	9	16	25			
1	8	27	64			
8	16	32	64			

[11]

(b) 0, 1, 1, 2, 3, 5, 8, 13, 21, …

This sequence is a Fibonacci sequence.
After the first two terms, the rule to find the next term is "add the two previous terms".
For example, $5 + 8 = 13$.

Use this rule to complete each of the following Fibonacci sequences.

2 4 ....

1 11

..... −1 1

[3]

(c) $\frac{1}{3}$, $\frac{3}{4}$, $\frac{4}{7}$, $\frac{7}{11}$, $\frac{11}{18}$, …

(i) One term of this sequence is $\frac{p}{q}$.

Find, in terms of p and q, the next term in this sequence.

..... [1]

(ii) Find the 6th term of this sequence.

..... [1]

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

1512289387

MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2019**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **18** printed pages and **2** blank pages.

1 **(a)** Mohsin has 600 pear trees and 720 apple trees on his farm.

(i) Write the ratio pear trees : apple trees in its simplest form.

..... : ..... [1]

(ii) Each apple tree produces 16 boxes of apples each year.
One box contains 18 kg of apples.

Calculate the total mass of apples produced by the 720 trees in one year.
Give your answer in standard form.

..... kg [3]

(b) **(i)** One week, the total mass of pears picked was 18 540 kg.
For this week, the ratio mass of apples : mass of pears = 13 : 9.

Find the mass of apples picked that week.

..... kg [2]

(ii) The apples cost Mohsin $0.85 per kilogram to produce.
He sells them at a profit of 60%.

Work out the selling price per kilogram of the apples.

$ ..... [2]

(c) Mohsin exports some of his pears to a shop in Belgium.
The shop buys the pears at \$1.50 per kilogram.
The shop sells the pears for 2.30 euros per kilogram.
The exchange rate is \$1 = 0.92 euros.

Calculate the percentage profit per kilogram made by the shop.

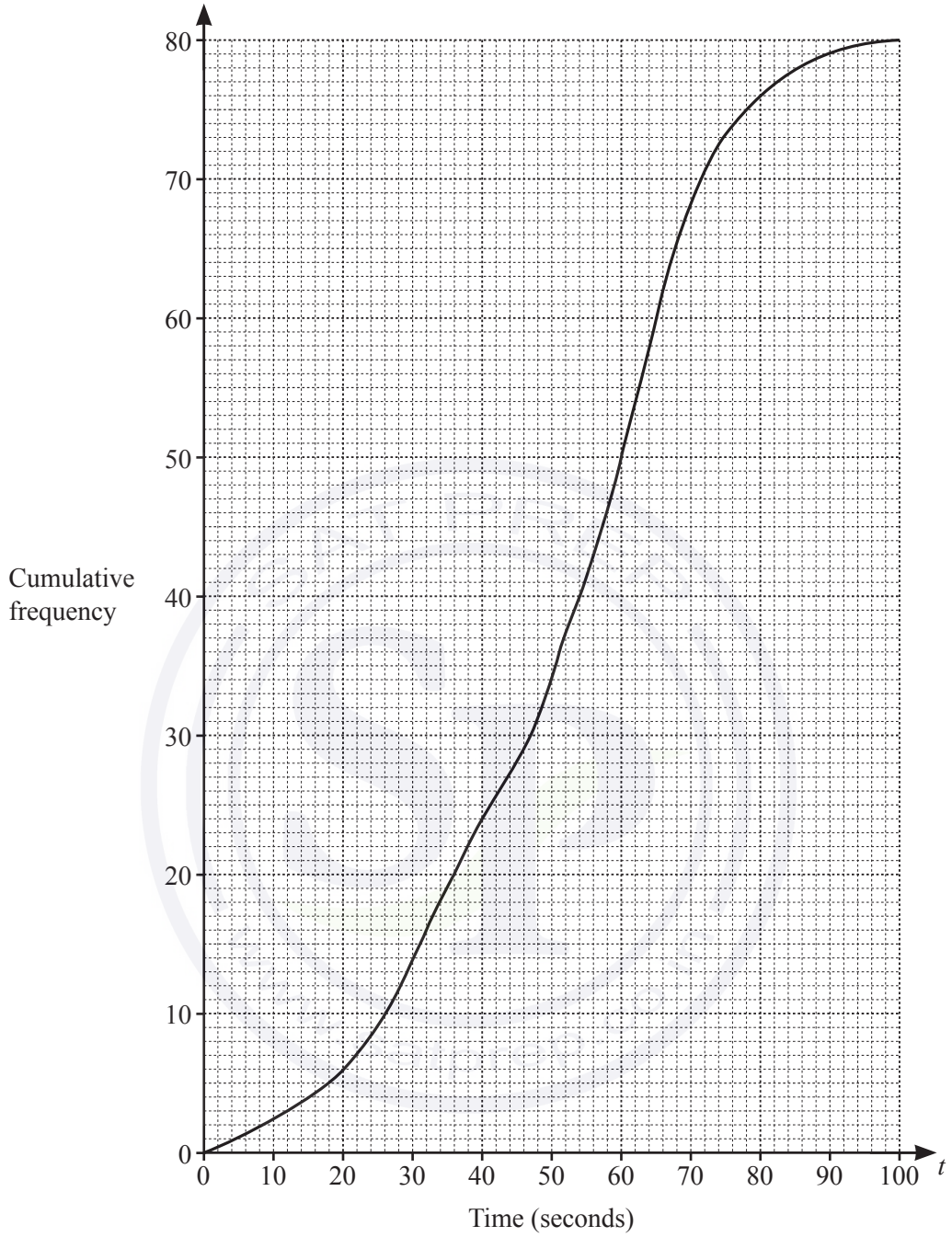
..... % [5]

(d) Mohsin's earnings increase exponentially at a rate of 8.7% each year.
During 2018 he earned \$195 600.

During 2027, how much **more** does he earn than during 2018?

\$ ..... [3]

2 The cumulative frequency diagram shows information about the time taken, t seconds, for a group of girls to each solve a maths problem.



(a) Use the cumulative frequency diagram to find an estimate for

(i) the median,

..... s [1]

(ii) the interquartile range,

..... s [2]

(iii) the 20th percentile,

..... s [1]

(iv) the number of girls who took more than 66 seconds to solve the problem.

..... [2]

(b) (i) Use the cumulative frequency diagram to complete the frequency table.

Time (t seconds)	$0 < t \leqslant 20$	$20 < t \leqslant 40$	$40 < t \leqslant 60$	$60 < t \leqslant 80$	$80 < t \leqslant 100$
Frequency	6				4

[2]

(ii) Calculate an estimate of the mean time.

..... s [4]

(c) A group of boys solved the same problem.
The boys had a median time of 60 seconds, a lower quartile of 46 seconds and an upper quartile of 66 seconds.

(i) Write down the percentage of boys with a time of 66 seconds or less.

..... % [1]

(ii) Howard says

The boys' times vary more than the girls' times.

Explain why Howard is incorrect.

.....

..... [2]

3 A line joins A (1, 3) to B (5, 8).

(a) **(i)** Find the midpoint of AB.

(..... , ...) [2]

(ii) Find the equation of the line AB.
Give your answer in the form $y = mx + c$.

$y =$ ..... [3]

(b) The line AB is transformed to the line PQ.

Find the co-ordinates of P and the co-ordinates of Q after AB is transformed by

(i) a translation by the vector $\begin{pmatrix} 5 \\ -2 \end{pmatrix}$,

P (..... , ...)

Q (..... , ...) [2]

(ii) a rotation through 90° anticlockwise about the origin,

P (..... , ...)

Q (..... , ...) [2]

(iii) a reflection in the line $x = 2$,

P (..... , ...)

Q (..... , ...) [2]

(iv) a transformation by the matrix $\begin{pmatrix} -1 & 2 \\ 0 & -1 \end{pmatrix}$.

P (..... , ...)

Q (..... , ...) [2]

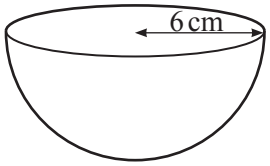
(c) Describe fully the **single** transformation that maps the line AB onto the line PQ where P is the point $(-2, -6)$ and Q is the point $(-10, -16)$.

.....

..... [3]

4 **(a)**

NOT TO SCALE



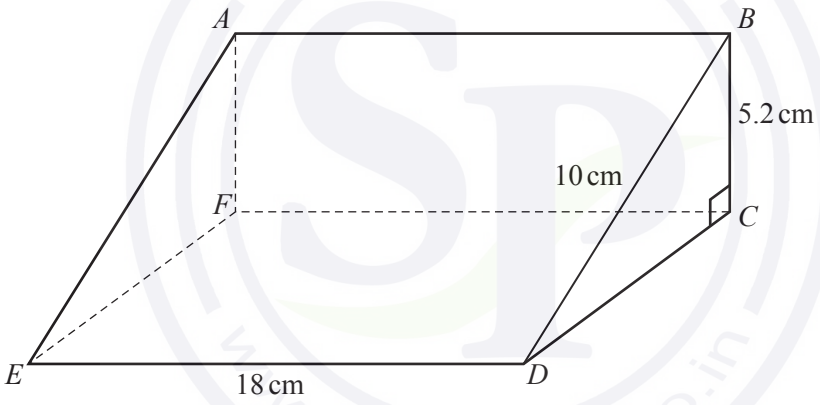
The diagram shows a hemisphere with radius 6 cm.

Calculate the volume.
Give the units of your answer.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

.... [3]

(b)



NOT TO SCALE

The diagram shows a prism $ABCDEF$.
The cross-section is a right-angled triangle BCD.
$BD = 10$ cm, $BC = 5.2$ cm and $ED = 18$ cm.

(i) **(a)** Work out the volume of the prism.

..... cm^3 [6]

(b) Calculate angle *BEC*.

Angle *BEC* = ... [4]

(ii) The point *G* lies on the line *ED* and *GD* = 7 cm.

Work out angle *BGE*.

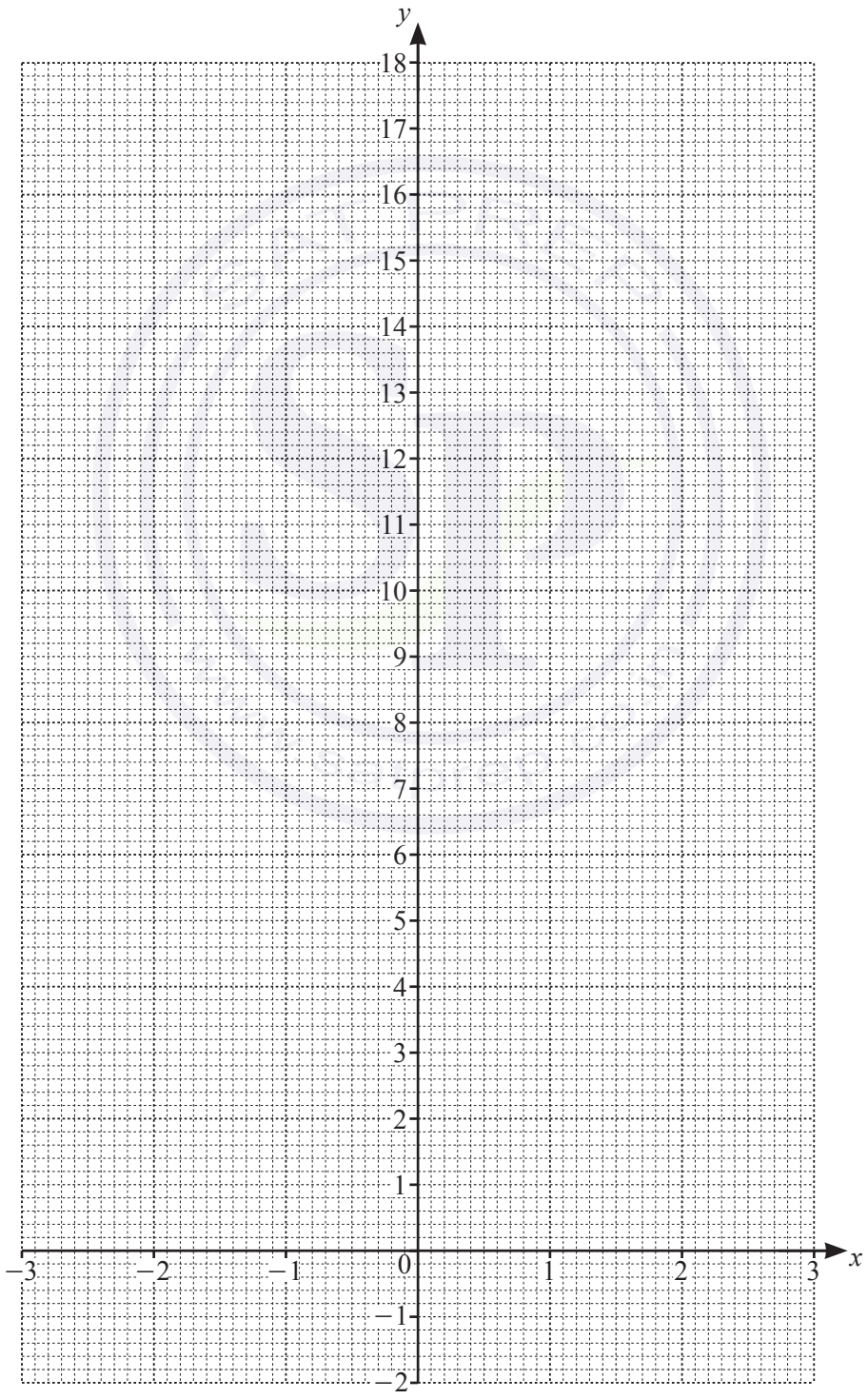
Angle *BGE* = ... [3]

5 The table shows some values of $y = \frac{x^2}{2} + \frac{1}{x^2} - \frac{2}{x}$, $x \neq 0$.

x	−3	−2	−1	−0.5	−0.3		0.2	0.3	0.5	1	2	3
y	5.3	3.3		8.1	17.8			4.5	0.1	−0.5	1.3	

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = \frac{x^2}{2} + \frac{1}{x^2} - \frac{2}{x}$ for $-3 \leqslant x \leqslant -0.3$ and $0.2 \leqslant x \leqslant 3$.



[5]

(c) Use your graph to solve $\frac{x^2}{2}+\frac{1}{x^2}-\frac{2}{x}\leqslant 0$.

..... $\leqslant x \leqslant$ ..... [2]

(d) Find the smallest positive integer value of k for which $\frac{x^2}{2}+\frac{1}{x^2}-\frac{2}{x}=k$ has two solutions for $-3\leqslant x\leqslant -0.3$ and $0.2\leqslant x\leqslant 3$.

..... [1]

(e) **(i)** By drawing a suitable straight line, solve $\frac{x^2}{2}+\frac{1}{x^2}-\frac{2}{x}=3x+1$ for $-3\leqslant x\leqslant -0.3$ and $0.2\leqslant x\leqslant 3$.

$x =$ ..... [3]

(ii) The equation $\frac{x^2}{2}+\frac{1}{x^2}-\frac{2}{x}=3x+1$ can be written as $x^4+ax^3+bx^2+cx+2=0$.

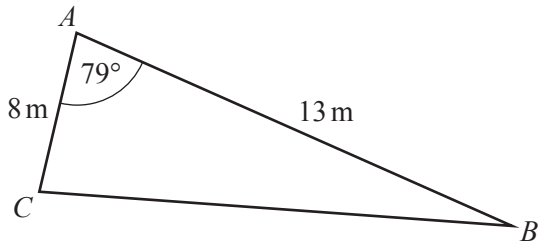
Find the values of a, b and c.

$a =$ .....

$b =$ .....

$c =$ ..... [3]

6 (a)



NOT TO SCALE

The diagram shows triangle ABC.

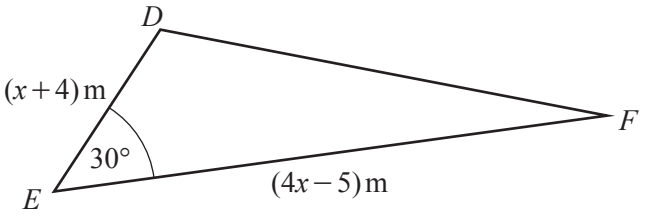
(i) Use the cosine rule to calculate BC.

$BC =$ ..... m [4]

(ii) Use the sine rule to calculate angle ACB.

Angle $ACB =$ ..... [3]

(b)



NOT TO SCALE

The area of triangle DEF is $70\,m^2$.

(i) Show that $4x^2 + 11x - 300 = 0$.

[4]

(ii) Use the quadratic formula to solve $4x^2 + 11x - 300 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

(iii) Find the length of DE.

$DE =$ ..... m [1]

7 $f(x) = 7 - 2x$ $g(x) = \frac{10}{x}$, $x \neq 0$ $h(x) = 27^x$

(a) Find

(i) $f(-3)$,

..... [1]

(ii) $hg(30)$,

..... [2]

(iii) $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(b) Solve.

$g(2x+1) = 4$

$x =$ ..... [3]

(c) Simplify, giving your answer as a single fraction.

$$\frac{1}{\mathrm{f}(x)} + \mathrm{g}(x)$$

..... [3]

(d) Find $\mathrm{h}^{-1}(19\,683)$.

..... [1]

8 **(a)** Make p the subject of

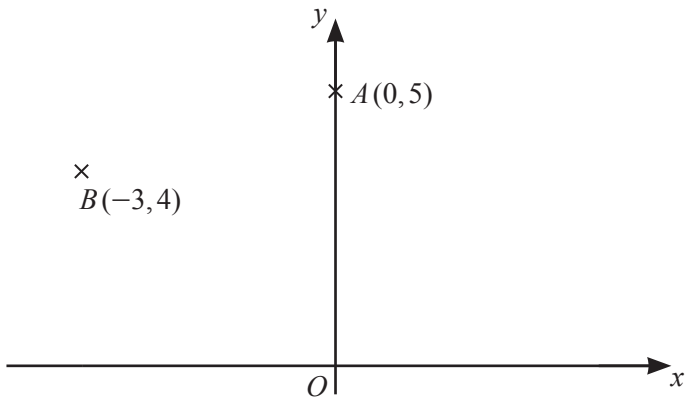
(i) $5p + 7 = m$,

$p =$ ..... [2]

(ii) $y^2 - 2p^2 = h$.

$p =$ ..... [3]

(b)



NOT TO SCALE

(i) Write $\overrightarrow{OA}$ as a column vector.

$\overrightarrow{OA} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(ii) Write $\overrightarrow{AB}$ as a column vector.

$\overrightarrow{AB} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(iii) A and B lie on a circle, centre O.

Calculate the length of the arc AB.

..... [6]

9 Car *A* and car *B* take part in a race around a circular track.
One lap of the track measures 7.6 km.

Car *A* takes 2 minutes and 40 seconds to complete each lap of the track.
Car *B* takes 2 minutes and 25 seconds to complete each lap of the track.
Both cars travel at a constant speed.

(a) Calculate the speed of car *A*.
Give your answer in kilometres per hour.

..... km/h [3]

(b) Both cars start the race from the same position, *S*, at the same time.

(i) Find the time taken when both car *A* and car *B* are next at position *S* **at the same time**.
Give your answer in minutes and seconds.

..... min ..... s [4]

(ii) Find the distance that car *A* has travelled at this time.

..... km [2]

BLANK PAGE

BLANK PAGE

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

7321613180

MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2019**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

1 **(a)** In a cycling club, the number of members are in the ratio males : females = 8 : 3.
The club has 342 females.

(i) Find the total number of members.

..... [2]

(ii) Find the percentage of the total number of members that are female.

..... % [1]

(b) The price of a bicycle is $1020.
Club members receive a 15% discount on this price.

Find how much a club member pays for this bicycle.

$ ..... [2]

(c) In 2019, the membership fee of the cycling club is $79.50 .
This is 6% more than last year.

Find the **increase** in the cost of the membership.

$ ..... [3]

(d) Asif cycles a distance of 105 km.
On the first part of his journey he cycles 60 km in 2 hours 24 minutes.
On the second part of his journey he cycles 45 km at 20 km/h.

Find his average speed for the whole journey.

..... km/h [4]

(e) Bryan invested $480 in an account 4 years ago.
The account pays compound interest at a rate of 2.1% per year.
Today, he uses some of the money in this account to buy a bicycle costing $430.

Calculate how much money remains in his account.

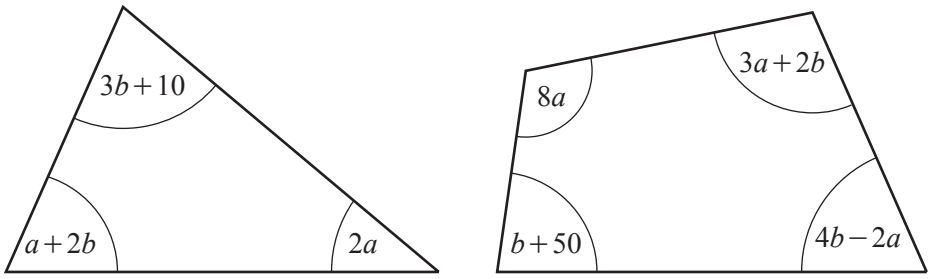
$ ..... [3]

(f) The formula $s = \frac{1}{2}at^2$ is used to calculate the distance, s, travelled by a bicycle.

When $a = 3$ and $t = 10$, each correct to the nearest integer, calculate the lower bound of the distance, s.

..... [2]

2 **(a)** The diagram shows a triangle and a quadrilateral.
All angles are in degrees.



NOT TO SCALE

(i) For the triangle, show that $3a + 5b = 170$.

[1]

(ii) For the quadrilateral, show that $9a + 7b = 310$.

[1]

(iii) Solve these simultaneous equations.
Show all your working.

$a =$ .....

$b =$ ..... [3]

(iv) Find the size of the smallest angle in the triangle.

..... [1]

(b) Solve the equation $6x - 3 = -12$.

$x =$ ..... [2]

(c) Rearrange $2(4x - y) = 5x - 3$ to make y the subject.

$y =$ ..... [3]

(d) Simplify.

$(27x^9)^{\frac{2}{3}}$

..... [2]

(e) Simplify.

$\dfrac{x^2 + 5x}{x^2 - 25}$

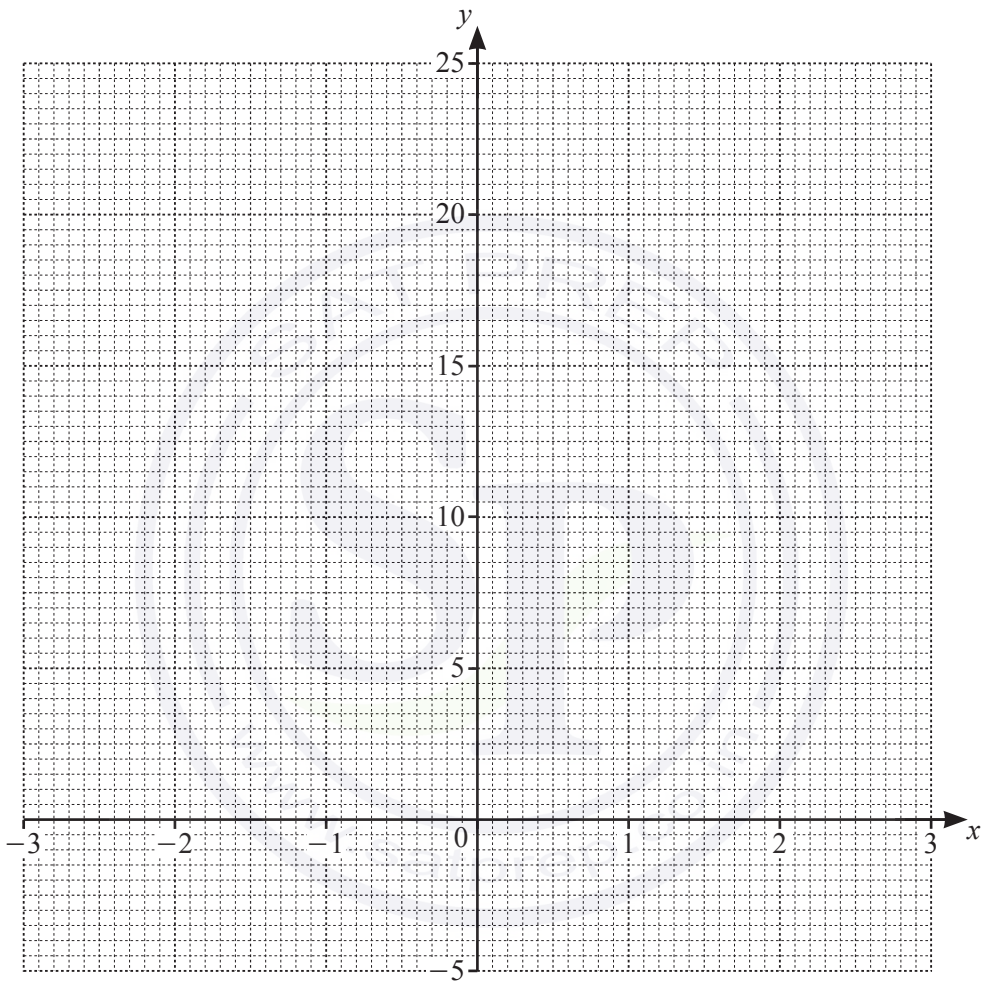
..... [3]

3 The table shows some values for $y = x^3 + x^2 - 5x$.

x	-3	-2	-1.5	-1	0	1	1.5	2	2.5	3
y	-3	6	6.4		0		-1.9	2	9.4	

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = x^3 + x^2 - 5x$ for $-3 \leqslant x \leqslant 3$.



[4]

(c) Use your graph to solve the equation $x^3 + x^2 - 5x = 0$.

$x =$ ..... or $x =$ ..... or $x =$ ..... [2]

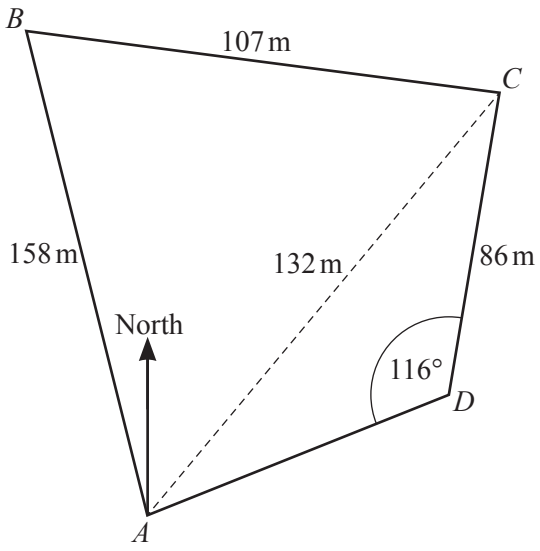
(d) By drawing a suitable tangent, find an estimate of the gradient of the curve at $x = 2$.

..... [3]

(e) Write down the largest value of the integer, k, so that the equation $x^3 + x^2 - 5x = k$ has three solutions for $-3 \leqslant x \leqslant 3$.

$k =$ ..... [1]

4



NOT TO SCALE

The diagram shows a field, *ABCD*, on horizontal ground.

(a) There is a vertical post at *C*.
From *B*, the angle of elevation of the top of the post is 19°.

Find the height of the post.

..... m [2]

(b) Use the cosine rule to find angle *BAC*.

Angle *BAC* = ... [4]

(c) Use the sine rule to find angle *CAD*.

Angle *CAD* = ... [3]

(d) Calculate the area of the field.

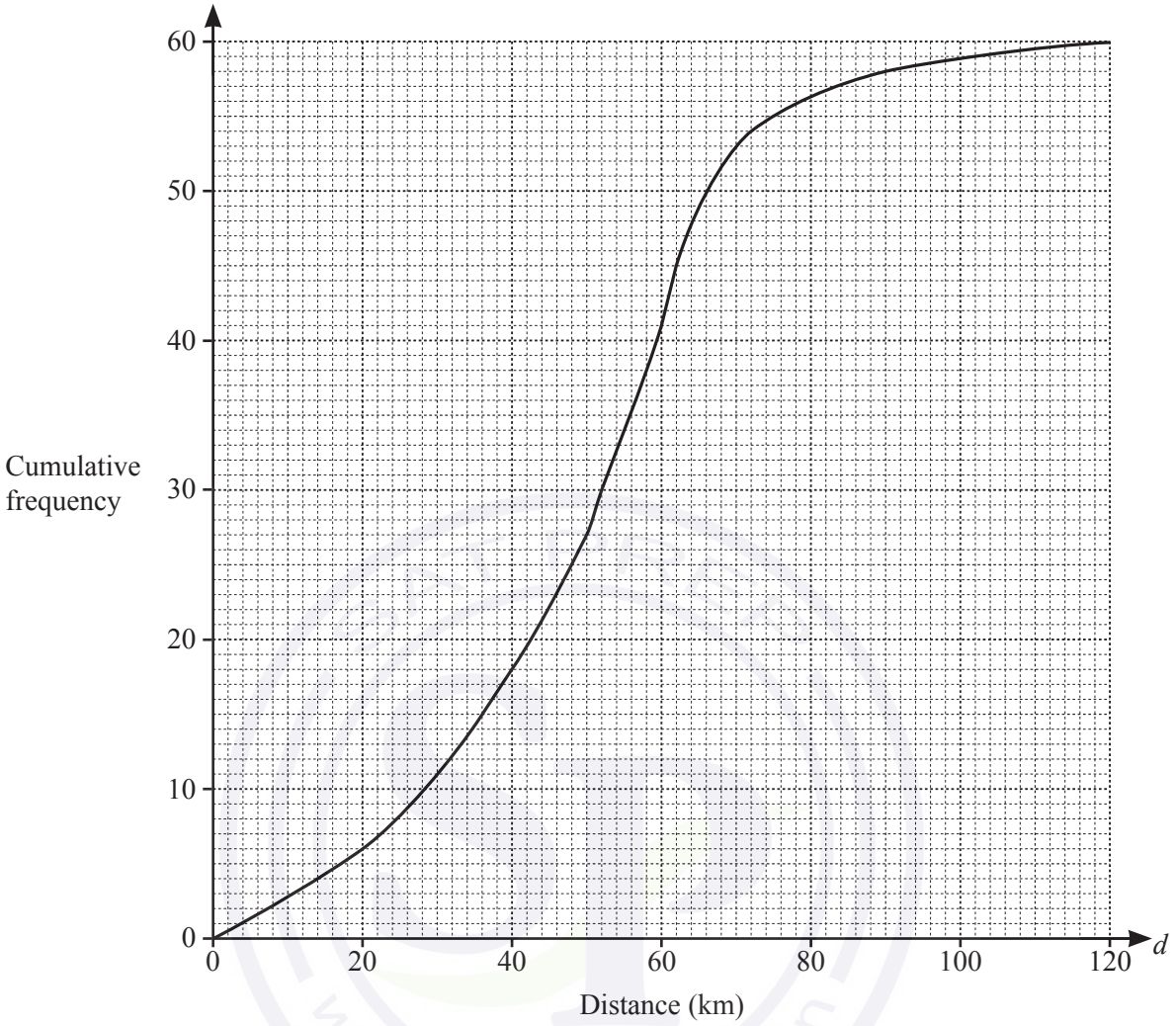
..... m^2 [3]

(e) The bearing of *D* from *A* is 070°.

Find the bearing of *A* from *C*.

..... [2]

5 The cumulative frequency diagram shows information about the distance, d km, travelled by each of 60 male cyclists in one weekend.



(a) Use the cumulative frequency diagram to find an estimate of

(i) the median,

..... km [1]

(ii) the lower quartile,

..... km [1]

(iii) the interquartile range.

..... km [1]

(b) For the same weekend, the interquartile range for the distances travelled by a group of female cyclists is 40 km.

Make one comment comparing the distribution of the distances travelled by the males with the distribution of the distances travelled by the females.

.....

..... [1]

(c) A male cyclist is chosen at random.

Find the probability that he travelled more than 50 km.

..... [2]

(d) **(i)** Use the cumulative frequency diagram to complete this frequency table.

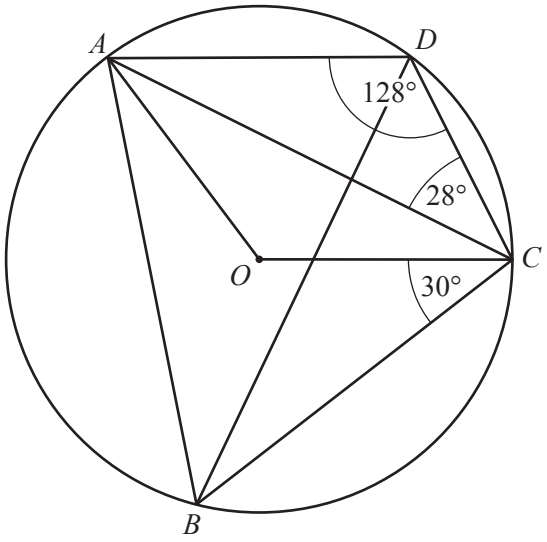
Distance (d km)	Number of male cyclists
$0 < d \leqslant 40$	18
$40 < d \leqslant 50$	9
$50 < d \leqslant 60$	
$60 < d \leqslant 70$	
$70 < d \leqslant 90$	
$90 < d \leqslant 120$	2

[2]

(ii) Calculate an estimate of the mean distance travelled.

..... km [4]

6 (a)



NOT TO SCALE

In the diagram, A, B, C and D lie on the circle, centre O.
Angle $ADC = 128°$, angle $ACD = 28°$ and angle $BCO = 30°$.

(i) Show that obtuse angle $AOC = 104°$.
Give a reason for each step of your working.

[3]

(ii) Find angle BAO.

Angle $BAO =$ ..... [2]

(iii) Find angle ABD.

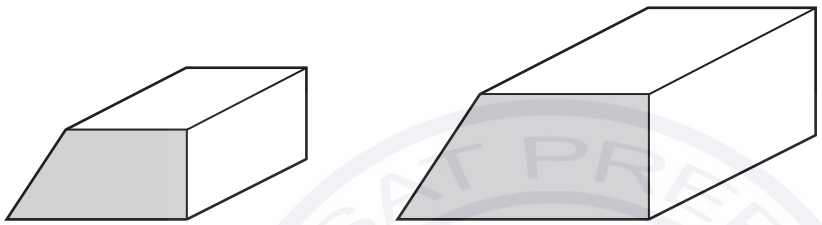
Angle $ABD =$ ..... [1]

(iv) The radius, OC, of the circle is 9.6 cm.

Calculate the total perimeter of the sector $OADC$.

..... cm [3]

(b)



NOT TO SCALE

The diagram shows two mathematically similar solid metal prisms.
The volume of the smaller prism is 648 cm^3 and the volume of the larger prism is 2187 cm^3.
The area of the cross-section of the smaller prism is 36 cm^2.

(i) Calculate the area of the cross-section of the larger prism.

..... cm^2 [3]

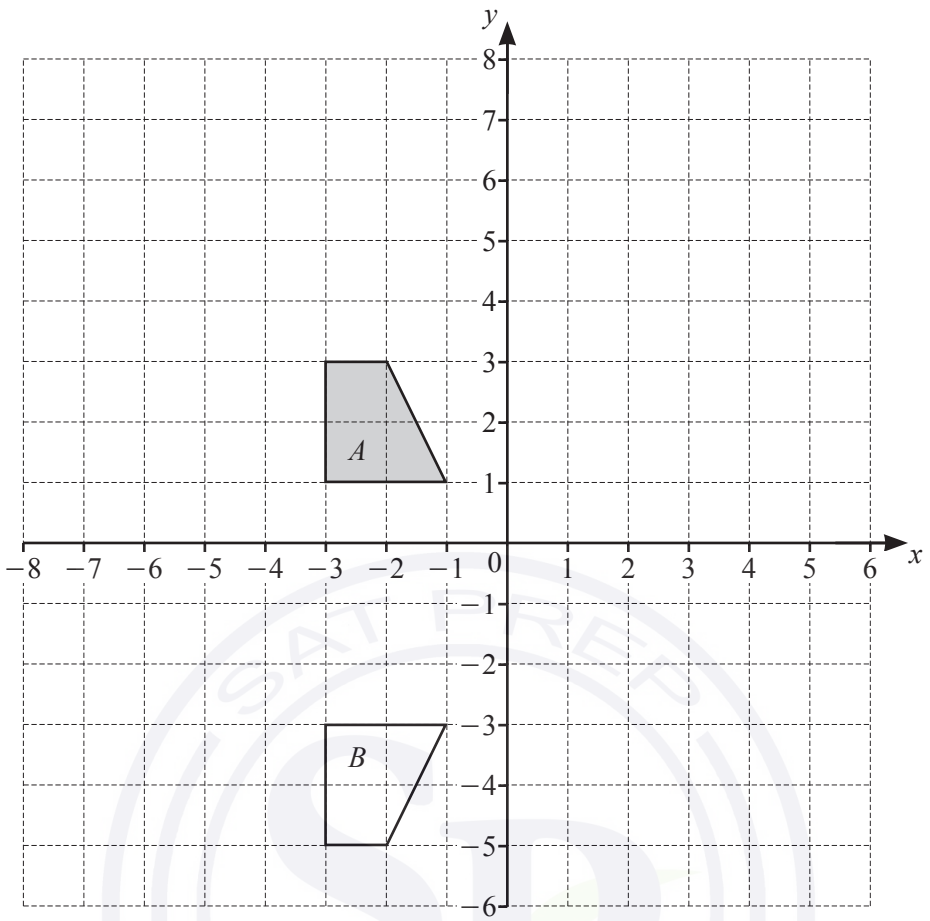
(ii) The larger prism is melted down into a sphere.

Calculate the radius of the sphere.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm [3]

7



(a) Describe fully the **single** transformation that maps shape *A* onto shape *B*.

.....

..... [2]

(b) On the grid, draw the image of

(i) shape *A* after a translation by the vector $\begin{pmatrix} -3 \\ 4 \end{pmatrix}$, [2]

(ii) shape *A* after a rotation through 180° about (0, 0), [2]

(iii) shape *A* after an enlargement, scale factor 2, centre (−7, 0). [2]

8 **(a)** A bag contains 4 red marbles and 2 yellow marbles.
Behnaz picks two marbles at random without replacement.

Find the probability that

(i) the marbles are both red,

..... [2]

(ii) the marbles are not both red.

..... [1]

(b) Another bag contains 5 blue marbles and 2 green marbles.
Bryn picks one marble at random without replacement.
If this marble is not green, he picks another marble at random without replacement.
He continues until he picks a green marble.

Find the probability that he picks a green marble on his first, second or third attempt.

..... [4]

9 $f(x) = 2x - 3$ $g(x) = 9 - x^2$ $h(x) = 3^x$

(a) Find

(i) $f(4)$,

..... [1]

(ii) $hg(3)$,

..... [2]

(iii) $g(2x)$ in its simplest form,

..... [1]

(iv) $fg(x)$ in its simplest form.

..... [2]

(b) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(c) Find x when $5f(x) = 3$.

$x =$ ..... [2]

(d) Solve the equation $\mathrm{gf}(x) = -16$.

$x =$ ..... or $x =$ ..... [4]

(e) Find x when $\mathrm{h}^{-1}(x) = -2$.

$x =$ ..... [1]

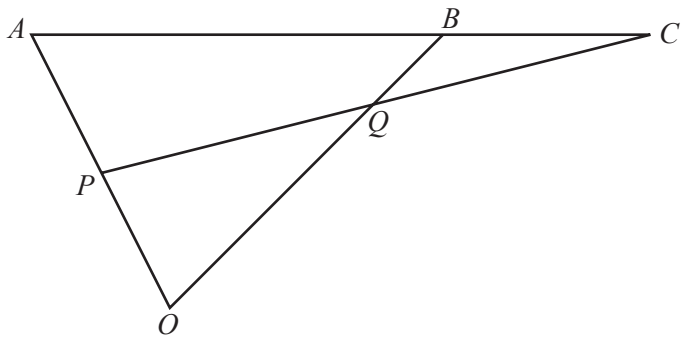
10 Solve.

$$\frac{1}{x} - \frac{2}{x+1} = 3$$

Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [7]

11



NOT TO SCALE

OAB is a triangle and ABC and PQC are straight lines.
P is the midpoint of OA, Q is the midpoint of PC and $OQ : QB = 3 : 1$.
$\overrightarrow{OA} = 4\mathbf{a}$ and $\overrightarrow{OB} = 8\mathbf{b}$.

(a) Find, in terms of **a** and/or **b**, in its simplest form

(i) $\overrightarrow{AB}$,

$\overrightarrow{AB} =$ ..... [1]

(ii) $\overrightarrow{OQ}$,

$\overrightarrow{OQ} =$ ..... [1]

(iii) $\overrightarrow{PQ}$.

$\overrightarrow{PQ} =$ ..... [1]

(b) By using vectors, find the ratio $AB : BC$.

..... : ..... [3]

BLANK PAGE

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

1402528913

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2019**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

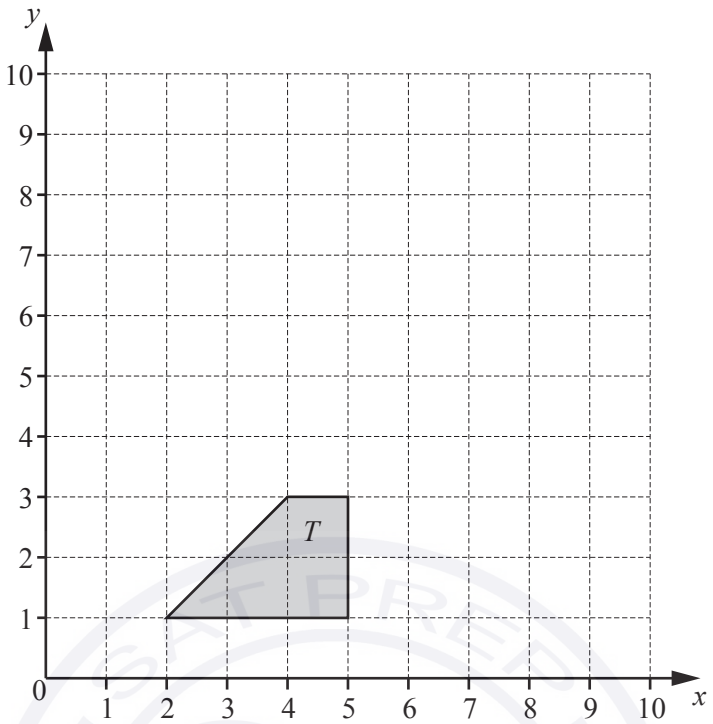
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **16** printed pages.

Cambridge Assessment International Education

[Turn over

1



(a) (i) Translate shape T by the vector $\begin{pmatrix} -1 \\ 6 \end{pmatrix}$.

Label the image A. [2]

(ii) Rotate shape T about the point (5, 3) through 180°.
Label the image B. [2]

(iii) Describe fully the **single** transformation that maps shape A onto shape B.

.....

..... [3]

(b) (i) Reflect shape T in the line $y = x$. [2]

(ii) Find the matrix that represents the transformation in **part (b)(i)**.

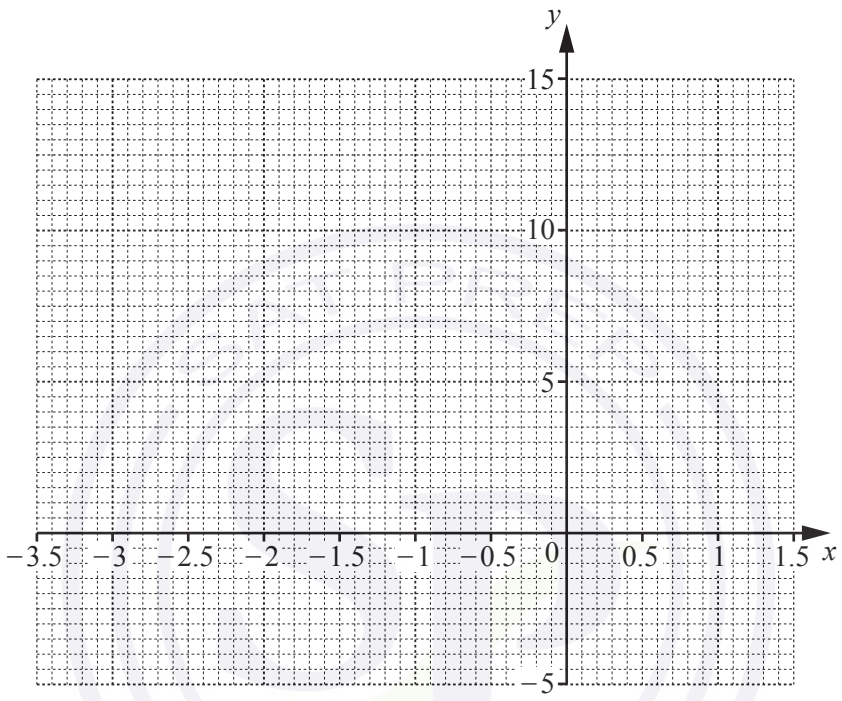
$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

2 The table shows some values for $y = x^3 + 3x^2 + 2$.

x	−3.5	−3	−2.5	−2	−1.5	−1	−0.5	0	0.5	1	1.5
y	−4.1		5.1	6	5.4	4	2.6		2.9		12.1

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = x^3 + 3x^2 + 2$ for $-3.5 \leqslant x \leqslant 1.5$.



[4]

(c) Use your graph to solve the equation $x^3 + 3x^2 + 2 = 0$ for $-3.5 \leqslant x \leqslant 1.5$.

$x =$ ..... [1]

(d) By drawing a suitable straight line, solve the equation $x^3 + 3x^2 + 2x + 2 = 0$ for $-3.5 \leqslant x \leqslant 1.5$.

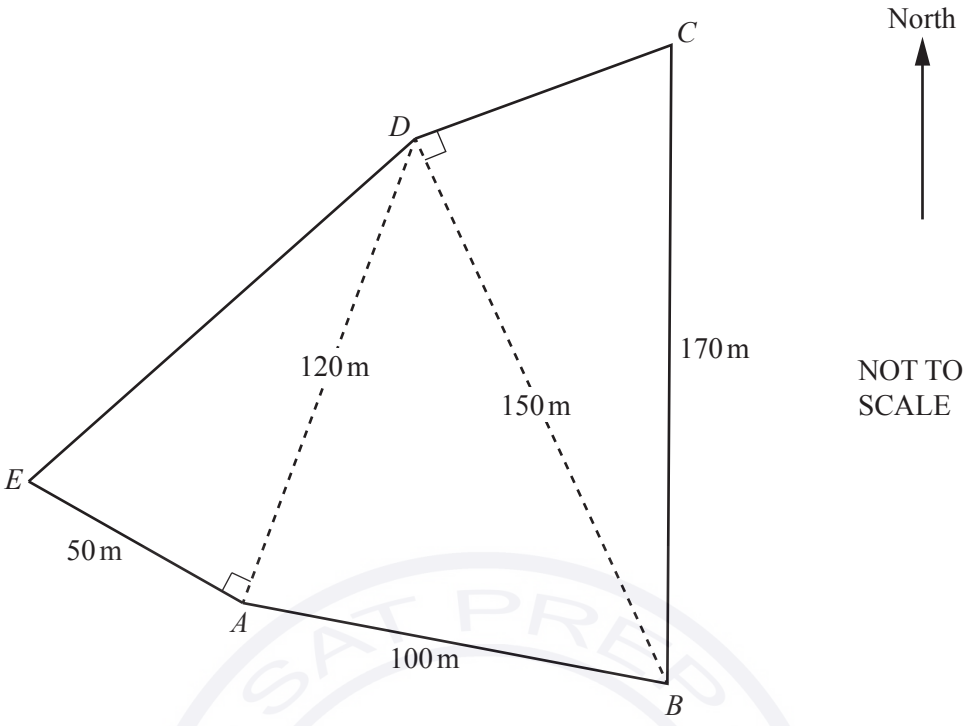
$x =$ ..... [2]

(e) For $-3.5 \leqslant x \leqslant 1.5$, the equation $x^3 + 3x^2 + 2 = k$ has three solutions and k is an integer.

Write down a possible value of k.

$k =$ ..... [1]

3



The diagram shows a field *ABCDE*.

(a) Calculate the perimeter of the field *ABCDE*.

..... m [4]

(b) Calculate angle *ABD*.

Angle *ABD* = ... [4]

(c) **(i)** Calculate angle *CBD*.

Angle *CBD* = ... [2]

(ii) The point *C* is due north of the point *B*.

Find the bearing of *D* from *B*.

..... [2]

(d) Calculate the area of the field *ABCDE*.
Give your answer in hectares.
[1 hectare = 10 000 m^2]

..... hectares [4]

4 **(a)** The test scores of 14 students are shown below.

21 21 23 26 25 21 22 20 21 23 23 27 24 21

(i) Find the range, mode, median and mean of the test scores.

Range = ...

Mode = ...

Median = ...

Mean = ... [6]

(ii) A student is chosen at random.

Find the probability that this student has a test score of more than 24.

..... [1]

(b) Petra records the score in each test she takes.

The mean of the first n scores is x.
The mean of the first $(n - 1)$ scores is $(x + 1)$.

Find the nth score in terms of n and x.
Give your answer in its simplest form.

..... [3]

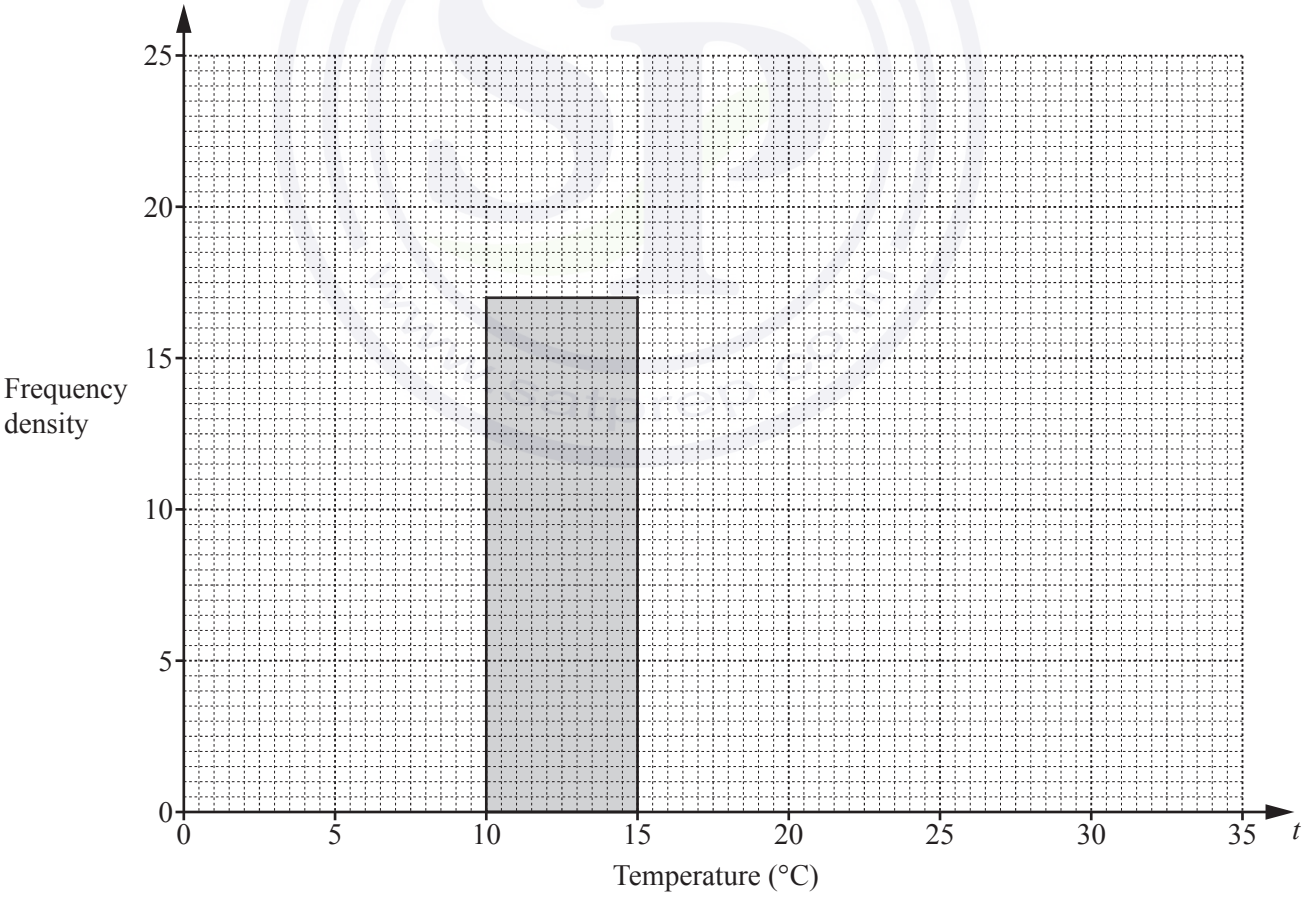
(c) During one year the midday temperatures, t°C, in Zedford were recorded.
The table shows the results.

Temperature (t°C)	$0 < t \leqslant 10$	$10 < t \leqslant 15$	$15 < t \leqslant 20$	$20 < t \leqslant 25$	$25 < t \leqslant 35$
Number of days	50	85	100	120	10

(i) Calculate an estimate of the mean.

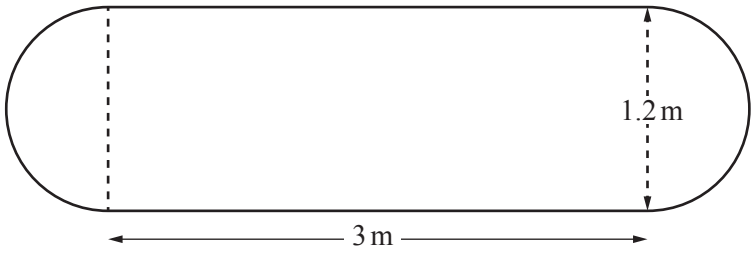
..... °C [4]

(ii) Complete the histogram to show the information in the table.



[4]

5



NOT TO SCALE

The diagram shows the surface of a garden pond, made from a rectangle and two semicircles.
The rectangle measures 3 m by 1.2 m.

(a) Calculate the area of this surface.

..... m^2 [3]

(b) The pond is a prism and the water in the pond has a depth of 20 cm.

Calculate the number of litres of water in the pond.

..... litres [3]

(c) After a rainfall, the number of litres of water in the pond is 1007.

Calculate the increase in the depth of water in the pond.
Give your answer in centimetres.

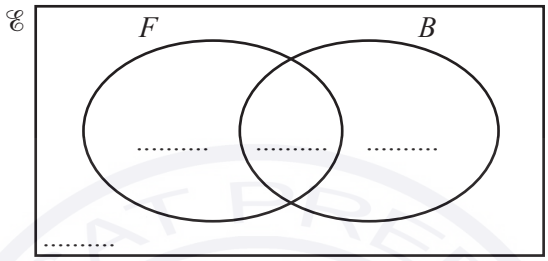
..... cm [3]

6 $\mathscr{E}$ = {students in a school}
F = {students who play football}
B = {students who play baseball}

There are 240 students in the school.

- 120 students play football
- 40 students play baseball
- 90 students play football but not baseball.

(a) Complete the Venn diagram to show this information.



[2]

(b) Find $n(F' \cap B')$.

..... [1]

(c) A student in the school is chosen at random.

Find the probability that this student plays baseball but not football.

..... [1]

(d) Two students who play baseball are chosen at random.

Find the probability that they both also play football.

..... [3]

7 **(a)** $s = ut + \frac{1}{2}at^2$

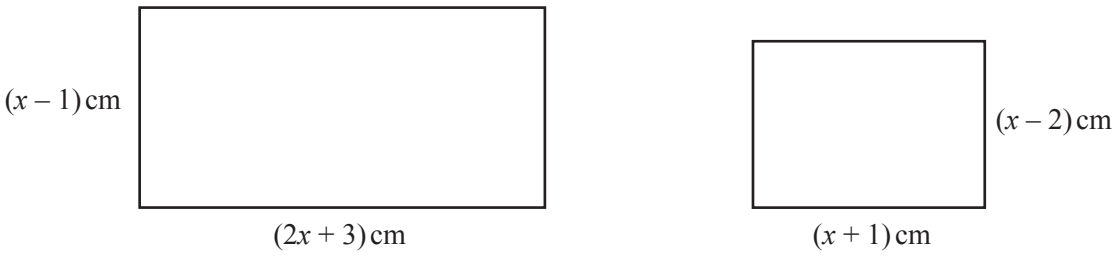
(i) Find s when $t = 26.5$, $u = 104.3$ and $a = -2.2$.
Give your answer in standard form, correct to 4 significant figures.

$s =$ ..... [4]

(ii) Rearrange the formula to write a in terms of u, t and s.

$a =$ ..... [3]

(b)



The difference between the areas of the two rectangles is $62\,\text{cm}^2$.

(i) Show that $x^2 + 2x - 63 = 0$.

[3]

(ii) Factorise $x^2 + 2x - 63$.

..... [2]

(iii) Solve the equation $x^2 + 2x - 63 = 0$ to find the difference between the perimeters of the two rectangles.

..... cm [2]

8 **(a)** The price of a book increases from \$2.50 to \$2.65 .

Calculate the percentage increase.

..... % [3]

(b) Scott invests \$500 for 7 years at a rate of 1.5% per year simple interest.

Calculate the value of his investment at the end of the 7 years.

\$..... [3]

(c) In a city the population is increasing exponentially at a rate of 1.6% per year.

Find the overall percentage increase at the end of 20 years.

..... % [2]

(d) The population of a village is 6400.
The population is decreasing exponentially at a rate of r% per year.
After 22 years, the population will be 2607.

Find the value of r.

r = ... [3]

9 $f(x) = 7x - 2$ $g(x) = x^2 + 1$ $h(x) = 3^x$

(a) Find gh(2).

..... [2]

(b) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(c) $gg(x) = ax^4 + bx^2 + c$

Find the values of a, b and c.

$a =$ .....

$b =$ .....

$c =$ ..... [3]

(d) Find x when $hf(x) = 81$.

$x =$ ..... [3]

10 The volume of each of the following solids is $1000\,\text{cm}^3$.

Calculate the value of x for each solid.

(a) A cube with side length x cm.

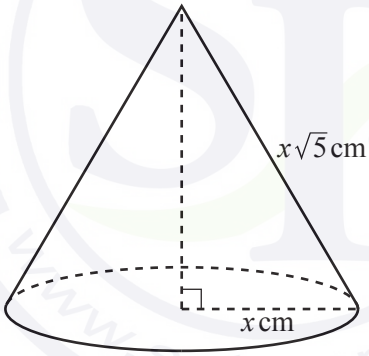
$x =$ ..... [1]

(b) A sphere with radius x cm.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$x =$ ..... [3]

(c)



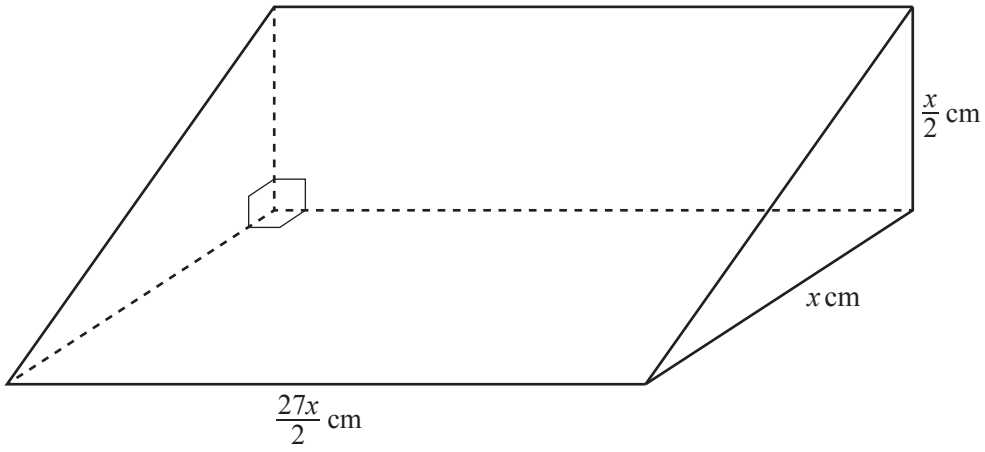
NOT TO SCALE

A cone with radius x cm and slant height $x\sqrt{5}$ cm.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

$x =$ ..... [4]

(d)



NOT TO SCALE

A prism with a right-angled triangle as its cross-section.

$x =$ ..... [4]

Question 11 is printed on the next page.

11 Brad travelled from his home in New York to Chamonix.

- He left his home at 16 30 and travelled by taxi to the airport in New York.
  This journey took 55 minutes and had an average speed of 18 km/h.

- He then travelled by plane to Geneva, departing from New York at 22 15.
  The flight path can be taken as an arc of a circle of radius 6400 km with a sector angle of 55.5°.
  The local time in Geneva is 6 hours ahead of the local time in New York.
  Brad arrived in Geneva at 11 25 the next day.

- To complete his journey, Brad travelled by bus from Geneva to Chamonix.
  This journey started at 13 00 and took 1 hour 36 minutes.
  The average speed was 65 km/h.
  The local time in Chamonix is the same as the local time in Geneva.

Find the overall average speed of Brad's journey from his home in New York to Chamonix.
Show all your working and give your answer in km/h.

..... km/h [11]

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

0141159428

MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2019**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **19** printed pages and **1** blank page.

Cambridge Assessment International Education

[Turn over

1 **(a)** The price of a newspaper increased from \$0.97 to \$1.13 .

Calculate the percentage increase.

..... % [3]

(b) One day, the newspaper had 60 pages of news and advertisements.
The ratio number of pages of news : number of pages of advertisements = 5 : 7.

(i) Calculate the number of pages of advertisements.

..... [2]

(ii) Write the number of pages of advertisements as a percentage of the number of pages of news.

..... % [1]

(c) On holiday Maria paid 2.25 euros for the newspaper when the exchange rate was \$1 = 0.9416 euros.
At home Maria paid \$1.13 for the newspaper.

Calculate the difference in price.
Give your answer in dollars, correct to the nearest cent.

\$ ..... [3]

(d) The number of newspapers sold decreases exponentially by x% each year.
Over a period of 21 years the number of newspapers sold decreases from 1 763 000 to 58 000.

Calculate the value of x.

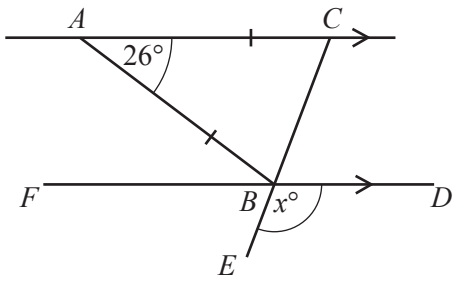
$x =$ ..... [3]

(e) Every page of the newspaper is a rectangle measuring 43 cm by 28 cm, both correct to the nearest centimetre.

Calculate the upper bound of the area of a page.

..... cm^2 [2]

2 (a)



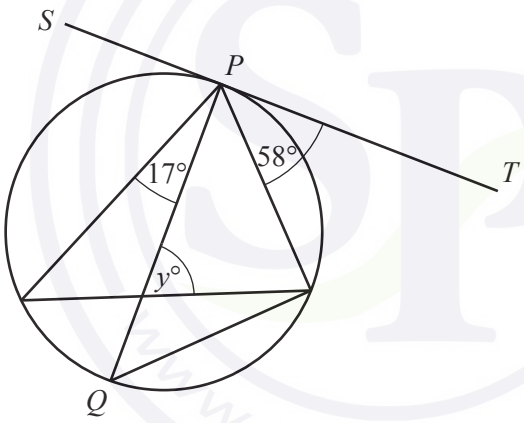
NOT TO SCALE

AC is parallel to *FBD*, *ABC* is an isosceles triangle and *CBE* is a straight line.

Find the value of x.

$x =$ ..... [3]

(b)



NOT TO SCALE

The diagram shows a circle with diameter *PQ*.
SPT is a tangent to the circle at *P*.

Find the value of y.

$y =$ ..... [5]

3 The probability that Andrei cycles to school is r.

(a) Write down, in terms of r, the probability that Andrei **does not** cycle to school.

..... [1]

(b) The probability that Benoit **does not** cycle to school is $1.3 - r$.
The probability that both Andrei and Benoit **do not** cycle to school is 0.4 .

(i) Complete the equation in terms of r.

(.....) × (.....) = 0.4 [1]

(ii) Show that this equation simplifies to $10r^2 - 23r + 9 = 0$.

[3]

(iii) Solve by factorisation $10r^2 - 23r + 9 = 0$.

r = ... or r = ... [3]

(iv) Find the probability that Benoit **does not** cycle to school.

..... [1]

4 **(a)** The equation of a straight line is $2y = 3x + 4$.

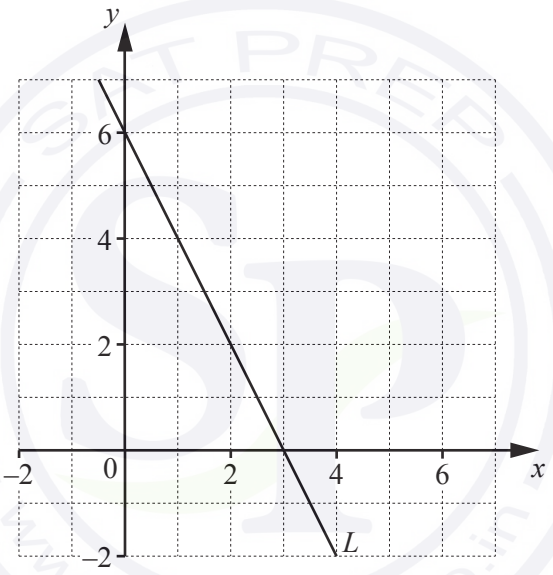
(i) Find the gradient of this line.

..... [1]

(ii) Find the co-ordinates of the point where the line crosses the y-axis.

(..... , ...) [1]

(b) The diagram shows a straight line L.



(i) Find the equation of line L.

..... [3]

(ii) Find the equation of the line perpendicular to line L that passes through (9, 3).

..... [3]

(c) A is the point $(8, 5)$ and B is the point $(-4, 1)$.

(i) Calculate the length of AB.

..... [3]

(ii) Find the co-ordinates of the midpoint of AB.

(..... , ...) [2]

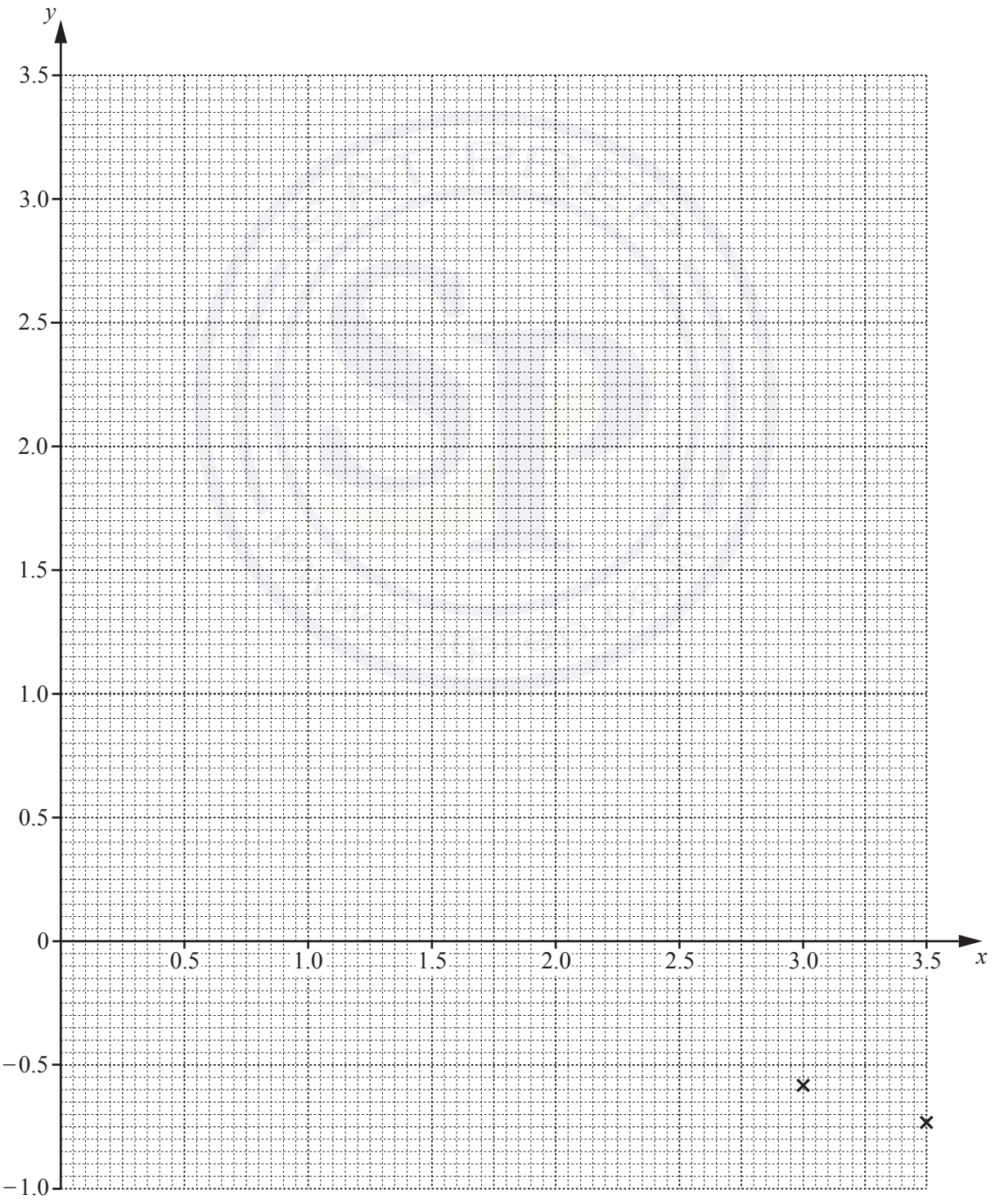
5 The table shows some values of $y = \frac{1}{2x} - \frac{x}{4}$ for $0.15 \leqslant x \leqslant 3.5$.

x	0.15	0.2	0.5	1	1.5	2	2.5	3	3.5
y	3.30		0.88		−0.04		−0.43	−0.58	−0.73

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = \frac{1}{2x} - \frac{x}{4}$ for $0.15 \leqslant x \leqslant 3.5$.

The last two points have been plotted for you.



[4]

(c) Use your graph to solve the equation $\frac{1}{2x} - \frac{x}{4} = \frac{1}{2}$ for $0.15 \leqslant x \leqslant 3.5$.

$x =$ ..... [1]

(d) **(i)** On the grid, draw the line $y = 2 - x$. [2]

(ii) Write down the x co-ordinates of the points where the line $y = 2 - x$ crosses the graph of $y = \frac{1}{2x} - \frac{x}{4}$ for $0.15 \leqslant x \leqslant 3.5$.

$x =$ ..... and $x =$ ..... [2]

(e) Show that the graph of $y = \frac{1}{2x} - \frac{x}{4}$ can be used to find the value of $\sqrt{2}$ for $0.15 \leqslant x \leqslant 3.5$.

[2]

6 **(a)** Expand and simplify.

$$(x+7)(x-3)$$

..... [2]

(b) Factorise completely.

(i) $15p^2q^2 - 25q^3$

..... [2]

(ii) $4fg + 6gh + 10fk + 15hk$

..... [2]

(iii) $81k^2 - m^2$

..... [2]

(c) Solve the equation.

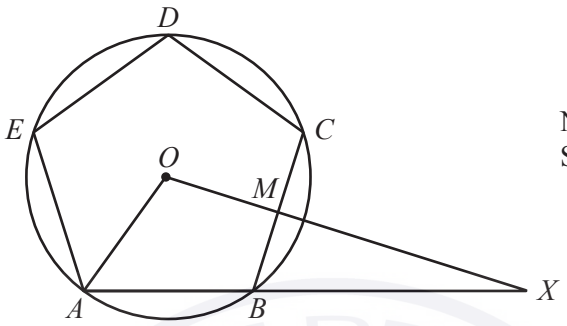
$$3(x-4) + \frac{x+2}{5} = 6$$

$x =$ ..... [4]

7 **(a)** Show that each interior angle of a regular pentagon is 108°.

[2]

(b)



NOT TO SCALE

The diagram shows a regular pentagon $ABCDE$.
The vertices of the pentagon lie on a circle, centre O, radius 12 cm.
M is the midpoint of BC.

(i) Find BM.

$BM =$ ..... cm [3]

(ii) OMX and ABX are straight lines.

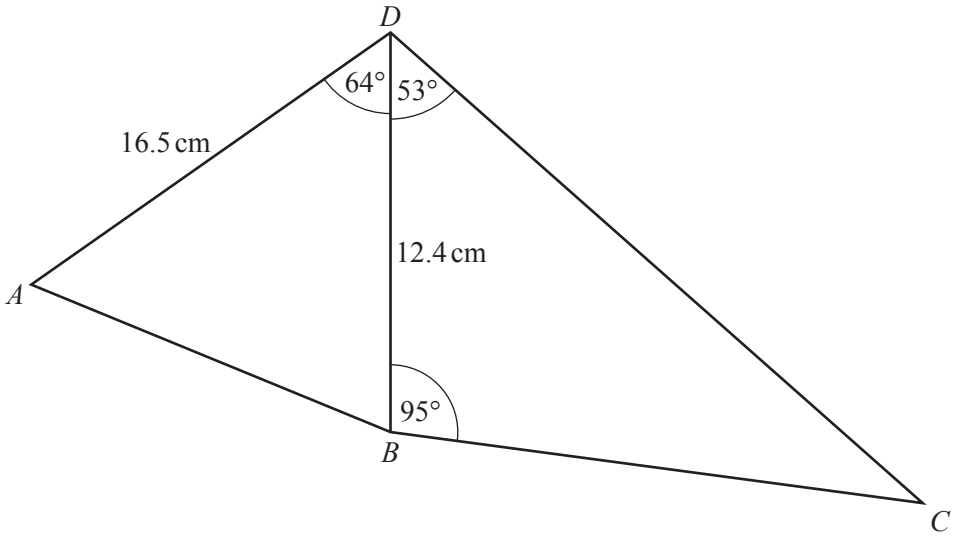
(a) Find BX.

$BX =$ ..... cm [3]

(b) Calculate the area of triangle AOX.

..... cm^2 [3]

8 (a)



NOT TO SCALE

The diagram shows two triangles ABD and BCD.
$AD = 16.5$ cm and $BD = 12.4$ cm.
Angle $ADB = 64°$, angle $BDC = 53°$ and angle $DBC = 95°$.

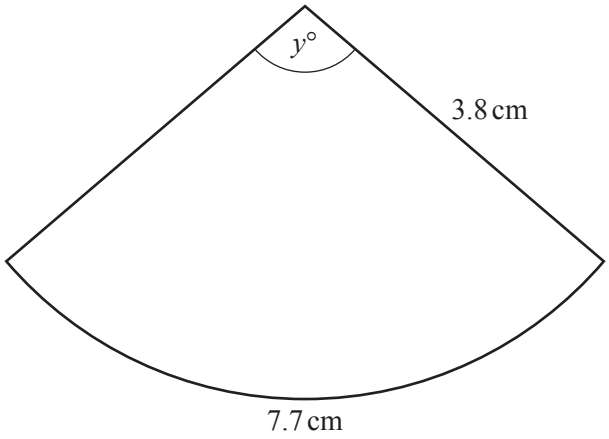
(i) Find AB.

$AB =$ ..... cm [4]

(ii) Find BC.

$BC =$ ..... cm [4]

(b)



NOT TO SCALE

The diagram shows a sector of a circle of radius 3.8 cm.
The arc length is 7.7 cm.

(i) Calculate the value of y.

$y =$ ..... [2]

(ii) Calculate the area of the sector.

..... cm^2 [2]

9 100 students were each asked how much money, \$$m$, they spent in one week.
The frequency table shows the results.

Amount (\$$m$)	$0 < m \leqslant 5$	$5 < m \leqslant 10$	$10 < m \leqslant 20$	$20 < m \leqslant 30$	$30 < m \leqslant 50$
Frequency	16	38	30	9	7

(a) Calculate an estimate of the mean.

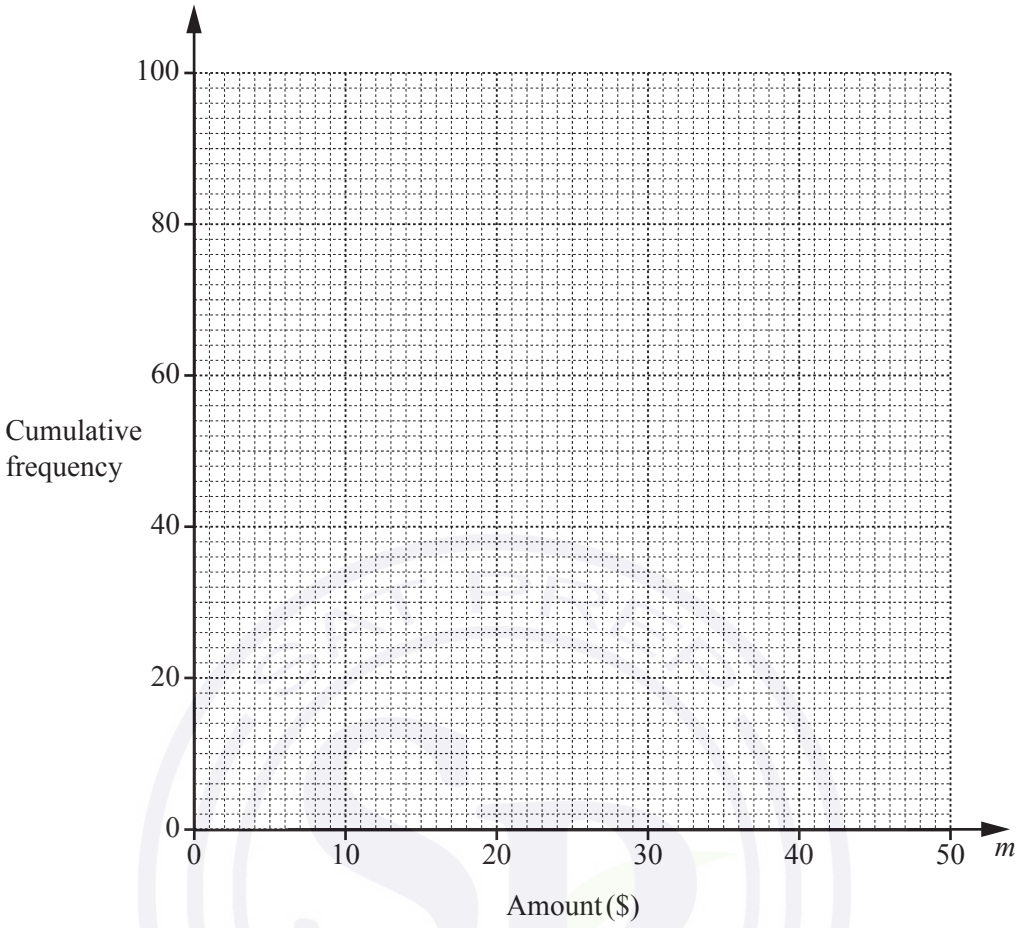
\$ ..... [4]

(b) Complete the cumulative frequency table below.

Amount (\$$m$)	$m \leqslant 5$	$m \leqslant 10$	$m \leqslant 20$	$m \leqslant 30$	$m \leqslant 50$
Cumulative frequency	16				100

[2]

(c) On the grid, draw the cumulative frequency diagram.



[3]

(d) Use your cumulative frequency diagram to find an estimate for

(i) the median,

$ ..... [1]

(ii) the interquartile range,

$ ..... [2]

(iii) the number of students who spent more than $25.

..... [2]

10 **(a)** The volume of a solid metal sphere is 24 430 cm^3.

(i) Calculate the radius of the sphere.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm [3]

(ii) The metal sphere is placed in an empty tank.
The tank is a cylinder with radius 50 cm, standing on its circular base.
Water is poured into the tank to a depth of 60 cm.

Calculate the number of litres of water needed.

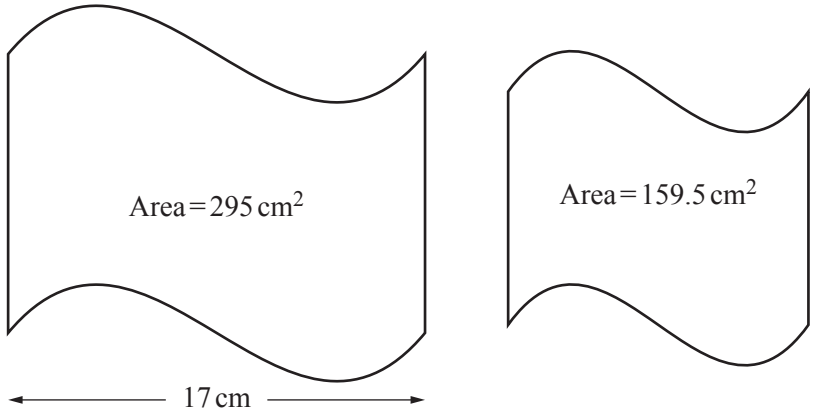
..... litres [3]

(b) A different tank is a cuboid measuring 1.8 m by 1.5 m by 1.2 m.
Water flows from a pipe into this empty tank at a rate of 200 cm^3 per second.

Find the time it takes to fill the tank.
Give your answer in hours and minutes.

..... hours ..... minutes [4]

(c)



NOT TO SCALE

The diagram shows two mathematically similar shapes with areas 295 cm^2 and 159.5 cm^2.
The width of the larger shape is 17 cm.

Calculate the width of the smaller shape.

..... cm [3]

11

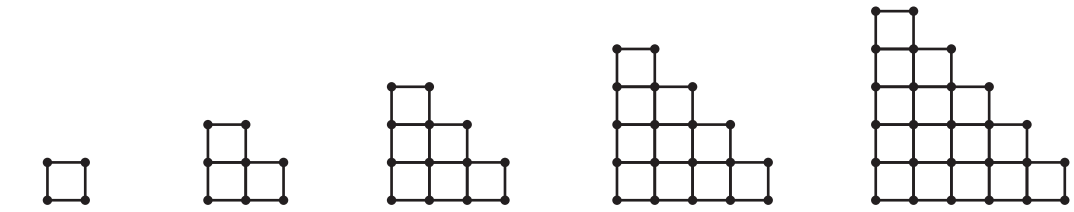


Diagram 1 Diagram 2 Diagram 3 Diagram 4 Diagram 5

The sequence of diagrams above is made up of small lines and dots.

(a) Complete the table.

	Diagram 1	Diagram 2	Diagram 3	Diagram 4	Diagram 5	Diagram 6
Number of small lines	4	10	18	28		
Number of dots	4	8	13	19		

[4]

(b) For Diagram n find an expression, in terms of n, for the number of small lines.

..... [2]

(c) Diagram r has 10 300 small lines.

Find the value of r.

$r =$ ..... [2]

(d) The number of dots in Diagram n is $an^2 + bn + 1$.

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [2]

BLANK PAGE

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

3506774698

MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2019**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

1 Here is part of a train timetable for a journey from London to Marseille.
All times given are in local time.
The local time in Marseille is 1 hour ahead of the local time in London.

London	07 19
Ashford	07 55
Lyon	13 00
Avignon	14 08
Marseille	14 46

(a) (i) Work out the total journey time from London to Marseille.
Give your answer in hours and minutes.

..... h ..... min [2]

(ii) The distance from London to Ashford is 90 km.
The local time in London is the same as the local time in Ashford.

Work out the average speed, in km/h, of the train between London and Ashford.

..... km/h [3]

(iii) During the journey, the train takes 35 seconds to completely cross a bridge.
The average speed of the train during this crossing is 90 km/h.
The length of the train is 95 metres.

Calculate the length, in metres, of this bridge.

..... m [4]

(b) The fares for the train journey are shown in the table below.

From London to Marseille	Standard fare	Premier fare
Adult	\$84	\$140
Child	\$60	\$96

(i) For the **standard fare**, write the ratio adult fare : child fare in its simplest form.

..... : ..... [1]

(ii) For an **adult**, find the percentage increase in the cost of the standard fare to the premier fare.

..... % [3]

(iii) For one journey from London to Marseille, the ratio

number of adults : number of children = 11 : 2.

There were 220 adults in total on this journey.
All of the children and 70% of the adults paid the standard fare.
The remaining adults paid the premier fare.

Calculate the total of the fares paid by the adults and the children.

\$ ..... [5]

(c) There were 3.08×10^5 passengers that made this journey in 2018.
This was a 12% decrease in the number of passengers that made this journey in 2017.

Find the number of passengers that made this journey in 2017.
Give your answer in standard form.

..... [3]

2 **(a)** Solve.

$$5x - 17 = 7x + 3$$

$x =$ ..... [2]

(b) Find the integer values of n that satisfy this inequality.

$$-7 < 4n \leqslant 8$$

..... [3]

(c) Simplify.

(i) $a^3 \times a^6$

..... [1]

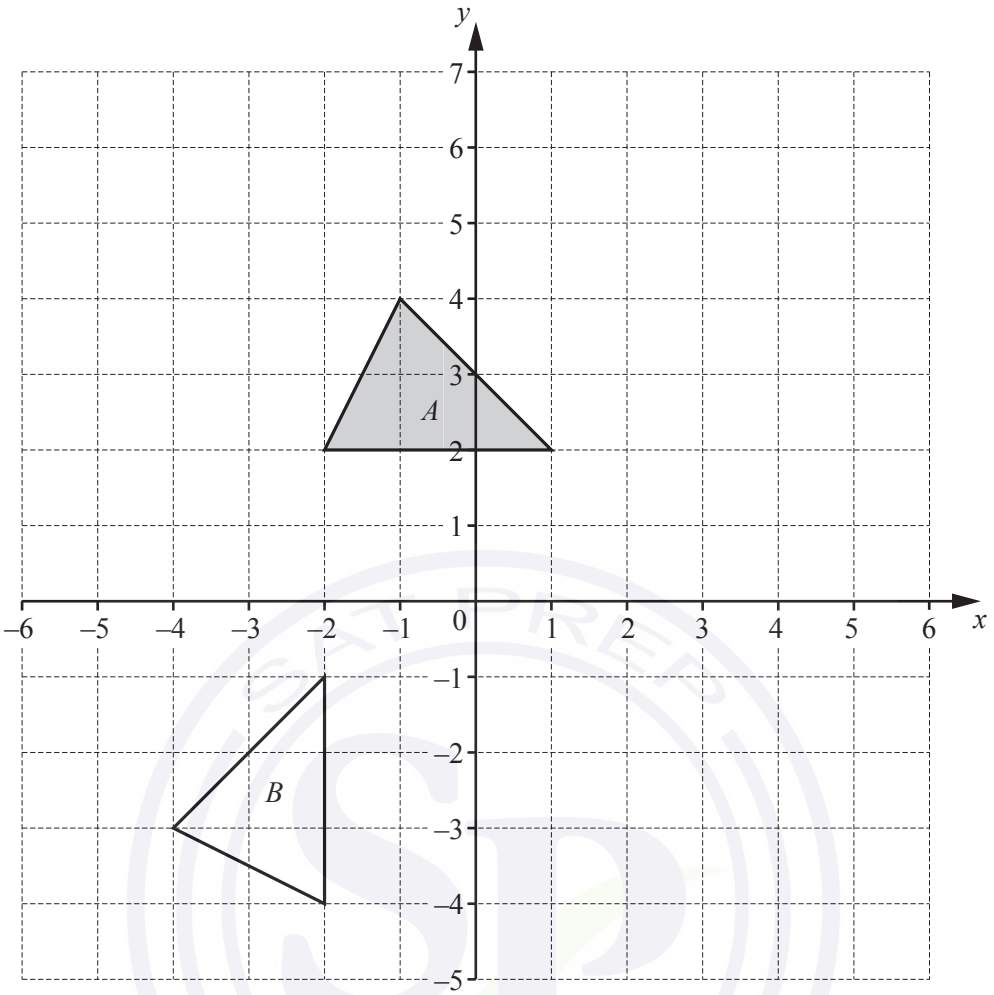
(ii) $(5xy^2)^3$

..... [2]

(iii) $\left(\frac{27x^{12}}{64y^3}\right)^{-\frac{1}{3}}$

..... [3]

3



(a) On the grid, draw the image of

(i) triangle A after a translation by the vector $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$, [2]

(ii) triangle A after a reflection in the line $y = x$. [2]

(b) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

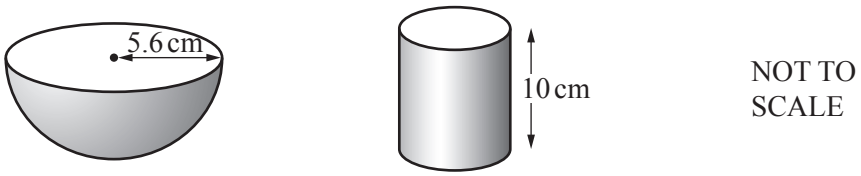
(c) **(i)** Find the matrix that represents an enlargement, scale factor -2, centre (0, 0).

$\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(ii) Calculate the determinant of the matrix in **part (c)(i)**.

..... [1]

4 (a)



The diagram shows a hemispherical bowl of radius 5.6 cm and a cylindrical tin of height 10 cm.

(i) Show that the volume of the bowl is 368 cm^3, correct to the nearest cm^3.
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

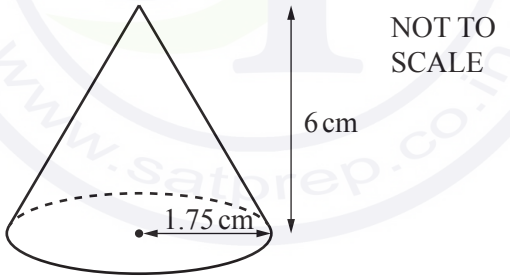
[2]

(ii) The tin is completely full of soup.
When all the soup is poured into the empty bowl, 80% of the volume of the bowl is filled.

Calculate the radius of the tin.

..... cm [4]

(b)

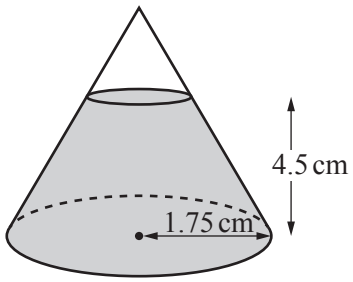


The diagram shows a cone with radius 1.75 cm and height 6 cm.

(i) Calculate the total surface area of the cone.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]

..... cm^2 [5]

(ii)



NOT TO SCALE

The cone contains salt to a depth of 4.5 cm.
The top layer of the salt forms a circle that is parallel to the base of the cone.

(a) Show that the volume of the salt inside the cone is 18.9 cm^3, correct to 1 decimal place.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

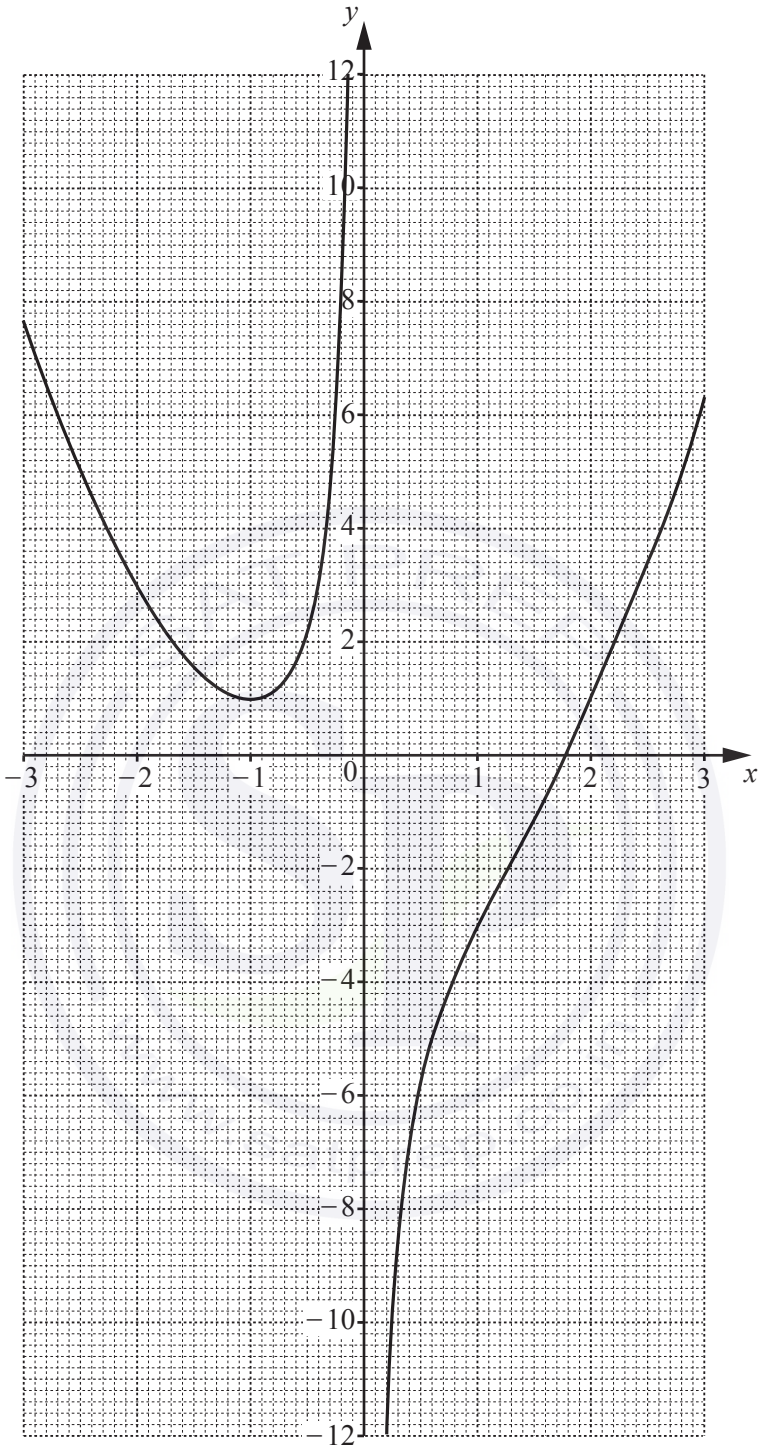
[4]

(b) The salt is removed from the cone at a constant rate of 200 mm^3 per second.

Calculate the time taken for the cone to be completely emptied.
Give your answer in seconds, correct to the nearest second.

..... s [3]

5 The diagram shows the graph of $y = \mathrm{f}(x)$ where $\mathrm{f}(x) = x^2 - \frac{2}{x} - 2, x \neq 0$.



(a) Use the graph to find

(i) f(1),

..... [1]

(ii) ff(−2).

..... [2]

(b) On the grid opposite, draw a suitable straight line to solve the equation $x^2 - \frac{2}{x} - 7 = -3x$ for $-3 \leqslant x \leqslant 3$.

$x =$ ..... or $x =$ ..... [4]

(c) By drawing a suitable tangent, find an estimate of the gradient of the curve at $x = -2$.

..... [3]

(d) **(i)** Complete the table for $y = g(x)$ where $g(x) = 2^{-x}$ for $-3 \leqslant x \leqslant 3$.

x	−3	−2	−1	0	1	2	3
y			2	1	0.5		0.125

[3]

(ii) On the grid opposite, draw the graph of $y = g(x)$. [3]

(iii) Use your graph to find the **positive** solution to the equation $f(x) = g(x)$.

$x =$ ..... [1]

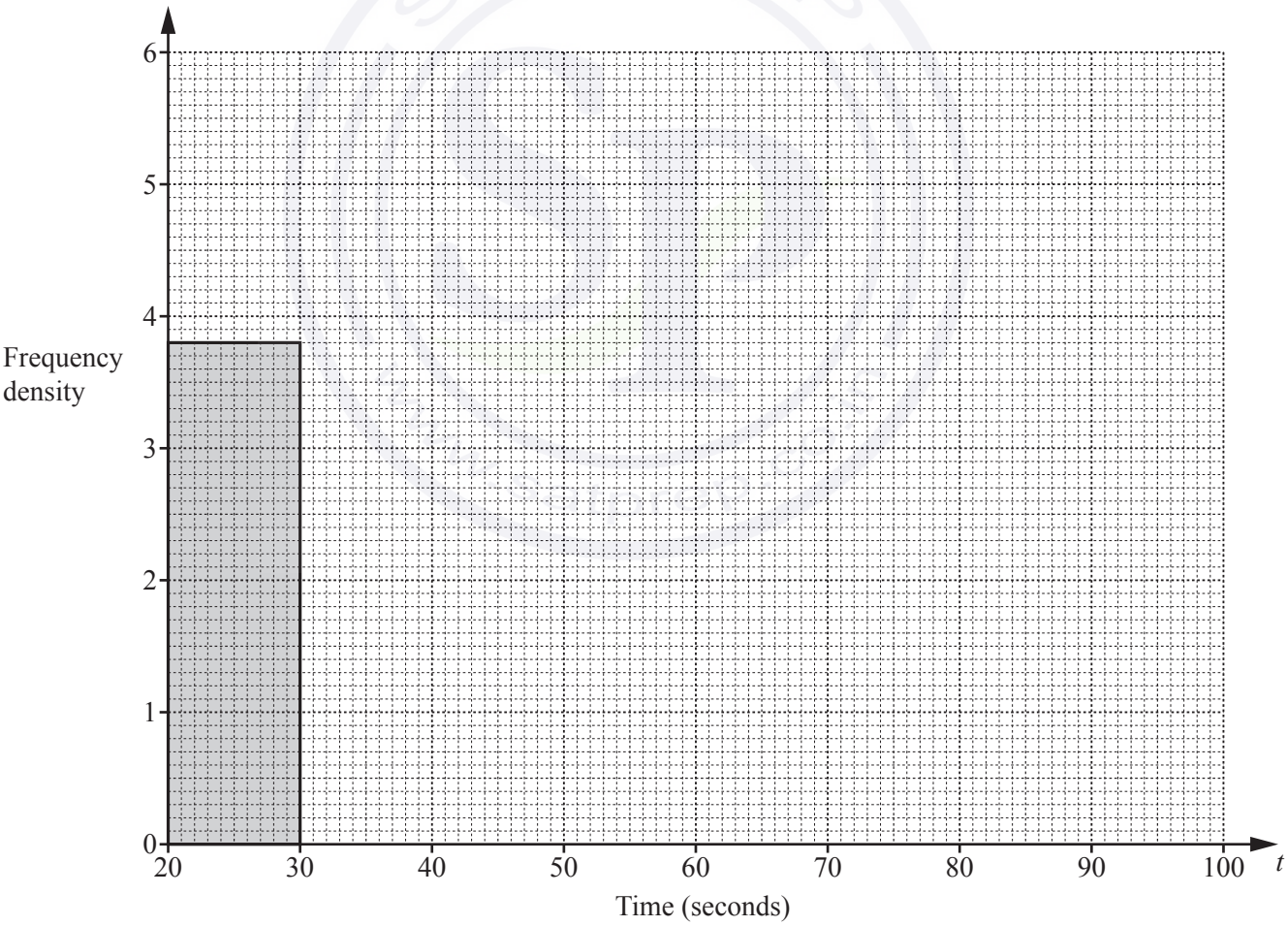
6 The table shows the time, t seconds, taken by each of 120 boys to solve a puzzle.

Time (t seconds)	$20 < t \leqslant 30$	$30 < t \leqslant 35$	$35 < t \leqslant 40$	$40 < t \leqslant 60$	$60 < t \leqslant 100$
Frequency	38	27	21	16	18

(a) Calculate an estimate of the mean time.

..... s [4]

(b) On the grid, complete the histogram to show the information in the frequency table.



[4]

7 A straight line joins the points A $(-2, -3)$ and C $(1, 9)$.

(a) Find the equation of the line AC in the form $y = mx + c$.

$y =$ ..... [3]

(b) Calculate the acute angle between AC and the x-axis.

..... [2]

(c) $ABCD$ is a kite, where AC is the longer diagonal of the kite.
B is the point (3.5, 2).

(i) Find the equation of the line BD in the form $y = mx + c$.

$y =$ ..... [3]

(ii) The diagonals AC and BD intersect at $(-0.5, 3)$.

Work out the co-ordinates of D.

(..... , ...) [2]

8 **(a)** Angelo has a bag containing 3 white counters and x black counters.
He takes two counters at random from the bag, without replacement.

(i) Complete the following statement.

The probability that Angelo takes two black counters is

$$\frac{x}{x+3} \times \frac{\text{.....}}{\text{.....}}.$$

[2]

(ii) The probability that Angelo takes two black counters is $\frac{7}{15}$.

(a) Show that $4x^2 - 25x - 21 = 0$.

[4]

(b) Solve by factorisation.

$$4x^2 - 25x - 21 = 0$$

$x =$ ..... or $x =$ ..... [3]

(c) Write down the number of black counters in the bag.

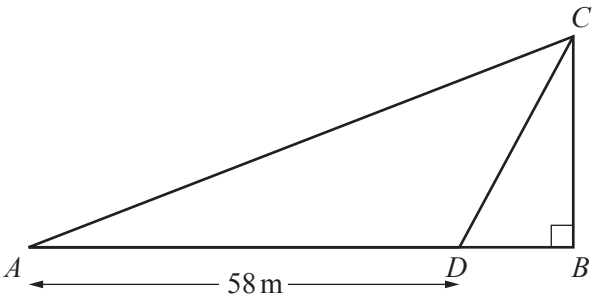
..... [1]

(b) Esme has a bag with 5 green counters and 4 red counters.
She takes three counters at random from the bag without replacement.

Work out the probability that the three counters are all the same colour.

..... [4]

9 (a)



NOT TO SCALE

In the diagram, BC is a vertical wall standing on horizontal ground AB.
D is the point on AB where $AD = 58$ m.
The angle of elevation of C from A is 26°.
The angle of elevation of C from D is 72°.

(i) Show that $AC = 76.7$ m, correct to 1 decimal place.

[5]

(ii) Calculate BD.

$BD =$ ..... m [3]

(b) Triangle EFG has an area of $70\,m^2$.
$EF : FG = 1 : 2$ and angle $EFG = 40°$.

(i) Calculate EF.

$EF =$ ..... m [4]

(ii) A **different** triangle PQR also has an area of $70\,m^2$.
$PQ : QR = 1 : 2$ and $PQ = EF$.

Find angle PQR.

Angle $PQR =$ ..... [1]

Question 10 is printed on the next page.

10 (a) 19, 15, 11, 7, ...

(i) Write down the next two terms of the sequence.

..... , ... [2]

(ii) Find the nth term of this sequence.

..... [2]

(iii) Find the value of n when the nth term is -65.

$n =$ ..... [2]

(b) Another sequence has nth term $2n^2 + 5n - 15$.

Find the difference between the 4th term and the 5th term of this sequence.

..... [2]

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

9926605767

MATHEMATICS **0580/42**

Paper 4 (Extended) **February/March 2019**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

1 Amol and Priya deliver 645 parcels in the ratio Amol : Priya = 11 : 4.

(a) Calculate the number of parcels Amol delivers.

..... [2]

(b) Amol drives his truck at an average speed of 50 km/h.
He leaves at 07 00 and arrives at 11 15.

Calculate the distance he drives.

..... km [2]

(c) Priya drives her van a distance of 54 km.
She leaves at 10 55 and arrives at 12 38.

Calculate her average speed.

..... km/h [3]

(d) Priya has 50 identical parcels.
Each parcel has a mass of 17 kg, correct to the nearest kilogram.

Find the upper bound for the total mass of the 50 parcels.

..... kg [1]

(e) 67 of the 645 parcels are damaged on the journey.

Calculate the percentage of parcels that are damaged.

..... % [1]

(f) **(i)** 29 parcels each have a value of $68.

By writing each of these numbers correct to 1 significant figure, find an estimate for the total value of these 29 parcels.

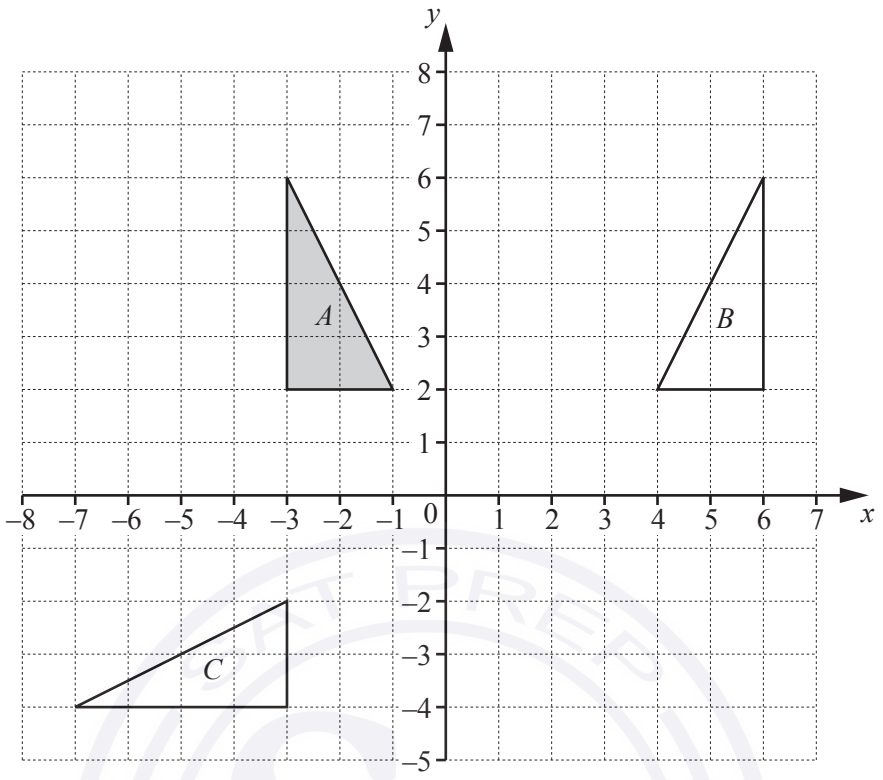
$ ..... [1]

(ii) Without doing any calculation, complete this statement.

The actual total value of these 29 parcels is less than the answer to **part (f)(i)**

because ..... [1]

2



(a) Describe fully the **single** transformation that maps

(i) triangle A onto triangle B,

.....

..... [2]

(ii) triangle A onto triangle C.

.....

..... [3]

(b) On the grid, draw the image of

(i) triangle A after an enlargement, scale factor $-\frac{1}{2}$, centre (3, 0), [2]

(ii) triangle A after a translation by the vector $\begin{pmatrix} -3 \\ 1 \end{pmatrix}$, [2]

(iii) triangle A after the transformation that is represented by the matrix $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$.

[3]

3 Sushila, Ravi and Talika each have a bag of balls.
Each of the bags contains 10 red balls and 8 blue balls.

(a) Sushila takes one ball at random from her bag.

Find the probability that she takes a red ball.

..... [1]

(b) Ravi takes two balls at random from his bag, without replacement.

Find the probability that one ball is red and one ball is blue.

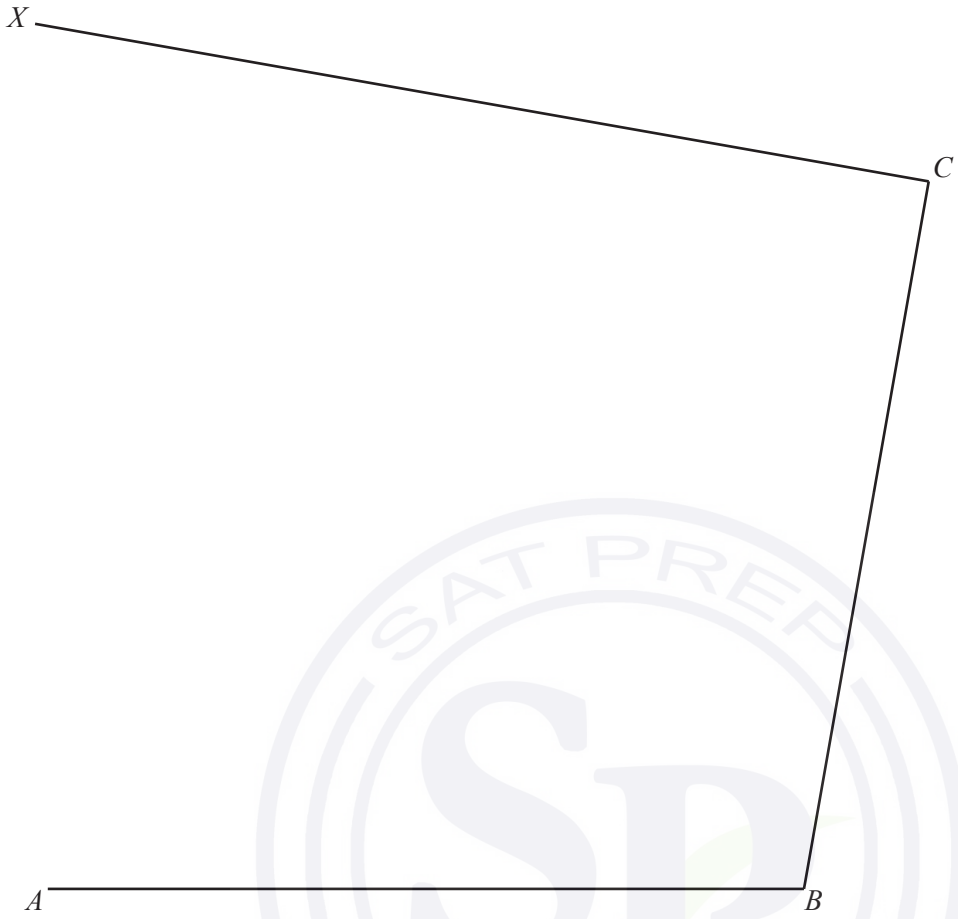
..... [3]

(c) Talika takes three balls at random from her bag, without replacement.

Calculate the probability that the three balls are the same colour.

..... [4]

4 The diagram shows an incomplete scale drawing of a market place, *ABCD*, where *D* is on *CX*.
The scale is 1 centimetre represents 5 metres.



Scale : 1 cm to 5 m

D lies on *CX* such that angle $DAB = 75°$.

(a) On the diagram, draw the line *AD* and mark the position of *D*. [2]

(b) Find the actual length of the side *BC* of the market place.

..... m [2]

(c) In this part, use a ruler and compasses only.

Street sellers are allowed in the part of the market place that is

- more than 35 metres from A

and

- nearer to C than to B

and

- nearer to CD than to BC.

On the diagram, construct and shade the region where street sellers are allowed. [7]

(d) Write the scale of the drawing in the form $1 : n$.

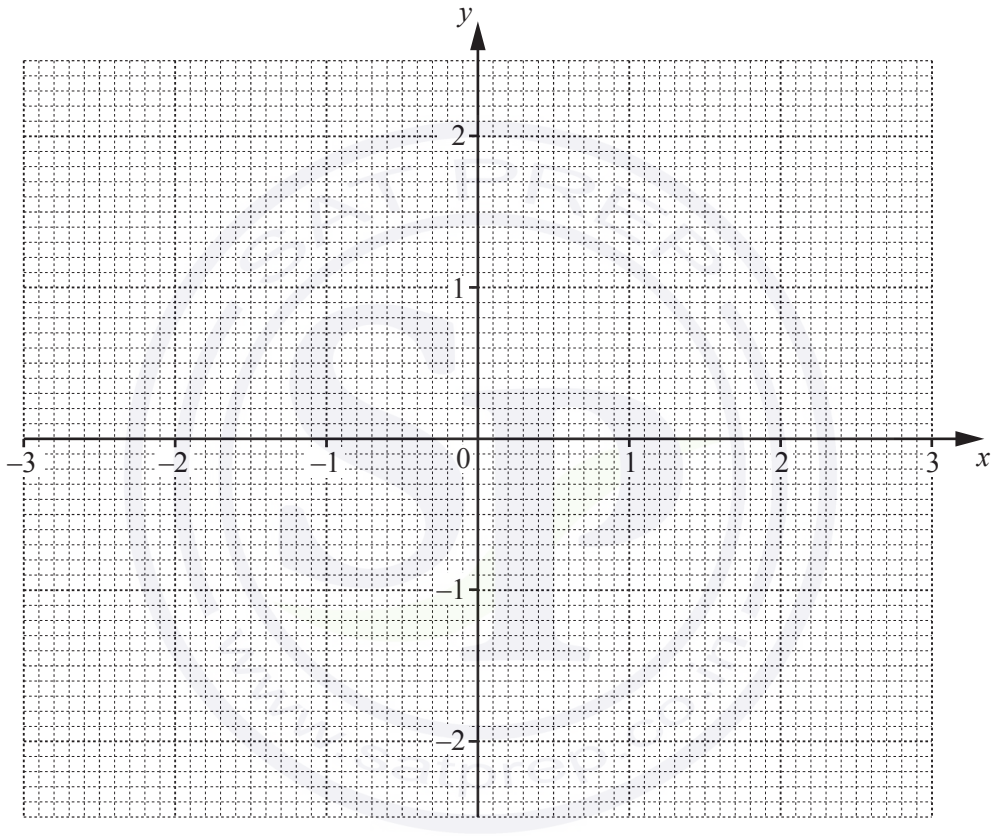
1 : ..... [1]

5 The table shows some values for $y = \frac{3}{10}x^3 - 2x$ for $-3 \leqslant x \leqslant 3$.

x	−3	−2	−1.5	−1	0	1	1.5	2	3
y			2.0	1.7	0		−2.0	−1.6	

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = \frac{3}{10}x^3 - 2x$ for $-3 \leqslant x \leqslant 3$.



[4]

(c) On the grid opposite, draw a suitable straight line to solve the equation $\frac{3}{10}x^3 - 2x = \frac{1}{2}(1-x)$ for $-3 \leqslant x \leqslant 3$.

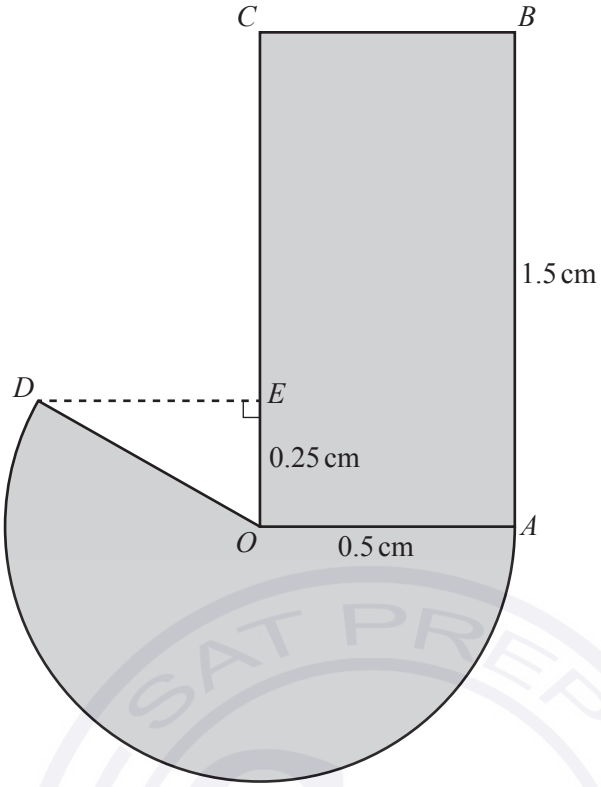
$x =$ ..... or $x =$ ..... or $x =$ ..... [4]

(d) For $-3 \leqslant x \leqslant 3$, the equation $\frac{3}{10}x^3 - 2x = 1$ has n solutions.

Write down the value of n.

$n =$ ..... [1]

6



The diagram shows a company logo made from a rectangle and a major sector of a circle.
The circle has centre O and radius OA.
$OA = OD = 0.5$ cm and $AB = 1.5$ cm.
E is a point on OC such that $OE = 0.25$ cm and angle $OED = 90°$.

(a) Calculate the perimeter of the logo.

..... cm [5]

(b) Calculate the area of the logo.

..... cm^2 [3]

(c) A mathematically similar logo is drawn.
The area of this logo is $77.44\,cm^2$.

(i) Calculate the radius of the major sector in this logo.

..... cm [3]

(ii) A gold model is made.
This model is a prism with a cross-section of area $77.44\,cm^2$.

This gold model is 15 mm thick.
One cubic centimetre of gold has a mass of 19 grams.

Calculate the mass of the gold model in kilograms.

..... kg [3]

7 **(a)** 20 students each record the mass, p grams, of their pencil case.
The table below shows the results.

Mass (p grams)	$0 < p \leqslant 50$	$50 < p \leqslant 100$	$100 < p \leqslant 125$	$125 < p \leqslant 150$	$150 < p \leqslant 200$
Frequency	2	5	4	6	3

(i) Calculate an estimate of the mean mass.

..... g [4]

(ii) Use the frequency table above to complete the cumulative frequency table.

Mass (p grams)	$p \leqslant 50$	$p \leqslant 100$	$p \leqslant 125$	$p \leqslant 150$	$p \leqslant 200$
Cumulative frequency					20

[2]

(iii) A student is chosen at random.

Find the probability that this student has a pencil case with a mass greater than 150 g.

..... [1]

(b) Some students each record the mass, m kg, of their school bag.
Adil wants to draw a histogram to show this information.

Complete the table below.

Mass (m kg)	$0 < m \leqslant 4$	$4 < m \leqslant 6$	$6 < m \leqslant 7$	$7 < m \leqslant 10$
Frequency	32			42
Height of bar on histogram (cm)	1.6	2	1.2	2.8

[2]

(c) The frequency table below shows information about the number of books read by some students in a reading marathon.

Number of books read	1	2	3	4	5	6	7	8
Frequency	2	2	16	10	9	4	x	2

(i) The mean number of books read is 4.28 .

Find the value of x.

$x =$ ..... [3]

(ii) Write down the mode.

..... [1]

(iii) Write down the median.

..... [1]

8 $f(x) = \frac{3}{x+2}$, $x \neq -2$ $g(x) = 8x - 5$ $h(x) = x^2 + 6$

(a) Work out $g\left(\frac{1}{4}\right)$.

..... [1]

(b) Work out ff(2).

..... [2]

(c) Find gg(x), giving your answer in its simplest form.

..... [2]

(d) Find $g^{-1}(x)$.

$g^{-1}(x) =$ ..... [2]

(e) Write $g(x) - f(x)$ as a single fraction in its simplest form.

..... [3]

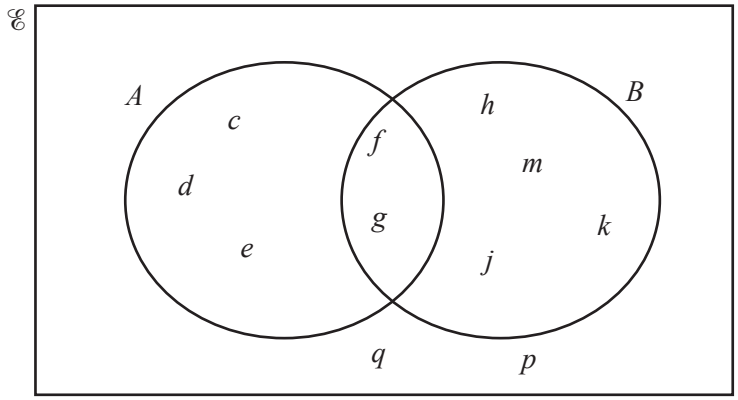
(f) **(i)** Show that $\text{hg}(x) = 19$ simplifies to $16x^2 - 20x + 3 = 0$.

[3]

(ii) Use the quadratic formula to solve $16x^2 - 20x + 3 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

9 **(a)** The Venn diagram shows two sets, A and B.



(i) Use set notation to complete the statements.

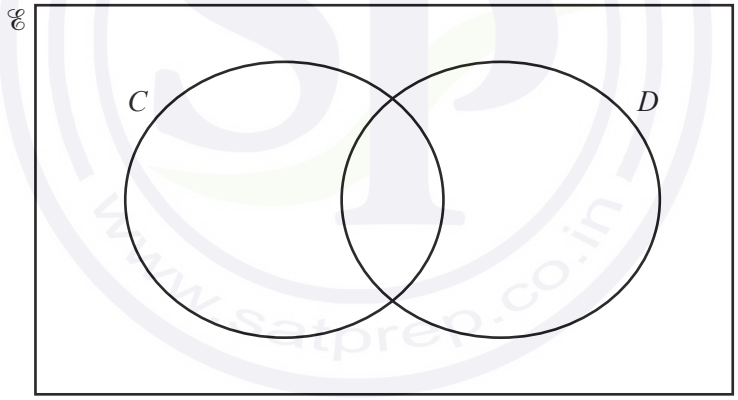
(a) d ..... A [1]

(b) $\{f, g\}$ = ... [1]

(ii) Complete the statement.

n (.....) = 6 [1]

(b) In the Venn diagram below, shade $C \cap D'$.

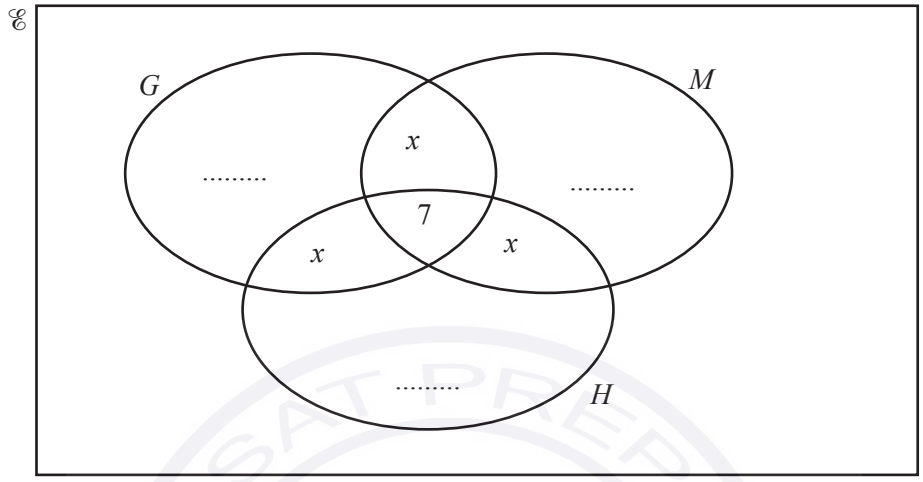


[1]

(c) 50 students study at least one of the subjects geography (G), mathematics (M) and history (H).

18 study only mathematics.
19 study two or three of these subjects.
23 study geography.

The Venn diagram below is to be used to show this information.



(i) Show that $x = 4$.

[2]

(ii) Complete the Venn diagram. [2]

(iii) Use set notation to complete this statement.

$(G \cup M \cup H)' =$ ..... [1]

(iv) Find $n(G \cap (M \cup H))$.

..... [1]

10 **(a)** Solve the simultaneous equations.
You must show all your working.

$$6x + 5y = 27$$
$$5x - 3y = 44$$

$x =$ .....

$y =$ ..... [4]

(b) y is inversely proportional to $(x+3)^2$.
When $x = 2$, $y = 8$.

Find y when $x = 7$.

$y =$ ..... [3]

(c) Solve the inequality.

$$3(x-2) < 7(x+2)$$

..... [3]

11 **(a)** The table shows the first five terms of sequence A and sequence B.

Term	1	2	3	4	5	6
Sequence A	7	13	23	37	55	
Sequence B	1	3	9	27	81	

(i) Complete the table for the 6th term of each sequence. [2]

(ii) Find the nth term of

(a) sequence A,

..... [2]

(b) sequence B.

..... [2]

(b) The nth term of another sequence is $4n^2 + n + 3$.

Find

(i) the 2nd term,

..... [1]

(ii) the value of n when the nth term is 498.

$n =$ ..... [3]

BLANK PAGE

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2578031092

MATHEMATICS **0580/41**

Paper 4 (Extended) **October/November 2018**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

1 Marianne sells photos.

(a) The selling price of each photo is \$6.

(i) The selling price for each photo is made up of two parts, printing cost and profit.
For each photo, the ratio printing cost : profit = 5 : 3.

Calculate the profit she makes on each photo.

\$ ..... [2]

(ii) Calculate her profit as a percentage of the selling price.

.....% [1]

(iii) Calculate the selling price of a photo in euros (€) when the exchange rate is €1 = \$1.091 .

€ ..... [2]

(b) Marianne sells two sizes of photo.
These photos are mathematically similar rectangles.
The smaller photo has length 15 cm and width 12 cm.
The larger photo has area 352.8 cm^2.

Calculate the length of the larger photo.

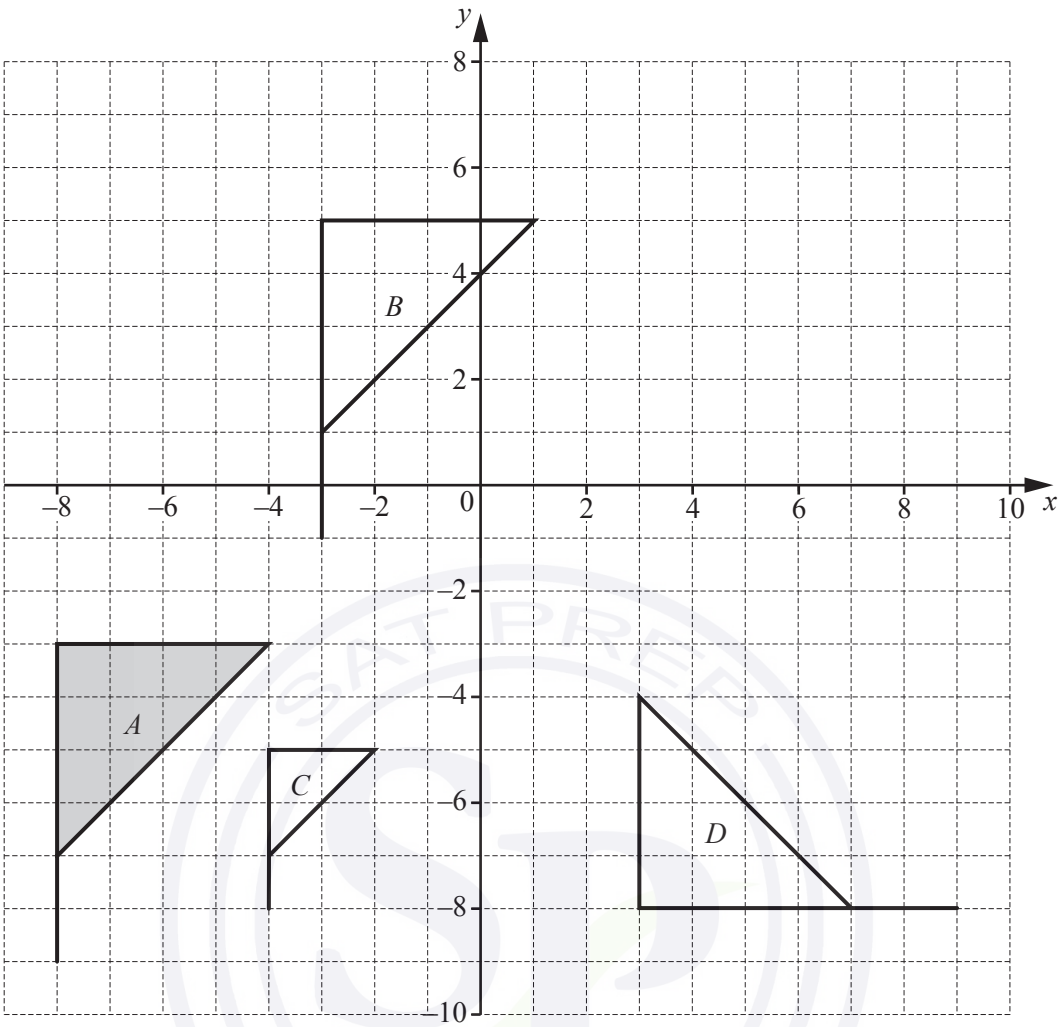
..... cm [3]

(c) In a sale, Marianne buys a new camera for \$483.
This is a reduction of 8% on the original price.

Calculate the original price of the camera.

\$ ..... [3]

2



(a) Describe fully the **single** transformation that maps

(i) flag *A* onto flag *B*,

.....

..... [2]

(ii) flag *A* onto flag *C*,

.....

..... [3]

(iii) flag *A* onto flag *D*.

.....

..... [3]

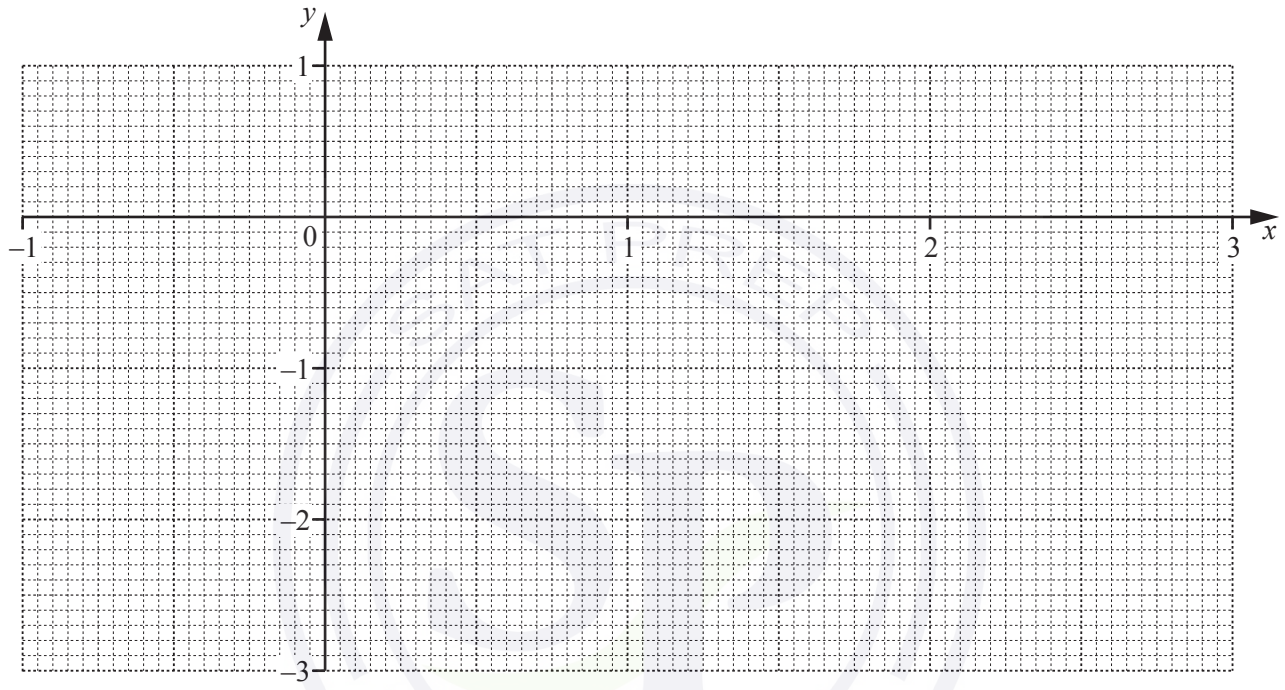
(b) Draw the reflection of flag *A* in the line $y = -1$. [2]

3 The table shows some values of $y = x^3 - 3x^2 + x$.

x	−0.75	−0.5	−0.25	0	0.5	1	1.5	2	2.5	2.75
y	−2.9	−1.4	−0.5		−0.1	−1	−1.9		−0.6	

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = x^3 - 3x^2 + x$ for $-0.75 \leqslant x \leqslant 2.75$. [4]



(c) Use your graph to complete the inequalities in x for which $y > -1$.

..... $< x <$ ..... and $x >$ ..... [3]

(d) The equation $x^3 - 3x^2 + 2x - 1 = 0$ can be solved by drawing a straight line on the grid.

(i) Write down the equation of this line.

..... [2]

(ii) On the grid, draw this line and use it to solve the equation $x^3 - 3x^2 + 2x - 1 = 0$.

$x =$ ..... [3]

(e) By drawing a suitable tangent, find an estimate for the gradient of the graph of $y = x^3 - 3x^2 + x$ at $x = -0.25$.

..... [3]

4 A school nurse records the height, h cm, of each of 180 children.
The table shows the information.

Height (h cm)	$60 < h \leqslant 70$	$70 < h \leqslant 90$	$90 < h \leqslant 100$	$100 < h \leqslant 110$	$110 < h \leqslant 115$	$115 < h \leqslant 125$
Frequency	8	26	35	67	28	16

(a) Calculate an estimate of the mean.
Give your answer correct to 1 decimal place.

..... cm [4]

(b) In a histogram showing the information, the height of the bar for the interval $60 < h \leqslant 70$ is 0.4 cm.

Calculate the height of the bar for each of the following intervals.

$115 < h \leqslant 125$ ..... cm

$110 < h \leqslant 115$ ..... cm

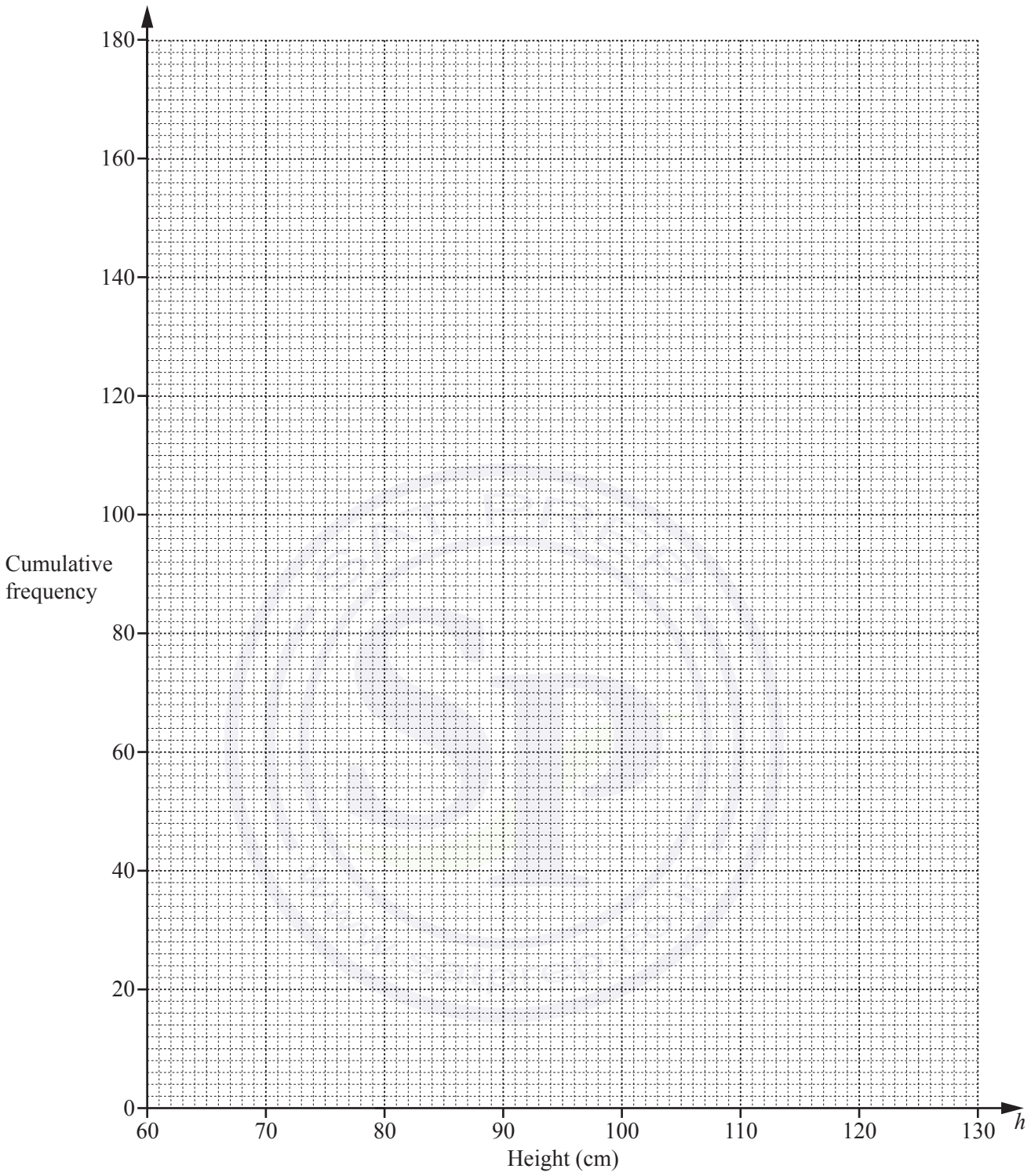
$70 < h \leqslant 90$ ..... cm [3]

(c) Complete the cumulative frequency table below.

Height (h cm)	$h \leqslant 70$	$h \leqslant 90$	$h \leqslant 100$	$h \leqslant 110$	$h \leqslant 115$	$h \leqslant 125$
Cumulative frequency						180

[2]

(d) On the grid opposite, draw a cumulative frequency diagram.



[3]

(e) Use your cumulative frequency diagram to find an estimate of

(i) the interquartile range,

..... cm [2]

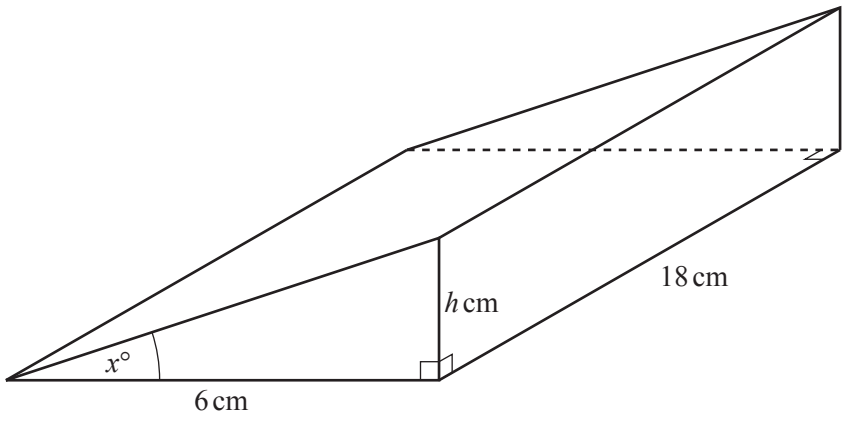
(ii) the 70th percentile,

..... cm [2]

(iii) the number of children with height greater than 106 cm.

..... [2]

5



The diagram shows a prism with length 18 cm and volume 253.8 cm^3.
The cross-section of the prism is a right-angled triangle with base 6 cm and height h cm.

(a) (i) Show that the value of h is 4.7 .

[3]

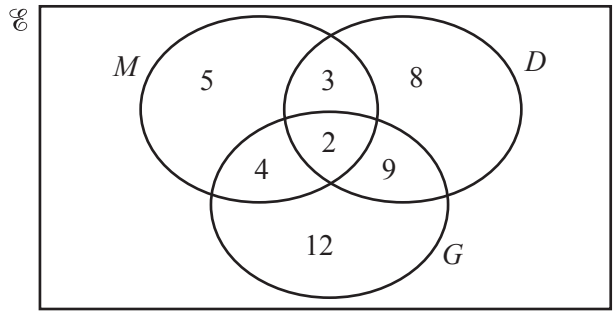
(ii) Calculate the value of x.

x = ... [2]

(b) Calculate the total surface area of the prism.

..... cm^2 [6]

6 (a)



The Venn diagram above shows information about the number of students who study Music (M), Drama (D) and Geography (G).

(i) How many students study Music?

..... [1]

(ii) How many students study exactly two subjects?

..... [1]

(iii) Two students are chosen at random from those who study Drama.

Calculate the probability that they both also study Music.

..... [3]

(iv) In the Venn diagram above, shade $M \cap D'$. [1]

(b) (i) $\mathscr{E} = \{x : x \text{ is an integer and } 1 \leqslant x \leqslant 10\}$

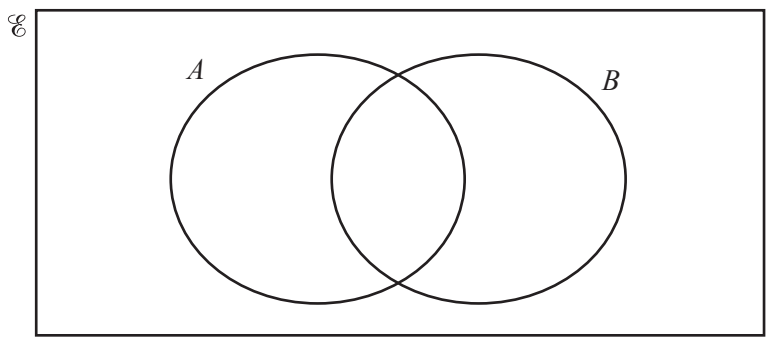
$A = \{x : x \text{ is even}\}$

$4 \in A \cap B$

$\mathrm{n}(A \cap B) = 1$

$(A \cup B)' = \{1, 7, 9\}$

Complete the Venn diagram below using this information.

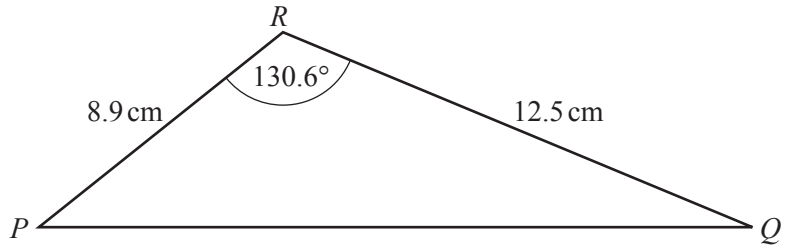


[4]

(ii) Use your Venn diagram to complete the statement.

$B = \{.....\}$ [1]

7 **(a)**

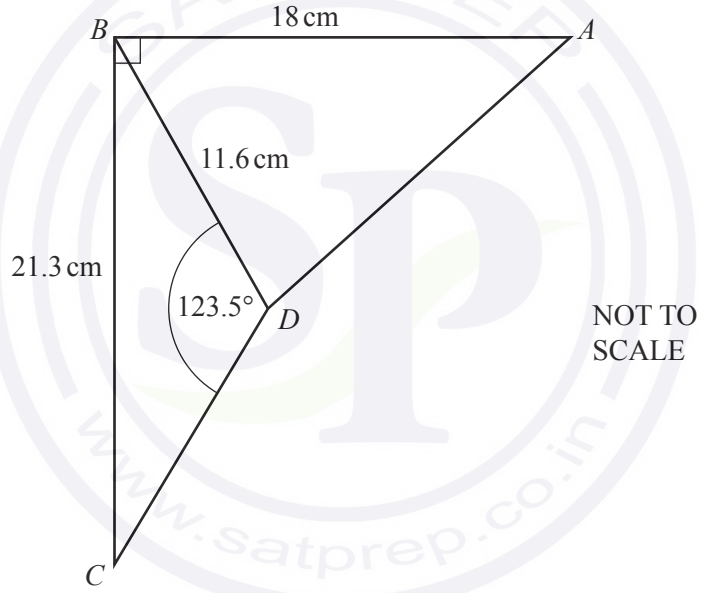


NOT TO SCALE

Calculate the area of triangle PQR.

..... cm^2 [2]

(b)



NOT TO SCALE

In the diagram, $AB = 18$ cm, $BC = 21.3$ cm and $BD = 11.6$ cm.
Angle $BDC = 123.5°$ and angle ABC is a right angle.

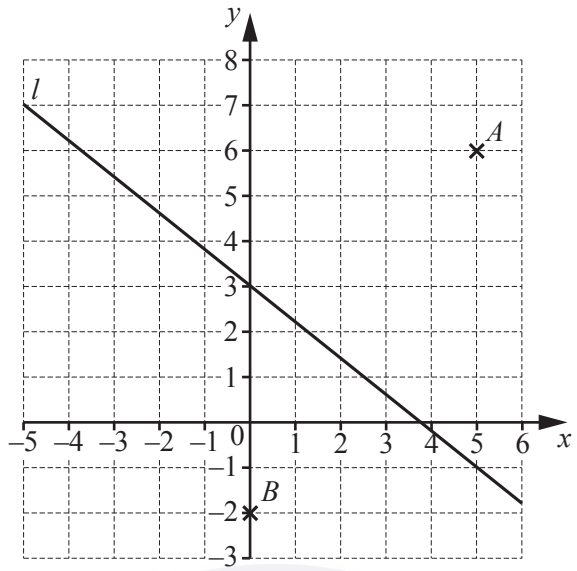
(i) Calculate angle BCD.

Angle BCD = ... [3]

(ii) Calculate AD.

AD = ... cm [5]

8



(a) Write down the co-ordinates of A.

(..... , ...) [1]

(b) Find the equation of line l in the form $y = mx + c$.

$y =$ ..... [3]

(c) Write down the equation of the line parallel to line l that passes through the point B.

..... [2]

(d) C is the point (8, 14).

(i) Write down the equation of the line perpendicular to line l that passes through the point C.

..... [3]

(ii) Calculate the length of AC.

..... [3]

(iii) Find the co-ordinates of the mid-point of BC.

(..... , ...) [2]

9 Paulo and Jim each buy sacks of rice but from different shops.
Paulo pays \$72 for sacks costing \$$m$ each.
Jim pays \$72 for sacks costing \$(m + 0.9) each.

(a) (i) Find an expression, in terms of m, for the number of sacks Paulo buys.

..... [1]

(ii) Find an expression, in terms of m, for the number of sacks Jim buys.

..... [1]

(b) Paulo buys 4 more sacks than Jim.

Write down an equation, in terms of m, and show that it simplifies to $10m^2 + 9m - 162 = 0$.

[4]

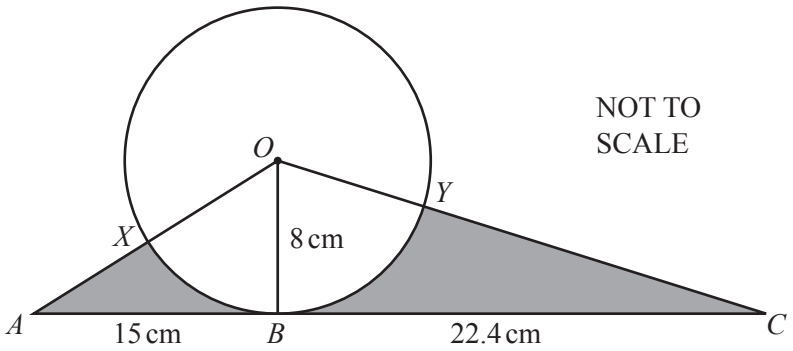
(c) (i) Solve $10m^2 + 9m - 162 = 0$.

m = ... or m = ... [3]

(ii) Find the number of sacks of rice that Paulo buys.

..... [1]

10



The diagram shows a circle, centre O.
The straight line ABC is a tangent to the circle at B.
$OB = 8$ cm, $AB = 15$ cm and $BC = 22.4$ cm.
AO crosses the circle at X and OC crosses the circle at Y.

(a) Calculate angle XOY.

Angle XOY = ... [5]

(b) Calculate the length of the arc XBY.

..... cm [2]

(c) Calculate the total area of the two shaded regions.

..... cm^2 [4]

Question 11 is printed on the next page.

11 **(a)** Factorise $5m^2 - 20p^4$.

..... [3]

(b) Make P the subject of the formula $A = P + \frac{PRT}{100}$.

$P =$ ..... [3]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

3938226969

MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2018**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

1 **(a)** The Muller family are on holiday in New Zealand.

(i) They change some euros (€) and receive $1962 (New Zealand dollars).
The exchange rate is €1 = $1.635 .

Calculate the number of euros they change.

€ ..... [2]

(ii) The family spend 15% of their New Zealand dollars on a tour.

Calculate the number of dollars they have left.

$ ..... [2]

(iii) The family visit two waterfalls, the Humboldt Falls and the Bridal Veil Falls.
The ratio of the heights Humboldt Falls : Bridal Veil Falls = 5 : 1.
The Humboldt Falls are 220 m higher than the Bridal Veil Falls.

Calculate the height of the Humboldt Falls.

..... m [2]

(b) (i) Water flows over the Browne Falls at a rate of 3680 litres per second.
After rain, this rate increases to 9752 litres per second.

Calculate the percentage increase in this rate.

..... % [3]

(ii) After rain, water flows over the Sutherland Falls at a rate of 74 240 litres per second.
This is an increase of 45% on the rate before the rain.

Calculate the rate before the rain.

..... litres/second [3]

2 **(a)** Solve $30 + 2x = 3(3 - 4x)$.

$x =$ ..... [3]

(b) Factorise $12ab^3 + 18a^3b^2$.

..... [2]

(c) Simplify.

(i) $5a^3c^2 \times 2a^2c^7$

..... [2]

(ii) $\left(\frac{16a^8}{c^{12}}\right)^{\frac{3}{4}}$

..... [2]

(d) y is inversely proportional to the square of $(x + 2)$.
When $x = 3$, $y = 2$.

Find y when $x = 8$.

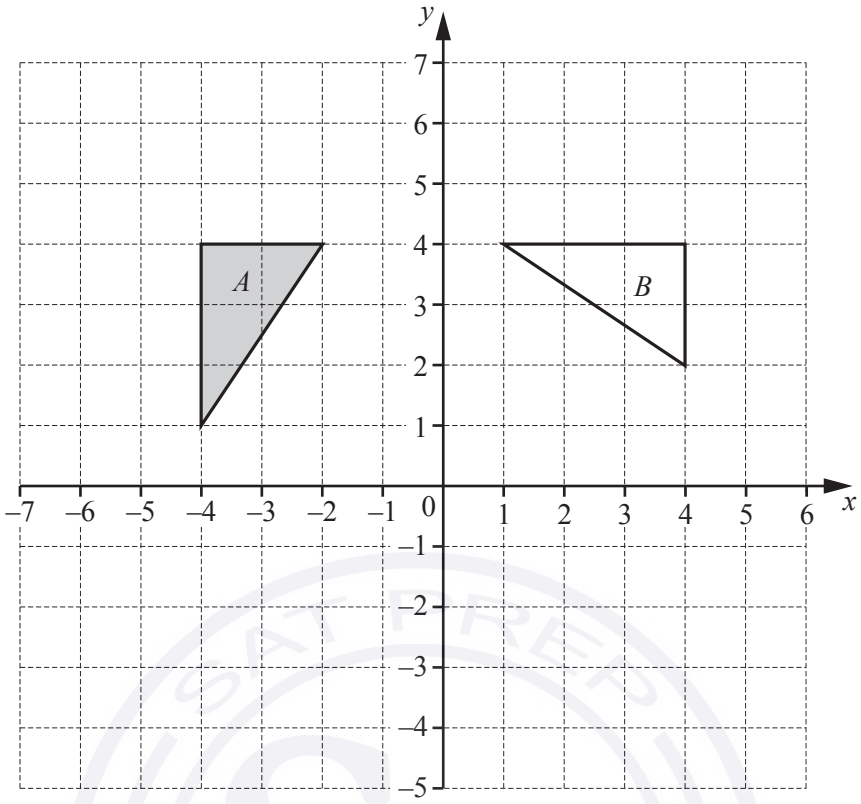
$y =$ ..... [3]

(e) Write as a single fraction in its simplest form.

$$\frac{5}{x-2} - \frac{x-5}{2}$$

..... [3]

3



(a) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

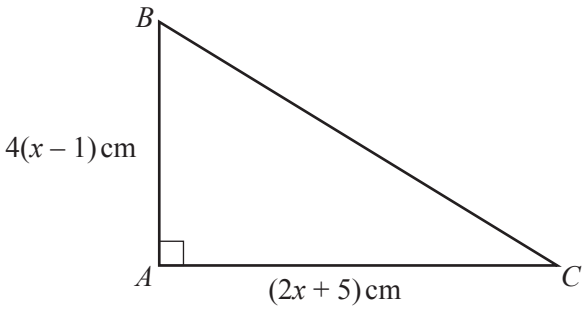
(b) On the grid, draw the image of

(i) triangle A after a reflection in the x-axis, [1]

(ii) triangle A after a translation by the vector $\begin{pmatrix} 7 \\ -5 \end{pmatrix}$, [2]

(iii) triangle A after the transformation represented by the matrix $\begin{pmatrix} 0.5 & 0 \\ 0 & 0.5 \end{pmatrix}$. [3]

4 The diagram shows a right-angled triangle ABC.



NOT TO SCALE

The area of this triangle is $30\,\text{cm}^2$.

(a) Show that $2x^2 + 3x - 20 = 0$.

[3]

(b) Use factorisation to solve the equation $2x^2 + 3x - 20 = 0$.

$x =$ ..... or $x =$ ..... [3]

(c) Calculate BC.

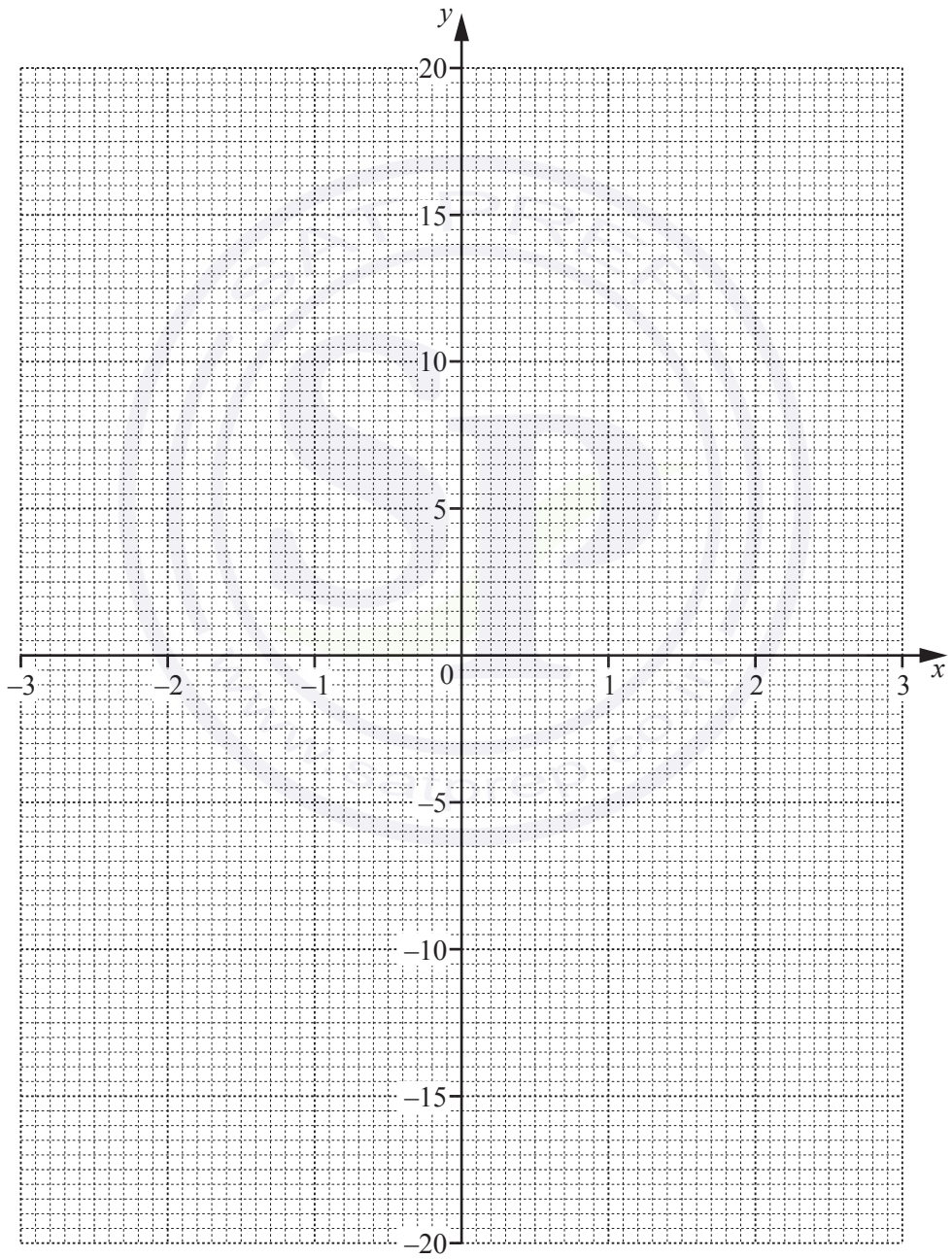
$BC =$ ..... cm [3]

5 The table shows some values of $y = x^3 - 3x - 1$.

x	–3	–2.5	–2	–1.5	–1	0	1	1.5	2	2.5	3
y	–19	–9.1		0.1	1	–1	–3	–2.1	1	7.1	

(a) Complete the table of values. [2]

(b) Draw the graph of $y = x^3 - 3x - 1$ for $-3 \leqslant x \leqslant 3$.



[4]

(c) A straight line through (0, –17) is a tangent to the graph of $y = x^3 - 3x - 1$.

(i) On the grid, draw this tangent. [1]

(ii) Find the co-ordinates of the point where the tangent meets your graph.

(..... , ...) [1]

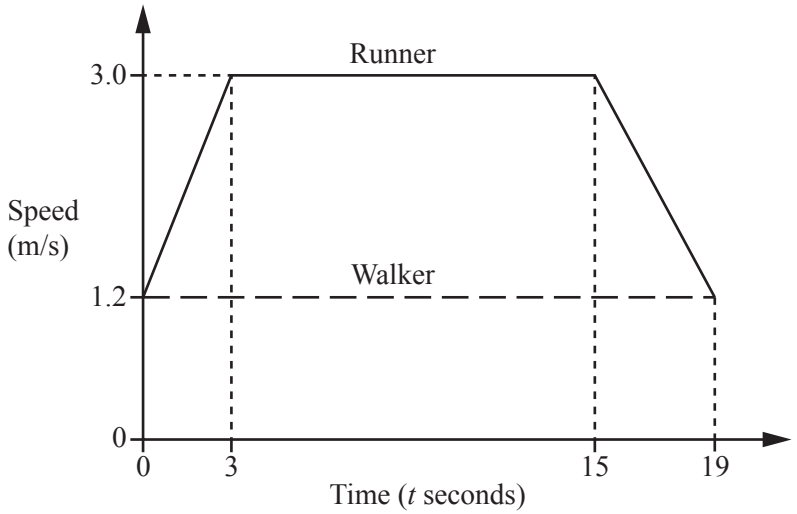
(iii) Find the equation of the tangent.
Give your answer in the form $y = mx + c$.

$y =$ ..... [3]

(d) By drawing a suitable straight line on the grid, solve the equation $x^3 - 6x - 3 = 0$.

$x =$ ..... or $x =$ ..... or $x =$ ..... [4]

6 The diagram shows the speed−time graph for part of a journey for two people, a runner and a walker.



NOT TO SCALE

(a) Calculate the acceleration of the runner for the first 3 seconds.

..... m/s^2 [1]

(b) Calculate the total distance travelled by the runner in the 19 seconds.

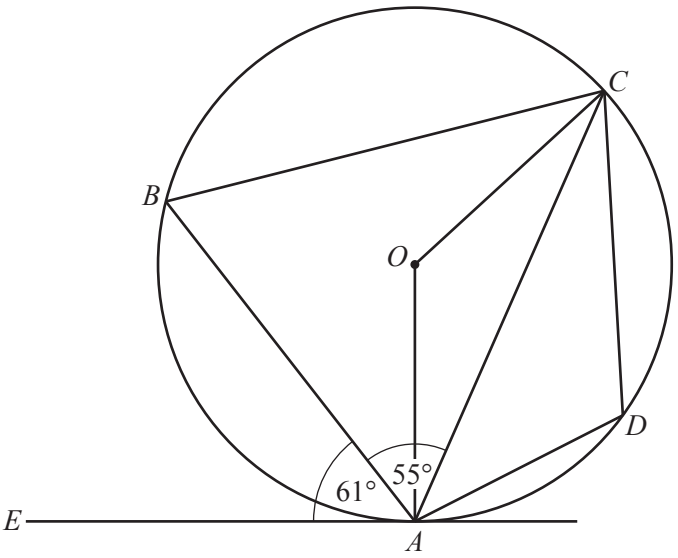
..... m [3]

(c) The runner and the walker are travelling in the same direction along the same path.
When $t = 0$, the runner is 10 metres behind the walker.

Find how far the runner is ahead of the walker when $t = 19$.

..... m [3]

7



NOT TO SCALE

In the diagram, A, B, C and D lie on the circle, centre O.
EA is a tangent to the circle at A.
Angle $EAB = 61°$ and angle $BAC = 55°$.

(a) Find angle BAO.

Angle $BAO =$ ..... [1]

(b) Find angle AOC.

Angle $AOC =$ ..... [2]

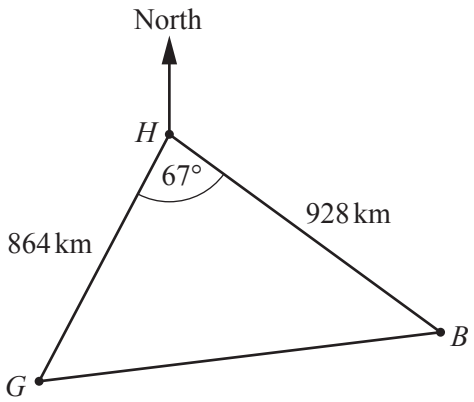
(c) Find angle ABC.

Angle $ABC =$ ..... [1]

(d) Find angle CDA.

Angle $CDA =$ ..... [1]

8 The diagram shows the positions of three cities, Geneva (G), Budapest (B) and Hamburg (H).



NOT TO SCALE

(a) A plane flies from Geneva to Hamburg.
The flight takes 2 hours 20 minutes.

Calculate the average speed in kilometres per hour.

..... km/h [2]

(b) Use the cosine rule to calculate the distance from Geneva to Budapest.

..... km [4]

(c) The bearing of Budapest from Hamburg is 133°.

(i) Find the bearing of Hamburg from Budapest.

..... [2]

(ii) Calculate the bearing of Budapest from Geneva.

..... [4]

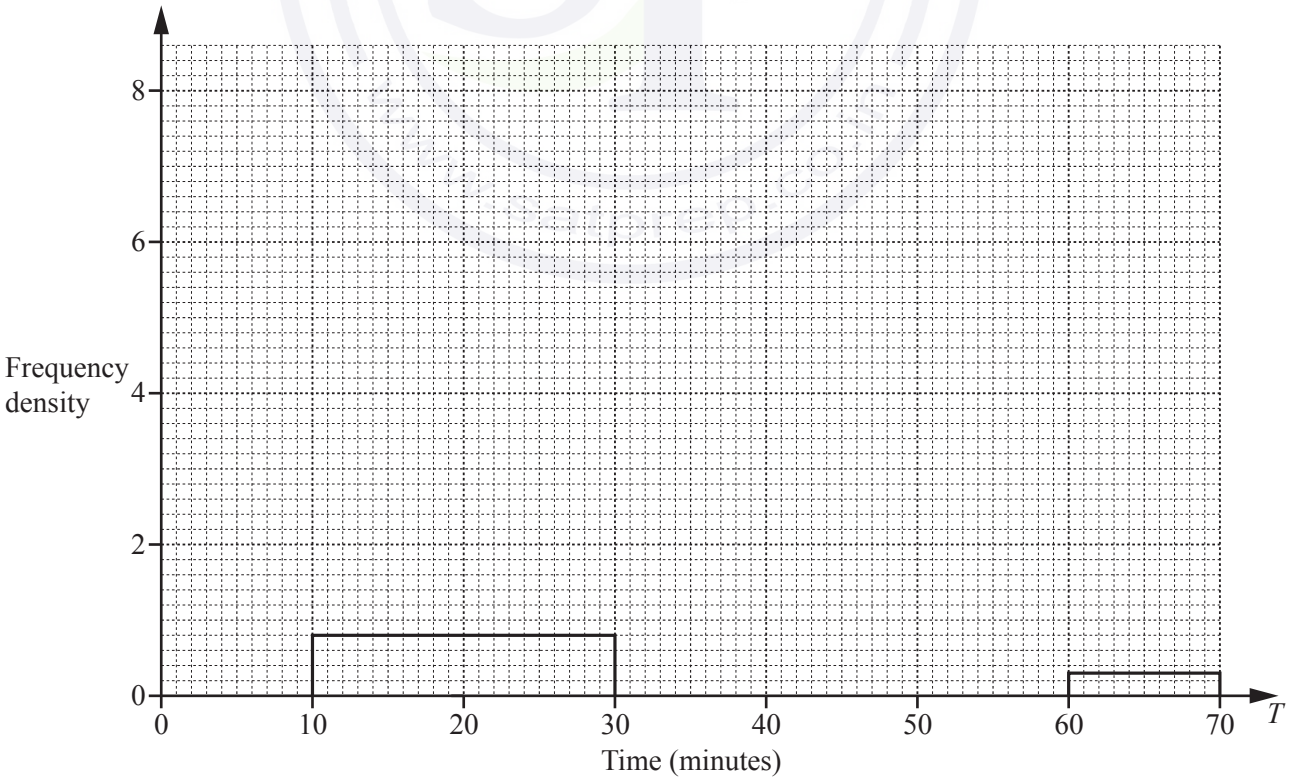
9 **(a)** The table shows the amount of time, T minutes, 120 people each spend in a supermarket one Saturday.

Time (T minutes)	Number of people
$10 < T \leqslant 30$	16
$30 < T \leqslant 40$	18
$40 < T \leqslant 45$	22
$45 < T \leqslant 50$	40
$50 < T \leqslant 60$	21
$60 < T \leqslant 70$	3

(i) Use the mid-points of the intervals to calculate an estimate of the mean.

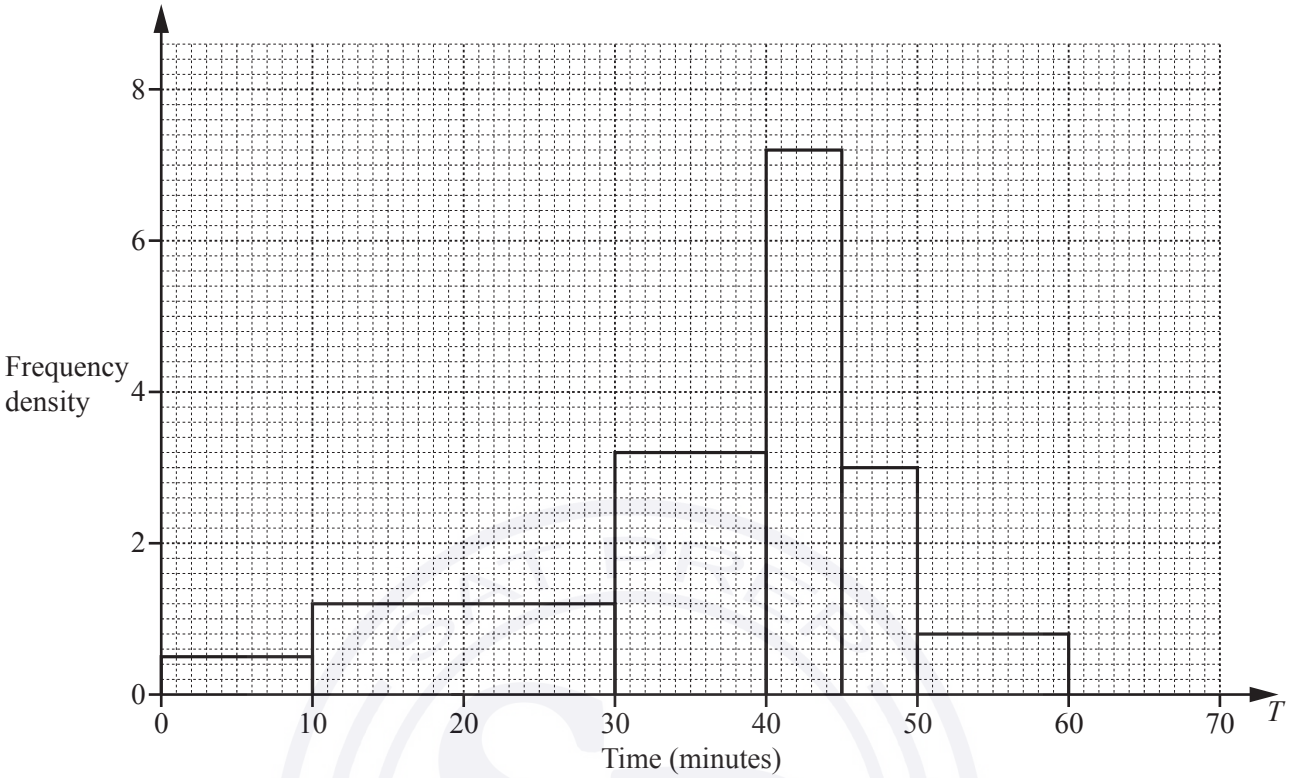
..... min [4]

(ii) Complete this histogram to show the information in the table.



[4]

(b) This histogram shows the amount of time, T minutes, 120 people each spend in the supermarket one Wednesday.



Make a comment comparing the distributions of the times for the two days.

.....

..... [1]

10 **(a)** The lake behind a dam has an area of 55 hectares.
When the gates in the dam are open, water flows out at a rate of 75 000 litres per second.

(i) Show that 90 million litres of water flows out in 20 minutes.

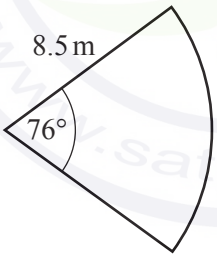
[1]

(ii) Beneath the surface, the lake has vertical sides.

Calculate the drop in the water level of the lake when the gates are open for 20 minutes.
Give your answer in centimetres.
[1 hectare = $10^4\,m^2$, 1000 litres = $1\,m^3$]

..... cm [3]

(iii)



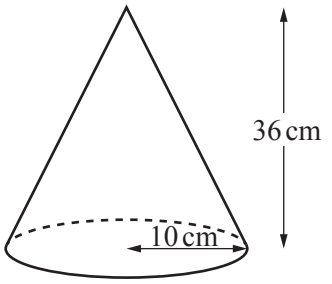
NOT TO SCALE

The cross-section of a gate is a sector of a circle with radius 8.5 m and angle 76°.

Calculate the perimeter of the sector.

..... m [3]

(b)



NOT TO SCALE

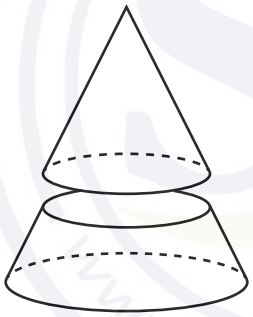
A solid metal cone has radius 10 cm and height 36 cm.

(i) Calculate the volume of this cone.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [2]

(ii) The cone is cut, parallel to its base, to give a smaller cone.



NOT TO SCALE

The volume of the smaller cone is half the volume of the original cone.
The smaller cone is melted down to make two different spheres.
The ratio of the radii of these two spheres is 1 : 2.

Calculate the radius of the smaller sphere.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm [4]

11 **(a)** $\mathbf{a} = \begin{pmatrix} -3 \\ 2 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 5 \\ 4 \end{pmatrix}$ $\mathbf{c} = \begin{pmatrix} 14 \\ 9 \end{pmatrix}$

(i) Find $3\mathbf{a} - 2\mathbf{b}$.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(ii) Find $|\mathbf{a}|$.

..... [2]

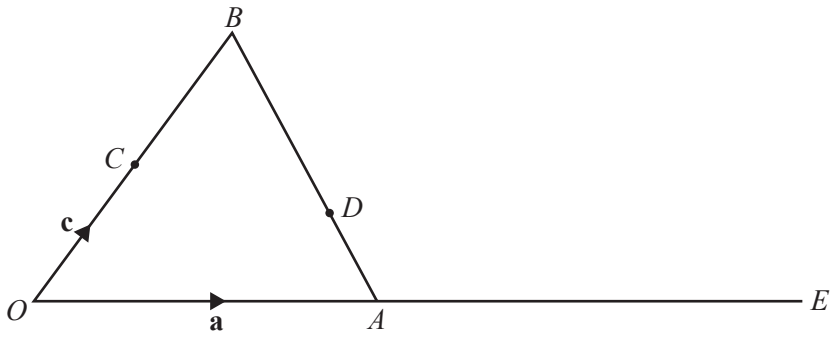
(iii) $m\mathbf{a} + n\mathbf{b} = \mathbf{c}$

Write down two simultaneous equations and solve them to find the value of m and the value of n. Show all your working.

$m =$ .....

$n =$ ..... [5]

(b)



NOT TO SCALE

OAB is a triangle and *C* is the mid-point of *OB*.
D is on *AB* such that $AD : DB = 3 : 5$.
OAE is a straight line such that $OA : AE = 2 : 3$.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$.

(i) Find, in terms of **a** and **c**, in its simplest form,

(a) $\overrightarrow{AB}$,

$\overrightarrow{AB} =$ ..... [1]

(b) $\overrightarrow{AD}$,

$\overrightarrow{AD} =$ ..... [1]

(c) $\overrightarrow{CE}$,

$\overrightarrow{CE} =$ ..... [1]

(d) $\overrightarrow{CD}$.

$\overrightarrow{CD} =$ ..... [2]

(ii) $\overrightarrow{CE} = k\overrightarrow{CD}$

Find the value of *k*.

$k =$ ..... [1]

Question 12 is printed on the next page.

12 A box contains 20 packets of potato chips.

6 packets contain barbecue flavoured chips.
10 packets contain salt flavoured chips.
4 packets contain chicken flavoured chips.

(a) Maria takes two packets at random **without replacement**.

(i) Show that the probability that she takes two packets of salt flavoured chips is $\frac{9}{38}$.

[2]

(ii) Find the probability that she takes two packets of different flavoured chips.

..... [4]

(b) Maria takes three packets at random, **without replacement**, from the 20 packets.

Find the probability that she takes **at least two** packets of chicken flavoured chips.

..... [3]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

2816863460

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2018**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **19** printed pages and **1** blank page.

CAMBRIDGE International Examinations

1 Adele, Barbara and Collette share \$680 in the ratio 9 : 7 : 4.

(a) Show that Adele receives \$306.

[1]

(b) Calculate the amount that Barbara and Collette each receives.

Barbara \$ .....

Collette \$ ..... [3]

(c) Adele changes her \$306 into euros (€) when the exchange rate is €1 = \$1.125 .

Calculate the number of euros she receives.

€ ..... [2]

(d) Barbara spends a total of \$17.56 on 5 kg of apples and 3 kg of bananas.
Apples cost \$2.69 per kilogram.

Calculate the cost per kilogram of bananas.

\$ ..... [3]

(e) Collette spends half of her share on clothes and $\frac{1}{5}$ of her share on books.

Calculate the amount she has left.

\$ ..... [3]

2 The scale drawing shows two boundaries, *AB* and *BC*, of a field *ABCD*.
The scale of the drawing is 1 cm represents 8 m.

Scale: 1 cm to 8 m

(a) The boundaries *CD* and *AD* of the field are each 72 m long.

(i) Work out the length of *CD* and *AD* on the scale drawing.

..... cm [1]

(ii) **Using a ruler and compasses only**, complete accurately the scale drawing of the field. [2]

(b) A tree in the field is

- equidistant from *A* and *B*

and

- equidistant from *AB* and *BC*.

On the scale drawing, construct two lines to find the position of the tree.
Use a straight edge and compasses only and leave in your construction arcs. [4]

3 **(a)** The price of a house decreased from \$82 500 to \$77 500.

Calculate the percentage decrease.

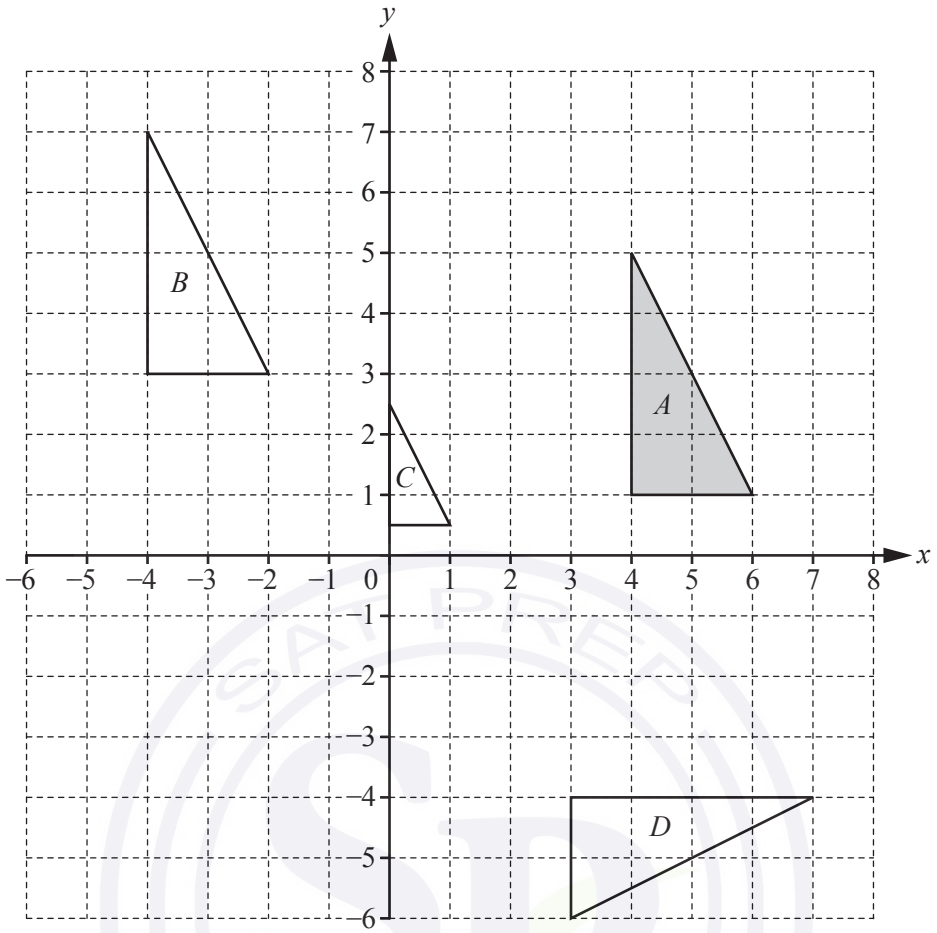
..... % [3]

(b) Roland invests \$12 000 in an account that pays compound interest at a rate of 2.2% per year.

Calculate the value of his investment at the end of 6 years.
Give your answer correct to the nearest dollar.

\$ ..... [3]

4



(a) Describe fully the **single** transformation that maps

(i) triangle A onto triangle B,

.....

..... [2]

(ii) triangle A onto triangle C,

.....

..... [3]

(iii) triangle A onto triangle D.

.....

..... [3]

(b) On the grid, draw the image of triangle A after an enlargement by scale factor 2, centre $(7, 3)$. [2]

5 **(a)** Factorise.

(i) $2mn + m^2 - 6n - 3m$

..... [2]

(ii) $4y^2 - 81$

..... [1]

(iii) $t^2 - 6t + 8$

..... [2]

(b) Rearrange the formula to make x the subject.

$$k = \frac{2m - x}{x}$$

$x =$ ..... [4]

(c) Solve the simultaneous equations.
You must show all your working.

$$\tfrac{1}{2}x - 3y = 9$$
$$5x + y = 28$$

$x =$ .....

$y =$ ..... [3]

(d) $\dfrac{3}{m+4} - \dfrac{4}{m} = 6$

(i) Show that this equation can be written as $6m^2 + 25m + 16 = 0$.

[3]

(ii) Solve the equation $6m^2 + 25m + 16 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$m =$ ..... or $m =$ ..... [4]

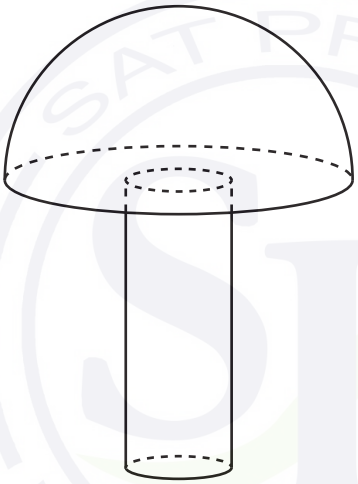
6 A solid hemisphere has volume 230 cm^3.

(a) Calculate the radius of the hemisphere.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm [3]

(b) A solid cylinder with radius 1.6 cm is attached to the hemisphere to make a toy.



NOT TO SCALE

The total volume of the toy is 300 cm^3.

(i) Calculate the height of the cylinder.

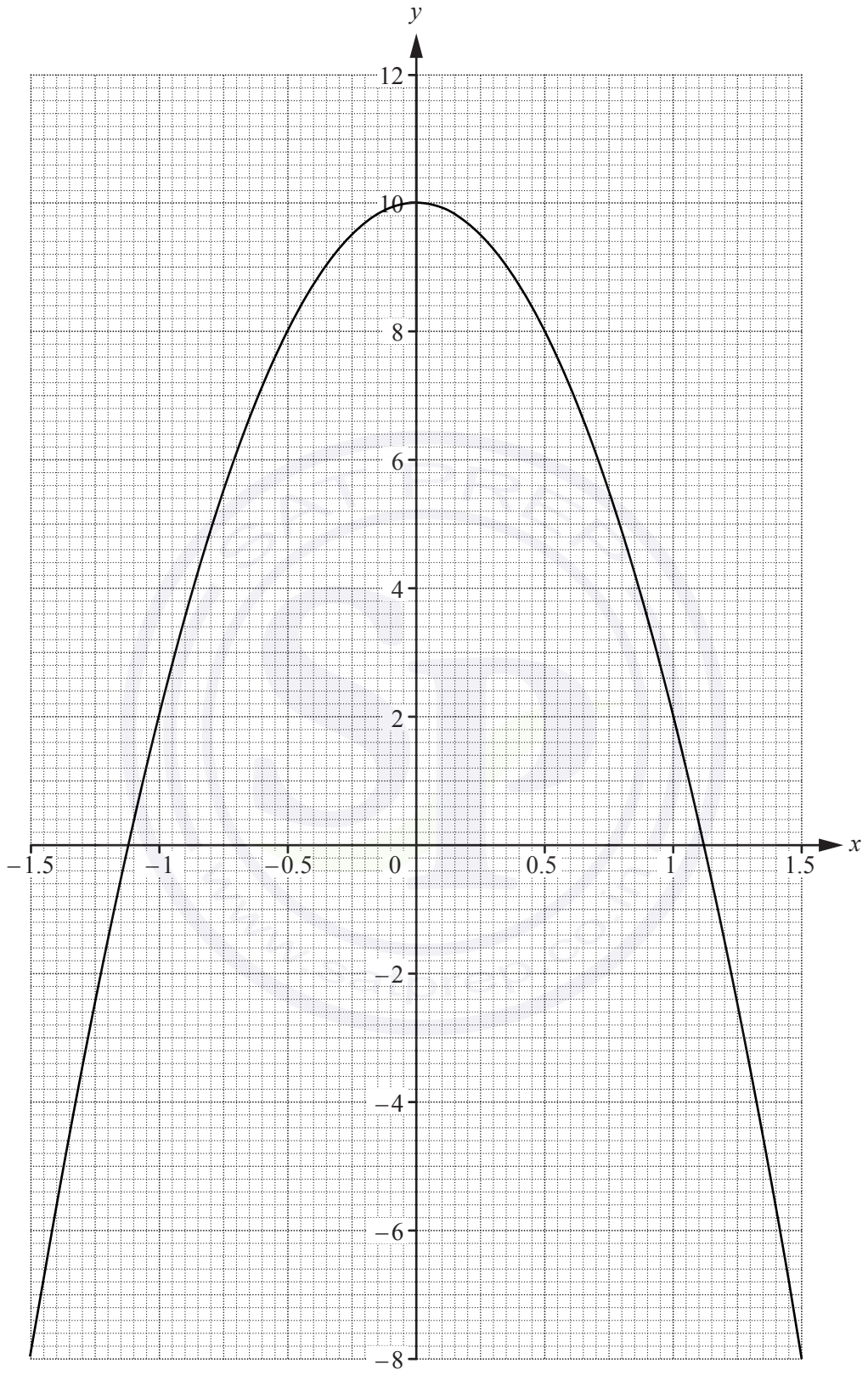
..... cm [3]

(ii) A mathematically similar toy has volume 19 200 cm^3.

Calculate the radius of the cylinder for this toy.

..... cm [3]

7 The graph of $y = 10 - 8x^2$ for $-1.5 \leqslant x \leqslant 1.5$ is drawn on the grid.



(a) Write down the equation of the line of symmetry of the graph.

..... [1]

(b) On the grid opposite, draw the tangent to the curve at the point where $x = 0.5$.
Find the gradient of this tangent.

..... [3]

(c) The table shows some values for $y = x^3 + 3x + 4$.

x	-1.5	-1	-0.5	0	0.5	1	1.5
y	-3.9				5.6	8	11.9

(i) Complete the table. [3]

(ii) On the grid opposite, draw the graph of $y = x^3 + 3x + 4$ for $-1.5 \leqslant x \leqslant 1.5$. [4]

(d) Show that the values of x where the two curves intersect are the solutions to the equation $x^3 + 8x^2 + 3x - 6 = 0$.

[1]

(e) By drawing a suitable straight line, solve the equation $x^3 + 5x + 2 = 0$ for $-1.5 \leqslant x \leqslant 1.5$.

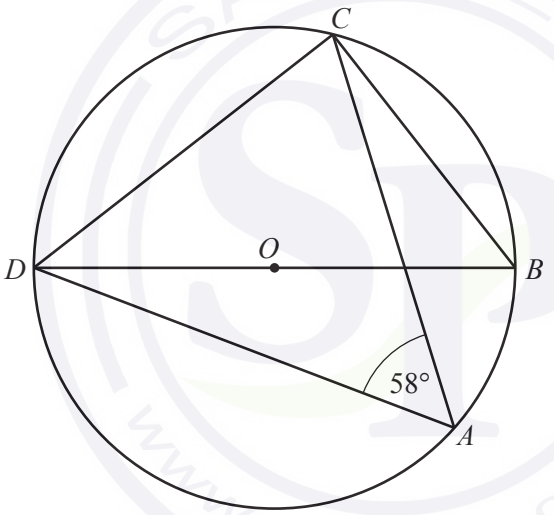
$x =$ ..... [3]

8 **(a)** The exterior angle of a regular polygon is $x°$ and the interior angle is $8x°$.

Calculate the number of sides of the polygon.

..... [3]

(b)



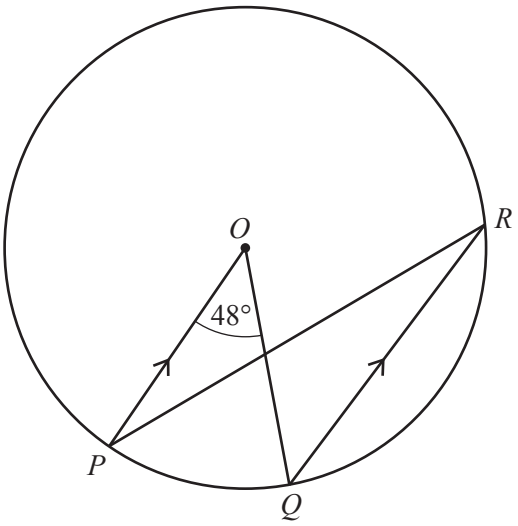
NOT TO SCALE

A, B, C and D are points on the circumference of the circle, centre O.
DOB is a straight line and angle $DAC = 58°$.

Find angle CDB.

Angle CDB = ... [3]

(c)



NOT TO SCALE

P, Q and R are points on the circumference of the circle, centre O.
PO is parallel to QR and angle $POQ = 48°$.

(i) Find angle OPR.

Angle OPR = ... [2]

(ii) The radius of the circle is 5.4 cm.

Calculate the length of the **major** arc PQ.

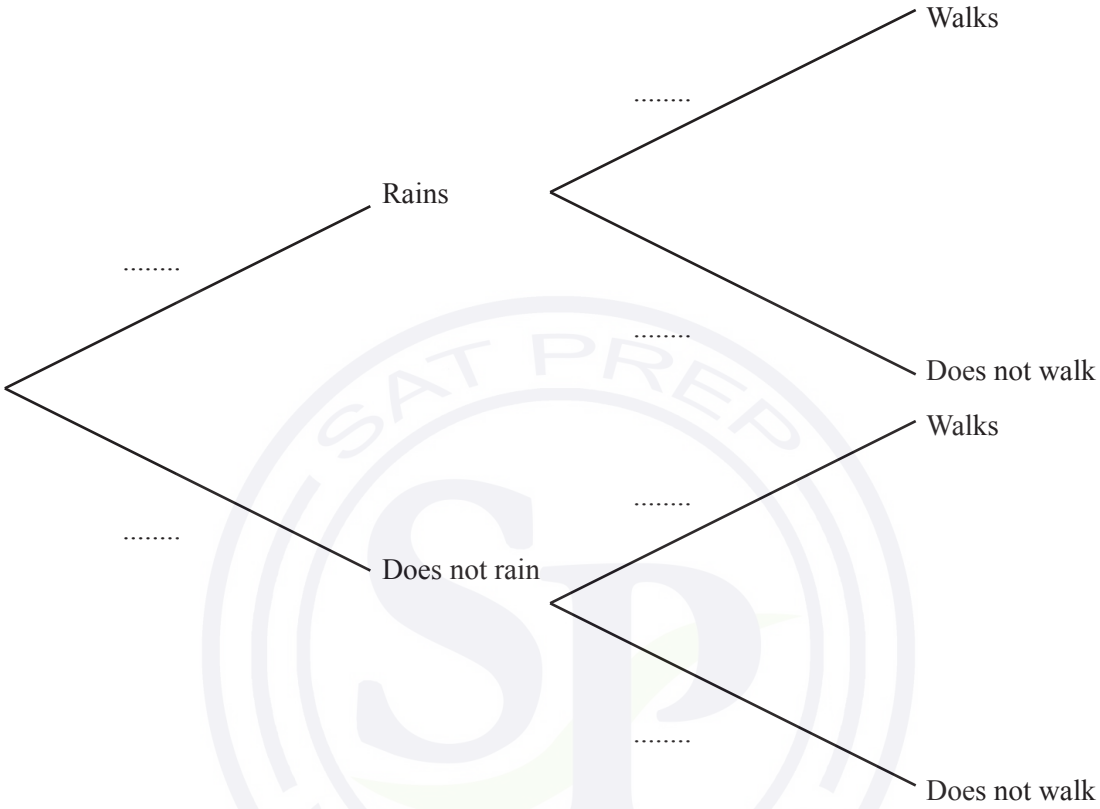
..... cm [3]

9 The probability that it will rain tomorrow is $\frac{5}{8}$.

If it rains, the probability that Rafael walks to school is $\frac{1}{6}$.

If it does not rain, the probability that Rafael walks to school is $\frac{7}{10}$.

(a) Complete the tree diagram.



[3]

(b) Calculate the probability that it will rain tomorrow and Rafael walks to school.

..... [2]

(c) Calculate the probability that Rafael does not walk to school.

..... [3]

10 **(a)** In 2017, the membership fee for a sports club was \$79.50 .
This was an increase of 6% on the fee in 2016.

Calculate the fee in 2016.

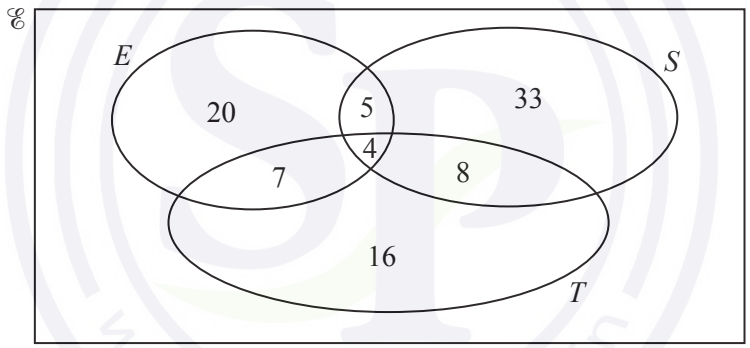
\$ ..... [3]

(b) On one day, the number of members using the exercise machines was 40, correct to the nearest 10.
Each member used a machine for 30 minutes, correct to the nearest 5 minutes.

Calculate the lower bound for the number of minutes the exercise machines were used on this day.

..... min [2]

(c) On another day, the number of members using the exercise machines (E), the swimming pool (S) and the tennis courts (T) is shown on the Venn diagram.



(i) Find the number of members using only the tennis courts.

..... [1]

(ii) Find the number of members using the swimming pool.

..... [1]

(iii) A member using the swimming pool is chosen at random.

Find the probability that this member also uses the tennis courts and the exercise machines.

..... [2]

(iv) Find $\mathrm{n}(T \cap (E \cup S))$.

..... [1]

11 (a) $\overrightarrow{OA} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$ $\overrightarrow{AB} = \begin{pmatrix} 8 \\ -7 \end{pmatrix}$ $\overrightarrow{AC} = \begin{pmatrix} -3 \\ 6 \end{pmatrix}$

Find

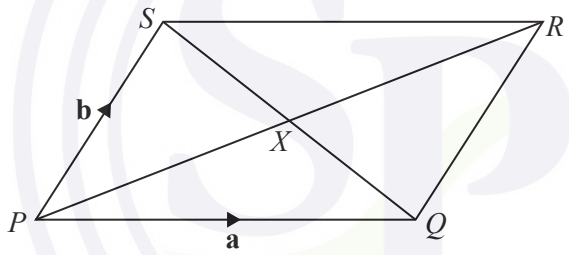
(i) $\left|\overrightarrow{OB}\right|$,

$\left|\overrightarrow{OB}\right|$ = ... [3]

(ii) $\overrightarrow{BC}$.

$\overrightarrow{BC}$ = $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(b)



NOT TO SCALE

PQRS is a parallelogram with diagonals *PR* and *SQ* intersecting at *X*.
$\overrightarrow{PQ} = \mathbf{a}$ and $\overrightarrow{PS} = \mathbf{b}$.

Find $\overrightarrow{QX}$ in terms of **a** and **b**.
Give your answer in its simplest form.

$\overrightarrow{QX}$ = ... [2]

(c) $\mathbf{M} = \begin{pmatrix} 2 & 5 \\ 1 & 8 \end{pmatrix}$

Calculate

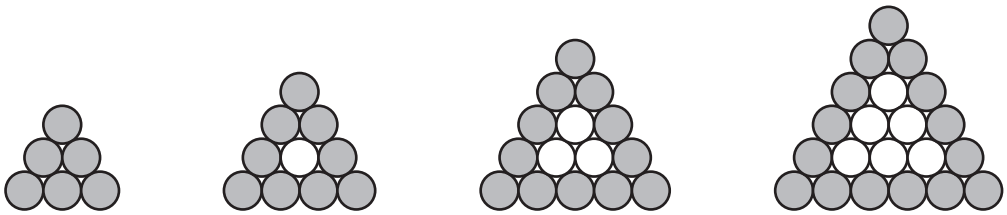
(i) $\mathbf{M}^2$,

$\mathbf{M}^2 =$ $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(ii) $\mathbf{M}^{-1}$.

$\mathbf{M}^{-1} =$ $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

12 Marco is making patterns with grey and white circular mats.



Pattern 1 Pattern 2 Pattern 3 Pattern 4

The patterns form a sequence.
Marco makes a table to show some information about the patterns.

Pattern number	1	2	3	4	5
Number of grey mats	6	9	12	15	
Total number of mats	6	10	15	21	

(a) Complete the table for Pattern 5. [2]

(b) Find an expression, in terms of n, for the number of grey mats in Pattern n.

..... [2]

(c) Marco makes a pattern with 24 grey mats.

Find the total number of mats in this pattern.

..... [2]

(d) Marco needs a total of 6 mats to make the first pattern.
He needs a total of 16 mats to make the first two patterns.
He needs a total of $\frac{1}{6}n^3 + an^2 + bn$ mats to make the first n patterns.

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [6]

BLANK PAGE

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

5134426042

MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2018**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **15** printed pages and **1** blank page.

CAMBRIDGE International Examinations

1 **(a)** Here is a list of ingredients to make 20 biscuits.

260 g of butter
500 g of sugar
650 g of flour
425 g of rice

(i) Find the mass of rice as a percentage of the mass of sugar.

..... % [1]

(ii) Find the mass of butter needed to make 35 of these biscuits.

..... g [2]

(iii) Michel has 2 kg of each ingredient.

Work out the greatest number of these biscuits that he can make.

..... [3]

(b) A company makes these biscuits at a cost of $1.35 per packet.
These biscuits are sold for $1.89 per packet.

(i) Calculate the percentage profit the company makes on each packet.

..... % [3]

(ii) The selling price of $1.89 has increased by 8% from last year.

Calculate the selling price last year.

$ ..... [3]

(c) Over a period of 3 years, the company's sales of biscuits increased from 15.6 million packets to 20.8 million packets.
The sales increased exponentially by the same percentage each year.

Calculate the percentage increase **each year**.

..... % [3]

(d) The people who work for the company are in the following age groups.

Group A	Group B	Group C
Under 30 years	30 to 50 years	Over 50 years

The ratio of the number in group A to the number in group B is 7 : 10.
The ratio of the number in group B to the number in group C is 4 : 3.

(i) Find the ratio of the number in group A to the number in group C.
Give your answer in its simplest form.

..... : ..... [3]

(ii) There are 45 people in group C.

Find the total number of people who work for the company.

..... [3]

2 The time taken for each of 120 students to complete a cooking challenge is shown in the table.

Time (t minutes)	$20 < t \leqslant 25$	$25 < t \leqslant 30$	$30 < t \leqslant 35$	$35 < t \leqslant 40$	$40 < t \leqslant 45$
Frequency	44	32	28	12	4

(a) (i) Write down the modal time interval.

..... $< t \leqslant$ ..... [1]

(ii) Write down the interval containing the median time.

..... $< t \leqslant$ ..... [1]

(iii) Calculate an estimate of the mean time.

..... min [4]

(iv) A student is chosen at random.

Find the probability that this student takes more than 40 minutes.

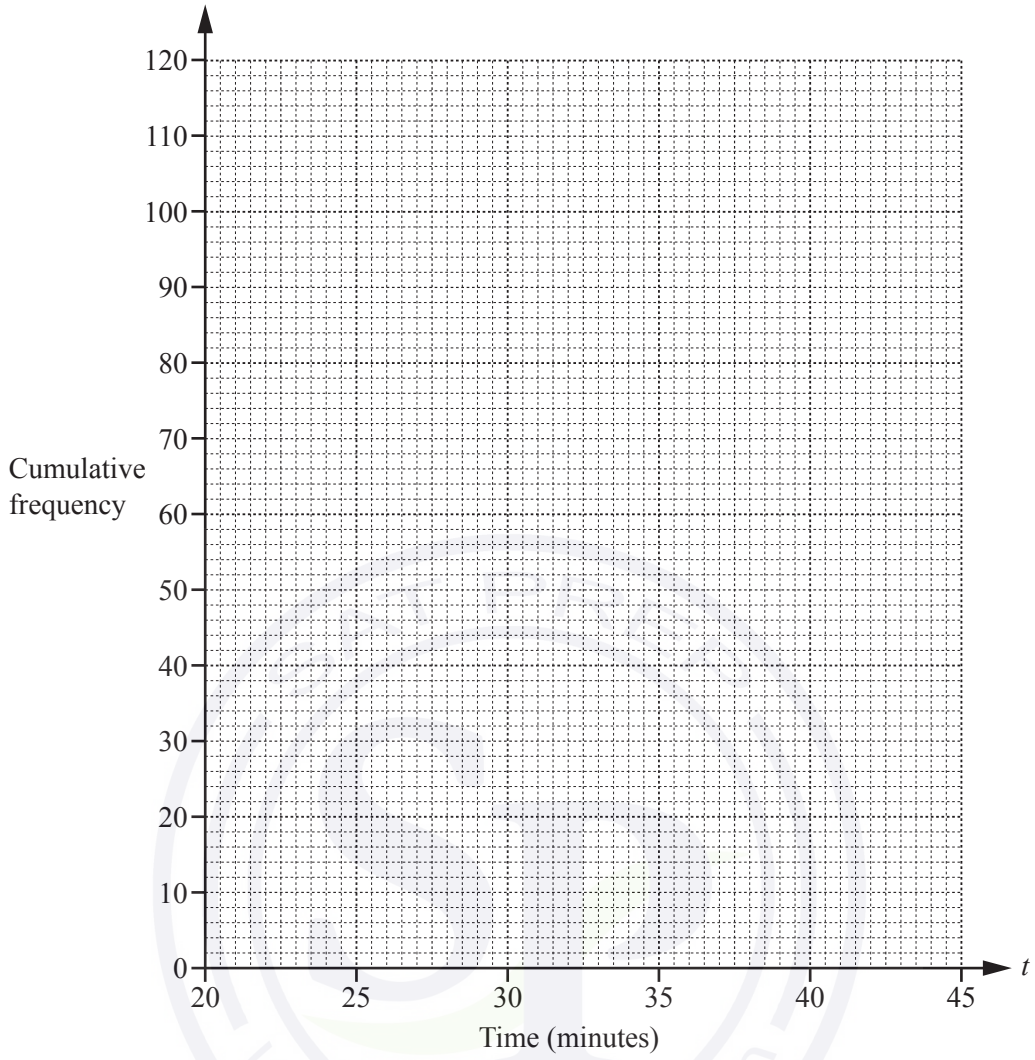
..... [1]

(b) (i) Complete the cumulative frequency table.

Time (t minutes)	$t \leqslant 20$	$t \leqslant 25$	$t \leqslant 30$	$t \leqslant 35$	$t \leqslant 40$	$t \leqslant 45$
Cumulative frequency	0	44				

[2]

(ii) On the grid, draw a cumulative frequency diagram to show this information.



[3]

(iii) Find the median time.

..... min [1]

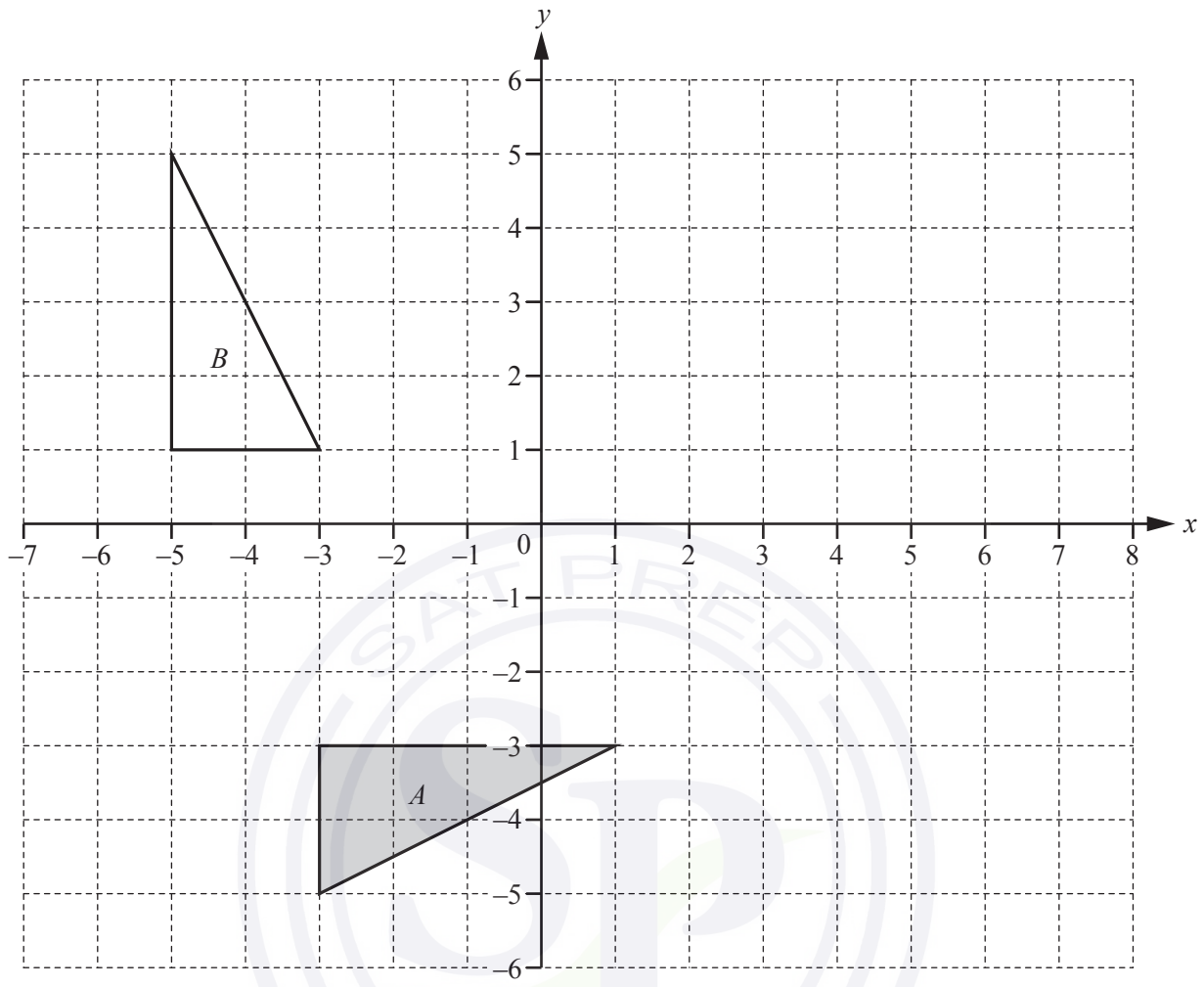
(iv) Find the interquartile range.

..... min [2]

(v) Find the number of students who took more than 37 minutes to complete the cooking challenge.

..... [2]

3



(a) **(i)** Draw the image of triangle A after a reflection in the line $x = 2$. [2]

(ii) Draw the image of triangle A after a translation by the vector $\begin{pmatrix} -2 \\ 4 \end{pmatrix}$. [2]

(iii) Draw the image of triangle A after an enlargement by scale factor $-\frac{1}{2}$, centre (3, 1). [3]

(b) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

(c) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$.

.....

..... [2]

4 **(a)** Simplify.

(i) $(3p^2)^5$

..... [2]

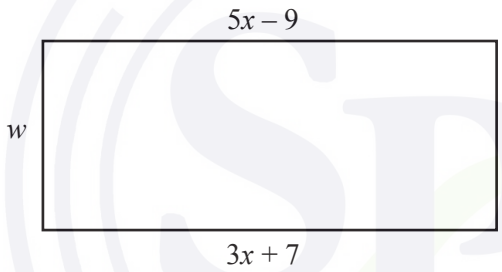
(ii) $18x^2y^6 \div 2xy^2$

..... [2]

(iii) $\left(\frac{5}{m}\right)^{-2}$

..... [1]

(b) In this part, all measurements are in metres.



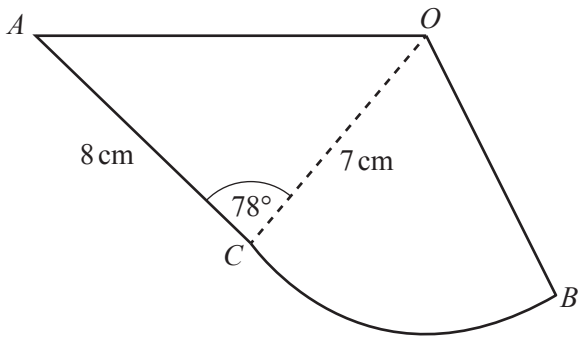
NOT TO SCALE

The diagram shows a rectangle.
The area of the rectangle is 310 m^2.

Work out the value of w.

$w =$ ..... [4]

5



NOT TO SCALE

The diagram shows a design made from a triangle AOC joined to a sector OCB.
$AC = 8$ cm, $OB = OC = 7$ cm and angle $ACO = 78°$.

(a) Use the cosine rule to show that $OA = 9.47$ cm, correct to 2 decimal places.

[4]

(b) Calculate angle OAC.

Angle $OAC =$ ..... [3]

(c) The perimeter of the design is 29.5 cm.

Show that angle $COB = 41.2°$, correct to 1 decimal place.

[5]

(d) Calculate the total area of the design.

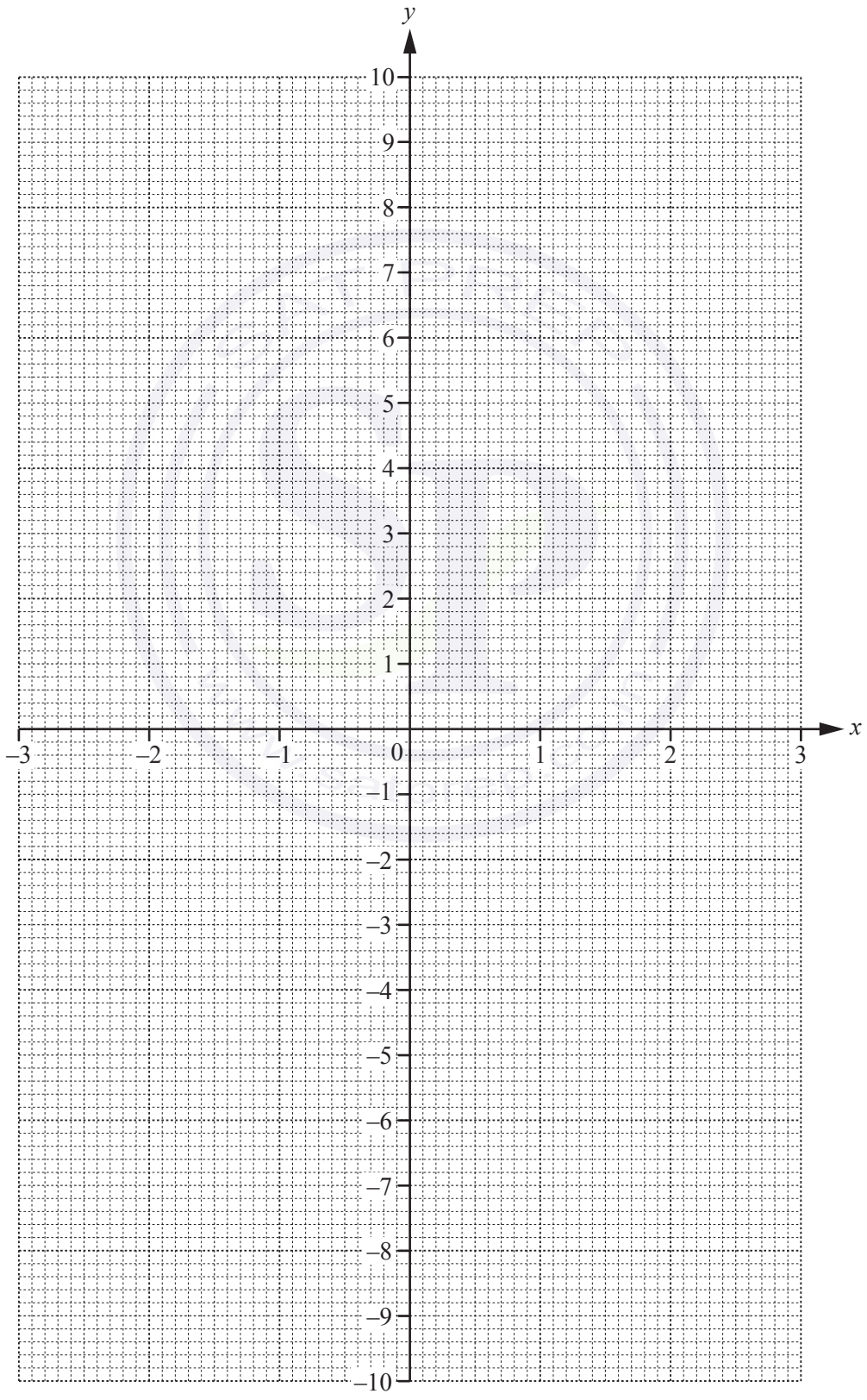
..... cm^2 [4]

6 **(a)** Complete the table of values for $y = \frac{x^3}{3} - \frac{1}{2x^2}$, $x \neq 0$.

x	-3	-2	-1	-0.5	-0.3		0.3	0.5	1	2	3
y	-9.1	-2.8	-0.8		-5.6		-5.5	-2.0			8.9

[3]

(b) On the grid, draw the graph of $y = \frac{x^3}{3} - \frac{1}{2x^2}$ for $-3 \leqslant x \leqslant -0.3$ and $0.3 \leqslant x \leqslant 3$.



[5]

(c) **(i)** By drawing a suitable tangent, find an estimate of the gradient of the curve at $x = -2$.

..... [3]

(ii) Write down the equation of the tangent to the curve at $x = -2$.
Give your answer in the form $y = mx + c$.

$y =$ ..... [2]

(d) Use your graph to solve the equations.

(i) $\frac{x^3}{3} - \frac{1}{2x^2} = 0$

$x =$ ..... [1]

(ii) $\frac{x^3}{3} - \frac{1}{2x^2} + 4 = 0$

$x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(e) The equation $\frac{x^3}{3} - \frac{1}{2x^2} + 4 = 0$ can be written in the form $ax^n + bx^{n-3} - 3 = 0$.

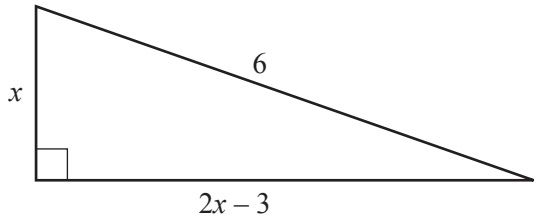
Find the value of a, the value of b and the value of n.

$a =$ .....

$b =$ .....

$n =$ ..... [3]

7 In this question, all measurements are in metres.



NOT TO SCALE

The diagram shows a right-angled triangle.

(a) Show that $5x^2 - 12x - 27 = 0$.

[3]

(b) Solve $5x^2 - 12x - 27 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

(c) Calculate the perimeter of the triangle.

..... m [2]

(d) Calculate the smallest angle of the triangle.

..... [2]

8 $f(x) = 8 - 3x$ $g(x) = \frac{10}{x+1}$, $x \neq -1$ $h(x) = 2^x$

(a) Find

(i) $hf\left(\frac{8}{3}\right)$,

..... [2]

(ii) $gh(-2)$,

..... [2]

(iii) $g^{-1}(x)$,

$g^{-1}(x) =$ ..... [3]

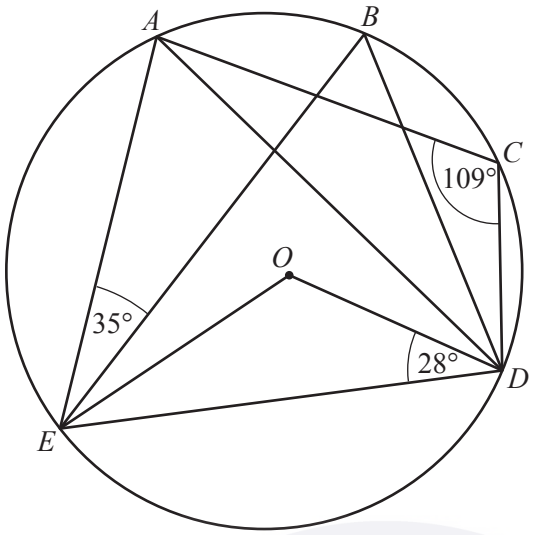
(iv) $f^{-1}f(5)$.

..... [1]

(b) Write $f(x) + g(x)$ as a single fraction in its simplest form.

..... [3]

9 (a)



NOT TO SCALE

A, B, C, D and E lie on the circle, centre O.
Angle $AEB = 35°$, angle $ODE = 28°$ and angle $ACD = 109°$.

(i) Work out the following angles, giving reasons for your answers.

(a) Angle $EBD =$ ..... because .....

.....

..... [3]

(b) Angle $EAD =$ ..... because .....

..... [2]

(ii) Work out angle BEO.

Angle $BEO =$ ..... [3]

(b) In a regular polygon, the interior angle is 11 times the exterior angle.

(i) Work out the number of sides of this polygon.

..... [3]

(ii) Find the sum of the interior angles of this polygon.

..... [2]

BLANK PAGE

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

3232999774

MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2018**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Geometrical instruments
Tracing paper (optional).

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **19** printed pages and **1** blank page.

CAMBRIDGE International Examinations

1 **(a)** Rowena buys and sells clothes.

(i) She buys a jacket for \$40 and sells it for \$45.40 .

Calculate the percentage profit.

..... % [3]

(ii) She sells a dress for \$42.60 after making a profit of 20% on the cost price.

Calculate the cost price.

\$ ..... [3]

(b) Sara invests \$500 for 15 years at a rate of 2% per year simple interest.

Calculate the total interest Sara receives.

\$ ..... [2]

(c) Tomas has two cars.

(i) The value, today, of one car is \$21 000.
The value of this car **decreases** exponentially by 18% each year.

Calculate the value of this car after 5 years.
Give your answer correct to the nearest hundred dollars.

\$ ..... [3]

(ii) The value, today, of the other car is \$15 000.
The value of this car **increases** exponentially by x% each year.
After 12 years the value of the car will be \$42 190.

Calculate the value of x.

$x =$ ..... [3]

2 (a) (i) $y = 2^x$

Complete the table.

x	0	1	2	3	4
y		2	4	8	

[2]

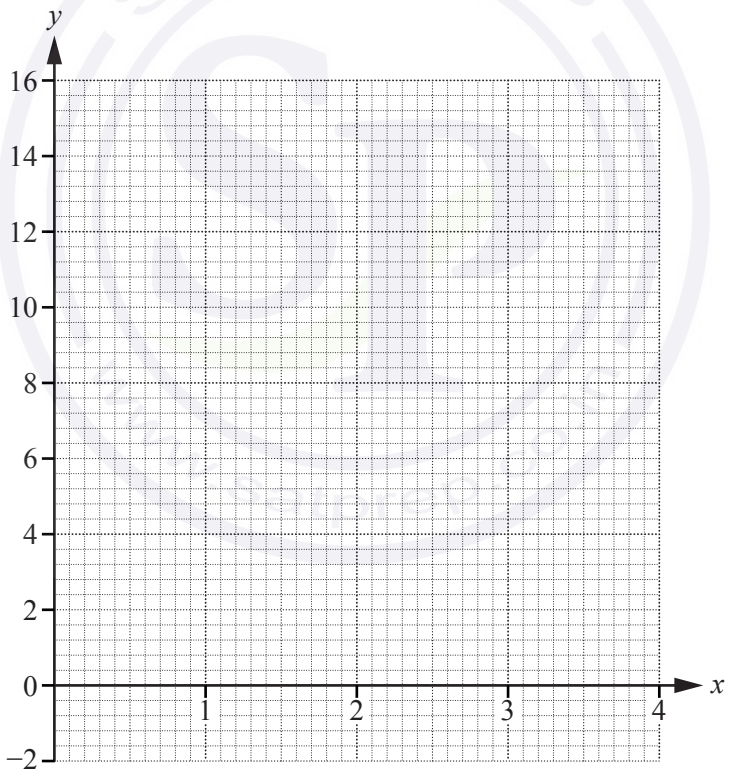
(ii) $y = 14 - x^2$

Complete the table.

x	0	1	2	3	4
y		13	10	5	

[2]

(b) On the grid, draw the graphs of $y = 2^x$ and $y = 14 - x^2$ for $0 \leqslant x \leqslant 4$.



[6]

(c) Use your graphs to solve the equations.

(i) $2^x = 12$

$x =$ ..... [1]

(ii) $2^x = 14 - x^2$

$x =$ ..... [1]

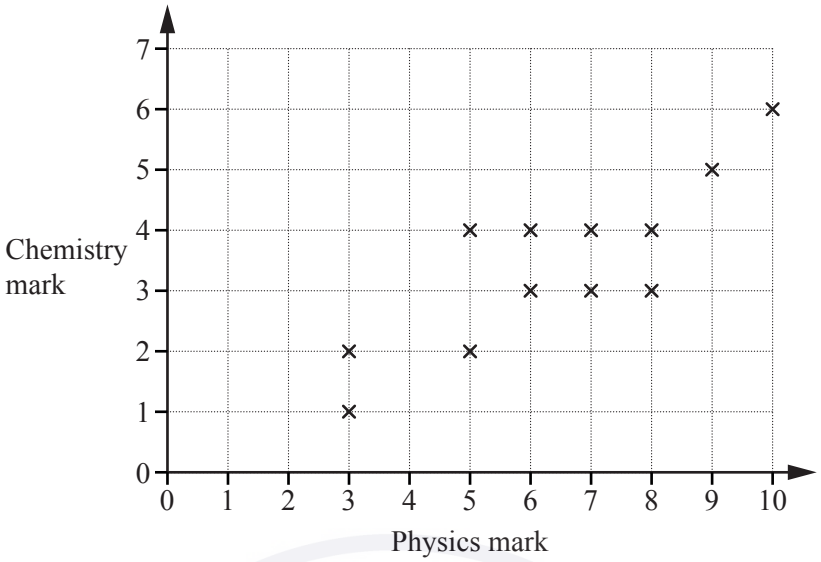
(d) **(i)** On the grid, draw the line from the point (4, 2) that has a gradient of -4. [1]

(ii) Complete the statement.

This straight line is a ..... to the graph of $y = 14 - x^2$

at the point (..... , ...). [2]

3 **(a)** The scatter diagram shows the physics mark and the chemistry mark for each of 12 students.



(i) What type of correlation is shown in the scatter diagram?

..... [1]

(ii) On the scatter diagram, draw a line of best fit. [1]

(iii) Find an estimate of the chemistry mark for another student who has a physics mark of 4.

..... [1]

(b) A teacher records the number of days each of the 24 students in her class are absent.
The frequency table shows the results.

Number of days	0	1	2	3	4	5
Frequency	10	8	3	2	0	1

Find the mode, the median and the mean.

Mode = ...

Median = ...

Mean = ... [5]

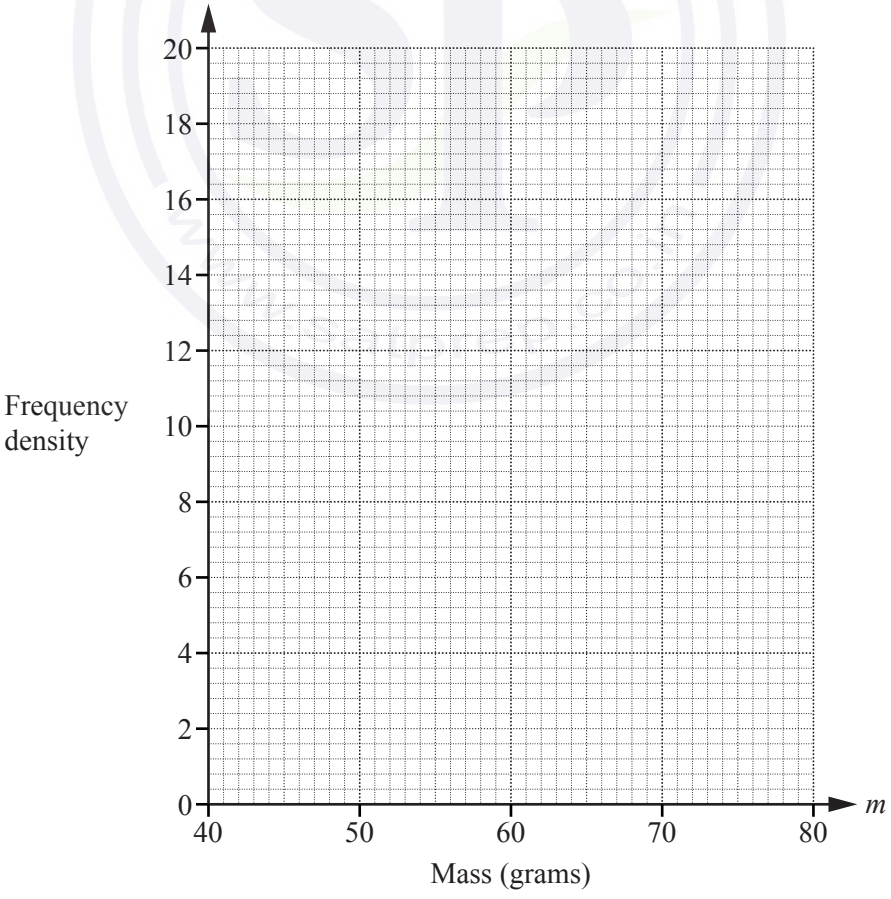
(c) Three sizes of eggs are sold in a shop.
The table shows the number of eggs of each size sold in one day.

Size	Small	Medium	Large
Mass (m grams)	$46 < m \leqslant 52$	$52 < m \leqslant 62$	$62 < m \leqslant 80$
Number of eggs sold	78	180	162

(i) Calculate an estimate of the mean mass.

..... g [4]

(ii) On the grid, draw a histogram to show the information in the table.



[4]

4 **(a)** The diagram shows two sets of cards.

Set *A*	1	1	2	2	2
Set *B*	0	1	1	1	2

(i) Jojo chooses two cards at random from Set *A* without replacement.

Find the probability that the two cards have the same number.

..... [3]

(ii) Jojo replaces the two cards.
Kylie then chooses one card at random from Set *A* and one card at random from Set *B*.

Find the probability that the two cards have the same number.

..... [3]

(iii) Who is the most likely to choose two cards that have the same number?
Show all your working.

..... [1]

(b)

Set C

4	4	5	5	5

Lena chooses three cards at random from Set C without replacement.

Find the probability that the third card chosen is numbered 4.

..... [3]

5 **(a)** At a football match, the price of an adult ticket is $\$x$ and the price of a child ticket is $\$(x-2.50)$.
There are 18 500 adults and 2400 children attending the football match.
The total amount paid for the tickets is \$320 040.

Find the price of an adult ticket.

\$..... [4]

(b) **(i)** Factorise $y^2+5y-84$.

..... [2]

(ii)

NOT TO SCALE

The area of the rectangle is 84 cm^2.

Find the perimeter.

..... cm [3]

(c) In a shop, the price of a monthly magazine is \$$m$ and the price of a weekly magazine is \$$(m - 0.75)$.
One day, the shop receives

- \$168 from selling monthly magazines
- \$207 from selling weekly magazines.

The total number of these magazines sold during this day is 100.

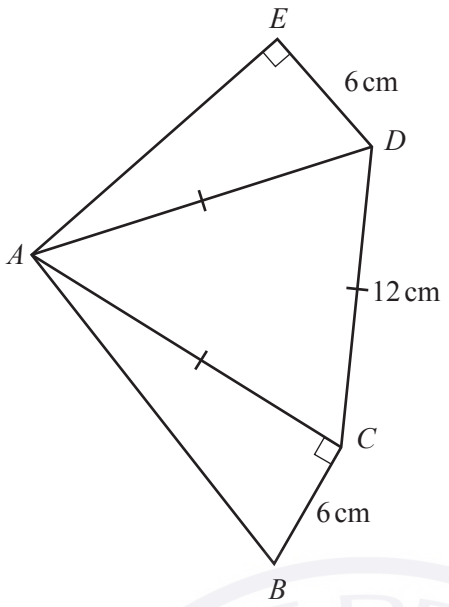
(i) Show that $50m^2 - 225m + 63 = 0$.

[3]

(ii) Find the price of a monthly magazine.
Show all your working.

\$ ..... [3]

6 (a)



NOT TO SCALE

In the pentagon $ABCDE$, angle ACB = angle AED = 90°.
Triangle ACD is equilateral with side length 12 cm.
$DE = BC = 6$ cm.

(i) Calculate angle BAE.

Angle BAE = ... [4]

(ii) Calculate AB.

AB = ... cm [2]

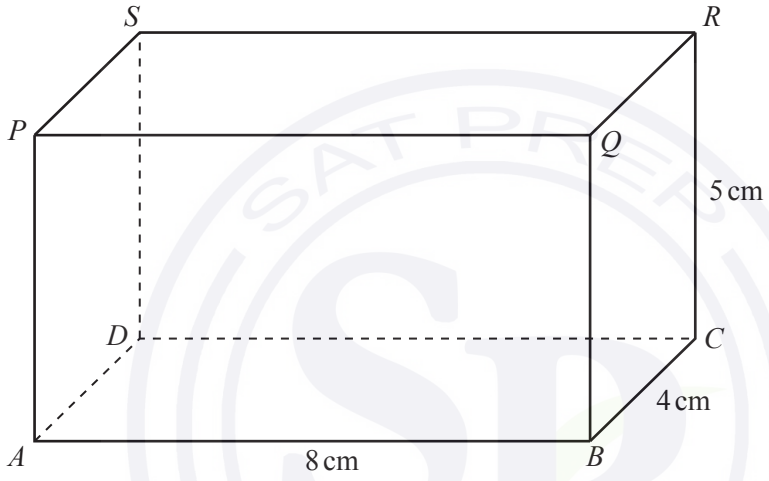
(iii) Calculate AE.

AE = ... cm [3]

(iv) Calculate the area of the pentagon.

..... cm^2 [4]

(b)



NOT TO SCALE

The diagram shows a cuboid.
$AB = 8$ cm, $BC = 4$ cm and $CR = 5$ cm.

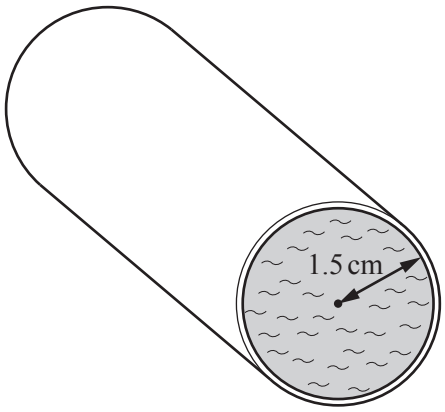
(i) Write down the number of planes of symmetry of this cuboid.

..... [1]

(ii) Calculate the angle between the diagonal AR and the plane $BCRQ$.

..... [4]

7 (a)



NOT TO SCALE

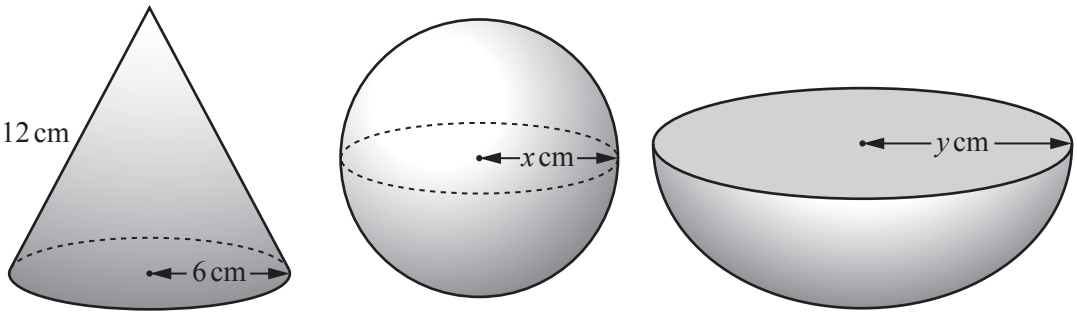
Water flows through a cylindrical pipe at a speed of 8 cm/s.
The radius of the circular cross-section is 1.5 cm and the pipe is always completely full of water.

Calculate the amount of water that flows through the pipe in 1 hour.
Give your answer in litres.

..... litres [4]

(b)

NOT TO SCALE



The diagram shows three solids.
The base radius of the cone is 6 cm and the slant height is 12 cm.
The radius of the sphere is x cm and the radius of the hemisphere is y cm.
The **total** surface area of each solid is the same.

(i) Show that the total surface area of the cone is $108\pi\,\text{cm}^2$.

[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]

[2]

(ii) Find the value of x and the value of y.

[The surface area, A, of a sphere with radius r is $A = 4\pi r^2$.]

x = ...

y = ... [4]

8 **(a)** $\mathbf{M} = \begin{pmatrix} 2 & 1 \\ 4 & 3 \end{pmatrix}$ $\mathbf{N} = \begin{pmatrix} 1 & 2 \end{pmatrix}$ $\mathbf{P} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$

(i) For the following calculations, put a tick (✓) if it is possible or put a cross (✗) if it is not possible. There is no need to carry out any of the calculations.

Calculation	✓ or ✗
$\mathbf{N} + \mathbf{P}$	
$\mathbf{NP}$	
$\mathbf{M}^2$	
$\mathbf{N}^2$	
$\mathbf{MN}$	
$\mathbf{NM}$	

[4]

(ii) Work out $\begin{pmatrix} 1 \\ 2 \end{pmatrix} + \mathbf{P}$.

..... [1]

(iii) Work out $\mathbf{PN}$.

..... [2]

(iv) Work out $\mathbf{M}^{-1}$.

..... [2]

(b) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$.

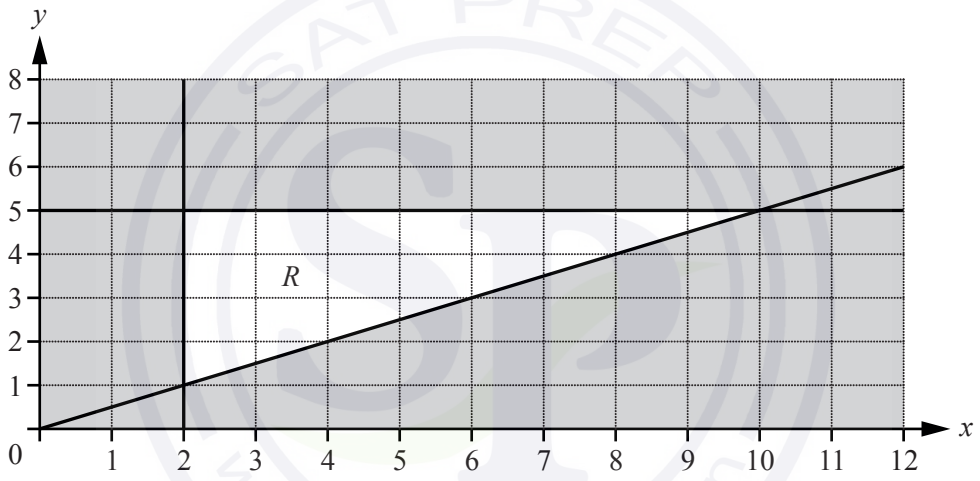
.....

..... [3]

9 **(a)** Find the equation of the straight line that is perpendicular to the line $y = \frac{1}{2}x + 1$ and passes through the point (1, 3).

..... [3]

(b)



(i) Find the three inequalities that define the region R.

.....

.....

..... [4]

(ii) Find the point (x, y), with integer co-ordinates, inside the region R such that $3x + 5y = 35$.

(..... , ...) [2]

10 (a) $f(x) = 2x - 3$ $g(x) = x^2 + 1$

(i) Find gg(2).

..... [2]

(ii) Find $g(x+2)$, giving your answer in its simplest form.

..... [2]

(iii) Find x when $f(x) = 7$.

$x =$ ..... [2]

(iv) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(b) $h(x) = x^x$, $x > 0$

(i) Calculate h(0.3).
Give your answer correct to 2 decimal places.

..... [2]

(ii) Find x when $h(x) = 256$.

$x =$ ..... [1]

BLANK PAGE

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

5874029265

MATHEMATICS **0580/42**

Paper 4 (Extended) **February/March 2018**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

1 **(a)** A shop sells dress fabric for \$2.97 per metre.

(i) A customer buys 9 metres of this fabric.

Calculate the change he receives from \$50.

\$ ..... [2]

(ii) The selling price of \$2.97 per metre is an increase of 8% on the cost price.

Calculate the cost price.

\$ ..... per metre [3]

(b) A dressmaker charges \$35 or 2300 rupees to make a dress.

Calculate the difference in price when the exchange rate is 1 rupee = \$0.0153 .
Give your answer in rupees.

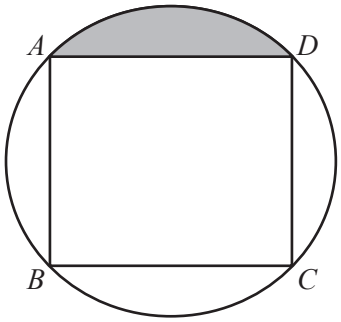
..... rupees [2]

(c) The dressmaker measures a length of fabric as 600 m, correct to the nearest 5 metres.
He cuts this into dress lengths of 9 m, correct to the nearest metre.

Calculate the largest number of complete dress lengths he could cut.

..... [3]

2



NOT TO SCALE

The vertices of a square *ABCD* lie on the circumference of a circle, radius 8 cm.

(a) Calculate the area of the square.

..... cm^2 [2]

(b) **(i)** Calculate the area of the shaded segment.

..... cm^2 [3]

(ii) Calculate the perimeter of the shaded segment.

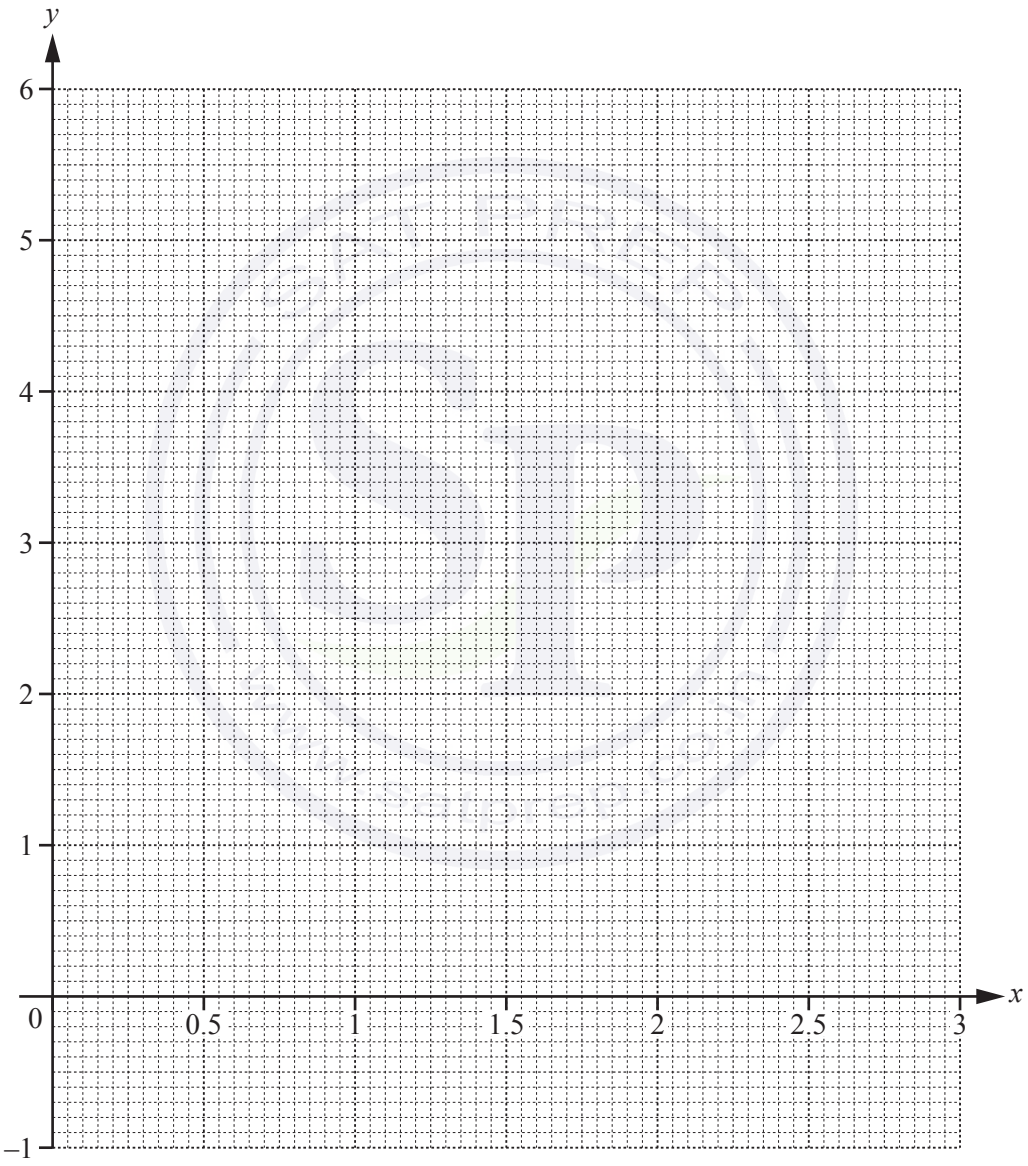
..... cm [4]

3 The table shows some values for $y = 2x + \frac{1}{x} - 3$ for $0.125 \leqslant x \leqslant 3$.

x	0.125	0.25	0.375	0.5	0.75	1	1.5	2	2.5	3
y	5.25	1.5	0.42			0	0.67	1.5		3.33

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = 2x + \frac{1}{x} - 3$ for $0.125 \leqslant x \leqslant 3$.



[4]

(c) Use your graph to solve $2x + \frac{1}{x} - 3 \geqslant 2$.

.....

..... [3]

(d) The equation $\frac{1}{x} = 7 - 3x$ can be solved using your graph in **part (b)** and a straight line.

(i) Write down the equation of this straight line.

..... [2]

(ii) Draw this straight line and solve the equation $\frac{1}{x} = 7 - 3x$.

$x =$ ..... or $x =$ ..... [3]

4 **(a)** Make t the subject of the formula $s = k - t^2$.

$t =$ ..... [2]

(b) **(i)** Factorise $x^2 - 25$.

..... [1]

(ii) Simplify $\dfrac{x^2 - 25}{x^2 - 2x - 35}$.

..... [3]

(c) Write as a single fraction in its simplest form.

$$\frac{x-8}{x} + \frac{3x}{x+1}$$

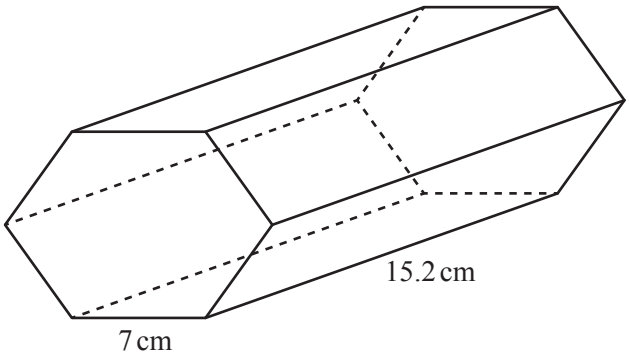
..... [3]

(d) Find the **integer** values of n that satisfy the inequality.

$$18 - 2n < 6n \leqslant 30 + n$$

..... [3]

5 (a)



NOT TO SCALE

The diagram shows a solid prism with length 15.2 cm.
The cross-section of this prism is a **regular** hexagon with side 7 cm.

(i) Calculate the volume of the prism.

..... cm^3 [5]

(ii) Calculate the total surface area of the prism.

..... cm^2 [3]

(b) Another solid metal prism with volume 500 cm^3 is melted and made into 6 identical spheres.

Calculate the radius of each sphere.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm [3]

6 Klaus buys x silver balloons and y gold balloons for a party.

He buys
- more gold balloons than silver balloons
- at least 15 silver balloons
- less than 50 gold balloons
- a total of no more than 70 balloons.

(a) Write down four inequalities, in terms of x and/or y, to show this information.

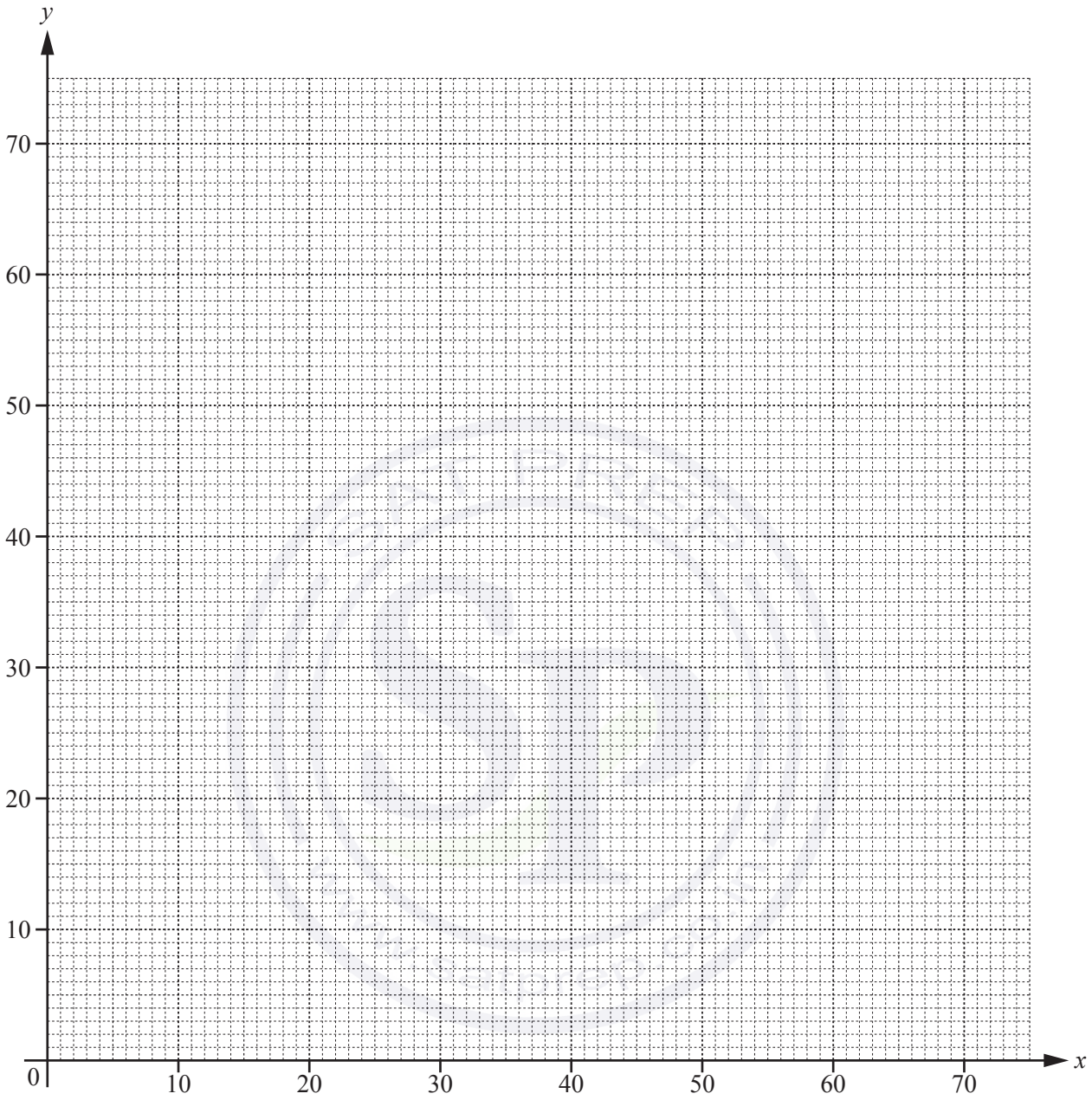
.....

.....

.....

..... [4]

(b) On the grid, show the information from **part (a)** by drawing four straight lines and shading the unwanted regions.



[5]

(c) Silver balloons cost \$2 and gold balloons cost \$3.

Calculate the most that Klaus could spend.

\$ ..... [2]

7 The frequency table shows information about the time, m minutes, that each of 160 people spend in a library.

Time (m minutes)	$0 < m \leqslant 10$	$10 < m \leqslant 40$	$40 < m \leqslant 60$	$60 < m \leqslant 90$	$90 < m \leqslant 100$	$100 < m \leqslant 120$
Frequency	3	39	43	55	11	9

(a) (i) Find the probability that one of these people, chosen at random, spends more than 100 minutes in the library.

..... [1]

(ii) Calculate an estimate of the mean time spent in the library.

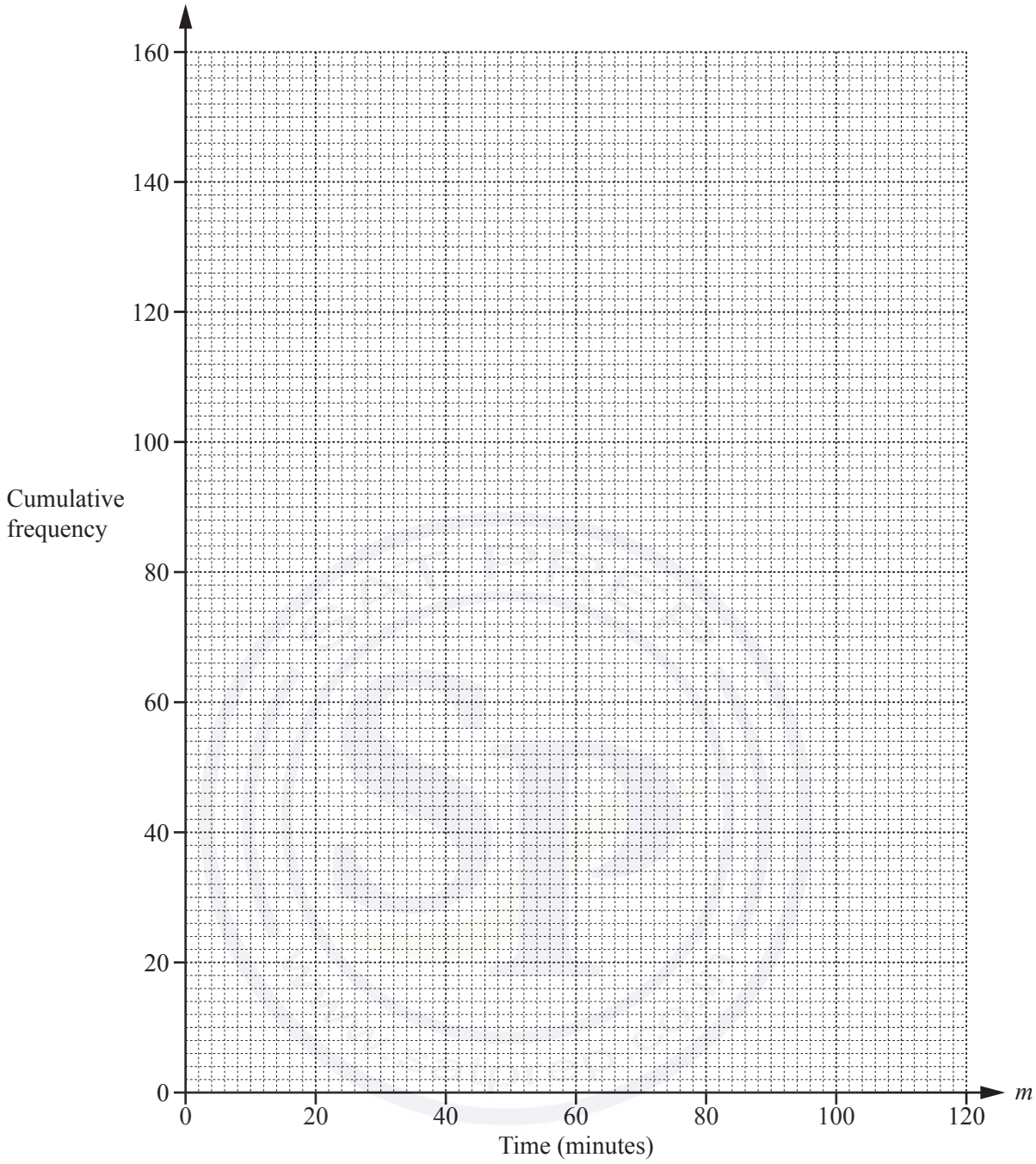
..... min [4]

(b) Complete the cumulative frequency table below.

Time (m minutes)	$m \leqslant 10$	$m \leqslant 40$	$m \leqslant 60$	$m \leqslant 90$	$m \leqslant 100$	$m \leqslant 120$
Cumulative frequency	3	42				

[2]

(c) On the grid opposite, draw the cumulative frequency diagram.



[3]

(d) Use your cumulative frequency diagram to find

(i) the median,

..... min [1]

(ii) the interquartile range,

..... min [2]

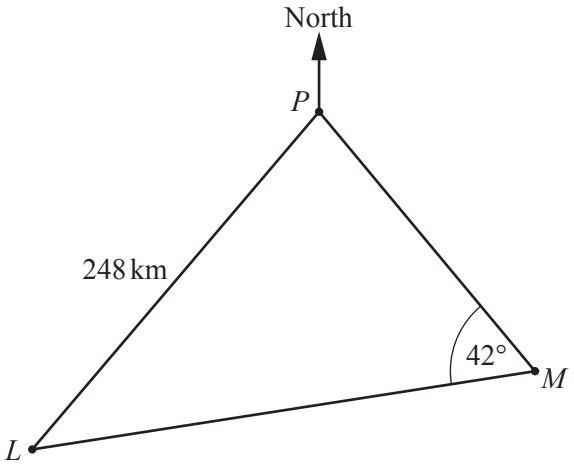
(iii) the 90th percentile,

..... min [2]

(iv) the number of people who spend more than 30 minutes in the library.

..... [2]

8



NOT TO SCALE

The diagram shows two ports, L and P, and a buoy, M.
The bearing of L from P is 201° and $LP = 248$ km.
The bearing of M from P is 127°.
Angle $PML = 42°$.

(a) Use the sine rule to calculate LM.

$LM =$ ..... km [4]

(b) A ship sails directly from L to P.

(i) Calculate the shortest distance from M to LP.

..... km [3]

(ii) The ship leaves L at 2045 and travels at a speed of 40 km/h.

Calculate the time the next day that the ship arrives at P.

..... [3]

9 **(a)** Find the magnitude of the vector $\begin{pmatrix} -1 \\ 7 \end{pmatrix}$.

..... [2]

(b) The determinant of the matrix $\begin{pmatrix} 6 & 2m \\ 5 & m \end{pmatrix}$ is 24.

Find the value of m.

$m =$ ..... [2]

(c) $\mathbf{L} = \begin{pmatrix} 2 & 5 \\ 3 & 9 \end{pmatrix}$ $\mathbf{M} = \begin{pmatrix} -4 \\ 2 \end{pmatrix}$ $\mathbf{N} = \begin{pmatrix} 1 & 7 \end{pmatrix}$

Work out the following.

(i) **NM**

..... [2]

(ii) **LM**

..... [2]

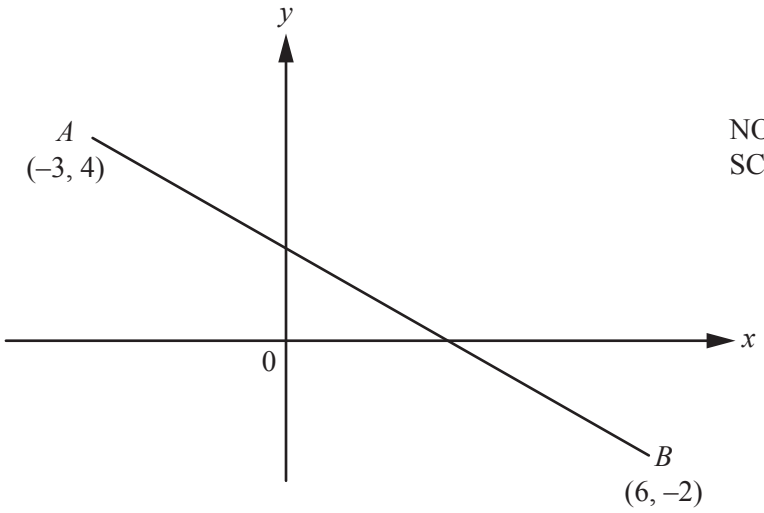
(iii) $\mathbf{L}^2$

..... [2]

(iv) $\mathbf{L}^{-1}$

..... [2]

10 (a)



Calculate the length of AB.

..... [3]

(b) The point P has co-ordinates $(10, 12)$ and the point Q has co-ordinates $(2, -4)$.

Find

(i) the co-ordinates of the mid-point of the line PQ,

(..... , ...) [2]

(ii) the gradient of the line PQ,

..... [2]

(iii) the equation of a line perpendicular to PQ that passes through the point $(2, 3)$.

..... [3]

11 The table shows the first five terms of sequences A, B and C.

Sequence	1st term	2nd term	3rd term	4th term	5th term	6th term
A	0	1	4	9	16	
B	4	5	6	7	8	
C	-4	-4	-2	2	8	

(a) Complete the table. [3]

(b) Find an expression for the nth term of

(i) sequence A,

..... [2]

(ii) sequence B.

..... [1]

(c) Find the value of n when the nth term of sequence A is 576.

$n =$ ..... [2]

(d) **(i)** Find an expression for the nth term of sequence C.
Give your answer in its simplest form.

..... [3]

(ii) Find the value of the 30th term of sequence C.

..... [2]

BLANK PAGE

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

9285179585

MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2017**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **20** printed pages.

CAMBRIDGE International Examinations

1 **(a)** Alex has \$20 and Bobbie has \$25.

(i) Write down the ratio Alex's money : Bobbie's money in its simplest form.

..... : ..... [1]

(ii) Alex and Bobbie each spend $\frac{1}{5}$ of their money.

Find the ratio Alex's remaining money : Bobbie's remaining money in its simplest form.

..... : ..... [1]

(iii) Alex and Bobbie **then** each spend \$4.

Find the new ratio Alex's remaining money : Bobbie's remaining money in its simplest form.

..... : ..... [2]

(b) **(i)** The population of a town in the year 1990 was 15 600.
The population is now 11 420.

Calculate the percentage decrease in the population.

.....% [3]

(ii) The population of 15 600 was 2.5% less than the population in the year 1980.

Calculate the population in the year 1980.

..... [3]

(c) Chris invests \$200 at a rate of x% per year simple interest.
At the end of 15 years the total interest received is \$48.

Find the value of x.

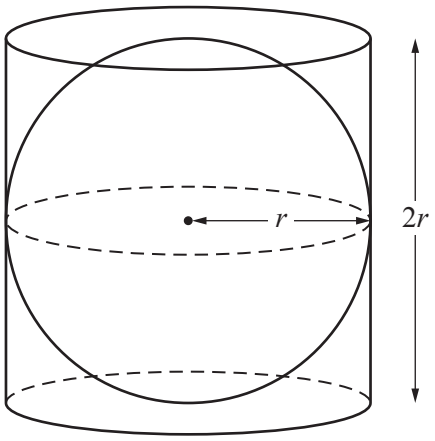
$x =$ ..... [2]

(d) Dani invests \$200 at a rate of y% per year compound interest.
At the end of 10 years the value of her investment is \$256.

Calculate the value of y, correct to 1 decimal place.

$y =$ ..... [3]

2 (a)



NOT TO SCALE

A sphere of radius r is inside a closed cylinder of radius r and height $2r$.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

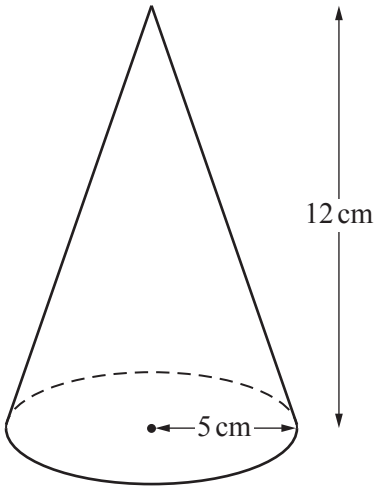
(i) When $r = 8$ cm, calculate the volume inside the cylinder which is **not** occupied by the sphere.

..... cm^3 [3]

(ii) Find r when the volume inside the cylinder **not** occupied by the sphere is $36\,cm^3$.

$r =$ ..... cm [3]

(b)



NOT TO SCALE

The diagram shows a solid cone with radius 5 cm and perpendicular height 12 cm.

(i) The **total** surface area is painted at a cost of \$0.015 per cm^2.

Calculate the cost of painting the cone.

[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]

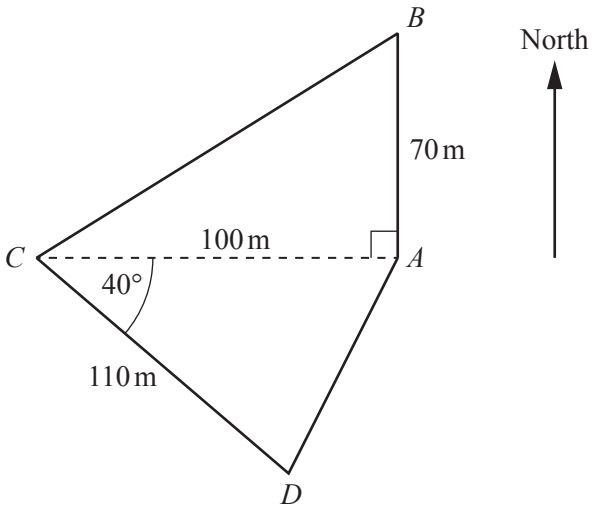
\$ ..... [4]

(ii) The cone is made of metal and is melted down and made into smaller solid cones with radius 1.25 cm and perpendicular height 3 cm.

Calculate the number of smaller cones that can be made.

..... [3]

3



The diagram shows a field *ABCD*.

(a) Calculate the area of the field *ABCD*.

.....m^2 [3]

(b) Calculate the perimeter of the field *ABCD*.

..... m [5]

(c) Calculate the shortest distance from A to CD.

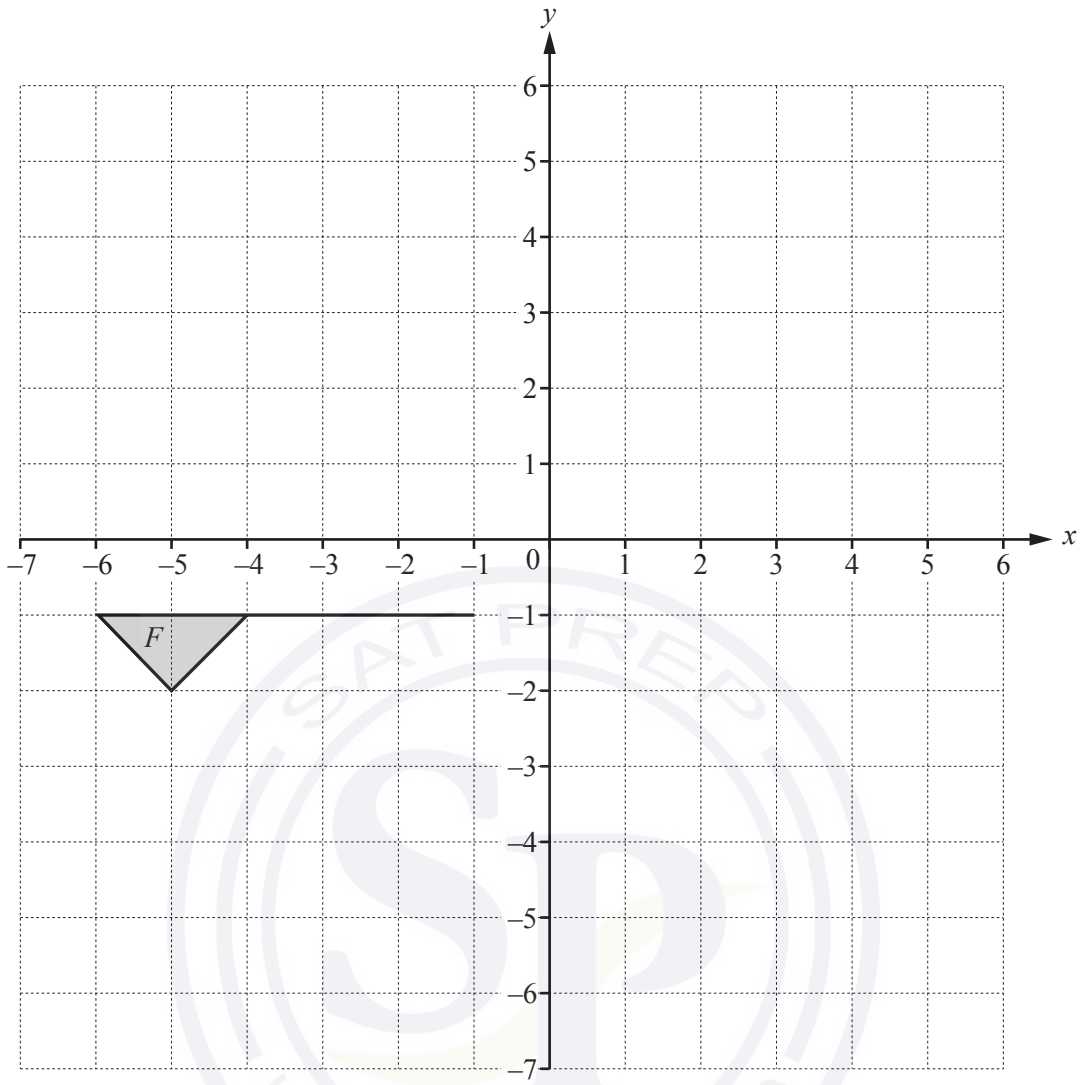
..... m [2]

(d) B is due north of A.

Find the bearing of C from B.

..... [3]

4 (a)



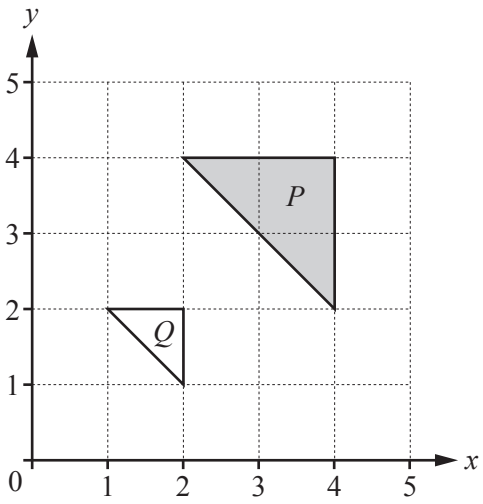
Draw the image of

(i) flag F after translation by the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$, [2]

(ii) flag F after rotation through 180° about (– 2, 0), [2]

(iii) flag F after reflection in the line $y = x$. [2]

(b)



(i) Describe fully the **single** transformation that maps triangle P onto triangle Q.

.....

..... [3]

(ii) Find the matrix that represents this transformation.

( ) [2]

(c) The point A is translated to the point B by the vector $\begin{pmatrix} 4u \\ 3u \end{pmatrix}$.

$|\overrightarrow{AB}| = 12.5$

Find u.

$u =$ ..... [3]

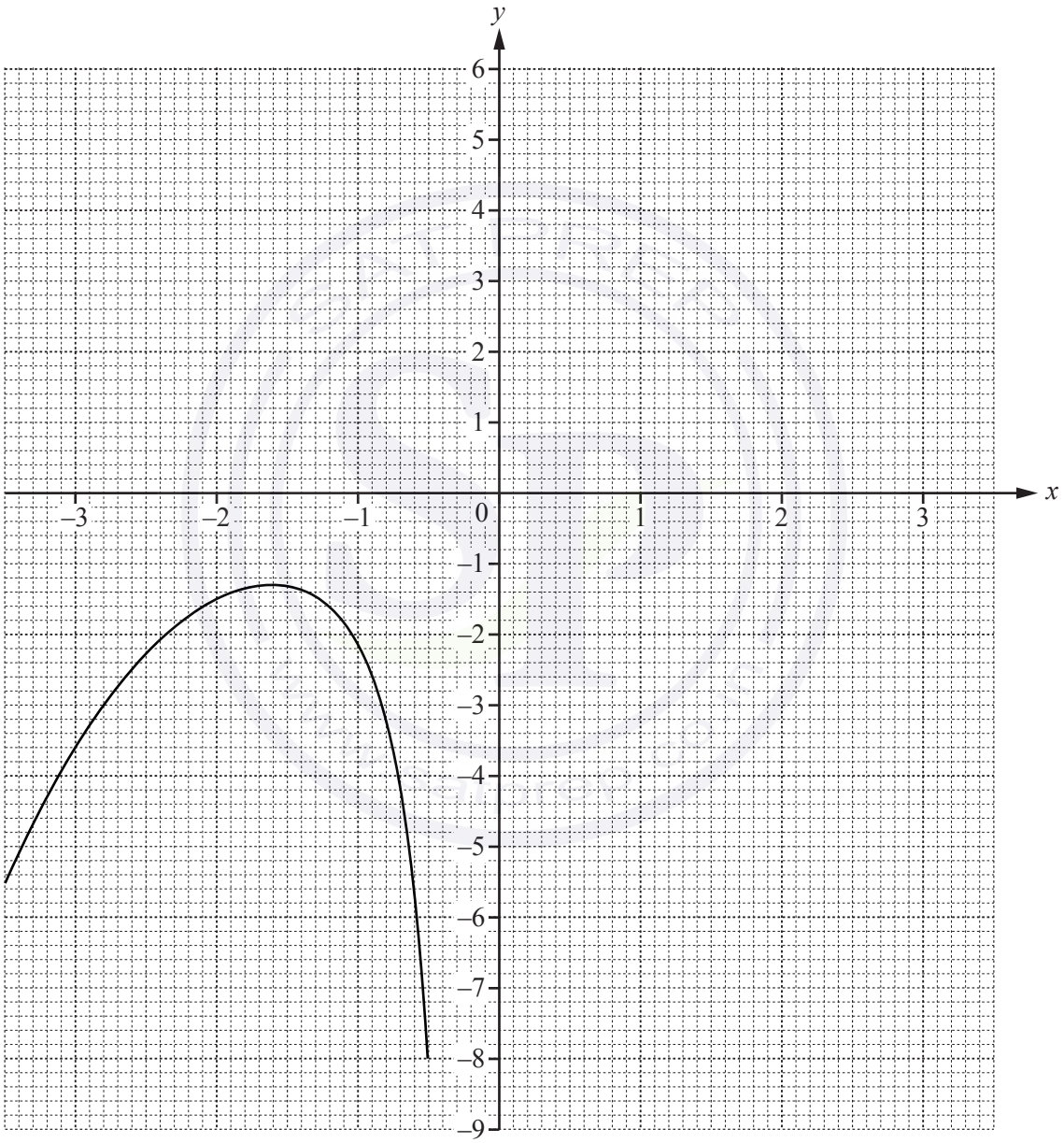
5 $y = \frac{x^3}{8} - \frac{2}{x^2}$, $x \neq 0$

(a) Complete the table of values.

x	0.5	1	1.5	2	2.5	3	3.5
y	−8.0	−1.9	−0.5	0.5	1.6		

[2]

(b)



The graph of $y = \frac{x^3}{8} - \frac{2}{x^2}$ for $-3.5 \leqslant x \leqslant -0.5$ has already been drawn.

On the grid, draw the graph of $y = \frac{x^3}{8} - \frac{2}{x^2}$ for $0.5 \leqslant x \leqslant 3.5$. [4]

(c) Use your graph to solve the equation $\frac{x^3}{8} - \frac{2}{x^2} = 0$.

$x =$ ..... [1]

(d) $\frac{x^3}{8} - \frac{2}{x^2} = k$ and k is an integer.

Write down a value of k when the equation $\frac{x^3}{8} - \frac{2}{x^2} = k$ has

(i) one answer, $k =$ ..... [1]

(ii) three answers. $k =$ ..... [1]

(e) By drawing a suitable tangent, estimate the gradient of the curve where $x = -3$.

..... [3]

(f) **(i)** By drawing a suitable line on the grid, find x when $\frac{x^3}{8} - \frac{2}{x^2} = 6 - x$.

$x =$ ..... [3]

(ii) The equation $\frac{x^3}{8} - \frac{2}{x^2} = 6 - x$ can be written as $x^5 + ax^3 + bx^2 + c = 0$.

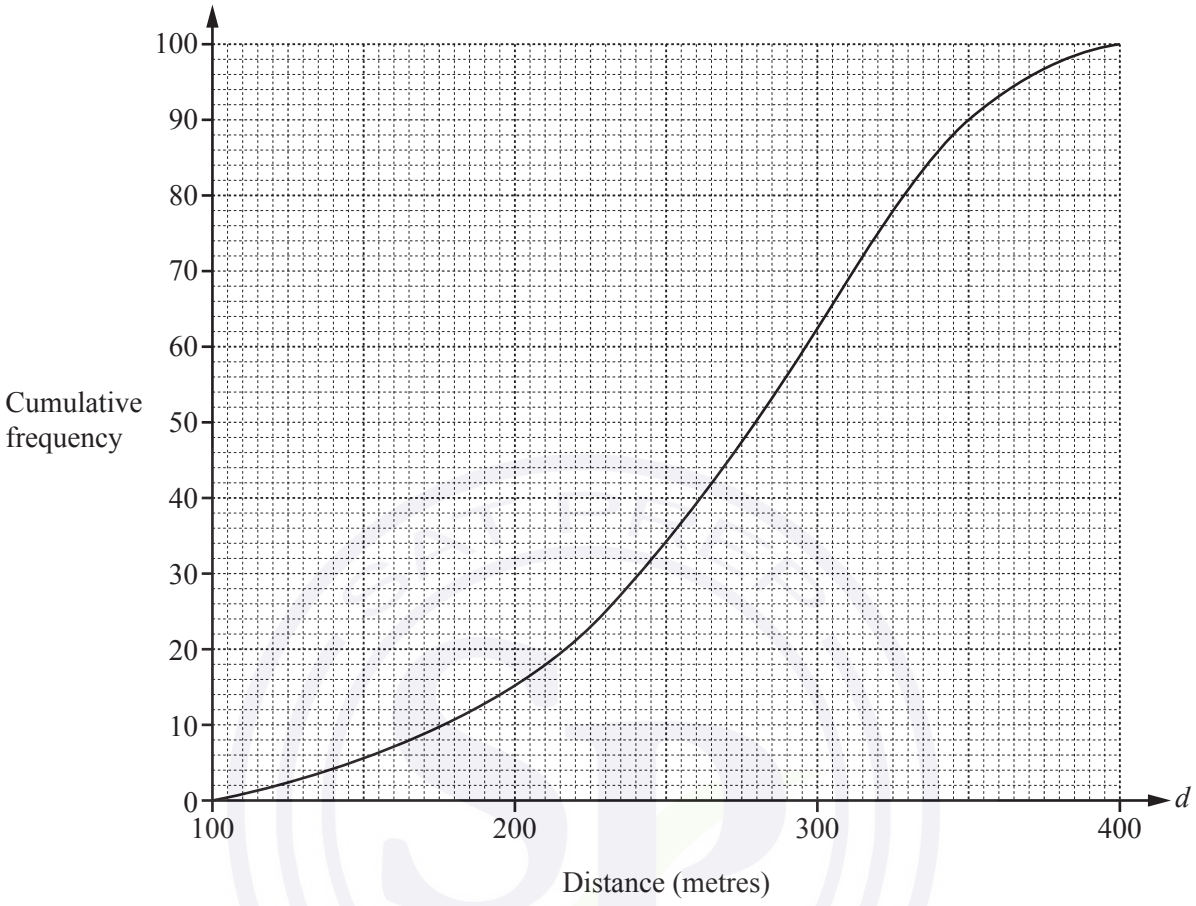
Find the values of a, b and c.

$a =$ .....

$b =$ .....

$c =$ ..... [4]

6 **(a)** There are 100 students in group *A*.
The teacher records the distance, *d* metres, each student runs in one minute.
The results are shown in the cumulative frequency diagram.



Find

(i) the median,

..... m [1]

(ii) the upper quartile,

..... m [1]

(iii) the inter-quartile range,

..... m [1]

(iv) the number of students who run more than 350 m.

..... [2]

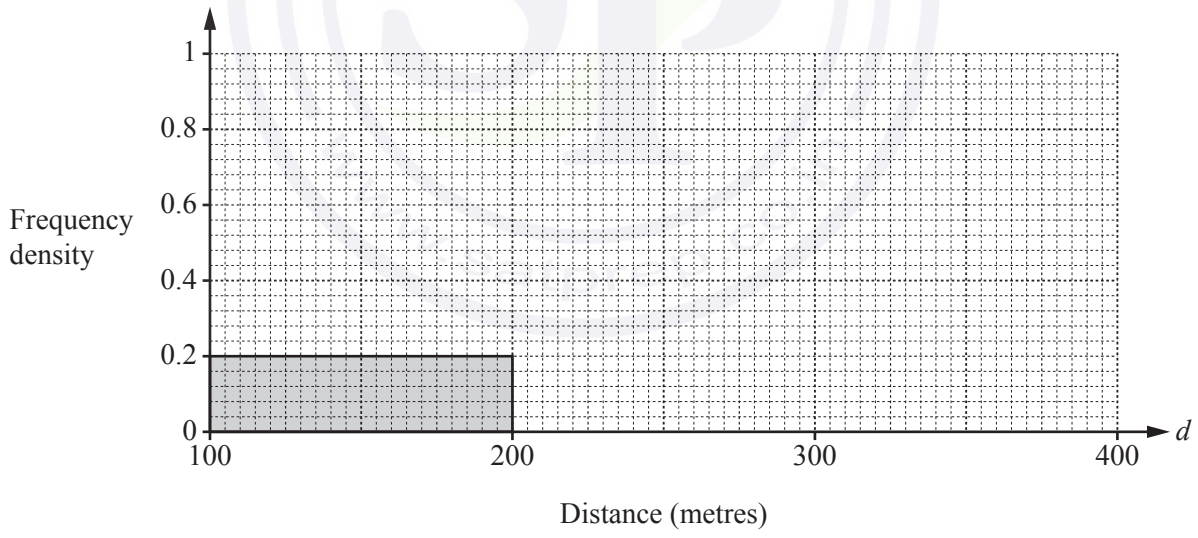
(b) There are 100 students in group *B*.
The teacher records the distance, *d* metres, each of these students runs in one minute.
The results are shown in the frequency table.

Distance (d metres)	$100 < d \leqslant 200$	$200 < d \leqslant 250$	$250 < d \leqslant 280$	$280 < d \leqslant 320$	$320 < d \leqslant 400$
Number of students	20	22	30	16	12

(i) Calculate an estimate of the mean distance for group *B*.

..... m [4]

(ii) Complete the histogram to show the information in the frequency table.



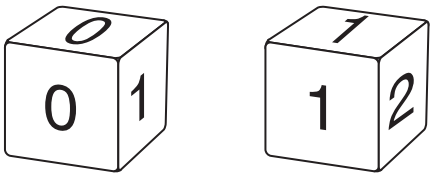
[4]

(c) For the 100 students in group *B*, the median is 258 m.

Complete the statement.

On average, the students in group *A* run ..... than the students in group *B*. [1]

7



A *B*

The diagram shows two fair dice.
The numbers on dice *A* are 0, 0, 1, 1, 1, 3.
The numbers on dice *B* are 1, 1, 2, 2, 2, 3.
When a dice is rolled, the score is the number on the top face.

(a) Dice *A* is rolled once.

Find the probability that the score is not 3.

..... [1]

(b) Dice *A* is rolled twice.

Find the probability that the score is 0 both times.

..... [2]

(c) Dice *A* is rolled 60 times.

Calculate an estimate of the number of times the score is 0.

..... [1]

(d) Dice *A* and dice *B* are each rolled once.
The product of the scores is recorded.

(i) Complete the possibility diagram.

Dice *B* \ Dice *A*	0	0	1	1	1	3
3	0	0				
2	0	0				
2	0	0				
2	0	0				
1	0	0				
1	0	0	1	1	1	3

[2]

(ii) Find the probability that the product of the scores is

(a) 2,

..... [1]

(b) greater than 3.

..... [1]

(e) Eva keeps rolling dice *B* until 1 is scored.

Find the probability that this happens on the 5th roll.

..... [2]

[Turn over

8 **(a)** The cost of 1 apple is a cents.
The cost of 1 pear is p cents.
The total cost of 7 apples and 9 pears is 354 cents.

(i) Write down an equation in terms of a and p.

..... [1]

(ii) The cost of 1 pear is 2 cents more than the cost of 1 apple.

Find the value of a and the value of p.

$a =$ .....

$p =$ ..... [3]

(b) Rowena walks 2 km at an average speed of x km/h.

(i) Write down an expression, in terms of x, for the time taken.

..... h [1]

(ii) Rowena then walks 3 km at an average speed of $(x - 1)$ km/h.
The total time taken to walk the 5 km is 2 hours.

(a) Show that $2x^2 - 7x + 2 = 0$.

[3]

(b) Find the value of x.
Show all your working and give your answer correct to 2 decimal places.

$x =$ ..... [4]

9 $f(x) = 1 - 2x$ $g(x) = x + 4$ $h(x) = x^2 + 1$

(a) Find $f(-1)$.

..... [1]

(b) Solve the equation.

$$2f(x) = g(x)$$

$x =$ ..... [2]

(c) Find $fg(x)$.
Give your answer in its simplest form.

..... [2]

(d) Find $hh(2)$.

..... [2]

(e) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(f) $\text{hgf}(x) = 4x^2 + px + q$

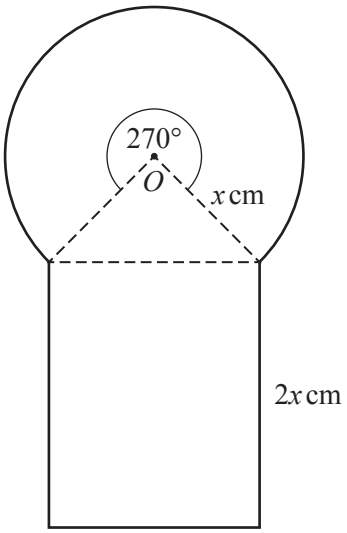
Find the value of p and the value of q.

$p =$ .....

$q =$ ..... [4]

Question 10 is printed on the next page.

10



NOT TO SCALE

The diagram shows a sector of a circle, a triangle and a rectangle.
The sector has centre O, radius x cm and angle 270°.
The rectangle has length $2x$ cm.

The total area of the shape is kx^2 cm^2.

(a) Find the value of k.

$k =$ ..... [5]

(b) Find the value of x when the total area is 110 cm^2.

$x =$ ..... [2]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2017**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

DC (NH/FC) 137038/3

CAMBRIDGE International Examinations

[Turn over

1 **(a)** The angles of a triangle are in the ratio 2 : 3 : 5.

(i) Show that the triangle is right-angled.

[1]

(ii) The length of the hypotenuse of the triangle is 12 cm.

Use trigonometry to calculate the length of the shortest side of this triangle.

..... cm [3]

(b) The sides of a different right-angled triangle are in the ratio 3 : 4 : 5.

(i) The length of the shortest side is 7.8 cm.

Calculate the length of the longest side.

..... cm [2]

(ii) Calculate the smallest angle in this triangle.

..... [3]

2 **(a)** Solve.

$$\frac{x}{7} = 49$$

$x =$ ..... [1]

(b) Simplify.

(i) x^0

..... [1]

(ii) $x^7 \times x^3$

..... [1]

(iii) $\dfrac{(3x^6)^2}{x^{-4}}$

..... [2]

(c) **(i)** Factorise completely.

$$2x^2 - 18$$

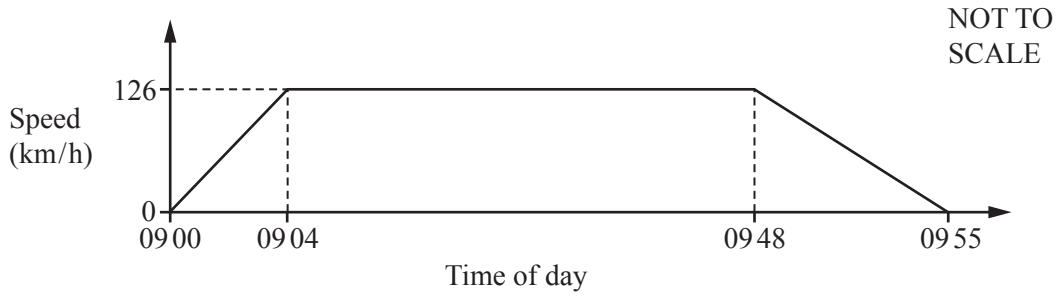
..... [2]

(ii) Simplify.

$$\frac{2x^2 - 18}{x^2 + 7x - 30}$$

..... [3]

3 The graph shows information about the journey of a train between two stations.



(a) **(i)** Work out the acceleration of the train during the first 4 minutes of this journey. Give your answer in km/h^2.

..... km/h^2 [2]

(ii) Calculate the distance, in kilometres, between the two stations.

..... km [4]

(b) (i) Show that 126 km/h is the same speed as 35 m/s.

[1]

(ii) The train has a total length of 220 m.
At 09 30, the train crossed a bridge of length 1400 m.

Calculate the time, in seconds, that the train took to completely cross the bridge.

.....s [3]

(c) On a different journey, the train took 73 minutes, correct to the nearest minute, to travel 215 km, correct to the nearest 5 km.

Calculate the upper bound of the average speed of the train for this journey.
Give your answer in km/h.

.....km/h [4]

4 The table shows information about the time, t minutes, taken for each of 150 girls to complete an essay.

Time (t minutes)	$60 < t \leqslant 65$	$65 < t \leqslant 70$	$70 < t \leqslant 80$	$80 < t \leqslant 100$	$100 < t \leqslant 150$
Frequency	10	26	34	58	22

(a) Write down the interval that contains the median time.

..... $< t \leqslant$ ..... [1]

(b) Calculate an estimate of the mean time.

.....min [4]

(c) Rafay looks at the frequency table.

(i) He says that it is not possible to work out the range of the times.

Explain why he is correct.

.....

..... [1]

(ii) He draws a pie chart to show this information.

Calculate the sector angle for the interval $65 < t \leqslant 70$ minutes.

..... [2]

(d) A girl is chosen at random.

Work out the probability that she took more than 100 minutes to complete the essay.

..... [1]

(e) Two girls are chosen at random.

Work out the probability that, to complete the essay,

(i) they both took 65 minutes or less,

..... [2]

(ii) one took 65 minutes or less and the other took more than 100 minutes.

..... [3]

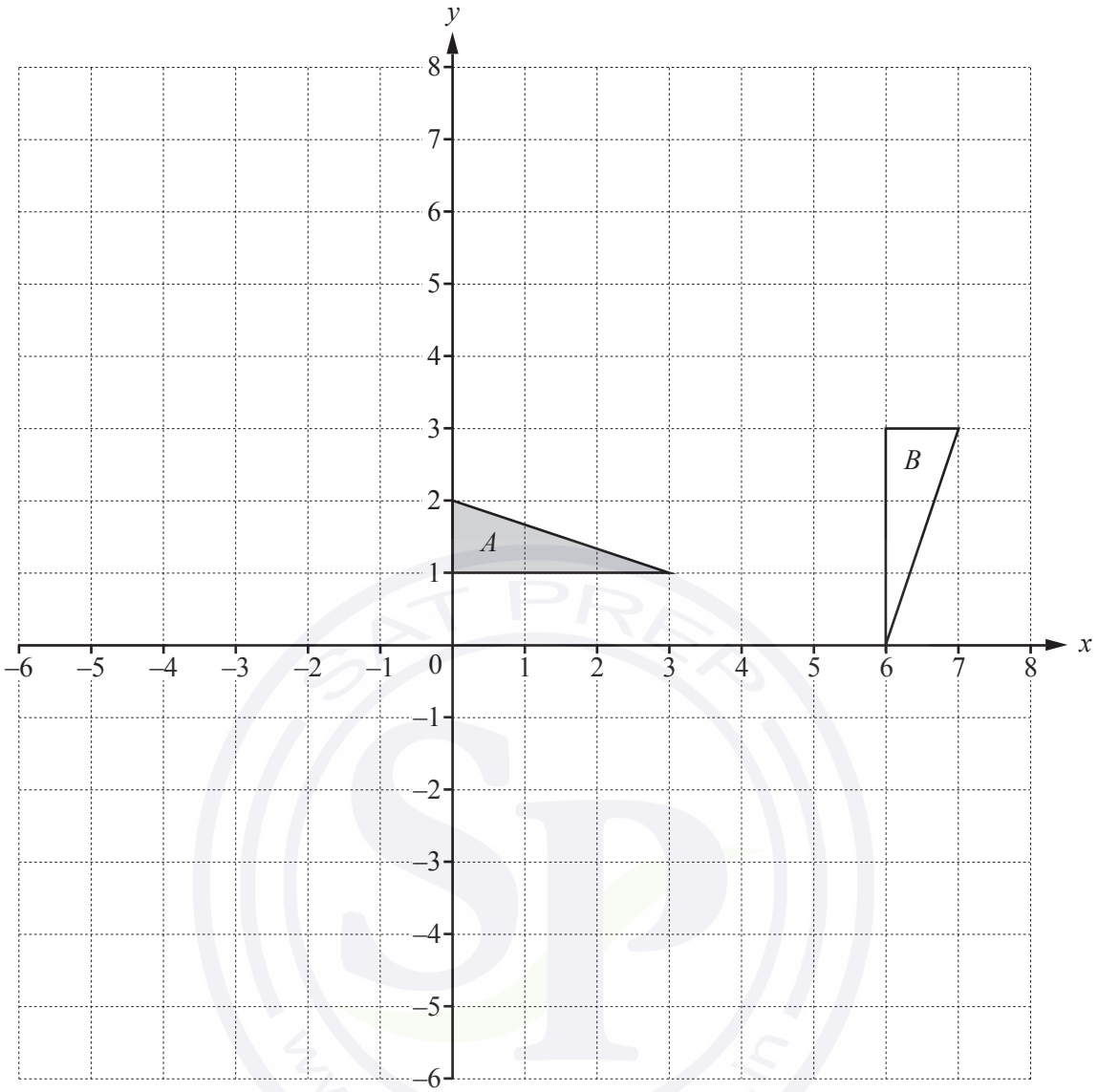
(f) The information in the frequency table is shown in a histogram.
The height of the block for the $60 < t \leqslant 65$ interval is 5 cm.

Complete the table.

Time (t minutes)	$60 < t \leqslant 65$	$65 < t \leqslant 70$	$70 < t \leqslant 80$	$80 < t \leqslant 100$	$100 < t \leqslant 150$
Height of block (cm)	5				

[3]

5



(a) Draw the image of

(i) triangle A after a reflection in the line $x = 0$, [2]

(ii) triangle A after an enlargement, scale factor 2, centre (0, 4), [2]

(iii) triangle A after a translation by the vector $\begin{pmatrix} -5 \\ 3 \end{pmatrix}$. [2]

(b) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

(c) $\mathbf{T} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ $\mathbf{U} = \begin{pmatrix} 3 & 1 \\ 0 & 2 \end{pmatrix}$

Point P has co-ordinates $(1, -4)$.

(i) Find $\mathbf{T}(P)$.

(....., ...) [2]

(ii) Find $\mathbf{TU}(P)$.

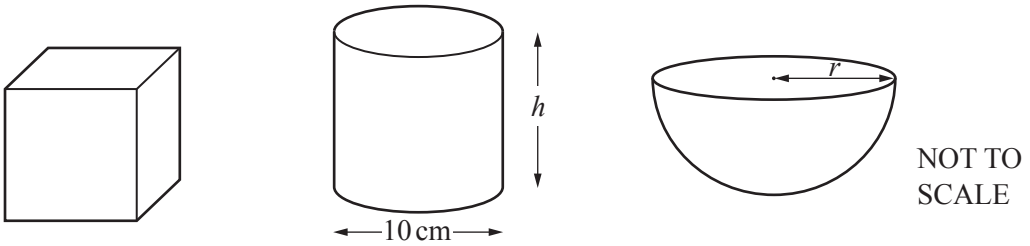
(....., ...) [2]

(iii) Describe the **single** transformation represented by the matrix **T**.

.....

..... [3]

6 (a)



The diagrams show a cube, a cylinder and a hemisphere.
The volume of each of these solids is $2000\,cm^3$.

(i) Work out the height, h, of the cylinder.

$h =$ ..... cm [2]

(ii) Work out the radius, r, of the hemisphere.

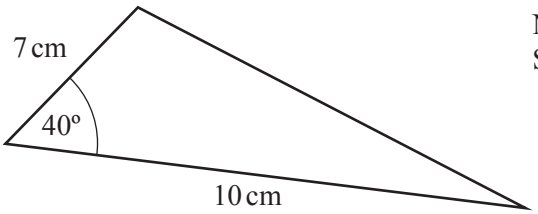
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$r =$ ..... cm [3]

(iii) Work out the surface area of the cube.

.....cm^2 [3]

(b)



NOT TO SCALE

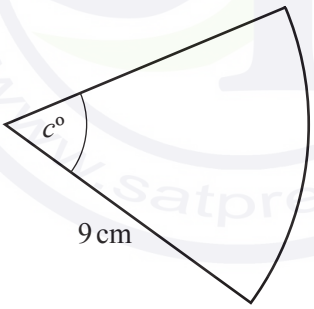
(i) Calculate the area of the triangle.

.....cm^2 [2]

(ii) Calculate the perimeter of the triangle and show that it is 23.5 cm, correct to 1 decimal place. Show all your working.

[5]

(c)



NOT TO SCALE

The perimeter of this sector of a circle is 28.2 cm.

Calculate the value of c.

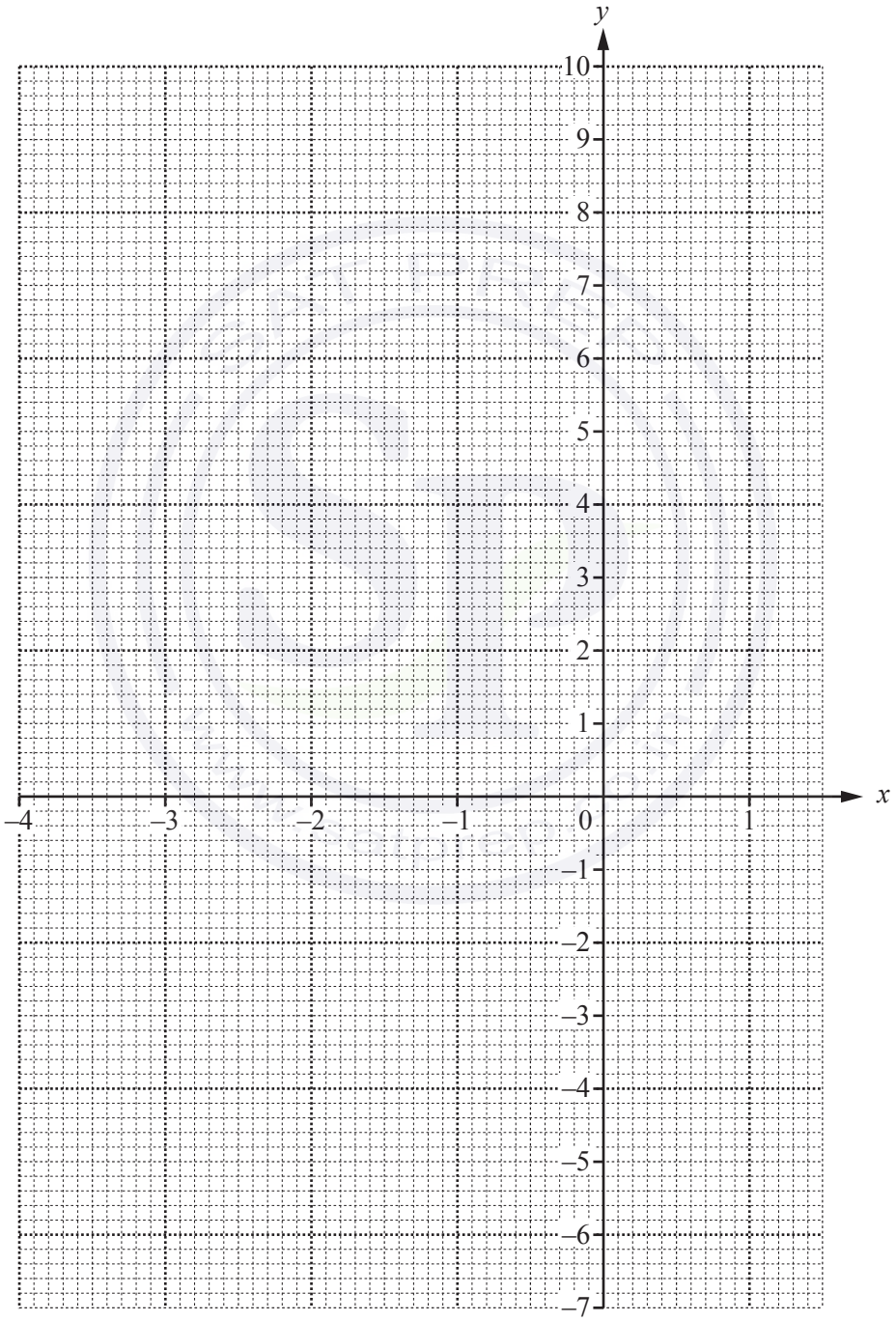
c = ... [3]

7 The table shows some values of $y = 2x^2 + 5x - 3$ for $-4 \leqslant x \leqslant 1.5$.

x	-4	-3	-2	-1	0	1	1.5
y		0	-5		-3	4	

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = 2x^2 + 5x - 3$ for $-4 \leqslant x \leqslant 1.5$.



[4]

(c) Use your graph to solve the equation $2x^2 + 5x - 3 = 3$.

$x =$ ..... or $x =$ ..... [2]

(d) $y = 2x^2 + 5x - 3$ can be written in the form $y = 2(x + a)^2 + b$.

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [3]

8 Line A has equation $y = 5x - 4$.
Line B has equation $3x + 2y = 18$.

(a) Find the gradient of

(i) line A,

..... [1]

(ii) line B.

..... [1]

(b) Write down the co-ordinates of the point where line A crosses the x-axis.

(....., ...) [2]

(c) Find the equation of the line perpendicular to line A which passes through the point (10, 9).
Give your answer in the form $y = mx + c$.

$y =$ ..... [4]

(d) Work out the co-ordinates of the point of intersection of line A and line B.

(....., ...) [3]

(e) Work out the area enclosed by line A, line B and the y-axis.

..... [3]

9 Luigi and Alfredo run in a 10 km race.
Luigi's average speed was x km/h.
Alfredo's average speed was 0.5 km/h slower than Luigi's average speed.

(a) Luigi took $\frac{10}{x}$ hours to run the race.

Write down an expression, in terms of x, for the time that Alfredo took to run the race.

..... h [1]

(b) Alfredo took 0.25 hours longer than Luigi to run the race.

(i) Show that $2x^2 - x - 40 = 0$.

[4]

(ii) Use the quadratic formula to solve $2x^2 - x - 40 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

(iii) Work out the time that Luigi took to run the 10 km race.
Give your answer in hours and minutes, correct to the nearest minute.

..... h ..... min [3]

Question 10 is printed on the next page.

10 (a) (i) Write 180 as a product of its prime factors.

..... [2]

(ii) Find the lowest common multiple (LCM) of 180 and 54.

..... [2]

(b) An integer, X, written as a product of its prime factors is $a^2 \times 7^{b+2}$.
An integer, Y, written as a product of its prime factors is $a^3 \times 7^2$.

The highest common factor (HCF) of X and Y is 1225.
The lowest common multiple (LCM) of X and Y is 42 875.

Find the value of X and the value of Y.

$X =$ .....

$Y =$ ..... [4]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

6433049420

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2017**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **16** printed pages.

CAMBRIDGE International Examinations

1 An energy company charged these prices in 2013.

Electricity price	Gas price
23.15 cents per day plus 13.5 cents for each unit used	24.5 cents per day plus 5.5 cents for each unit used

(a) (i) In 90 days, the Siddique family used 1885 units of **electricity**.

Calculate the total cost, in dollars, of the electricity they used.

$ ..... [2]

(ii) In 90 days, the **gas** used by the Khan family cost $198.16 .

Calculate the number of units of gas used.

..... units [3]

(b) In 2013, the price for each unit of electricity was 13.5 cents.
Over the next 3 years, this price increased exponentially at a rate of 8% per year.

Calculate the price for each unit of electricity after 3 years.

..... cents [2]

(c) Over these 3 years, the price for each unit of gas increased from 5.5 cents to 7.7 cents.

(i) Calculate the percentage increase from 5.5 cents to 7.7 cents.

..... % [3]

(ii) Over the 3 years, the 5.5 cents increased exponentially by the same percentage each year to 7.7 cents.

Calculate the percentage increase **each year**.

..... % [3]

(d) In 2015, the energy company divided its profits in the ratio

shareholders : bonuses : development = 5 : 2 : 6.

In 2015, its profits were $390 million.

Calculate the amount the company gave to shareholders.

$ ..... million [2]

(e) The share price of the company in June 2015 was $258.25 .
This was an increase of 3.3% on the share price in May 2015.

Calculate the share price in May 2015.

$ ..... [3]

2 The time taken for each of 90 cars to complete one lap of a race track is shown in the table.

Time (t seconds)	$70 < t \leqslant 71$	$71 < t \leqslant 72$	$72 < t \leqslant 73$	$73 < t \leqslant 74$	$74 < t \leqslant 75$
Frequency	17	24	21	18	10

(a) Write down the modal time interval.

..... $< t \leqslant$ ..... [1]

(b) Calculate an estimate of the mean time.

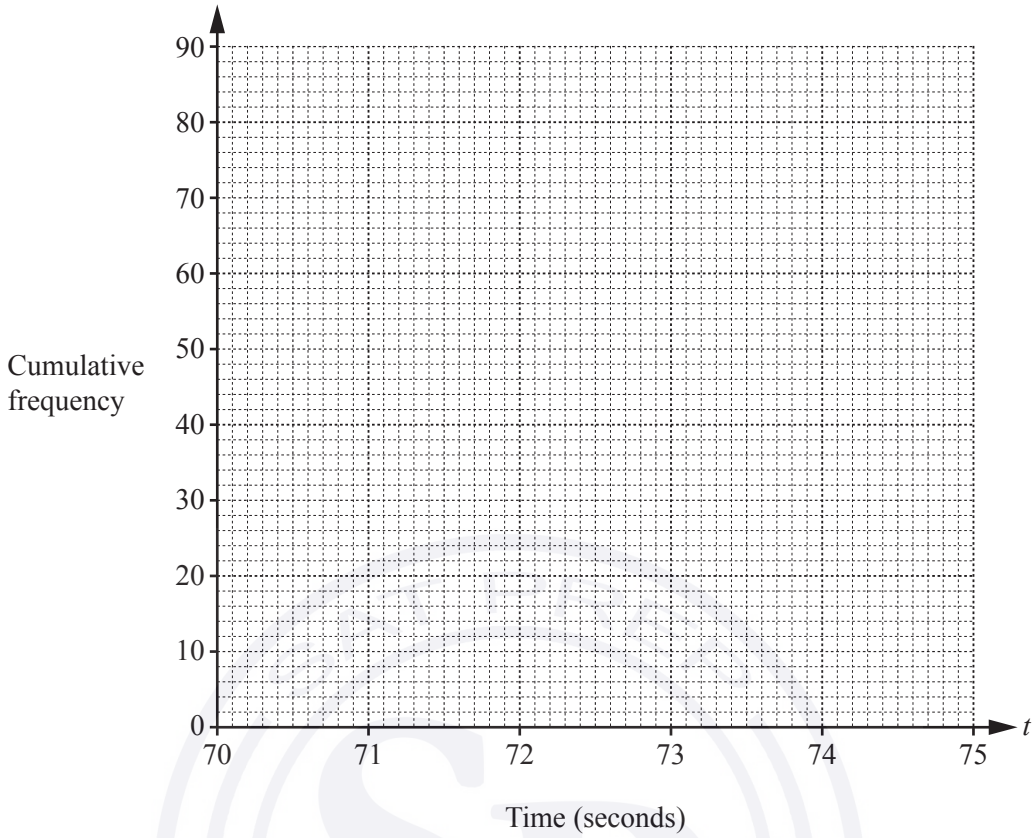
..... s [4]

(c) **(i)** Complete the cumulative frequency table.

Time (t seconds)	$t \leqslant 71$	$t \leqslant 72$	$t \leqslant 73$	$t \leqslant 74$	$t \leqslant 75$
Cumulative frequency	17				

[2]

(ii) On the grid, draw a cumulative frequency diagram to show this information.



[3]

(iii) Find the median time.

..... s [1]

(iv) Find the inter-quartile range.

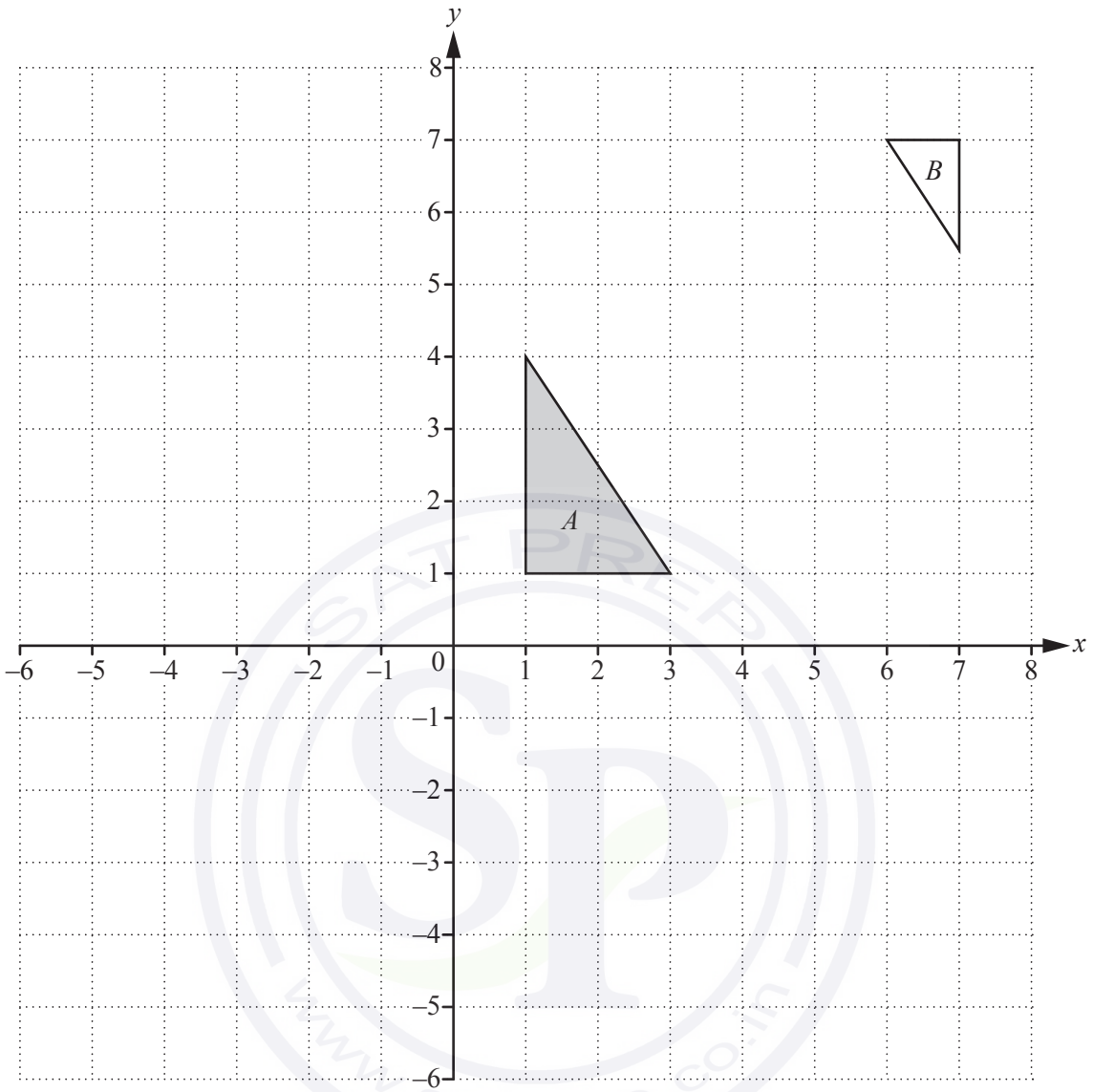
..... s [2]

(d) One lap of the race track measures 3720 metres, correct to the nearest 10 metres.
A car completed the lap in 75 seconds, correct to the nearest second.

Calculate the upper bound for the average speed of this car.
Give your answer in kilometres per hour.

..... km/h [4]

3



(a) **(i)** Draw the image of triangle A after reflection in the line $x = 4$. [2]

(ii) Draw the image of triangle A after rotation of 90° anticlockwise about (0, 0). [2]

(iii) Draw the image of triangle A after translation by the vector $\begin{pmatrix} 1 \\ -5 \end{pmatrix}$. [2]

(b) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

(c) Find the matrix that represents the transformation in **part (a)(ii)**.

$\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(d) Point P has co-ordinates (4, 1).

$\mathbf{F} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ and $\mathbf{G} = \begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}$ represent transformations.

(i) Find $\mathbf{G}(P)$, the image of P after the transformation represented by $\mathbf{G}$.

(..... , ...) [2]

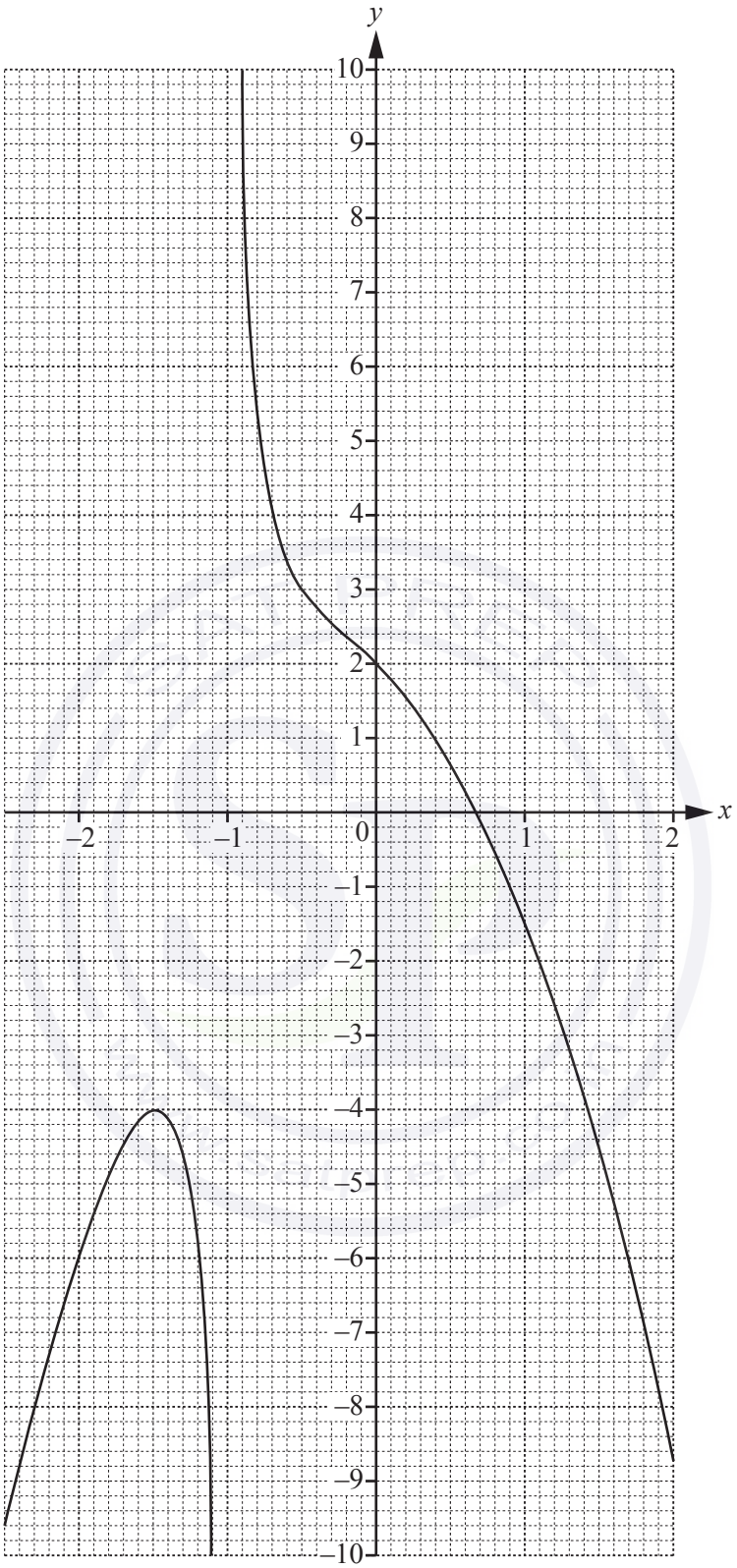
(ii) Find $\mathbf{GF}(P)$.

(..... , ...) [3]

(iii) Find the matrix $\mathbf{Q}$ such that $\mathbf{GQ}(P) = P$.

$\begin{pmatrix} & \\ & \end{pmatrix}$ [3]

4 The diagram shows the graph of $y = f(x)$ for $-2.5 \leqslant x \leqslant 2$.



(a) Find f(1).

..... [1]

(b) Solve $f(x) = 3$.

$x =$ ..... [1]

(c) The equation $f(x) = k$ has only one solution for $-2.5 \leqslant x \leqslant 2$.

Write down the range of values of k for which this is possible.

..... [2]

(d) By drawing a suitable straight line, solve the equation $f(x) = x - 5$.

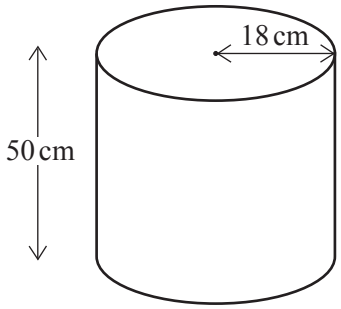
$x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(e) Draw a tangent to the graph of $y = f(x)$ at the point where $x = 1$.

Use your tangent to estimate the gradient of $y = f(x)$ when $x = 1$.

..... [3]

5 **(a)** The diagram shows a cylindrical container used to serve coffee in a hotel.



NOT TO SCALE

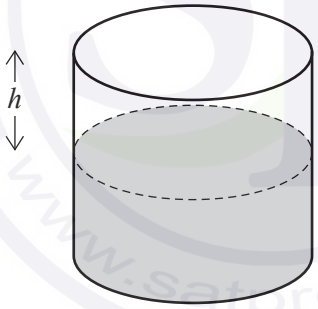
The container has a height of 50 cm and a radius of 18 cm.

(i) Calculate the volume of the cylinder and show that it rounds to 50 900 cm^3, correct to 3 significant figures.

[2]

(ii) 30 litres of coffee are poured into the container.

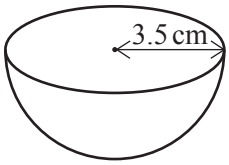
Work out the height, h, of the empty space in the container.



NOT TO SCALE

h = ... cm [3]

(iii) Cups in the shape of a hemisphere are filled with coffee from the container.
The radius of a cup is 3.5 cm.



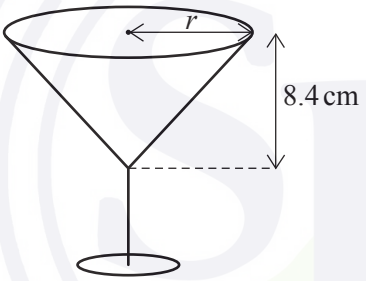
NOT TO SCALE

Work out the maximum number of these cups that can be completely filled from the 30 litres of coffee in the container.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... [4]

(b) The hotel also uses glasses in the shape of a cone.



NOT TO SCALE

The capacity of each glass is 95 cm^3.

(i) Calculate the radius, r, and show that it rounds to 3.3 cm, correct to 1 decimal place.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

[3]

(ii) Calculate the curved surface area of the cone.

[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi r l$.]

..... cm^2 [4]

6 **(a)** Expand the brackets and simplify.

(i) $4(2x+5)-5(3x-7)$

..... [2]

(ii) $(x-7)^2$

..... [2]

(b) Solve.

(i) $\frac{2x}{3}+5=-7$

$x =$ ..... [3]

(ii) $4x+9=3(2x-7)$

$x =$ ..... [3]

(iii) $3x^2-1=74$

$x =$ ..... or $x =$ ..... [3]

7 A line joins the points $A(-3, 8)$ and $B(2, -2)$.

(a) Find the co-ordinates of the midpoint of AB.

(..... , ...) [2]

(b) Find the equation of the line through A and B.
Give your answer in the form $y = mx + c$.

$y =$ ..... [3]

(c) Another line is parallel to AB and passes through the point (0, 7).

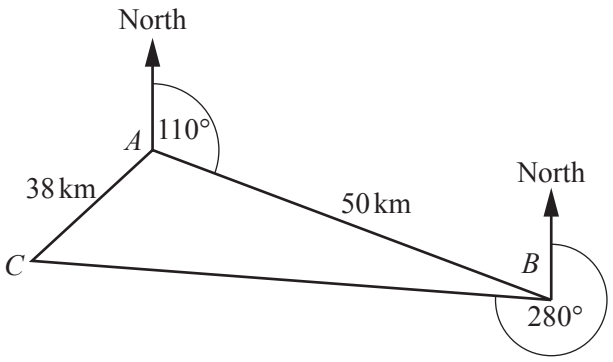
Write down the equation of this line.

..... [2]

(d) Find the equation of the line perpendicular to AB which passes through the point (1, 5).
Give your answer in the form $ax + by + c = 0$ where a, b and c are integers.

..... [4]

8 (a)



NOT TO SCALE

A, B and C are three towns.
The bearing of B from A is 110°.
The bearing of C from B is 280°.
$AC = 38$ km and $AB = 50$ km.

(i) Find the bearing of A from B.

..... [2]

(ii) Calculate angle BAC.

Angle BAC = ... [5]

(iii) A road is built from A to join the straight road BC.

Calculate the shortest possible length of this new road.

..... km [3]

(b) Town A has a rectangular park.
The length of the park is x m.
The width of the park is 25 m shorter than the length.
The area of the park is 2200 m^2.

(i) Show that $x^2 - 25x - 2200 = 0$.

[1]

(ii) Solve $x^2 - 25x - 2200 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

Question 9 is printed on the next page.

9 **(a)** The nth term of a sequence is $8n - 3$.

(i) Write down the first two terms of this sequence.

..... , ... [1]

(ii) Show that the number 203 is not in this sequence.

[2]

(b) Find the nth term of these sequences.

(i) 13, 19, 25, 31, …

..... [2]

(ii) 4, 8, 14, 22, …

..... [2]

(c) … , 20, 50, …

The second term of this sequence is 20 and the third term is 50.
The rule for finding the next term in this sequence is subtract y then multiply by 5.

Find the value of y and work out the first term of this sequence.

$y =$ .....

First term = ... [4]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

9418659189

MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2017**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **20** printed pages.

CAMBRIDGE International Examinations

1 **(a)** Annie and Dermot share \$600 in the ratio 11 : 9.

(i) Show that Annie receives \$330.

[1]

(ii) Find the amount that Dermot receives.

\$ ..... [1]

(b) **(i)** Annie invests \$330 at a rate of 1.5% per year compound interest.

Calculate the amount that Annie has after 8 years.
Give your answer correct to the nearest dollar.

\$ ..... [3]

(ii) Find the amount of **interest** that Annie has, after the 8 years, as a percentage of the \$330.

..... % [2]

(c) Dermot has $70 to spend.
He spends $24.75 on a shirt.

(i) Find $24.75 as a fraction of $70.
Give your answer in its lowest terms.

..... [1]

(ii) The $24.75 is the sale price after reducing the original price by 10%.

Calculate the original price.

$ ..... [3]

(d) After one year, the value of Annie's car had reduced by 20%.
At the end of the second year, the value of Annie's car had reduced by a further 15% of its value at the end of the first year.

(i) Calculate the overall percentage reduction after the two years.

..... % [2]

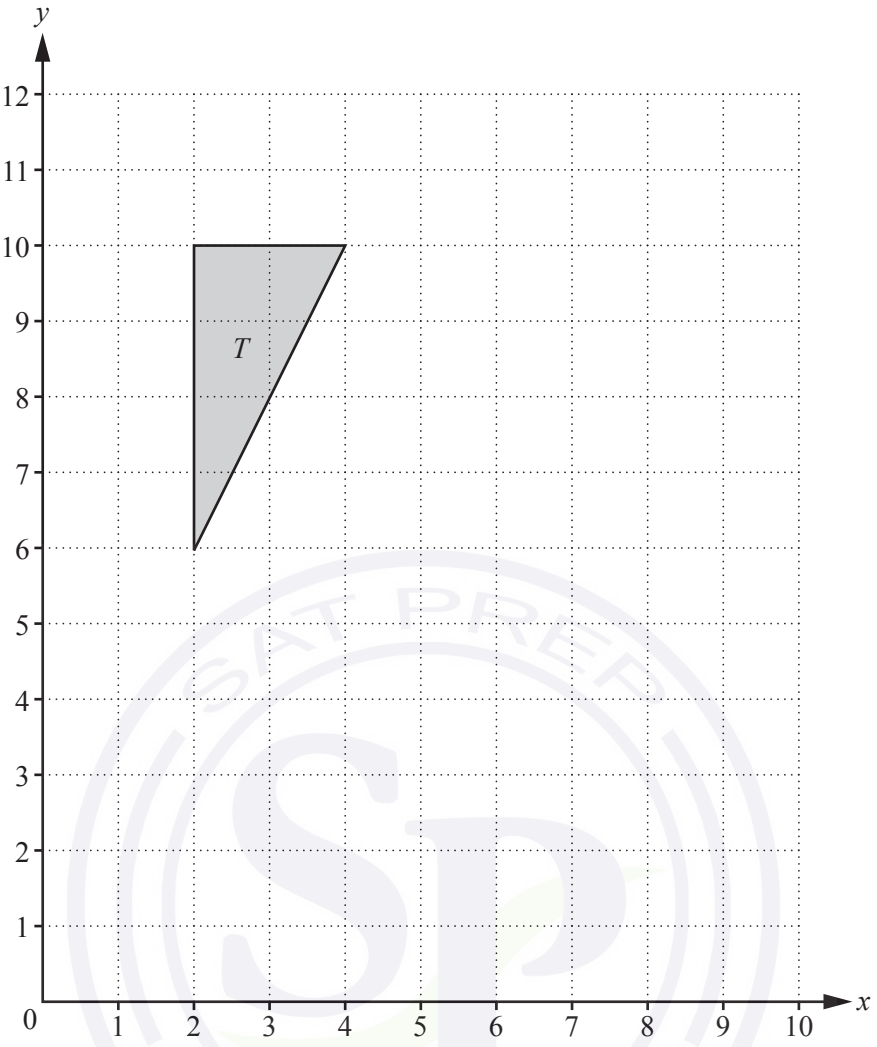
(ii) After three years the overall percentage reduction in the value of Annie's car is 40.84%.

Calculate the percentage reduction in the third year.

..... % [2]

[Turn over

2 (a)



On the grid, draw the image of

(i) triangle T after translation by the vector $\begin{pmatrix} 6 \\ -5 \end{pmatrix}$, [2]

(ii) triangle T after rotation through 90° anticlockwise with centre (4, 10), [2]

(iii) triangle T after enlargement with scale factor $\frac{1}{2}$, centre (10, 0). [2]

(b) Describe fully the **single** transformation that is represented by the matrix $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$.

.....

..... [2]

(c) $\mathbf{M} = \begin{pmatrix} 2 & 3 \\ 2 & 4 \end{pmatrix}$ $\mathbf{N} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ $\mathbf{P} = (1 \quad 5)$

(i) Find

(a) **MN**,

$\mathbf{MN} =$ [2]

(b) **NP**,

$\mathbf{NP} =$ [2]

(c) $\mathbf{M}^{-1}$.

$\mathbf{M}^{-1} =$ $\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

(ii) Write down a product of two of the matrices **M**, **N** and **P** which it is not possible to work out.

..... [1]

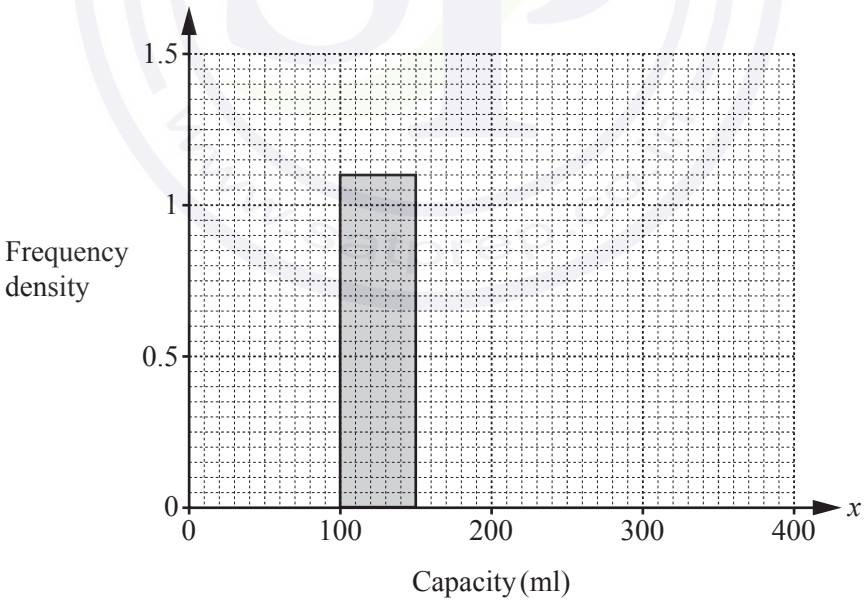
3 **(a)** 200 students estimate the capacity, x millilitres, of a cup.
The results are shown in the frequency table.

Capacity (x ml)	$0 < x \leqslant 100$	$100 < x \leqslant 150$	$150 < x \leqslant 200$	$200 < x \leqslant 250$	$250 < x \leqslant 400$
Frequency	20	55	66	35	24

(i) Calculate an estimate of the mean.

..... ml [4]

(ii) Complete the histogram.



[4]

(b) The 200 students also estimate the mass, m grams, of a small rock.
The results are shown in the cumulative frequency table.

Mass (m grams)	$m \leqslant 50$	$m \leqslant 100$	$m \leqslant 150$	$m \leqslant 200$	$m \leqslant 250$
Cumulative frequency	28	64	104	168	200

(i) On the grid, draw a cumulative frequency diagram.

[3]

(ii) Find

(a) the 65th percentile,

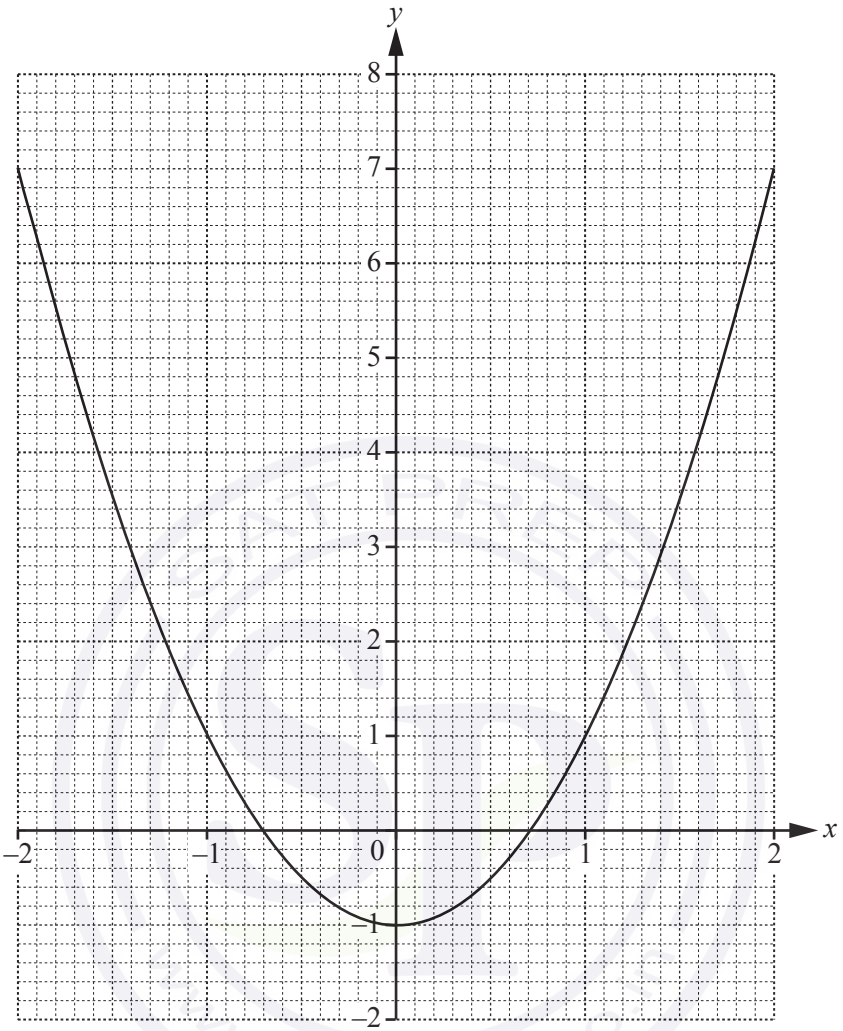
..... g [1]

(b) the number of students who estimated more than 75 g.

..... [2]

4 $f(x) = 2x^2 - 1$

The graph of $y = f(x)$, for $-2 \leqslant x \leqslant 2$, is drawn on the grid.



(a) Use the graph to solve the equation $f(x) = 5$.

$x =$ ..... or $x =$ ..... [2]

(b) **(i)** Draw the tangent to the graph of $y = f(x)$ at the point $(-1.5, 3.5)$. [1]

(ii) Use your tangent to estimate the gradient of $y = f(x)$ when $x = -1.5$.

..... [2]

(c) $g(x) = 2^x$

(i) Complete the table for $y = g(x)$.

x	-2	-1	0	1	2
y	0.25	0.5		2	4

[1]

(ii) On the grid opposite, draw the graph of $y = g(x)$ for $-2 \leqslant x \leqslant 2$. [3]

(d) Use your graphs to solve

(i) the equation $f(x) = g(x)$,

$x =$ ..... or $x =$ ..... [2]

(ii) the inequality $f(x) < g(x)$.

..... [1]

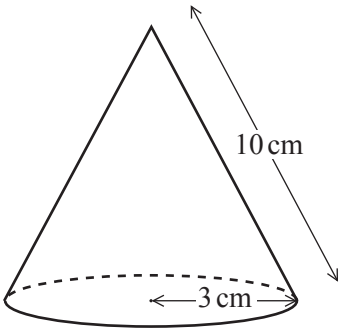
(e) **(i)** Write down the three values.

$g(-3) =$ ..... $g(-5) =$ ..... $g(-10) =$ ..... [1]

(ii) Complete the statement.

As x decreases, $g(x)$ approaches the value ..... [1]

5



NOT TO SCALE

The diagram shows a hollow cone with radius 3 cm and slant height 10 cm.

(a) (i) Calculate the curved surface area of the cone.

[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]

..... cm^2 [2]

(ii) Calculate the perpendicular height of the cone.

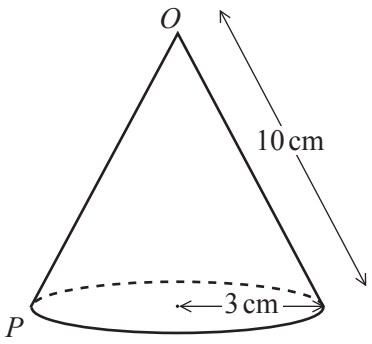
..... cm [3]

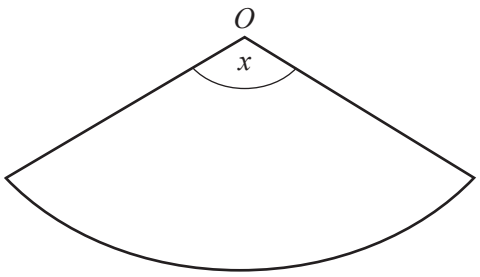
(iii) Calculate the volume of the cone.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [2]

(b)





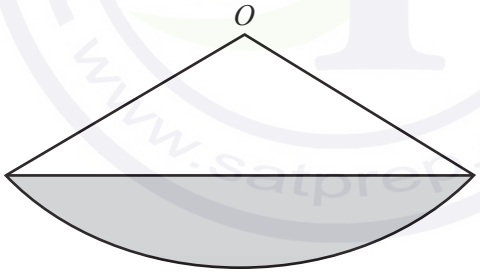
NOT TO SCALE

The cone is cut along the line OP and is opened out into a sector as shown in the diagram.

Calculate the sector angle x.

$x =$ ..... [4]

(c)



NOT TO SCALE

The diagram shows the same sector as in **part (b)**.

Calculate the area of the shaded segment.

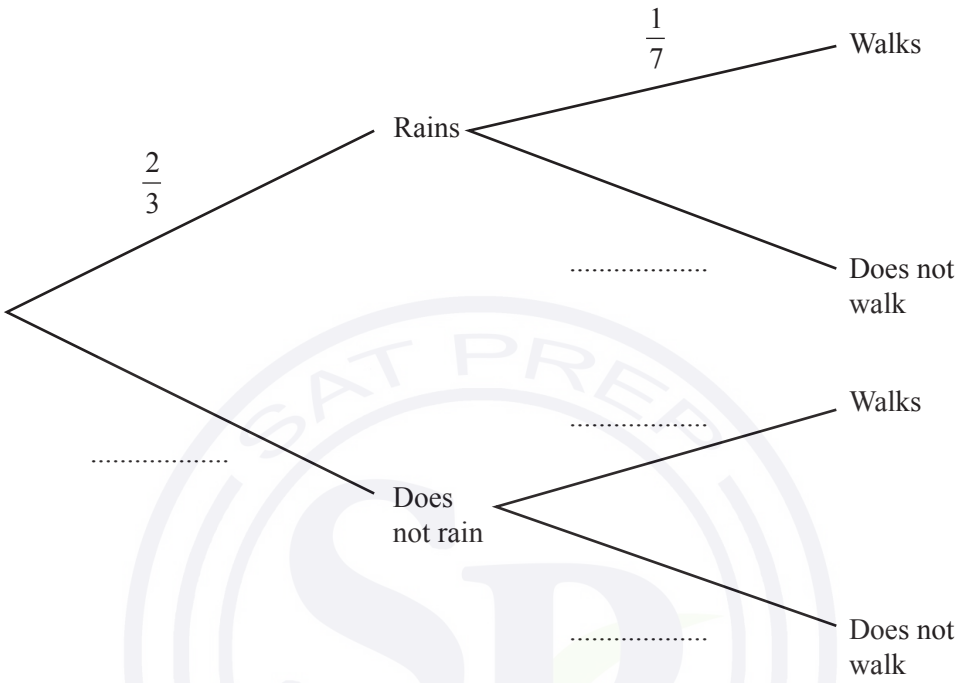
..... cm^2 [4]

6 Each morning the probability that it rains is $\frac{2}{3}$.

If it rains, the probability that Asha walks to school is $\frac{1}{7}$.

If it does not rain, the probability that Asha walks to school is $\frac{4}{7}$.

(a) Complete the tree diagram.



[2]

(b) Find the probability that it rains and Asha walks to school.

..... [2]

(c) **(i)** Find the probability that Asha does not walk to school.

..... [3]

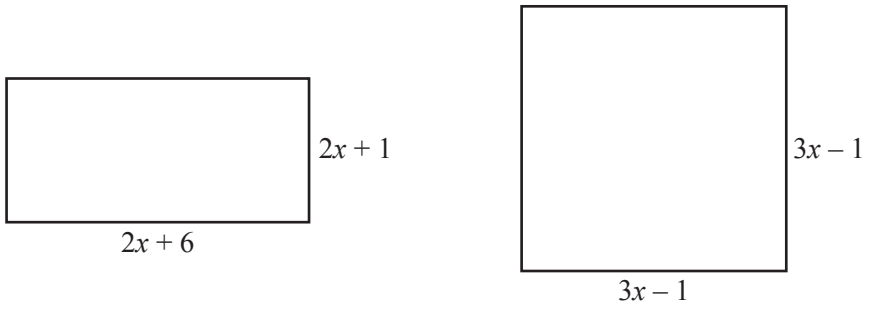
(ii) Find the expected number of days Asha does not walk to school in a term of 70 days.

..... [2]

(d) Find the probability that it rains on exactly one morning in a school week of 5 days.

..... [2]

7 **(a)** In this part, all lengths are in centimetres.



(i) Find the value of x when the perimeter of the rectangle is equal to the perimeter of the square.

$x =$ ..... [3]

(ii) Find the value of x when the area of the rectangle is equal to the area of the square.
Show all your working.

$x =$ ..... [7]

(b) (i) Factorise $x^2 + 4x - 5$.

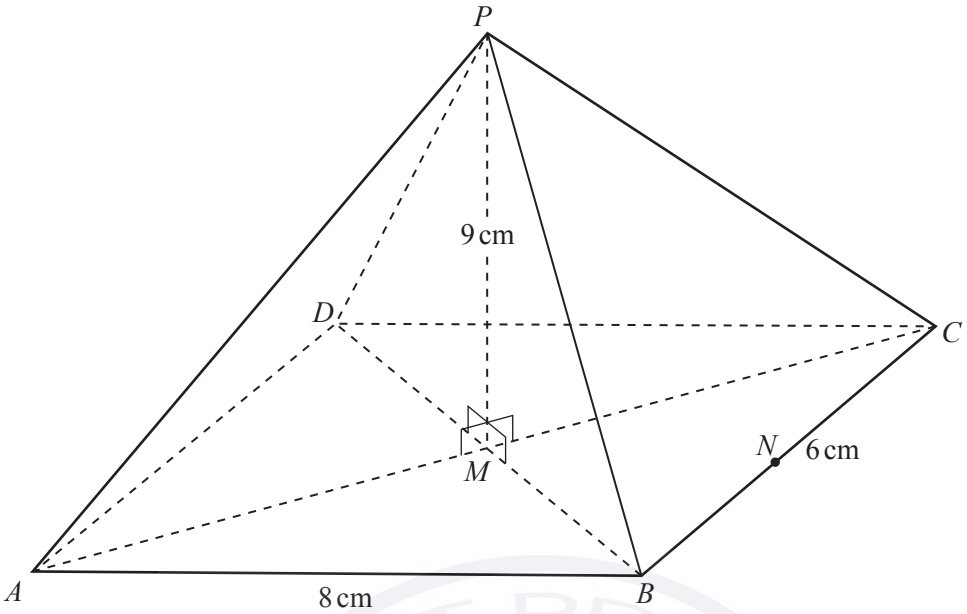
..... [2]

(ii) Solve the equation $\frac{5}{x} - \frac{8}{x+1} = 1$.

Show all your working.

$x =$ ..... or $x =$ ..... [4]

8



The diagram shows a pyramid on a rectangular base $ABCD$.
AC and BD intersect at M and P is vertically above M.
$AB = 8$ cm, $BC = 6$ cm and $PM = 9$ cm.

(a) N is the midpoint of BC.

Calculate angle PNM.

Angle $PNM =$ ..... [2]

(b) Show that $BM = 5$ cm.

[1]

(c) Calculate the angle between the edge PB and the base $ABCD$.

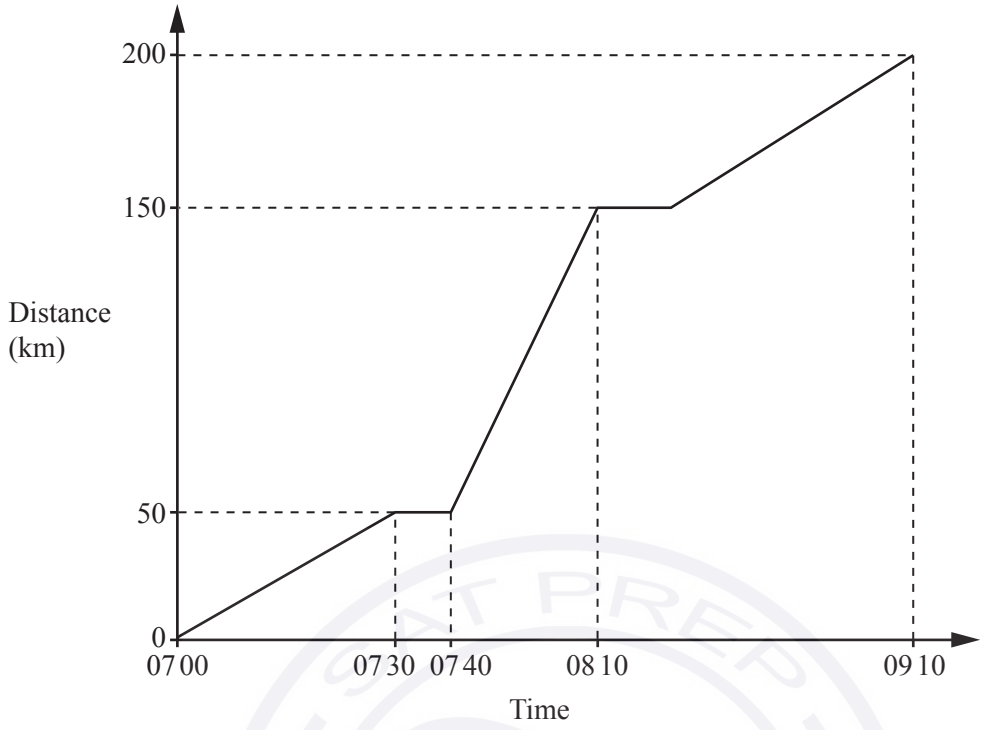
..... [2]

(d) A point X is on PC so that $PX = 7.5$ cm.

Calculate BX.

$BX =$ ..... cm [6]

9 (a)



NOT TO SCALE

The distance-time graph shows the journey of a train.

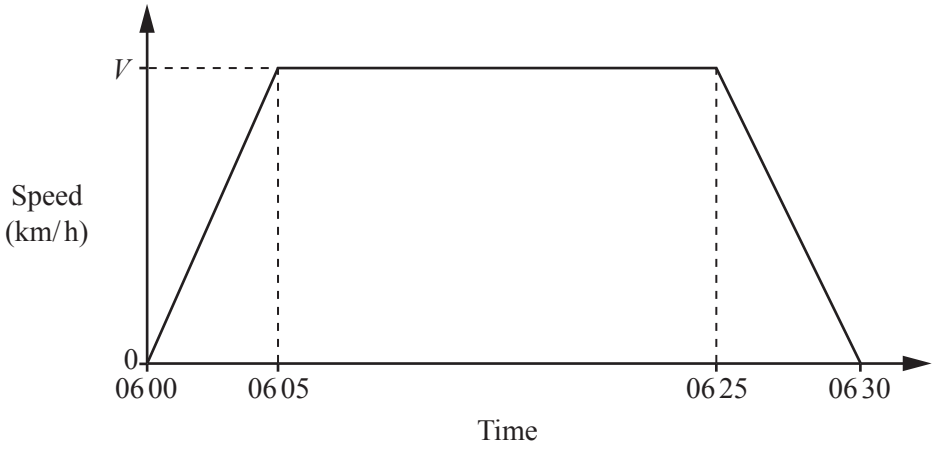
(i) Find the speed of the train between 07 00 and 07 30.

..... km/h [1]

(ii) Find the average speed for the whole journey.

..... km/h [3]

(b)



The speed-time graph shows the first 30 minutes of another train journey.
The distance travelled is 100 km.
The maximum speed of the train is V km/h.

(i) Find the value of V.

$V =$ ..... [3]

(ii) Find the acceleration of the train during the first 5 minutes.
Give your answer in m/s^2.

..... m/s^2 [2]

Question 10 is printed on the next page.

10 $f(x) = 3x - 2$ $g(x) = x^2$ $h(x) = 3^x$

(a) Find $f(-3)$.

..... [1]

(b) Find the value of x when $f(x) = 19$.

$x =$ ..... [2]

(c) Find $fh(2)$.

..... [2]

(d) Find $gf(x) + f(x) + x$.
Give your answer in its simplest form.

..... [3]

(e) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

0731247115

MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2017**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Geometrical instruments
Tracing paper (optional).

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

1 **(a)** In 2016, a company sold 9600 cars, correct to the nearest hundred.

(i) Write down the lower bound for the number of cars sold.

..... [1]

(ii) The average profit on each car sold was \$2430, correct to the nearest \$10.

Calculate the lower bound for the total profit.
Write down the exact answer.

\$..... [2]

(iii) Write your answer to **part (a)(ii)** correct to 4 significant figures.

\$..... [1]

(iv) Write your answer to **part (a)(iii)** in standard form.

\$..... [1]

(b) In April, the number of cars sold was 546.
This was an increase of 5% on the number of cars sold in March.

Calculate the number of cars sold in March.

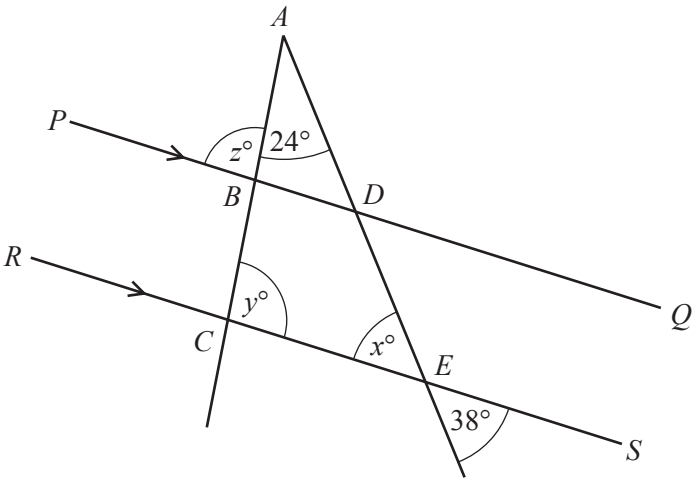
..... [3]

(c) The price of a new car grows exponentially by 3% per year.
A new car has a price of $3000 in 2013.

Find the price of a new car 4 years later.

$..... [2]

2 (a)



NOT TO SCALE

PQ is parallel to *RS*.
ABC and *ADE* are straight lines.

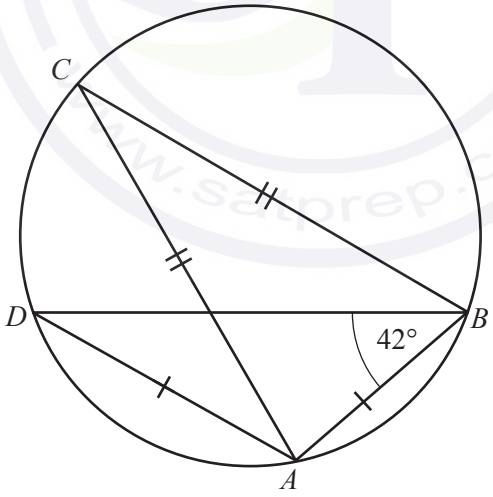
Find the values of x, y and z.

$x =$ .....

$y =$ .....

$z =$ ..... [3]

(b)



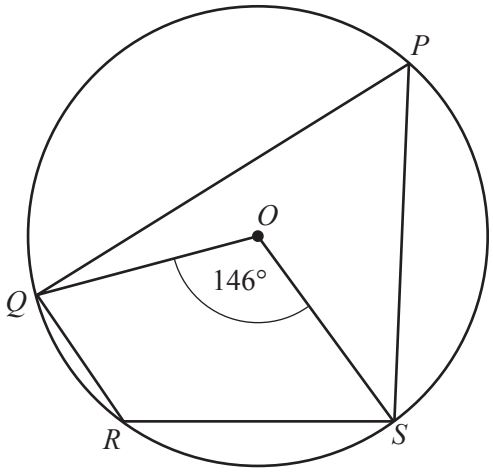
NOT TO SCALE

The points *A*, *B*, *C* and *D* lie on the circumference of the circle.
$AB = AD$, $AC = BC$ and angle $ABD = 42°$.

Find angle *CAB*.

Angle *CAB* = ... [3]

(c)



NOT TO SCALE

The points P, Q, R and S lie on the circumference of the circle, centre O.
Angle $QOS = 146°$.

Find angle QRS.

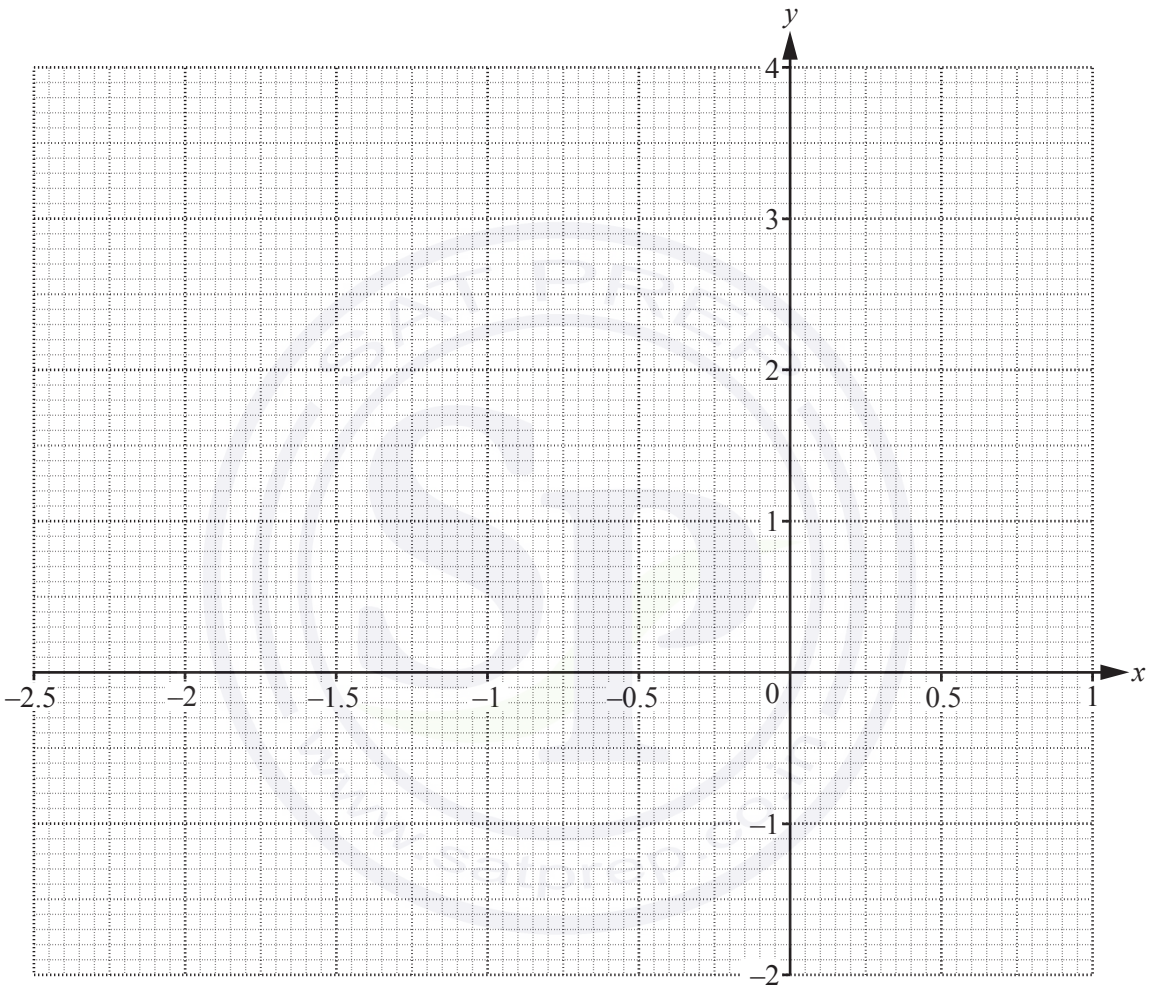
Angle QRS = ... [2]

3 The table shows some values for $y = 2x^3 + 4x^2$.

x	–2.2	–2	–1.5	–1	–0.5	0	0.5	0.8
y	–1.94				0.75	0		3.58

(a) Complete the table. [4]

(b) Draw the graph of $y = 2x^3 + 4x^2$ for $-2.2 \leqslant x \leqslant 0.8$.



[4]

(c) Find the number of solutions to the equation $2x^3 + 4x^2 = 3$.

..... [1]

(d) **(i)** The equation $2x^3 + 4x^2 - x = 1$ can be solved by drawing a straight line on the grid.

Write down the equation of this straight line.

$y =$ ..... [1]

(ii) Use your graph to solve the equation $2x^3 + 4x^2 - x = 1$.

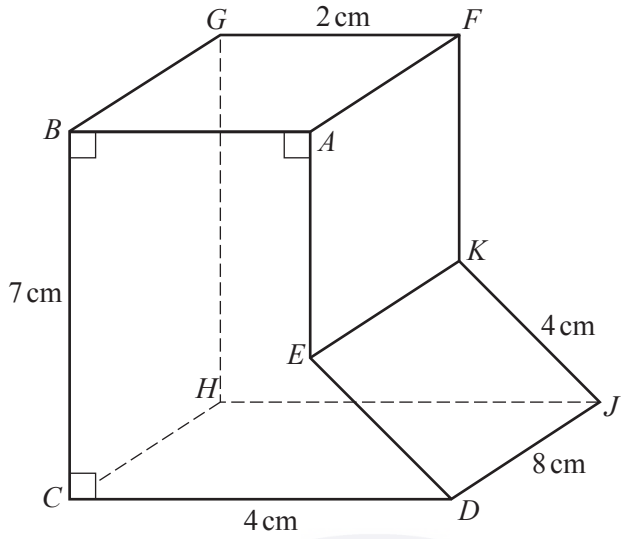
$x =$ ..... or $x =$ ..... or $x =$ .....[3]

(e) The tangent to the graph of $y = 2x^3 + 4x^2$ has a negative gradient when $x = k$.

Complete the inequality for k.

..... $< k <$ .....[2]

4 **(a)** The diagram shows a solid metal prism with cross section *ABCDE*.



NOT TO SCALE

(i) Calculate the area of the cross section *ABCDE*.

.....cm^2 [6]

(ii) The prism is of length 8 cm.

Calculate the volume of the prism.

.....cm^3 [1]

(b) A cylinder of length 13 cm has volume 280 cm^3.

(i) Calculate the radius of the cylinder.

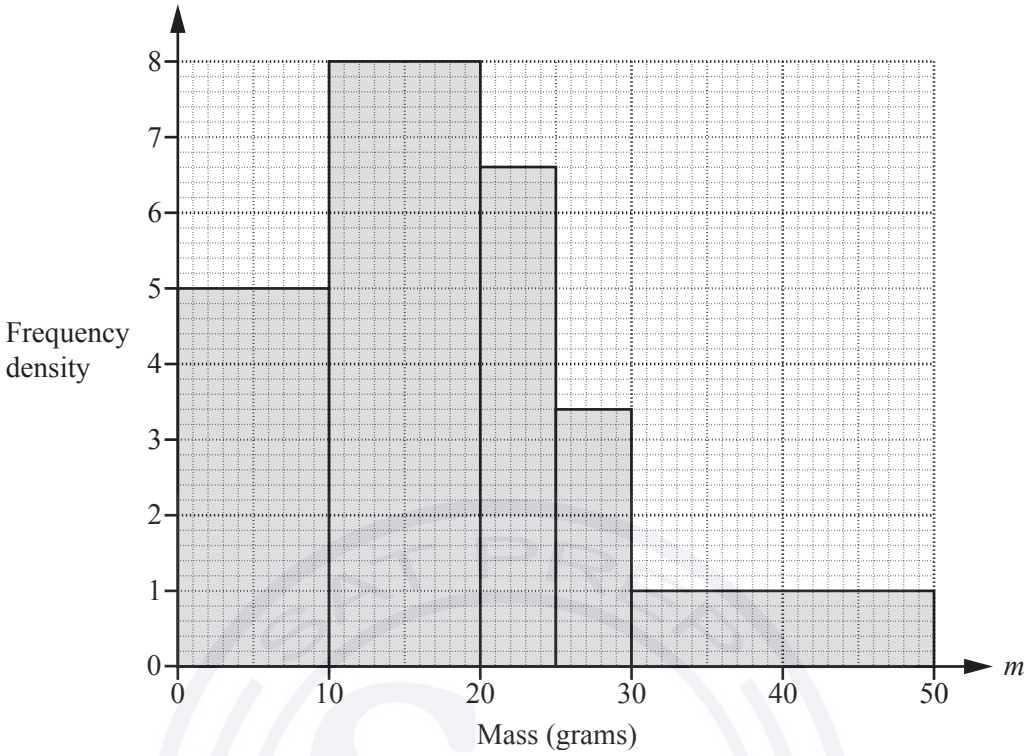
..... cm [3]

(ii) The cylinder is placed in a box that is a cube of side 14 cm.

Calculate the percentage of the volume of the box that is occupied by the cylinder.

.....% [3]

5 **(a)** Haroon has 200 letters to post.
The histogram shows information about the masses, m grams, of the letters.



(i) Complete the frequency table for the 200 letters.

Mass (m grams)	$0 < m \leqslant 10$	$10 < m \leqslant 20$	$20 < m \leqslant 25$	$25 < m \leqslant 30$	$30 < m \leqslant 50$
Frequency	50			17	

[3]

(ii) Calculate an estimate of the mean mass.

..... g [4]

(b) Haroon has 15 parcels to post.
The table shows information about the sizes of these parcels.

Size	Small	Large
Frequency	9	6

Two parcels are selected at random.

Find the probability that

(i) both parcels are large,

..... [2]

(ii) one parcel is small and the other is large.

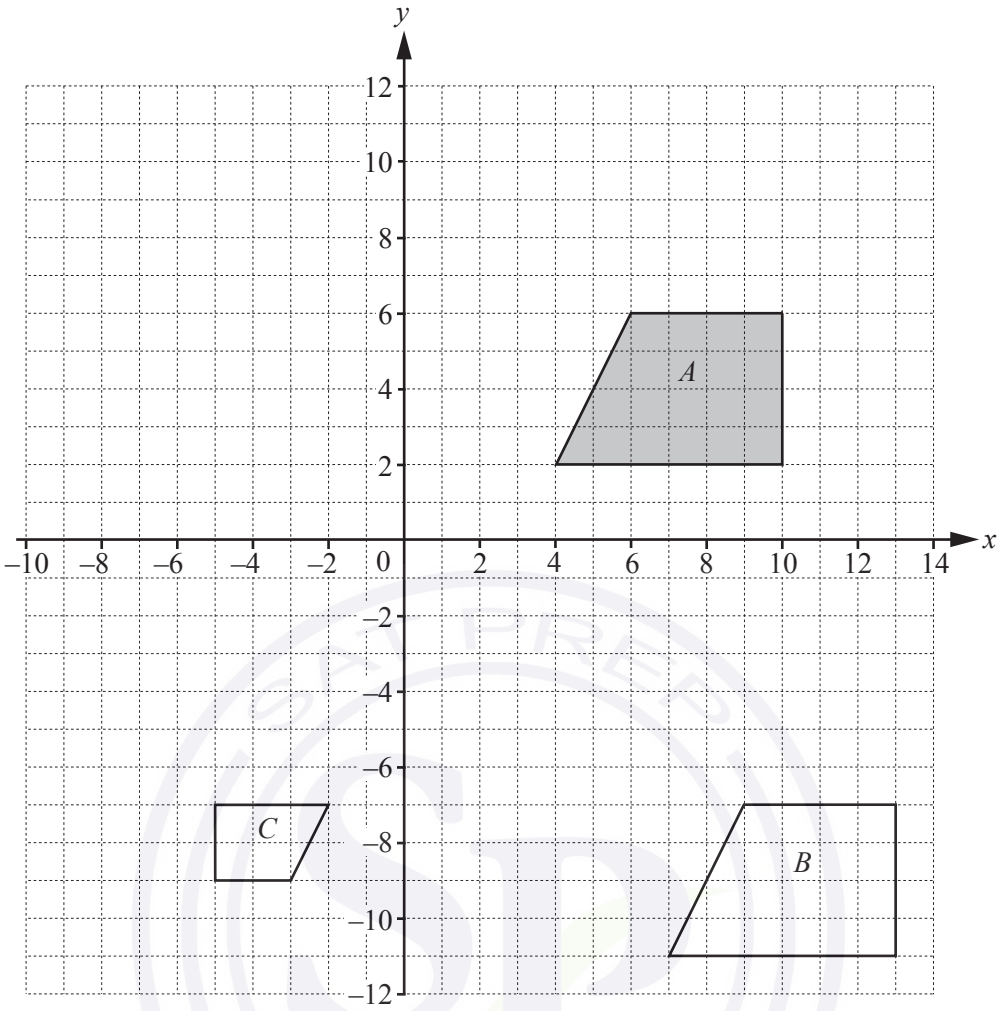
..... [3]

(c) The probability that a parcel arrives late is $\frac{3}{80}$.
4000 parcels are posted.

Calculate an estimate of the number of parcels expected to arrive late.

..... [1]

6



(a) Describe fully the **single** transformation that maps shape *A* onto

(i) shape *B*,

.....

..... [2]

(ii) shape *C*.

.....

..... [3]

(b) Draw the image of shape *A* after rotation through 90° anticlockwise about the point (3, −1). [2]

(c) Draw the image of shape *A* after reflection in $y = 1$. [2]

(d) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$.

.....

..... [3]

7 **(a)** Solve the simultaneous equations.
You must show all your working.

$$2x + 3y = 11$$
$$3x - 5y = -50$$

$x =$ .....

$y =$ ..... [4]

(b) $x^2 - 12x + a = (x + b)^2$

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [3]

(c) Write as a single fraction in its simplest form.

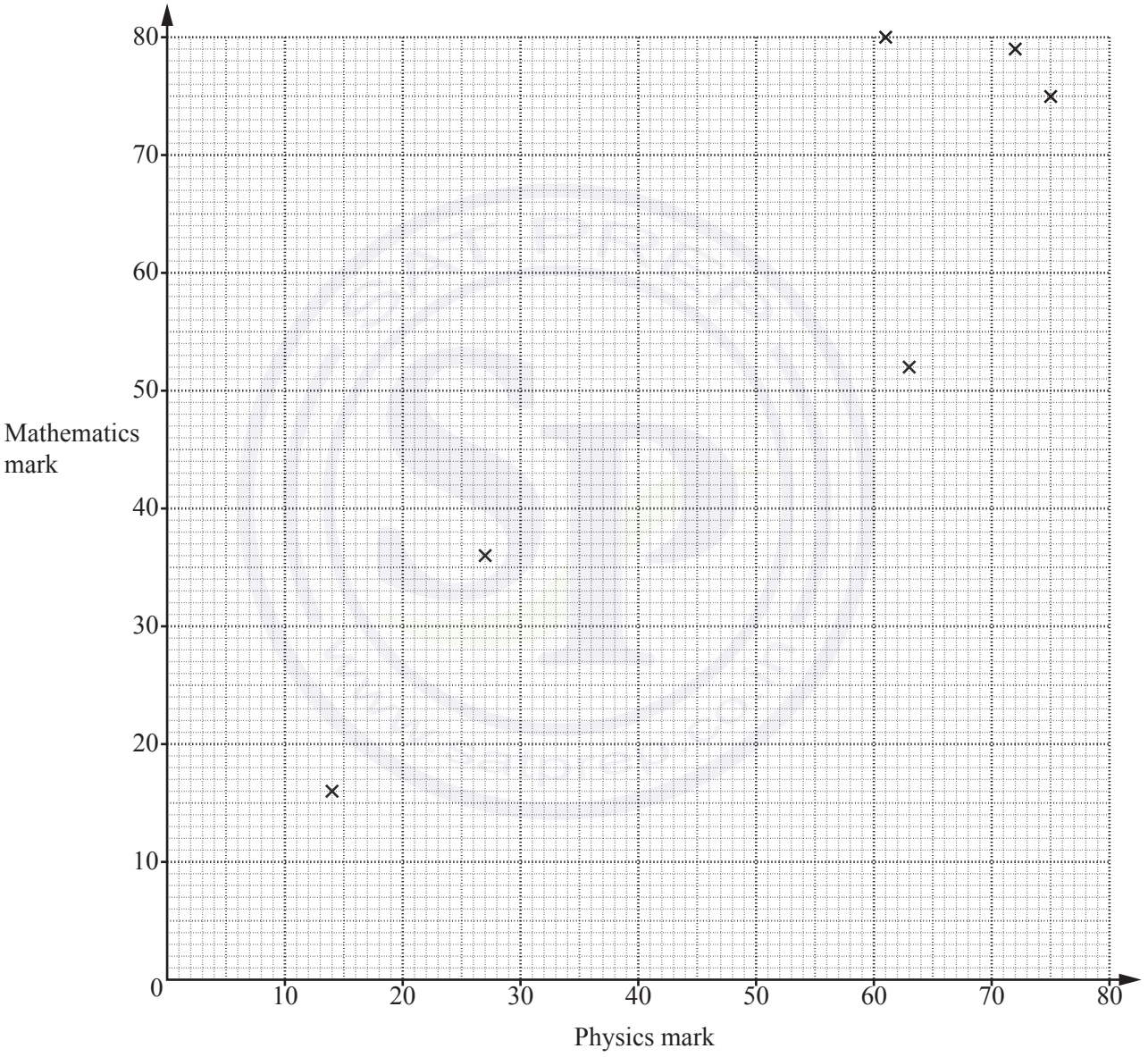
$$\frac{x}{2x-5} + \frac{3x+2}{x-1}$$

..... [4]

8 **(a)** The table shows the marks gained by 10 students in their physics test and their mathematics test.

Physics mark	63	61	14	27	72	75	44	40	28	50
Mathematics mark	52	80	16	36	79	75	51	35	24	63

(i) Complete the scatter diagram below.
The first six points have been plotted for you.



[2]

(ii) What type of correlation is shown in the scatter diagram?

..... [1]

(b) The marks of 30 students in a spelling test are shown in the table below.

Mark	0	1	2	3	4	5
Frequency	2	4	5	5	6	8

Find the mean, median, mode and range of these marks.

Mean = ...

Median = ...

Mode = ...

Range = ... [7]

(c) The table shows the marks gained by some students in their English test.

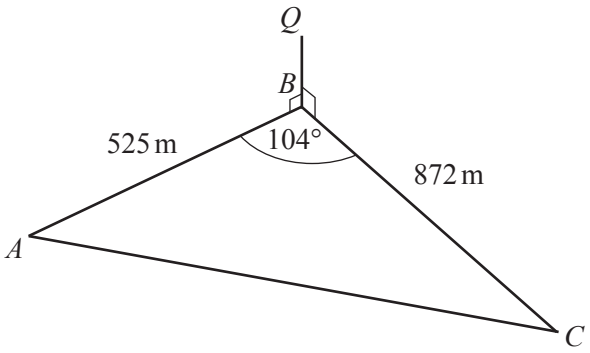
Mark	52	75	91
Number of students	x	45	11

The mean mark for these students is 70.3 .

Find the value of x.

x = ... [3]

9



NOT TO SCALE

ABC is a triangular field on horizontal ground.
There is a vertical pole *BQ* at *B*.
AB = 525 m, *BC* = 872 m and angle *ABC* = 104°.

(a) Use the cosine rule to calculate the distance *AC*.

AC = ... m [4]

(b) The angle of elevation of *Q* from *C* is 1.0°.

Showing all your working, calculate the angle of elevation of *Q* from *A*.

..... [4]

(c) **(i)** Calculate the area of the field.

..... m^2 [2]

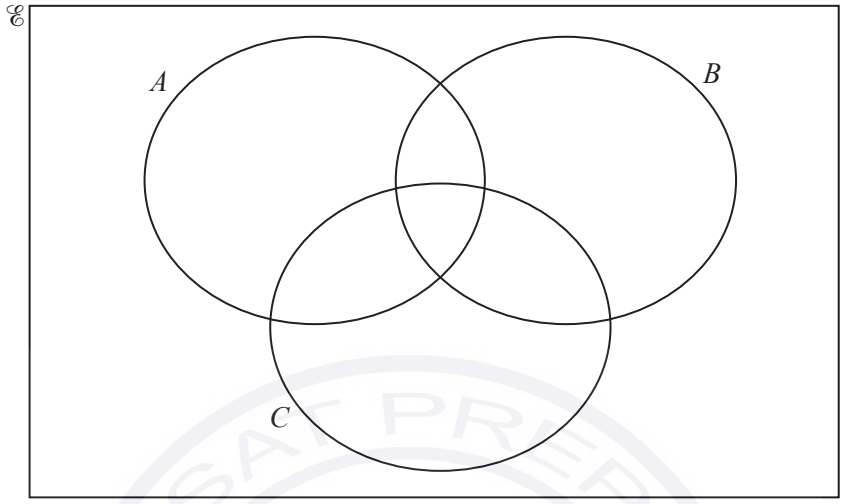
(ii) The field is drawn on a map with the scale 1 : 20 000.

Calculate the area of the field on the map in cm^2.

.....cm^2 [2]

10 $\mathscr{E} = \{21, 22, 23, 24, 25, 26, 27, 28, 29, 30\}$
$A = \{ x : x \text{ is a multiple of } 3\}$
$B = \{ x : x \text{ is prime}\}$
$C = \{ x : x \leqslant 25\}$

(a) Complete the Venn diagram.



[4]

(b) Use set notation to complete the statements.

(i) 26 ..... B [1]

(ii) $A \cap B =$ ..... [1]

(c) List the elements of $B \cup (C \cap A)$.

..... [2]

(d) Find

(i) $n(C)$,

..... [1]

(ii) $n(B' \cup (B \cap C))$.

..... [1]

(e) $(A \cap C)$ is a subset of $(A \cup C)$.

Complete this statement using set notation.

$(A \cap C)$ ..... $(A \cup C)$ [1]

11 The table shows the first four terms in sequences A, B, C and D.

Complete the table.

Sequence	1st term	2nd term	3rd term	4th term	5th term		nth term
A	16	25	36	49			
B	5	8	11	14			
C	11	17	25	35			
D	$\frac{3}{2}$	$\frac{4}{3}$	$\frac{5}{4}$	$\frac{6}{5}$			

[12]

BLANK PAGE

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

4943321439

MATHEMATICS **0580/42**

Paper 4 (Extended) **February/March 2017**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

1 The Smith family paid \$5635 for a holiday in India.
The total cost was divided in the ratio travel : accommodation : entertainment = 10 : 17 : 8.

(a) Calculate the percentage of the total cost spent on entertainment.

.....% [2]

(b) Show that the amount spent on accommodation was \$2737.

[2]

(c) The \$5635 was the total amount Mr Smith received from an investment he made 5 years ago.
Compound interest at a rate of 2.42% per year was paid on this investment.

Calculate the amount he invested 5 years ago.

\$ ..... [3]

(d) Mr Smith, his wife and their three children visit a theme park.
The tickets cost 2500 Rupees for an adult and 1650 Rupees for a child.

Calculate the total cost of the tickets.

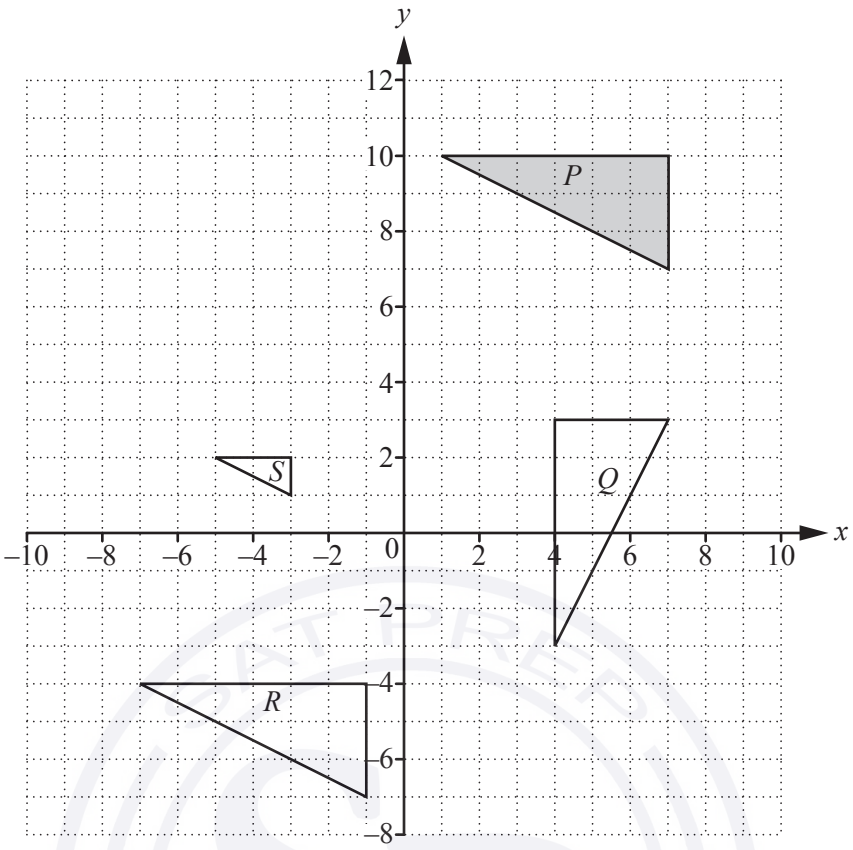
..... Rupees [2]

(e) One day the youngest child spent 130 Rupees on sweets.
On this day the exchange rate was 1 Rupee = \$0.0152 .

Calculate the value of the sweets in dollars, correct to the nearest cent.

\$ ..... [2]

2



(a) Describe fully the **single** transformation that maps

(i) shape P onto shape Q,

.....

..... [3]

(ii) shape P onto shape R,

.....

..... [2]

(iii) shape P onto shape S.

.....

..... [3]

(b) (i) Draw the reflection of **shape *S*** in the line $y = x$. [2]

(ii) Write down the matrix that represents the transformation in **part (b)(i)**.

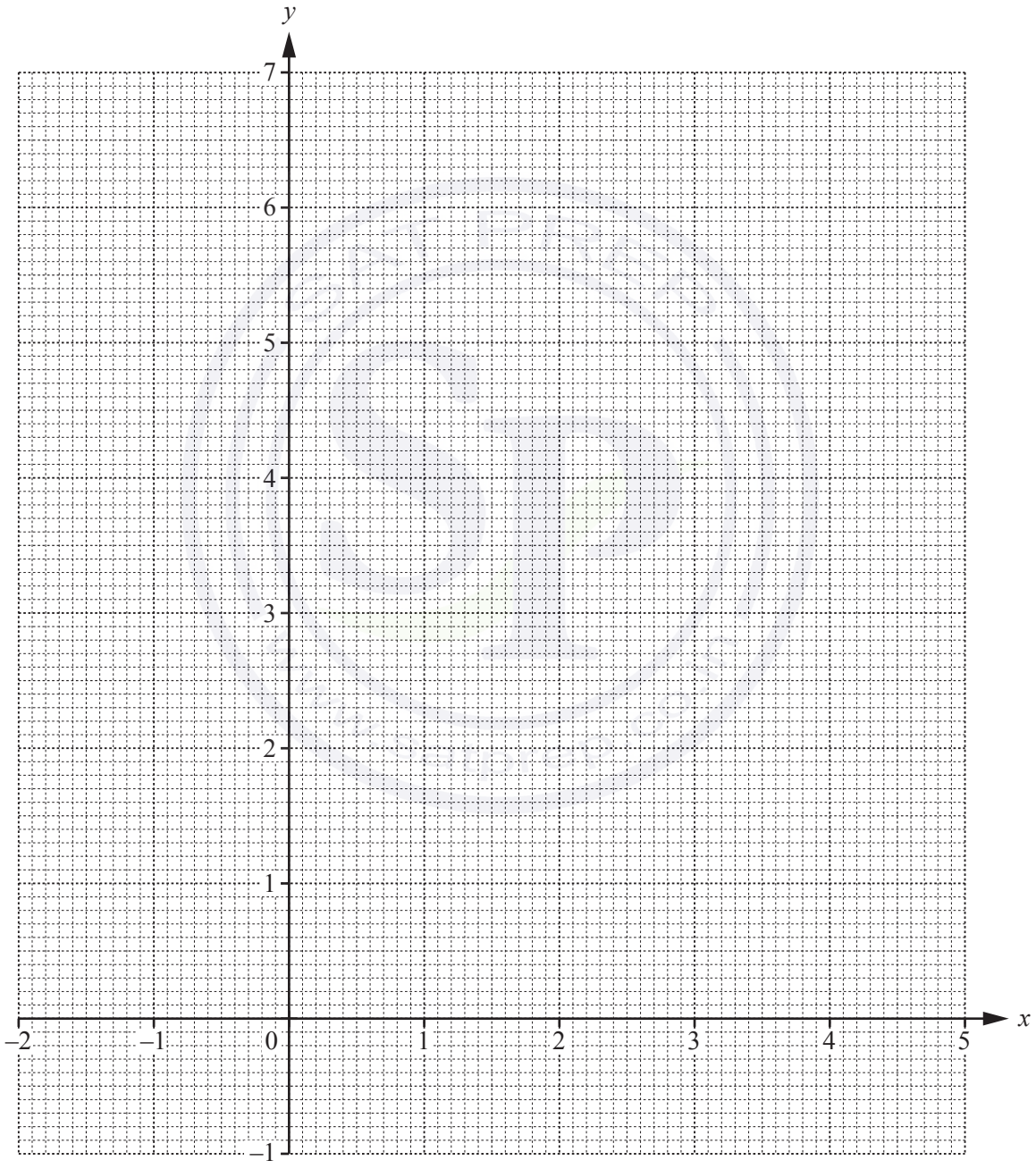
$\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

3 The table shows some values for $y = 1.5^x - 1$.

x	–2	–1	0	1	2	3	4	5
y	−0.56	−0.33				2.38	4.06	6.59

(a) Complete the table. [3]

(b) Draw the graph of $y = 1.5^x - 1$ for $-2 \leqslant x \leqslant 5$.



[4]

(c) Use your graph to solve the equation $1.5^x - 1 = 3.5$.

$x =$ ..... [2]

(d) By drawing a suitable straight line, solve the equation $1.5^x - x - 2 = 0$.

$x =$ ..... or $x =$ .....[3]

(e) **(i)** On the grid, plot the point A at (5, 5). [1]

(ii) Draw the tangent to the graph of $y = 1.5^x - 1$ that passes through the point A. [1]

(iii) Work out the gradient of this tangent.

..... [2]

4 Ravi spins a biased 5-sided spinner, numbered 1 to 5.
The probability of each number is shown in the table.

Number	1	2	3	4	5
Probability	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{1}{3}$	x	x

(a) Find the value of x.

$x =$ ..... [3]

(b) Ravi spins the spinner once.

Find the probability that the number is 2 or 3.

..... [2]

(c) Ravi spins the spinner twice.

Find the probability that

(i) the number is 2 both times,

..... [2]

(ii) the sum of the numbers is 3.

..... [3]

(d) Ravi spins the spinner 72 times.

Calculate how many times he expects the number 1.

..... [1]

5 **(a)** **(i)** Factorise $3x^2 + 11x - 4$.

..... [2]

(ii) Solve the equation $3x^2 + 11x - 4 = 0$.

$x =$ ..... or $x =$ .....[1]

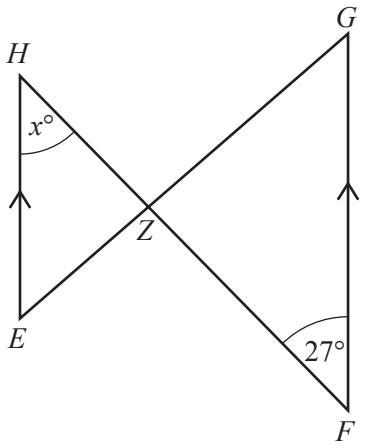
(b) **(i)** Show that $\frac{2}{2x+11} - \frac{1}{x-4} = \frac{1}{2}$ simplifies to $2x^2 + 3x - 6 = 0$.

[4]

(ii) Solve the equation $2x^2 + 3x - 6 = 0$.
You must show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ .....[4]

6 (a)



NOT TO SCALE

In the diagram, EH is parallel to FG.
The straight lines EG and FH intersect at Z.
Angle $ZFG = 27°$.

(i) Find the value of x.

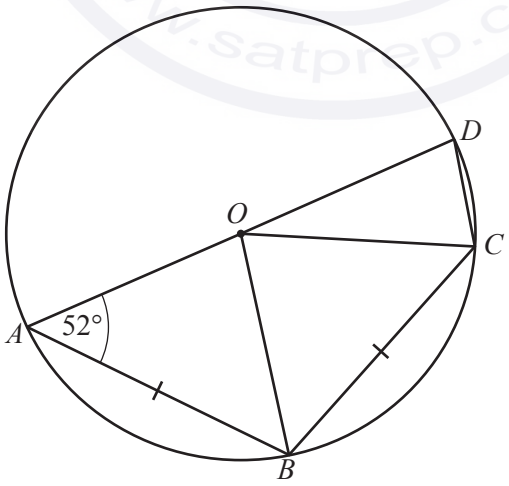
$x =$ ..... [1]

(ii) $EH = 5$ cm, $FG = 9$ cm and $ZG = 7$ cm.

Calculate EZ.

$EZ =$ ..... cm [2]

(b) The diagram shows points A, B, C and D on the circumference of a circle, centre O.
AD is a straight line, $AB = BC$ and angle $OAB = 52°$.

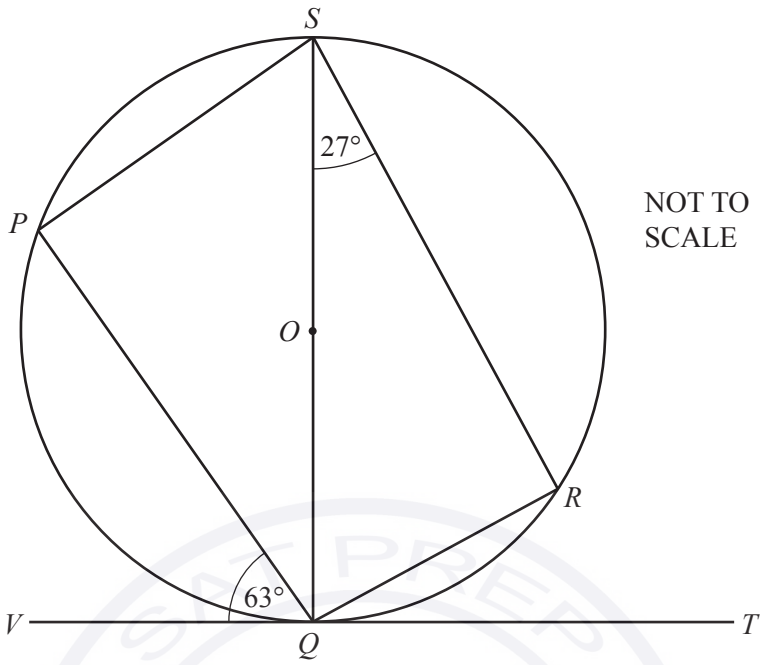


NOT TO SCALE

Find angle ADC.

Angle $ADC =$ ..... [3]

(c) The diagram shows points P, Q, R and S on the circumference of a circle, centre O.
VT is the tangent to the circle at Q.



Complete the statements.

(i) Angle QPS = angle QRS = ... ° because .....

..... [2]

(ii) Angle SQP = ... ° because .....

..... [2]

(iii) **Part (c)(i)** and **part (c)(ii)** show that

the cyclic quadrilateral $PQRS$ is a ..... [1]

7 The table shows information about the time taken by 400 people to complete a race.

Time taken (m minutes)	$45 < m \leqslant 50$	$50 < m \leqslant 60$	$60 < m \leqslant 70$	$70 < m \leqslant 90$	$90 < m \leqslant 100$	$100 < m \leqslant 120$
Frequency	23	64	122	136	26	29

(a) Calculate an estimate of the mean time taken.

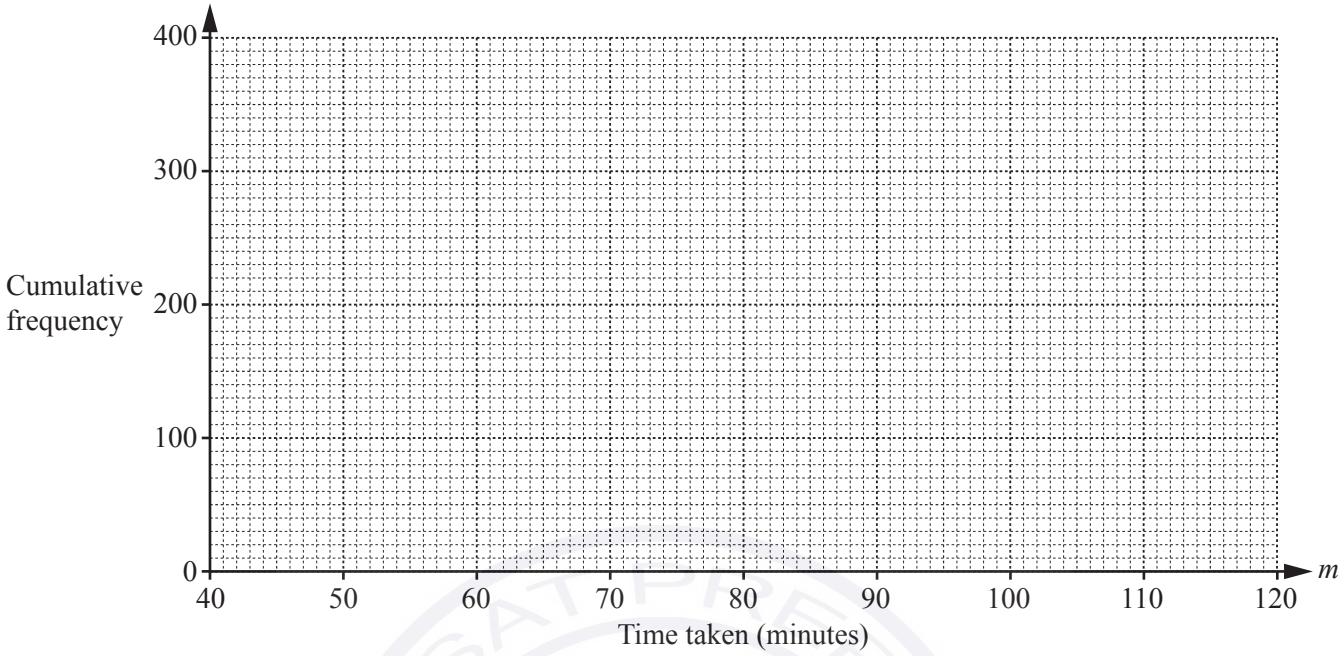
..... min [4]

(b) (i) Complete the cumulative frequency table.

Time taken (m minutes)	$m \leqslant 50$	$m \leqslant 60$	$m \leqslant 70$	$m \leqslant 90$	$m \leqslant 100$	$m \leqslant 120$
Cumulative frequency	23					400

[2]

(ii) On the grid, draw a cumulative frequency diagram to show this information.



[3]

(iii) Use your diagram to estimate

(a) the median,

..... min [1]

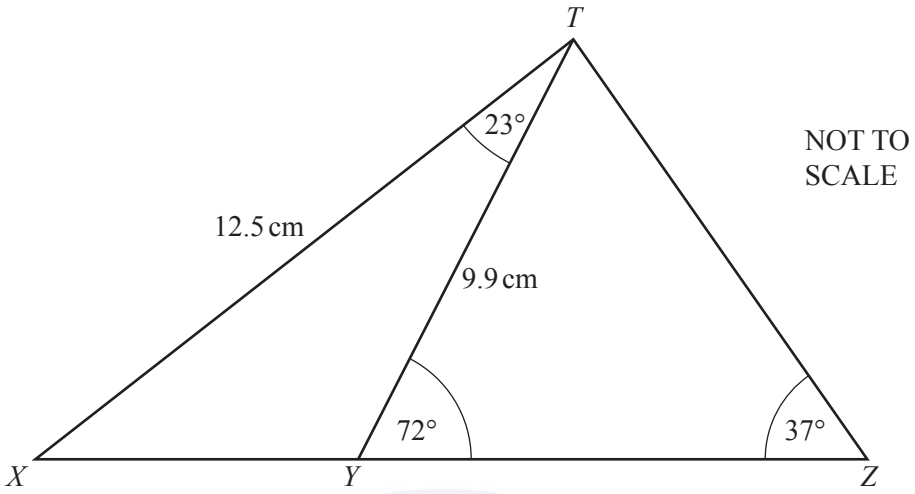
(b) the inter-quartile range,

..... min [2]

(c) the 60th percentile.

..... min [2]

8 **(a)** In triangle TXZ, $TX = 12.5$ cm and angle $TZX = 37°$.
Y is a point on the line XZ such that $TY = 9.9$ cm, angle $XTY = 23°$ and angle $TYZ = 72°$.



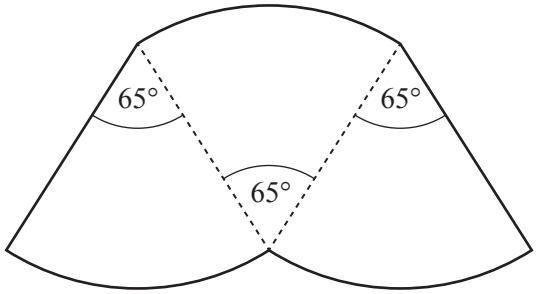
(i) Calculate XY.

$XY =$ ..... cm [4]

(ii) Calculate TZ.

$TZ =$ ..... cm [3]

(b) The diagram shows a shape made up of three identical sectors of a circle, each with sector angle 65°. The perimeter of the shape is 20.5 cm.



NOT TO SCALE

Calculate the radius of the circle.

..... cm [4]

9 Bernie buys x packets of seeds and y plants for his garden.
He wants to buy more packets of seeds than plants.
The inequality $x > y$ shows this information.

He also wants to buy
- less than 10 packets of seeds
- at least 2 plants.

(a) Write down two more inequalities in x or y to show this information.

.....

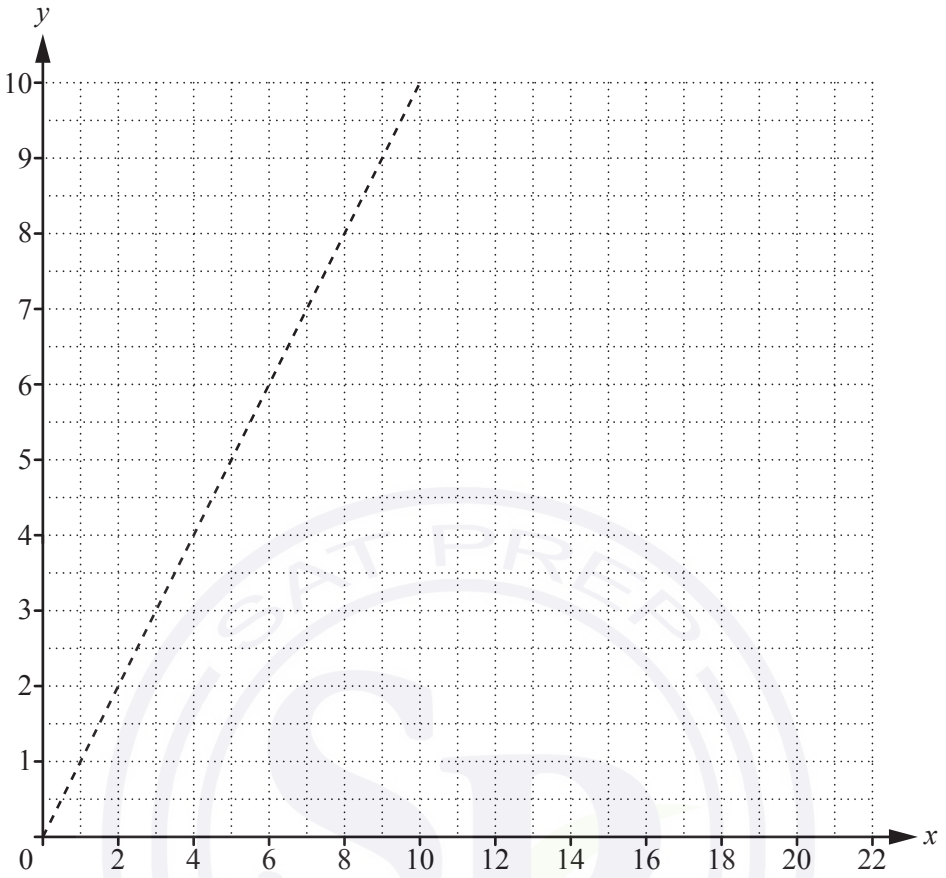
..... [2]

(b) Each packet of seeds costs \$1 and each plant costs \$3.
The maximum amount Bernie can spend is \$21.

Write down another inequality in x and y to show this information.

..... [1]

(c) The line $x = y$ is drawn on the grid.
Draw three more lines to show your inequalities and shade the **unwanted** regions.



[5]

(d) Bernie buys 8 packets of seeds.

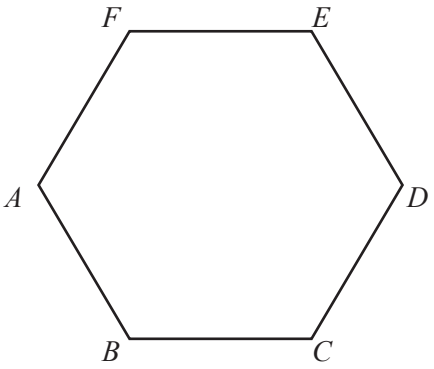
(i) Find the maximum number of plants he can buy.

..... [1]

(ii) Find the total cost of these packets of seeds and plants.

$..... [1]

10 **(a)** The diagram shows a regular hexagon $ABCDEF$ of side 10 cm.



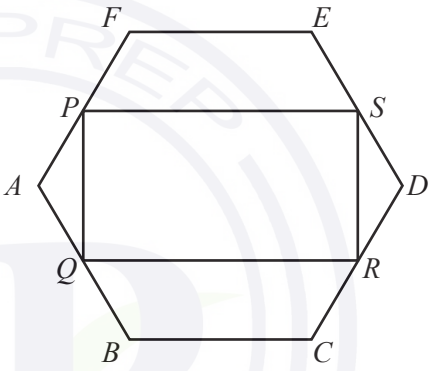
NOT TO SCALE

(i) Show that angle $BAF = 120°$.

[2]

(ii) The vertices of a rectangle $PQRS$ touch the sides FA, AB, CD and DE.

PS is parallel to FE and $AP = x$ cm.



NOT TO SCALE

Use trigonometry to find the length of PQ in terms of x.

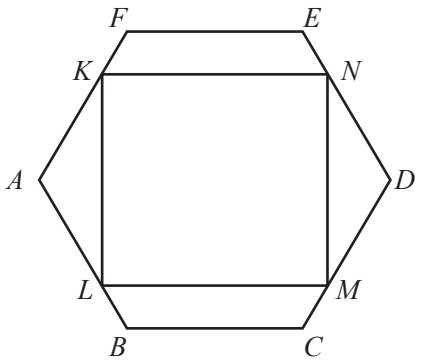
$PQ =$ ..... cm [3]

(iii) $PF = (10 - x)$ cm.

Show that $PS = (20 - x)$ cm.

[3]

(b)



NOT TO SCALE

The diagram shows the vertices of a square *KLMN* touching the sides of the same hexagon *ABCDEF*, with *KN* parallel to *FE*.

Use your results from **part (a)(ii)** and **part (a)(iii)** to find the length of a side of the square.

..... cm [4]

11 On Monday, Ankuri sent this text message to two friends.

> Today is Day Number 1.
> Tomorrow, please add 1 to the Day Number and send this text message to two friends.

All the friends who receive a text message follow the instructions.

(a) Complete the table.

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Day Number	1	2	3				
Number of text messages sent today	2	4					

[4]

(b) Write down an expression for the number of text messages sent on Day Number n.

..... [1]

(c) Ankuri thinks that, by the end of Day Number 3, the **total** number of text messages that have been sent is $2^4 - 2$.

(i) Show that she is correct.

[2]

(ii) Complete the statement.

The **total** number of text messages sent by the end of Day Number 5 is ..... which is equal to $2^k - 2$ where k = ... [2]

(iii) Write down an expression for the **total** number of text messages sent by the end of Day Number n.

..... [1]

(iv) Find the Day Number when the **total** number of text messages sent by the end of the day is 1022.

..... [1]

BLANK PAGE

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

MATHEMATICS **0580/41**

Paper 4 (Extended) **October/November 2016**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **19** printed pages and **1** blank page.

CAMBRIDGE International Examinations

[Turn over

1 **(a)** **(i)** Divide \$105 in the ratio 4 : 3.

\$ ..... and \$ ..... [2]

(ii) Increase \$105 by 12%.

\$ ..... [2]

(iii) In a sale the original price of a jacket is reduced by 16% to \$105.

Calculate the original price of the jacket.

\$ ..... [3]

(b) Jakob invests \$500 at a rate of 2% per year compound interest.
Claudia invests \$500 at a rate of 2.5% per year simple interest.

Calculate the difference between these two investments after 30 years.
Give your answer in dollars correct to the nearest cent.

\$ ..... [6]

(c) Michel invests \$$P$ at a rate of 3.8% per year compound interest.
After 30 years the value of this investment is \$1469.

Calculate the value of P.

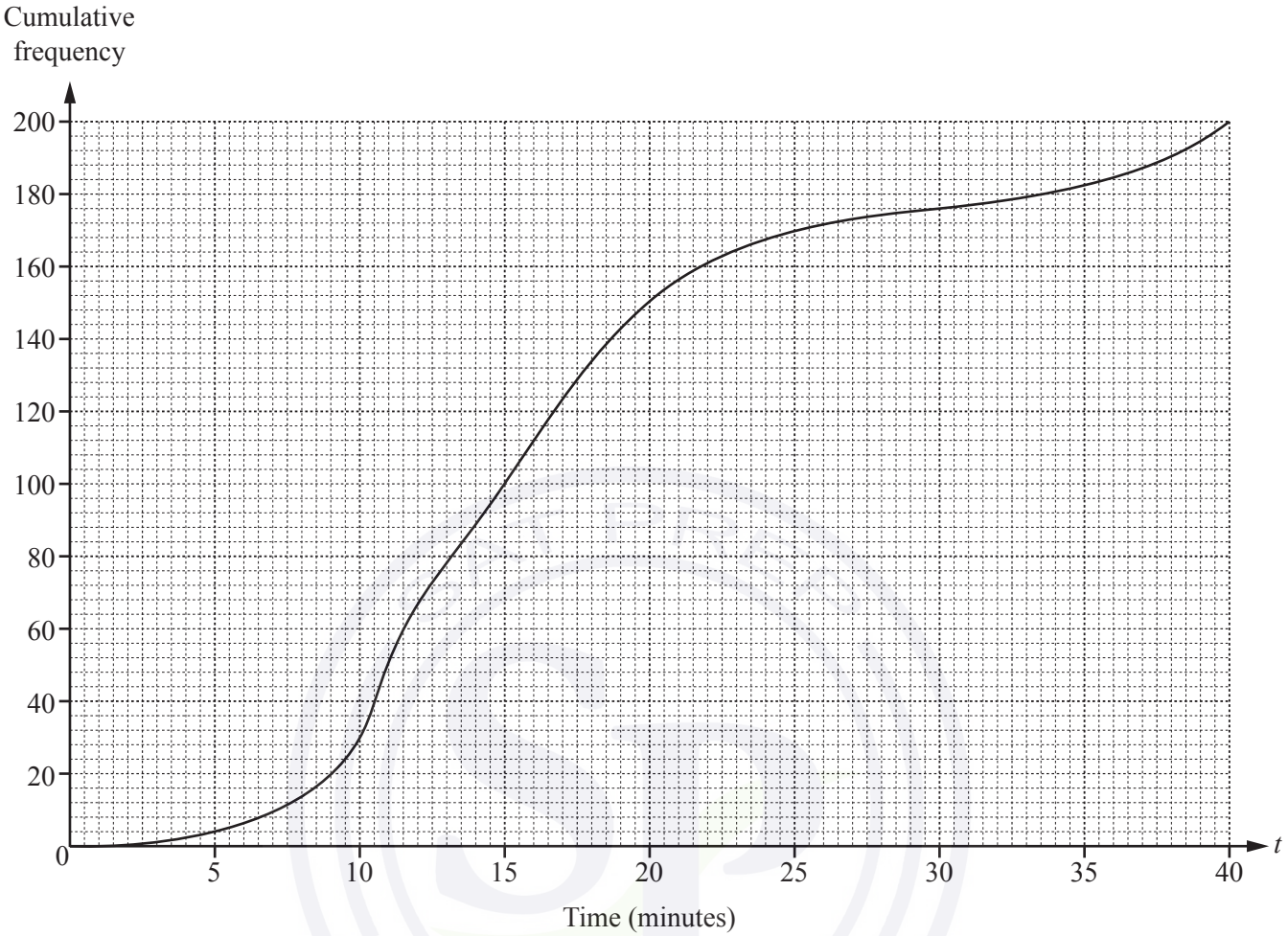
P = ... [3]

(d) The population of a city increases exponentially at a rate of x% **every 5 years**.
In 1960 the population was 60 100.
In 2015 the population was 120 150.

Calculate the value of x.

x = ... [3]

2 **(a)** 200 students record the time, t minutes, for their journey from home to school.
The cumulative frequency diagram shows the results.



Find

(i) the median,

.....min [1]

(ii) the lower quartile,

.....min [1]

(iii) the inter-quartile range,

.....min [1]

(iv) the 15th percentile,

.....min [1]

(v) the number of students whose journey time was more than 30 minutes.

..... [2]

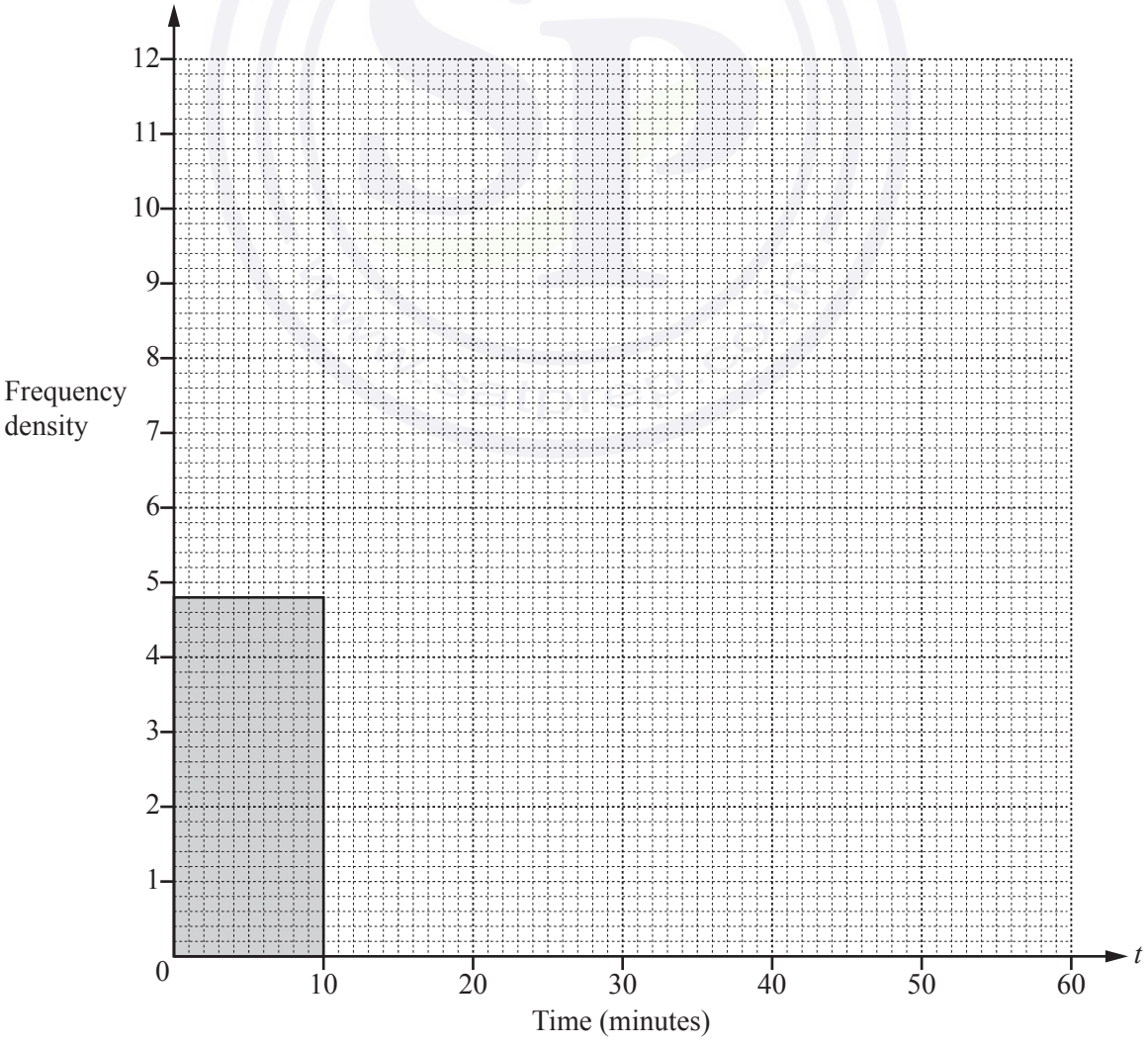
(b) The 200 students record the time, t minutes, for their journey from school to home. The frequency table shows the results.

Time (t minutes)	$0 < t \leqslant 10$	$10 < t \leqslant 15$	$15 < t \leqslant 20$	$20 < t \leqslant 30$	$30 < t \leqslant 60$
Frequency	48	48	60	26	18

(i) Calculate an estimate of the mean.

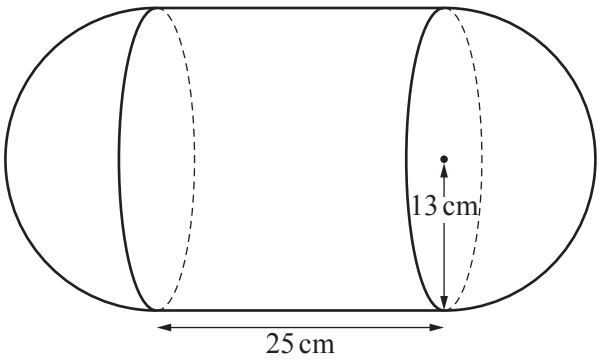
..... min [4]

(ii) On the grid, complete the histogram to show the information in the frequency table.



[4]

3 (a)



NOT TO SCALE

The diagram shows a solid made up of a cylinder and two hemispheres.
The radius of the cylinder and the hemispheres is 13 cm.
The length of the cylinder is 25 cm.

(i) One cubic centimetre of the solid has a mass of 2.3 g.

Calculate the mass of the solid.
Give your answer in kilograms.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... kg [4]

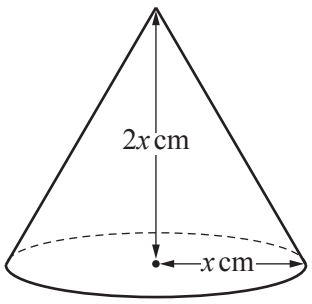
(ii) The surface of the solid is painted at a cost of $4.70 per square metre.

Calculate the cost of painting the solid.

[The surface area, A, of a sphere with radius r is $A = 4\pi r^2$.]

$..... [4]

(b)



NOT TO SCALE

The cone in the diagram has radius x cm and height $2x$ cm.
The volume of the cone is 500 cm^3.

Find the value of x.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

x = ... [3]

(c) Two mathematically similar solids have volumes of 180 cm^3 and 360 cm^3.
The surface area of the smaller solid is 180 cm^2.

Calculate the surface area of the larger solid.

..... cm^2 [3]

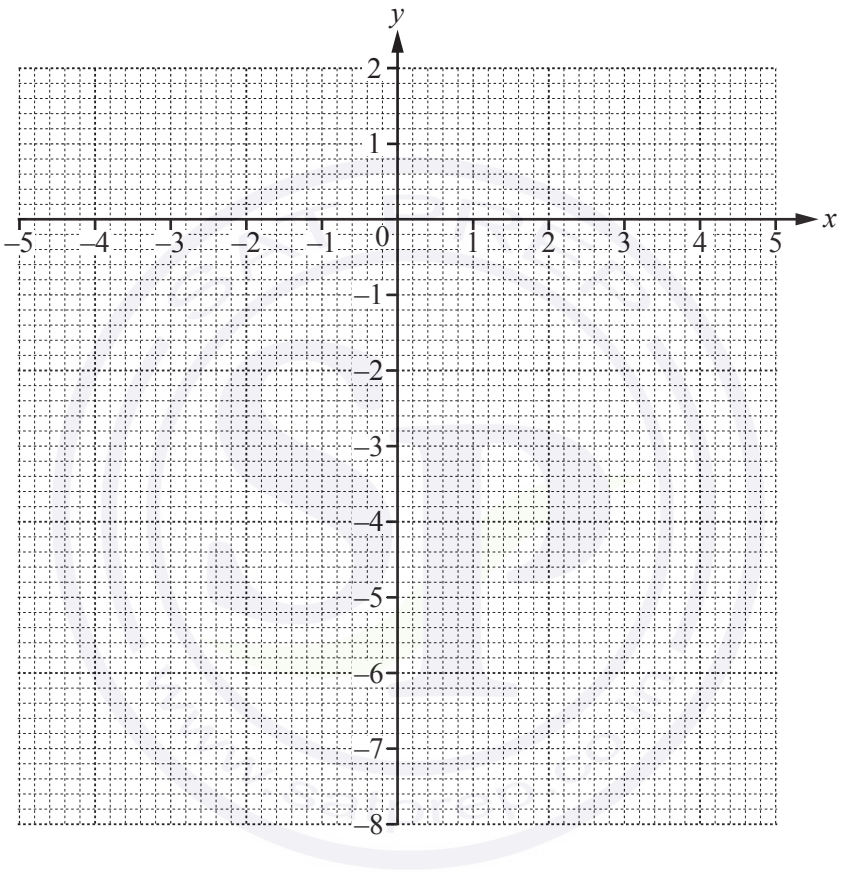
4 $y = 1 - \frac{2}{x^2}, \ x \neq 0$

(a) Complete the table.

x	–5	–4	–3	–2	–1	–0.5		0.5	1	2	3	4	5
y		0.88	0.78			–7		–7			0.78	0.88	

[3]

(b) On the grid, draw the graph of $y = 1 - \frac{2}{x^2}$ for $-5 \leqslant x \leqslant -0.5$ and $0.5 \leqslant x \leqslant 5$.



[5]

(c) **(i)** On the grid, draw the graph of $y = -x - 1$ for $-3 \leqslant x \leqslant 5$. [2]

(ii) Solve the equation $1 - \frac{2}{x^2} = -x - 1$.

$x =$ ..... [1]

(iii) The equation $1-\frac{2}{x^2}=-x-1$ can be written in the form $x^3+px^2+q=0$.

Find the value of p and the value of q.

p = ...

q = ... [3]

(d) The graph of $y=1-\frac{2}{x^2}$ cuts the positive x-axis at A.

B is the point $(0, -2)$.

(i) Write down the co-ordinates of A.

(..... , ...) [1]

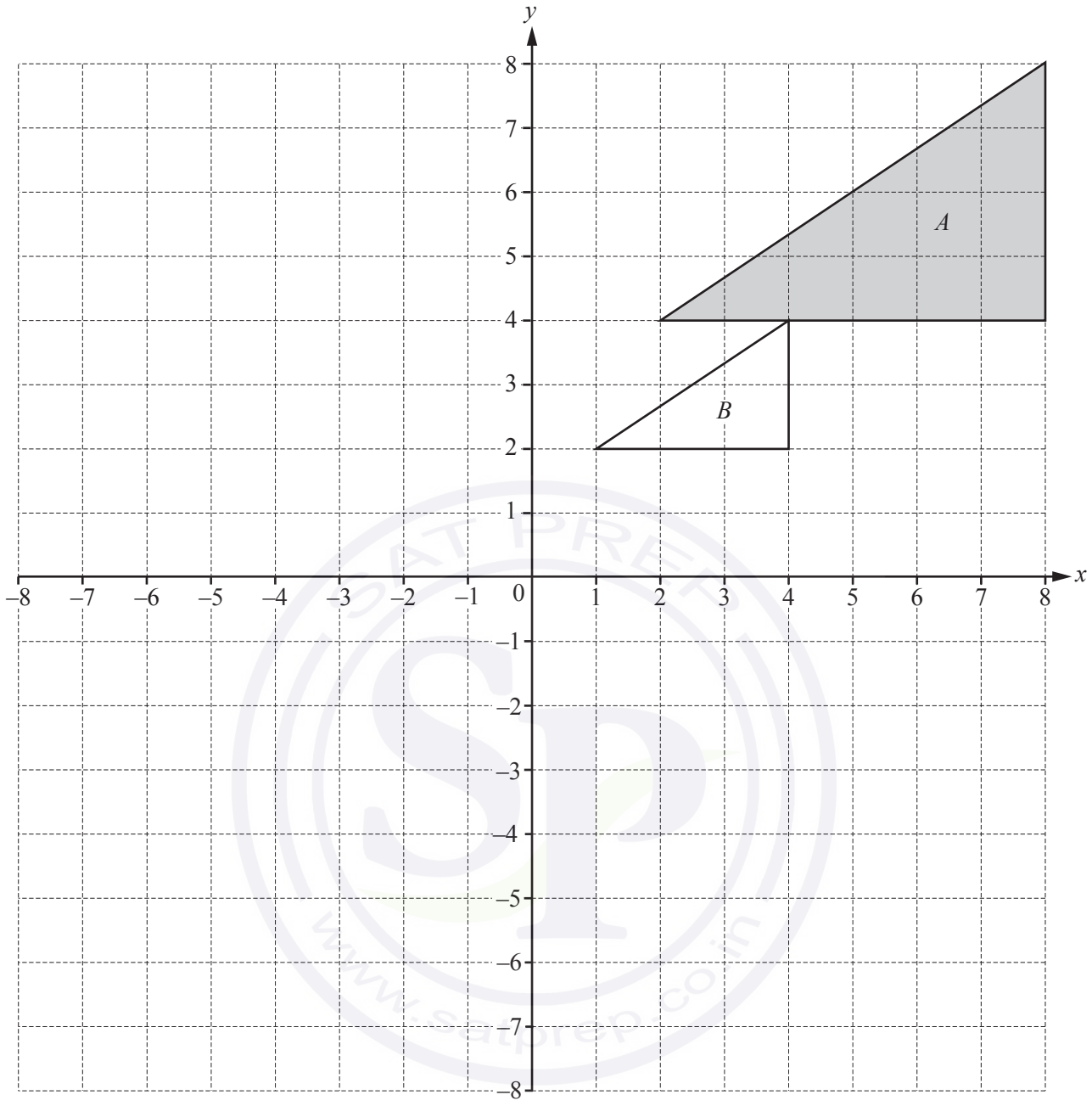
(ii) On the grid, draw the straight line that passes through A and B. [1]

(iii) Complete the statement.

The straight line that passes through A and B is a .....

at the point ..... [2]

5



(a) $\mathbf{v} = \begin{pmatrix} -4 \\ -8 \end{pmatrix}$

(i) Draw the image of triangle *A* after the translation by vector **v**. [2]

(ii) Calculate $|\mathbf{v}|$.

..... [2]

(b) (i) Describe fully the **single** transformation that maps triangle *A* onto triangle *B*.

.....

..... [3]

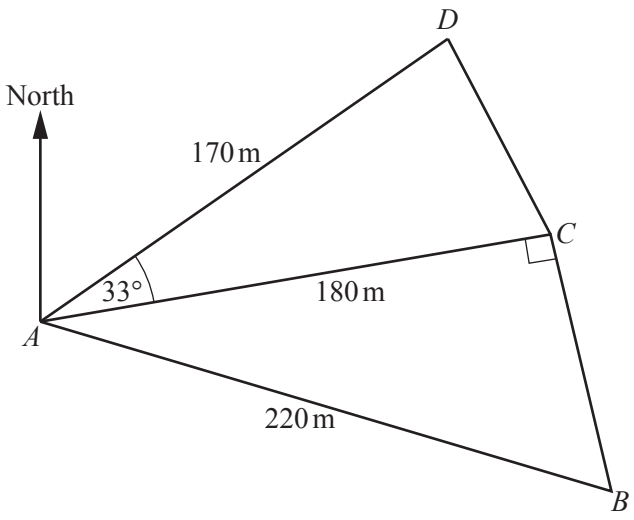
(ii) Find the matrix that represents the transformation that maps triangle *A* onto triangle *B*.

$\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(iii) Calculate the determinant of the matrix in **part (b)(ii)**.

..... [1]

6



NOT TO SCALE

The diagram shows five straight footpaths in a park.
$AB = 220$ m, $AC = 180$ m and $AD = 170$ m.
Angle $ACB = 90°$ and angle $DAC = 33°$.

(a) Calculate BC.

$BC =$ ..... m [3]

(b) Calculate CD.

$CD =$ ..... m [4]

(c) Calculate the shortest distance from D to AC.

..... m [2]

(d) The bearing of D from A is 047°.

Calculate the bearing of B from A.

..... [3]

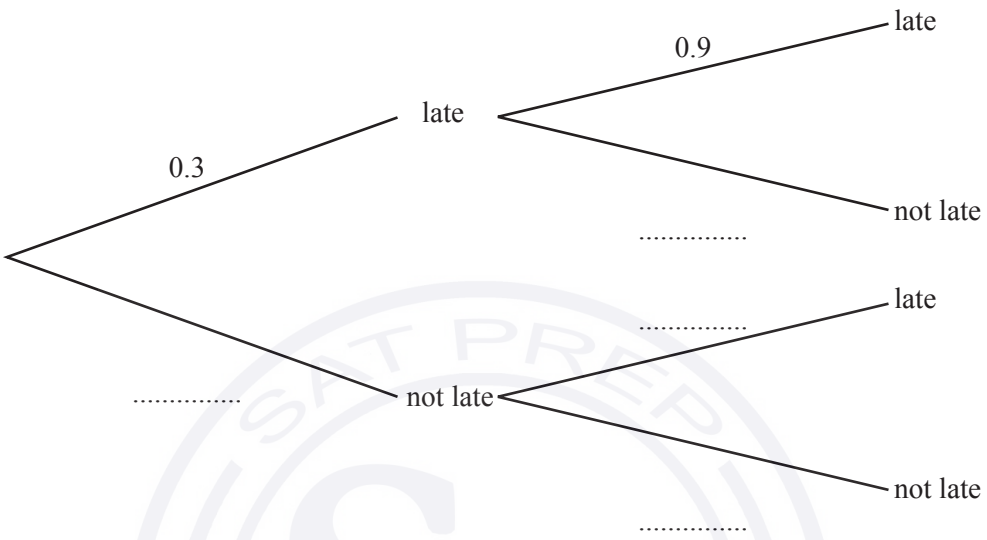
(e) Calculate the area of the quadrilateral $ABCD$.

.....m^2 [3]

[Turn over

7 A train stops at station A and then at station B.
If the train is late at station A, the probability that it is late at station B is 0.9 .
If the train is not late at station A, the probability that it is late at station B is 0.2 .
The probability that the train is late at station A is 0.3 .

(a) Complete the tree diagram.



[2]

(b) **(i)** Find the probability that the train is late at one or both of the stations.

..... [3]

(ii) This train makes 250 journeys.

Find the number of journeys that the train is expected to be late at one or both of the stations.

..... [1]

(c) The train continues to station C.
The probability that it is late at all 3 stations is 0.27 .

Describe briefly what this probability shows.

.....

..... [1]

8 Apples cost x cents each and oranges cost $(x + 2)$ cents each.
Dylan spends \$3.23 on apples and \$3.23 on oranges.
The **total** of the number of apples and the number of oranges Dylan buys is 36.

(a) Write an equation in x and show that it simplifies to $18x^2 - 287x - 323 = 0$.

[4]

(b) **(i)** Find the two prime factors of 323.

..... , ...[1]

(ii) Complete the statement.

$18x^2 - 287x - 323 = (18x$ .....$)(x$ .....$)$ [2]

(iii) Solve the equation $18x^2 - 287x - 323 = 0$.

$x =$ ..... or $x =$ .....[1]

(c) Find the largest number of apples Dylan can buy for \$2.

..... [1]

9 $f(x) = 2x + 1$ $g(x) = 3x - 2$ $h(x) = 3^x$

(a) Find $hf(2) - fh(1)$.

..... [3]

(b) Find $gf(x)$, giving your answer in its simplest form.

..... [2]

(c) Solve the inequality $f(x) > g(x)$.

..... [2]

(d) Solve the equation $h(x) = \frac{1}{9}$.

$x =$ ..... [1]

(e) Find $g^{-1}(x)$.

$g^{-1}(x) =$ ..... [2]

(f) Find $\frac{5}{\mathrm{f}(x)} + \mathrm{g}(x)$.

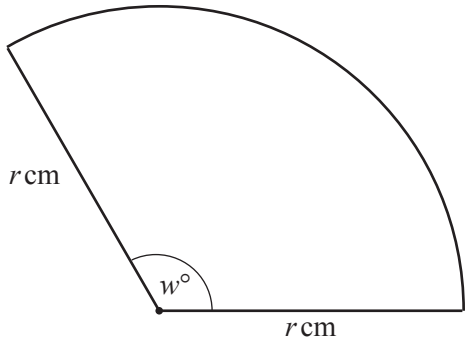
Give your answer as a single fraction.

..... [3]

(g) Solve the equation $\mathrm{f}^{-1}(x) = 4$.

$x =$ ..... [1]

10 (a)



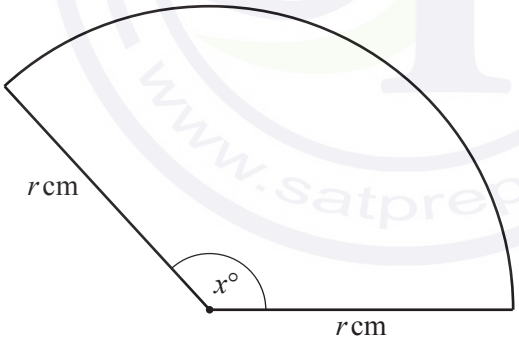
NOT TO SCALE

The area of this sector is r^2 square centimetres.

Find the value of w.

$w =$ ..... [3]

(b)



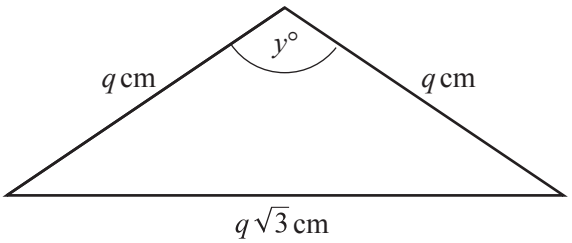
NOT TO SCALE

The perimeter of this sector is $2r + \frac{7\pi r}{10}$ centimetres.

Find the value of x.

$x =$ ..... [3]

(c)



NOT TO SCALE

The perimeter of the isosceles triangle is $2q + q\sqrt{3}$ centimetres.

Find the value of y.

$y =$ ..... [4]

BLANK PAGE

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2096705365

MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2016**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **20** printed pages.

1 **(a)** **(i)** Each year the value of a car decreases by 15% of its value at the beginning of that year.
Alberto buys a car for \$18 000.

Calculate the value of Alberto's car after 3 years.

\$ ..... [2]

(ii) Belinda bought a car one year ago.
The value of this car has decreased by 15% to \$14025.

Calculate how much Belinda paid for the car.

\$ ..... [3]

(b) Chris invested some money at a rate of 5% per year compound interest.
After 2 years the value of this investment is \$286.65 .

Calculate how much Chris invested.

\$ ..... [2]

(c) Dani invested \$200 and after 2 years the value of this investment is \$224.72 .

Calculate the rate of interest per year when the interest is

(i) simple,

.....% [3]

(ii) compound.

.....% [3]

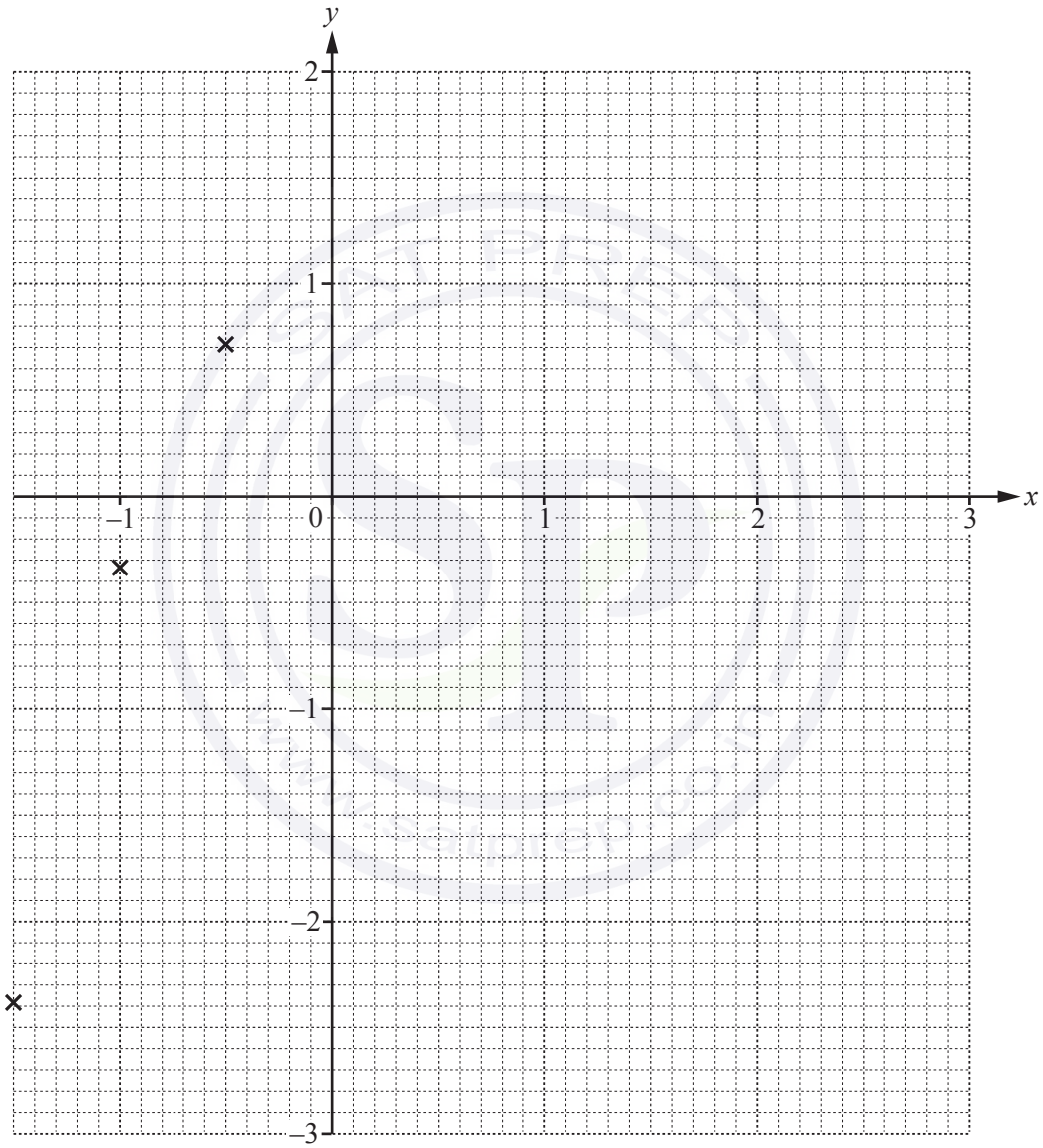
2 **(a)** Complete the table of values for $y = \frac{x^3}{3} - x^2 + 1$.

x	–1.5	–1	–0.5	0	0.5	1	1.5	2	2.5	3
y	–2.38	–0.33	0.71		0.79	0.33	–0.13	–0.33	–0.04	

[2]

(b) Draw the graph of $y = \frac{x^3}{3} - x^2 + 1$ for $-1.5 \leqslant x \leqslant 3$.

The first 3 points have been plotted for you.



[4]

(c) Using your graph, solve the equations.

(i) $\frac{x^3}{3} - x^2 + 1 = 0$

$x =$ ..... or $x =$ ..... or $x =$ .....[3]

(ii) $\frac{x^3}{3} - x^2 + x + 1 = 0$

$x =$ ..... [2]

(d) Two tangents to the graph of $y = \frac{x^3}{3} - x^2 + 1$ can be drawn parallel to the x-axis.

(i) Write down the equation of each of these tangents.

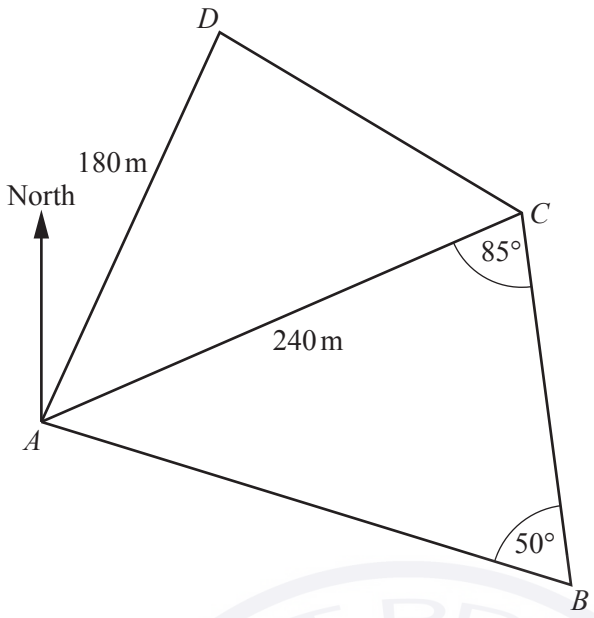
.....

..... [2]

(ii) For $0 \leqslant x \leqslant 3$, write down the smallest possible value of y.

$y =$ ..... [1]

3



NOT TO SCALE

The diagram shows a field, $ABCD$.
$AD = 180$ m and $AC = 240$ m.
Angle $ABC = 50°$ and angle $ACB = 85°$.

(a) Use the sine rule to calculate AB.

$AB =$ ..... m [3]

(b) The area of triangle $ACD = 12\,000\,\text{m}^2$.

Show that angle $CAD = 33.75°$, correct to 2 decimal places.

[3]

(c) Calculate BD.

$BD =$ ..... m [5]

(d) The bearing of D from A is 030°.

Find the bearing of

(i) B from A,

..... [1]

(ii) A from B.

..... [2]

4 200 people run 10 km.
The table shows some information about the times, t minutes, taken to run the 10 km.

Time (t minutes)	$30 < t \leqslant 40$	$40 < t \leqslant 45$	$45 < t \leqslant 50$	$50 < t \leqslant 55$	$55 < t \leqslant 60$	$60 < t \leqslant 80$
Frequency	8	22	95	55	14	6

(a) Howard takes 40 minutes to run the 10 km.

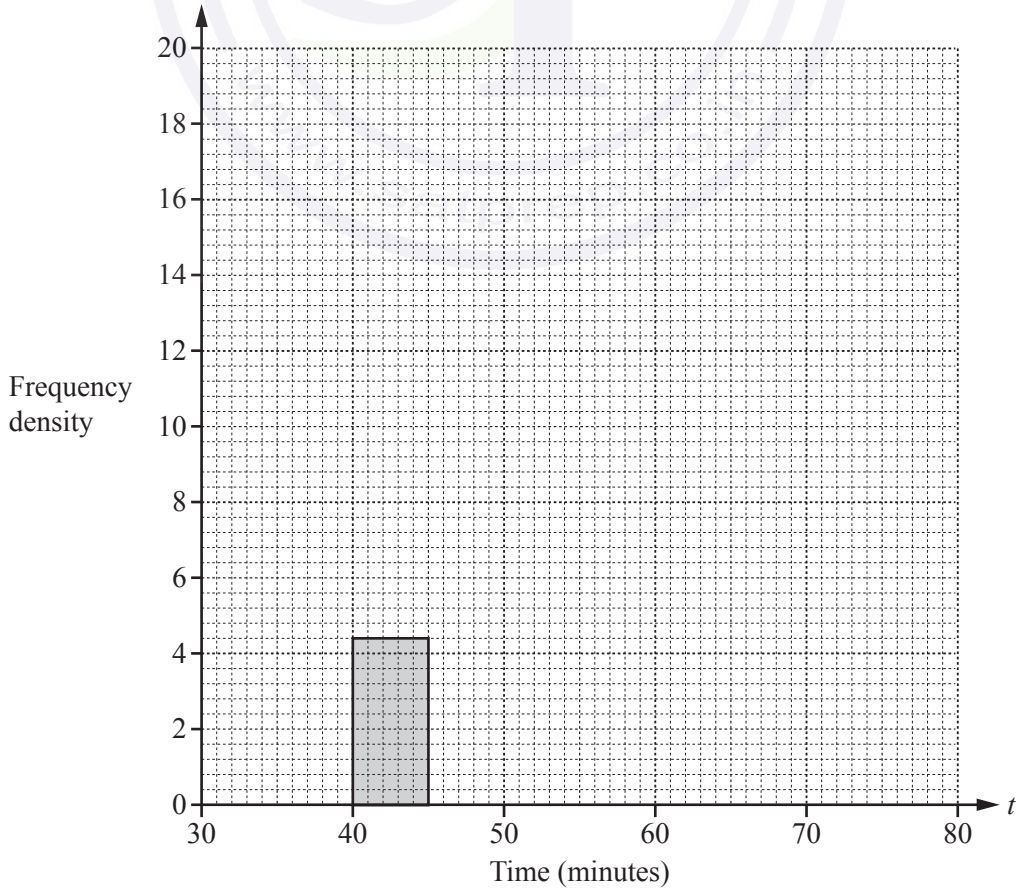
Calculate his average speed in kilometres per hour.

..... km/h [2]

(b) Calculate an estimate of the mean time.

..... min [4]

(c) Complete the histogram to show the information in the table.



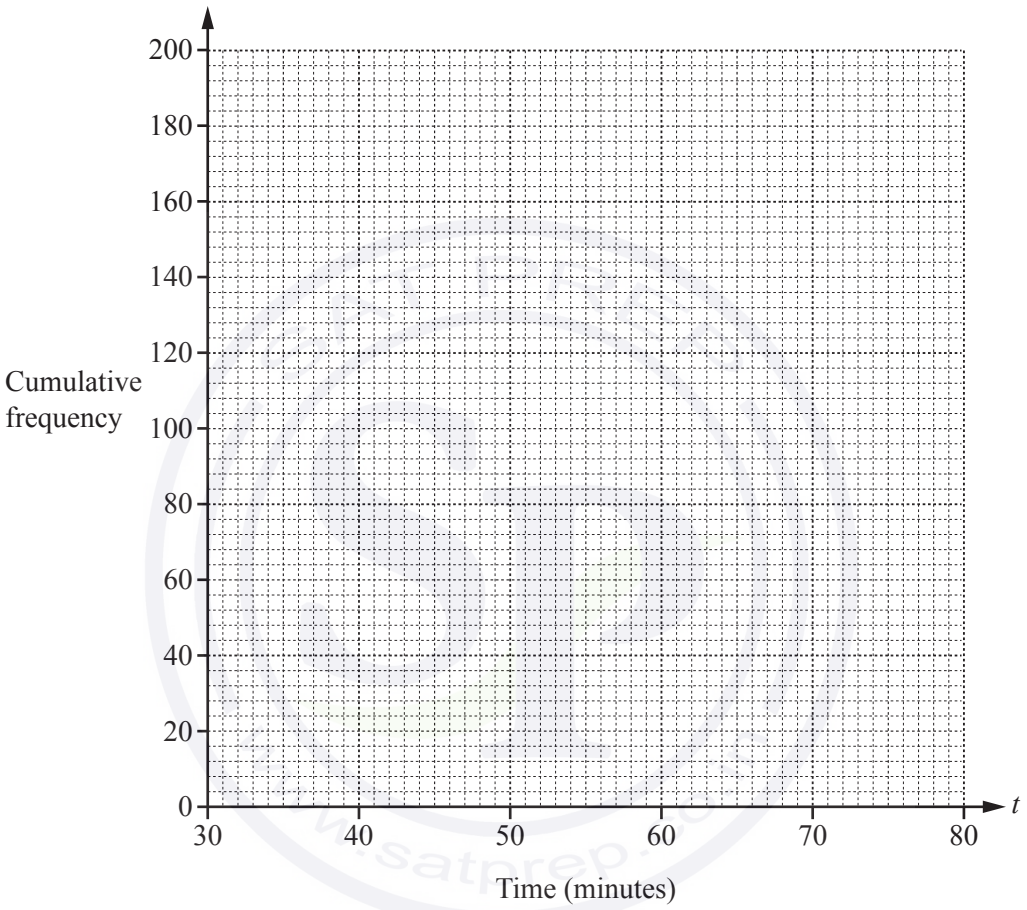
[4]

(d) (i) Use the frequency table opposite to complete the cumulative frequency table.

Time (t minutes)	$t \leqslant 40$	$t \leqslant 45$	$t \leqslant 50$	$t \leqslant 55$	$t \leqslant 60$	$t \leqslant 80$
Cumulative frequency	8	30			194	200

[1]

(ii) Draw a cumulative frequency diagram to show the information in the table above.



[3]

(iii) Use your diagram to find

(a) the median,

..... min [1]

(b) the 90th percentile,

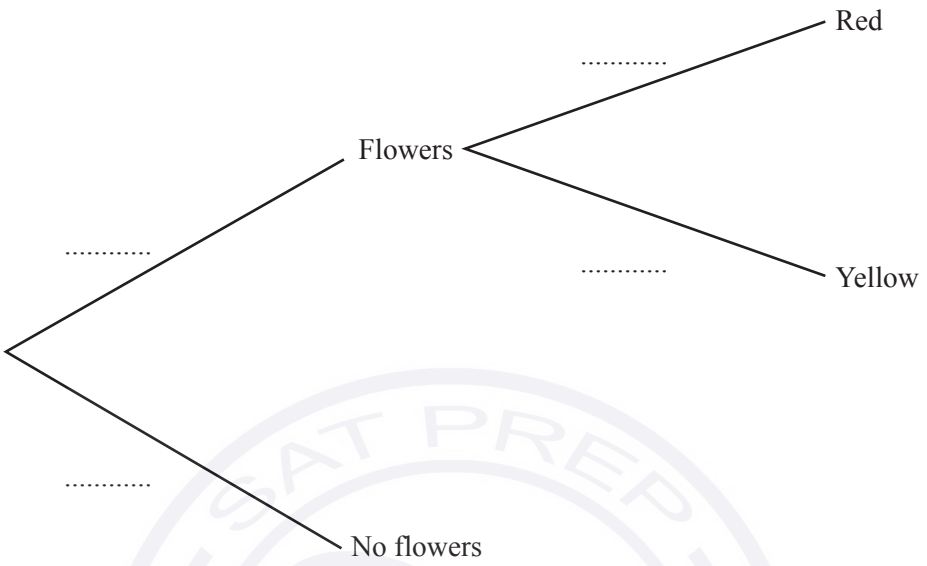
..... min [1]

(c) the number of people who took more than 58 minutes to run the 10 km.

..... [2]

5 The probability that a plant will produce flowers is $\frac{7}{8}$.
The flowers are either red or yellow.
If the plant produces flowers, the probability that the flowers are red is $\frac{3}{4}$.

(a) (i) Complete the tree diagram by writing a probability beside each branch.



[2]

(ii) Calculate the probability that a plant, chosen at random, will produce red flowers.

..... [2]

(iii) Two plants are chosen at random.

Calculate the probability that both will produce red flowers.

..... [2]

(b) Alphonse buys 200 of these plants.

Calculate the number of plants that are expected to produce flowers.

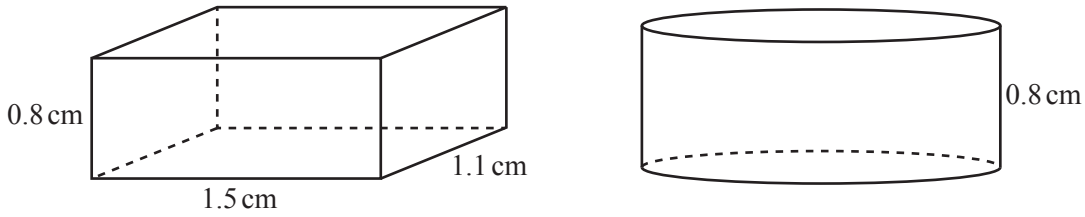
..... [2]

(c) Gabriel has 1575 plants with red flowers.

Estimate the total number of plants that Gabriel has.

..... [2]

6 (a)



NOT TO SCALE

The diagram shows two sweets.
The cuboid has length 1.5 cm, width 1.1 cm and height 0.8 cm.
The cylinder has height 0.8 cm and the same volume as the cuboid.

(i) Calculate the volume of the cuboid.

..... cm^3 [2]

(ii) Calculate the radius of the cylinder.

..... cm [2]

(iii) Calculate the difference between the surface areas of the two sweets.

..... cm^2 [5]

(b) A bag of sweets contains x orange sweets and y lemon sweets.
Each orange sweet costs 2 cents and each lemon sweet costs 3 cents.

The cost of a bag of sweets is less than 24 cents.
There are at least 9 sweets in each bag.
There are at least 2 lemon sweets in each bag.

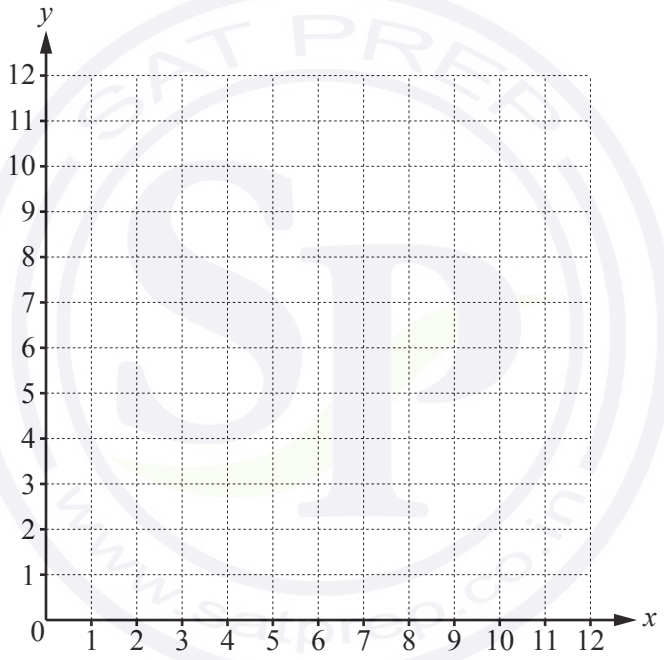
(i) One of the inequalities that shows this information is $2x + 3y < 24$.

Write down the other two inequalities.

.....

..... [2]

(ii) On the grid, by shading the unwanted regions, show the region which satisfies the three inequalities.



[4]

(iii) Find the lowest cost of a bag of sweets.
Write down the value of x and the value of y that give this cost.

Lowest cost = ... cents

x = ...

y = ... [3]

7 **(a)** $1= 3.67 dirhams

Calculate the value, in dollars, of 200 dirhams.
Give your answer correct to 2 decimal places.

$..... [2]

(b) **(i)** Write as a single fraction, in its simplest form.

$$\frac{1000}{x} - \frac{1000}{x+1}$$

..... [3]

(ii) One day in 2014, 1 euro was worth x rand.
One year later, 1 euro was worth $(x + 1)$ rand.

Winston changed 1000 rand into euros in both years.
In 2014 he received 4.50 euros more than in 2015.

Write an equation in terms of x and show that it simplifies to

$$9x^2 + 9x - 2000 = 0.$$

[3]

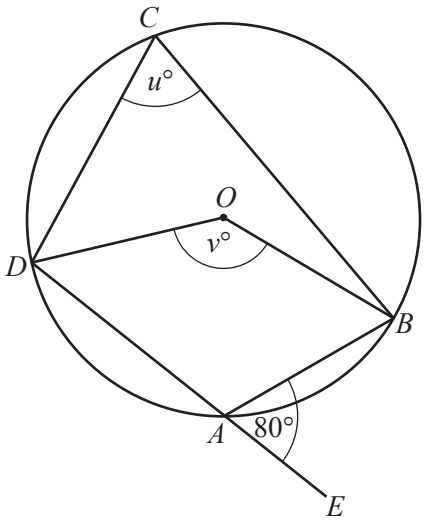
(iii) Use the quadratic formula to solve the equation $9x^2 + 9x - 2000 = 0$.
Show all your working and give your answers correct to 2 decimal places.

x = ... or x = ... [4]

(iv) Calculate the number of euros Winston received in 2014.
Give your answer correct to 2 decimal places.

.....euros [2]

8 **(a)**



NOT TO SCALE

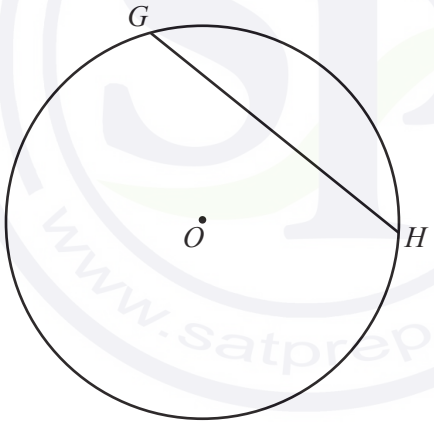
A, B, C and D lie on the circle, centre O.
DAE is a straight line.

Find the value of u and the value of v.

u = ...

v = ... [2]

(b)



NOT TO SCALE

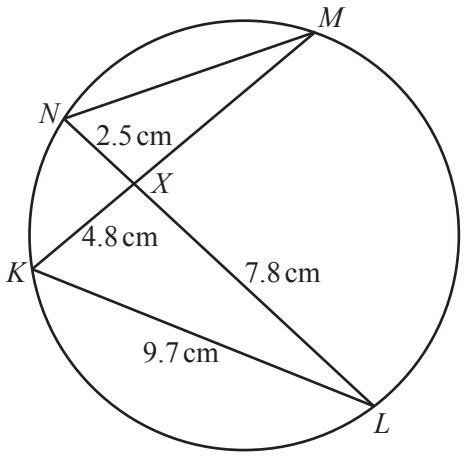
The diagram shows a circle, centre O, radius 8 cm.
GH is a chord of length 10 cm.

Calculate the length of the perpendicular from O to GH.

..... cm [3]

(c) *K, L, M* and *N* lie on the circle.
KM and *LN* intersect at *X*.
KL = 9.7 cm, *KX* = 4.8 cm,
LX = 7.8 cm and *NX* = 2.5 cm.

Calculate *MN*.



NOT TO SCALE

MN = ... cm [2]

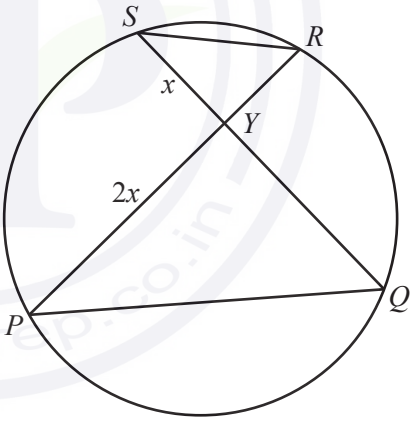
(d) All lengths are in centimetres.

P, *Q*, *R* and *S* lie on the circle.
PR and *QS* intersect at *Y*.
PY = $2x$ and *YS* = x.

The area of triangle $YRS = \frac{5}{12}x(x-1)$.

The area of triangle $YQP = x(x+1)$.

Find the value of x.



NOT TO SCALE

x = ... [4]

9 **(a)** $y = \frac{3}{x} + 2, \quad x \neq 0$

(i) Find the value of y when $x = -6$.

$y =$ ..... [1]

(ii) Find x in terms of y.

$x =$ ..... [3]

(b) $g(x) = 2 - x$ $h(x) = 2^x$

(i) Find g(5).

..... [1]

(ii) Find hhh(2).

..... [2]

(iii) Find x when $g(x) = h(3)$.

$x =$ ..... [2]

(iv) Find x when $g^{-1}(x) = -1$.

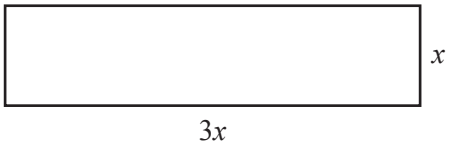
$x =$ ..... [1]

Question 10 is printed on the next page.

10 The **perimeter** of each of the three shapes is 60 cm.

Find x in each part.

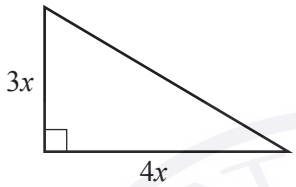
(a) Rectangle



NOT TO SCALE

x = ... cm [2]

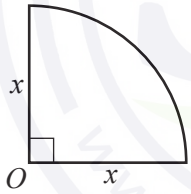
(b) Triangle



NOT TO SCALE

x = ... cm [3]

(c) Sector



NOT TO SCALE

x = ... cm [3]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

8650279967

MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2016**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **19** printed pages and **1** blank page.

1 **(a)** A jigsaw puzzle has edge pieces and inside pieces.
The ratio edge pieces : inside pieces = 3 : 22.

(i) There are 924 inside pieces.

Calculate the total number of pieces in the puzzle.

..... [2]

(ii) Find the percentage of the total number of pieces that are edge pieces.

.....% [1]

(iii) Anjum and Betty spent a total of 9 hours completing the puzzle.
The ratio Anjum's time : Betty's time = 7 : 5.

Work out how much time Anjum spent on the puzzle.

..... hours [2]

(b) The price of the puzzle was $15.99 in a sale.
This was 35% less than the original price.

Calculate the original price of the puzzle.

$..... [3]

(c) Betty takes a photograph of the completed puzzle.
The photograph and the completed puzzle are mathematically similar.

The area of the photograph is 875 cm^2 and the area of the puzzle is 2835 cm^2.
The length of the photograph is 35 cm.

Work out the length of the puzzle.

..... cm [3]

(d) **(i)** The area of another puzzle is 6610 cm^2.

Change 6610 cm^2 into m^2.

.....m^2 [1]

(ii) The cost price of this puzzle is $12.50 .
The selling price is $18.50 .

Calculate the percentage profit.

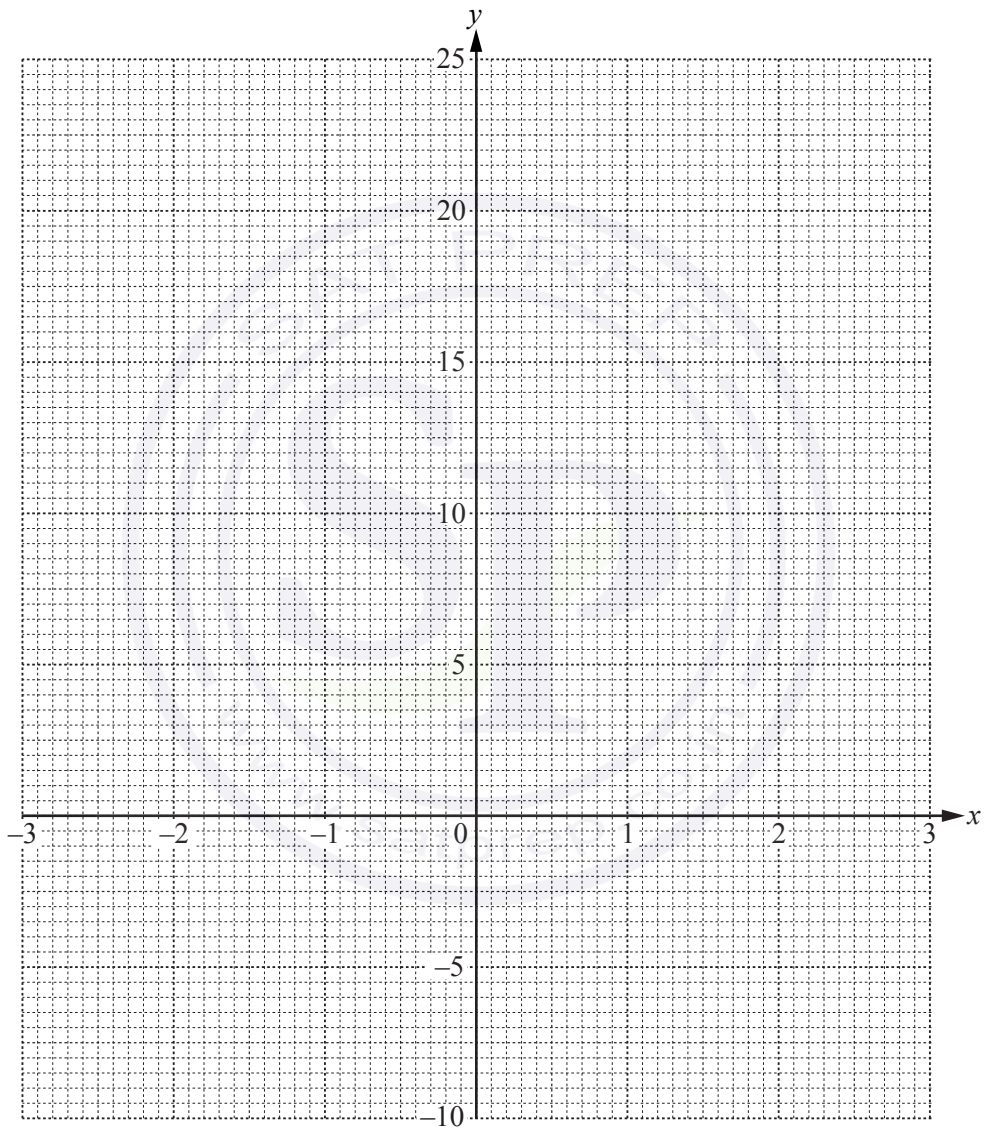
.....% [3]

2 **(a)** Complete the table for $y = 3x + \frac{2}{x^2} + 1,\ x \neq 0$.

x	–3	–2	–1	–0.5	–0.3		0.3	0.5	1	2	3
y	–7.8		0	7.5	22.3		24.1		6	7.5	10.2

[2]

(b) On the grid, draw the graph of $y = 3x + \frac{2}{x^2} + 1$ for $-3 \leqslant x \leqslant -0.3$ and $0.3 \leqslant x \leqslant 3$.



[5]

(c) Write down the value of the largest integer, k, so that the equation $3x + \frac{2}{x^2} + 1 = k$ has exactly one solution.

$k =$ ..... [1]

(d) (i) By drawing a suitable straight line on the grid, solve $3x + \frac{2}{x^2} + 1 = 15 - 3x$.

$x =$ ..... or $x =$ ..... or $x =$ ..... [4]

(ii) The equation $3x + \frac{2}{x^2} + 1 = 15 - 3x$ can be written in the form $ax^3 + bx^2 + cx + 2 = 0$, where a, b and c are integers.

Find a, b and c.

$a =$ .....

$b =$ .....

$c =$ ..... [3]

3 **(a)** Solve.

$8x - 5 = 22 - 4x$

$x =$ ..... [2]

(b) Solve.

$6x \geqslant 2x + 14$

..... [2]

(c) Factorise.

$x^2 - 4x - 21$

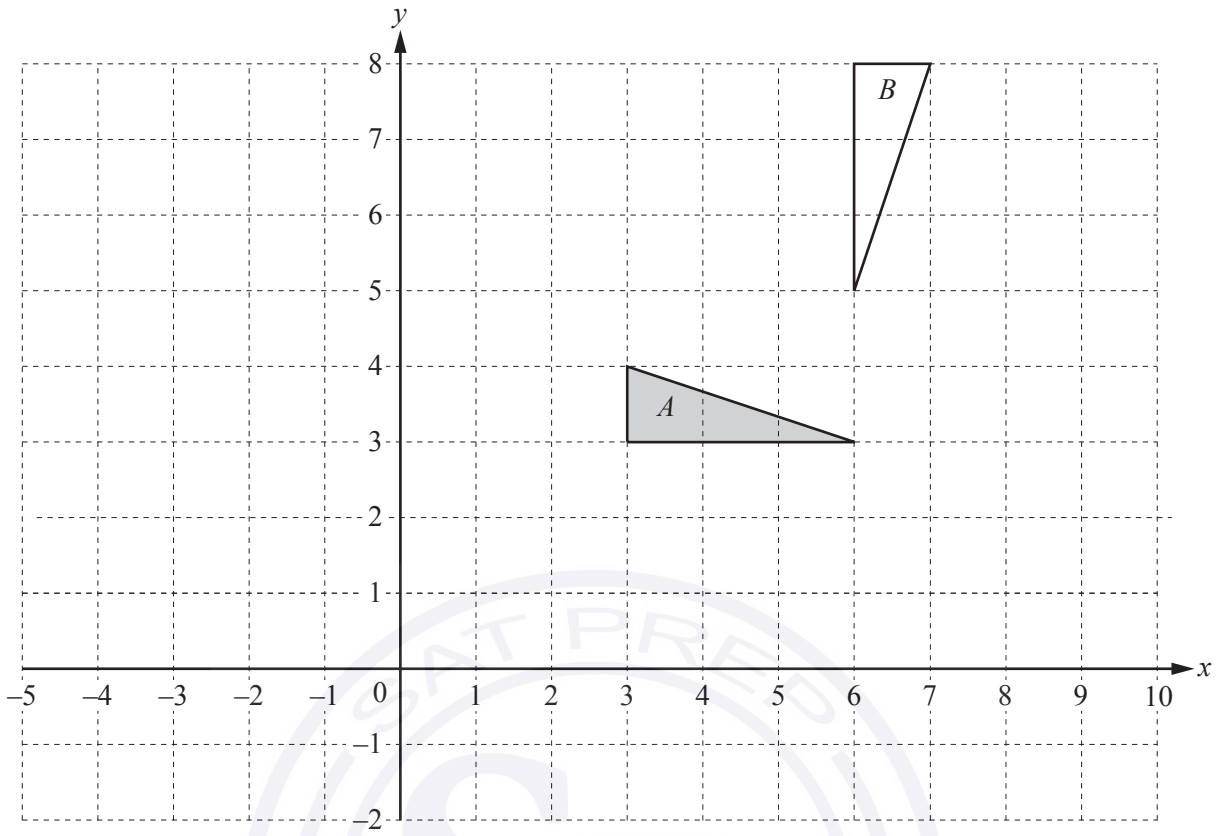
..... [2]

(d) Expand the brackets and simplify.

$(3x - 2y)(4x + 3y)$

..... [3]

4



(a) Draw the image when triangle A is reflected in the line $x = 1$. [2]

(b) Draw the image when triangle A is translated by the vector $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$. [2]

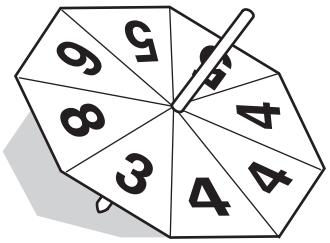
(c) Draw the image when triangle A is enlarged by scale factor 2 with centre (4, 5). [2]

(d) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

5 Sandra has a fair eight-sided spinner.
The numbers on the spinner are 3, 4, 4, 4, 5, 5, 6 and 8.
Sandra spins the spinner twice and records each number it lands on.



Find the probability that

(a) both numbers are 8,

..... [2]

(b) the two numbers are not both 8,

..... [1]

(c) one number is odd and one number is even,

..... [2]

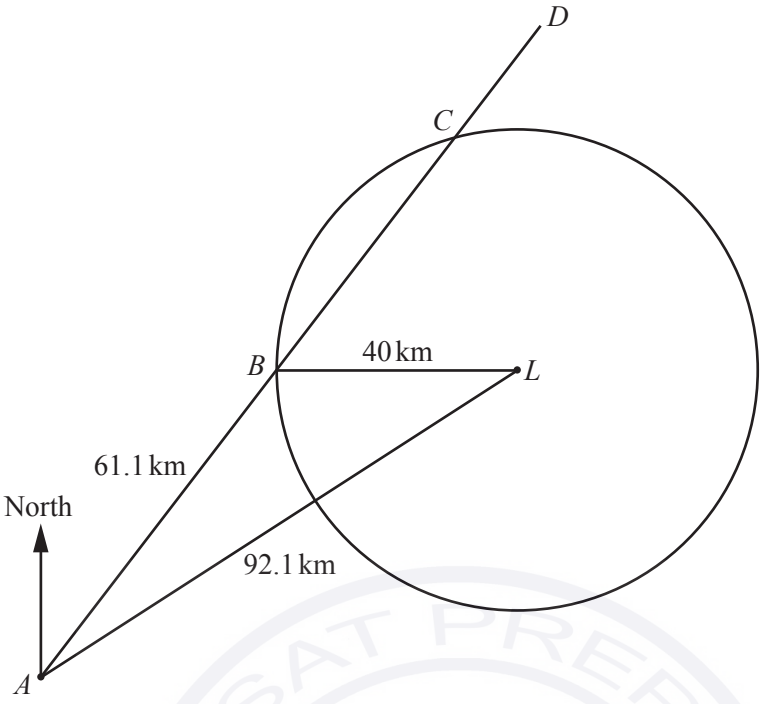
(d) the total of the two numbers is at least 13,

..... [3]

(e) the second number is bigger than the first number.

..... [3]

6



NOT TO SCALE

The diagram shows the position of a port, A, and a lighthouse, L.
The circle, centre L and radius 40 km, shows the region where the light from the lighthouse can be seen.
The straight line, $ABCD$, represents the course taken by a ship after leaving the port.
When the ship reaches position B it is due west of the lighthouse.

$AL = 92.1$ km, $AB = 61.1$ km and $BL = 40$ km.

(a) Use the cosine rule to show that angle $ABL = 130.1°$, correct to 1 decimal place.

[4]

(b) Calculate the bearing of the lighthouse, L, from the port, A.

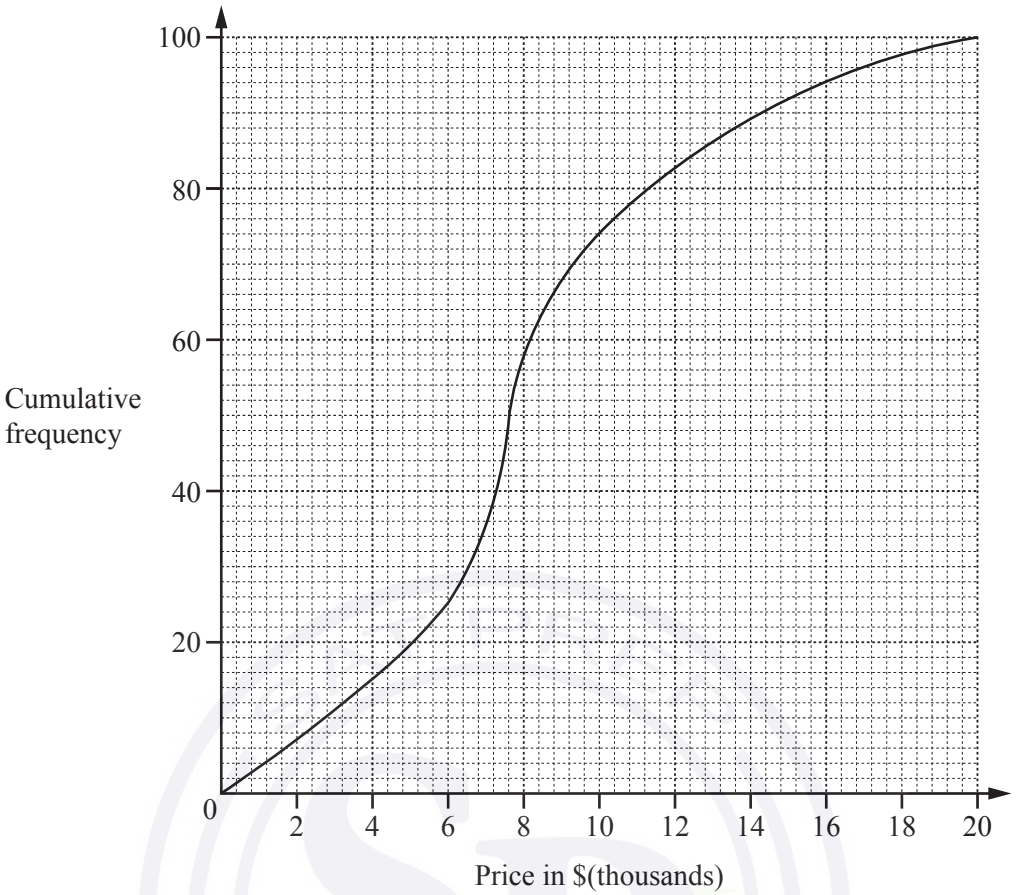
..... [4]

(c) The ship sails at a speed of 28 km/h.

Calculate the length of time for which the light from the lighthouse can be seen from the ship.
Give your answer correct to the nearest minute.

..... h ..... min [5]

7 (a) (i)



The cumulative frequency diagram shows information about the prices of 100 cars on Website A.
Use the information to complete this table.

Lower quartile	Median	Upper quartile	Inter-quartile range
$	$7600	$	$

[2]

(ii) This table shows information about the prices of cars on Website B.

Lower quartile	Median	Upper quartile	Inter-quartile range
$7600	$10 800	$13 600	$6000

Here are two statements comparing the distributions of the prices of cars on Website A and Website B.

For each statement write True or False.
Give a reason for each answer, stating clearly which statistic you use to make your decision.

(a) The prices of cars on Website A are lower than the prices of cars on Website B.

..... because .....

..... [1]

(b) A greater percentage of cars have a price more than \$13 600 on Website A compared to Website B.

..... because .....

..... [1]

(b) The table shows the prices of cars on Website B.

Price (\$$P$)	Number of cars
$0 < P \leqslant 6000$	9
$6000 < P \leqslant 8000$	29
$8000 < P \leqslant 10000$	20
$10000 < P \leqslant 12000$	14
$12000 < P \leqslant 14000$	21
$14000 < P \leqslant 22000$	27

Calculate an estimate of the mean price of the 120 cars.

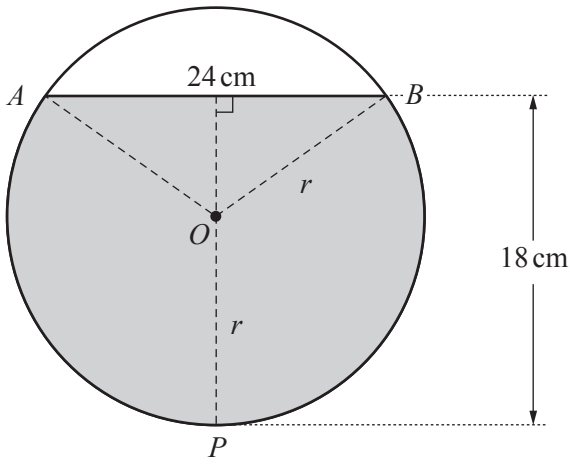
\$..... [4]

(c) The price of a car is \$8760.
Bryan pays a deposit of 25% of this price and then 24 equal monthly payments.
After 24 months, he will have paid a total of \$9948.

Calculate the cost of one monthly payment.

\$..... [3]

8



NOT TO SCALE

The diagram shows the cross section of a cylinder, centre O, radius r, lying on its side.
The cylinder contains water to a depth of 18 cm.
The width, AB, of the surface of the water is 24 cm.

(a) Use an algebraic method to show that $r = 13$ cm.

[4]

(b) Show that angle $AOB = 134.8°$, correct to 1 decimal place.

[2]

(c) **(i)** Calculate the area of the major sector $OAPB$.

.....cm^2 [3]

(ii) Calculate the area of the shaded segment APB.

.....cm^2 [3]

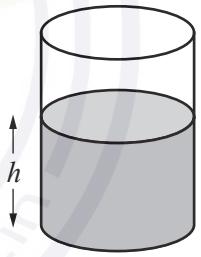
(iii) The length of the cylinder is 40 cm.

Calculate the volume of water in the cylinder.

.....cm^3 [1]

(d) The cylinder is turned so that it stands on one of its circular ends.
In this position, the depth of the water is h.

Find h.



NOT TO SCALE

h = ... cm [2]

9 **(a)** $\mathbf{m} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ $\mathbf{n} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

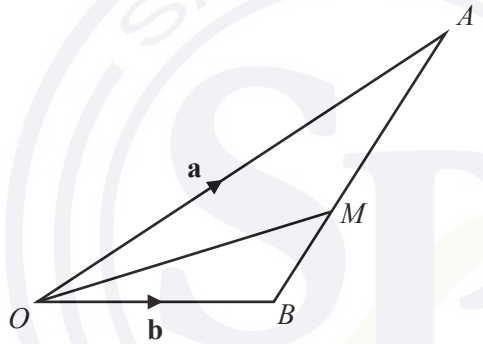
(i) Work out $2\mathbf{m} - 3\mathbf{n}$.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(ii) Calculate $|2\mathbf{m} - 3\mathbf{n}|$.

..... [2]

(b) **(i)**



NOT TO SCALE

In the diagram, O is the origin, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
The point M lies on AB such that $AM : MB = 3 : 2$.

Find, in terms of **a** and **b**, in its simplest form

(a) $\overrightarrow{AB}$,

$\overrightarrow{AB}$ = ... [1]

(b) $\overrightarrow{AM}$,

$\overrightarrow{AM}$ = ... [1]

(c) the position vector of M.

..... [2]

(ii) OM is extended to the point C.
The position vector of C is $\mathbf{a} + k\mathbf{b}$.

Find the value of k.

$k =$ ..... [1]

10 **(a)** Complete the table for the four sequences A, B, C and D.

	Sequence				Next term	*n*th term
A	2	5	8	11		
B	20	14	8	2		
C	1	4	9	16		
D	0	2	6	12		

[10]

(b) The sum of the first n terms of a sequence is $\frac{n(3n+1)}{2}$.

(i) When the sum of the first n terms is 155, show that $3n^2 + n - 310 = 0$.

[2]

(ii) Solve $3n^2 + n - 310 = 0$.

n = ... or n = ... [3]

(iii) Complete the statement.

The sum of the first ..... terms of this sequence is 155. [1]

11 Solve. $\frac{2}{x+3}+\frac{1}{12}=\frac{3}{2x-1}$

x = ... or x = ... [7]

BLANK PAGE

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

1049118799

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2016**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Geometrical instruments
Tracing paper (optional).

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **19** printed pages and **1** blank page.

1 **(a)** Kristian and Stephanie share some money in the ratio 3 : 2.
Kristian receives $72.

(i) Work out how much Stephanie receives.

$ ..... [2]

(ii) Kristian spends 45% of his $72 on a computer game.

Calculate the price of the computer game.

$ ..... [1]

(iii) Kristian also buys a meal for $8.40 .

Calculate the fraction of the $72 Kristian has left after buying the computer game and the meal.
Give your answer in its lowest terms.

..... [2]

(iv) Stephanie buys a book in a sale for $19.20 .
This sale price is after a reduction of 20%.

Calculate the original price of the book.

$ ..... [3]

(b) Boris invests $550 at a rate of 2% per year simple interest.

Calculate the amount Boris has after 10 years.

$ ..... [3]

(c) Marlene invests $550 at a rate of 1.9% per year compound interest.

Calculate the amount Marlene has after 10 years.

$ ..... [2]

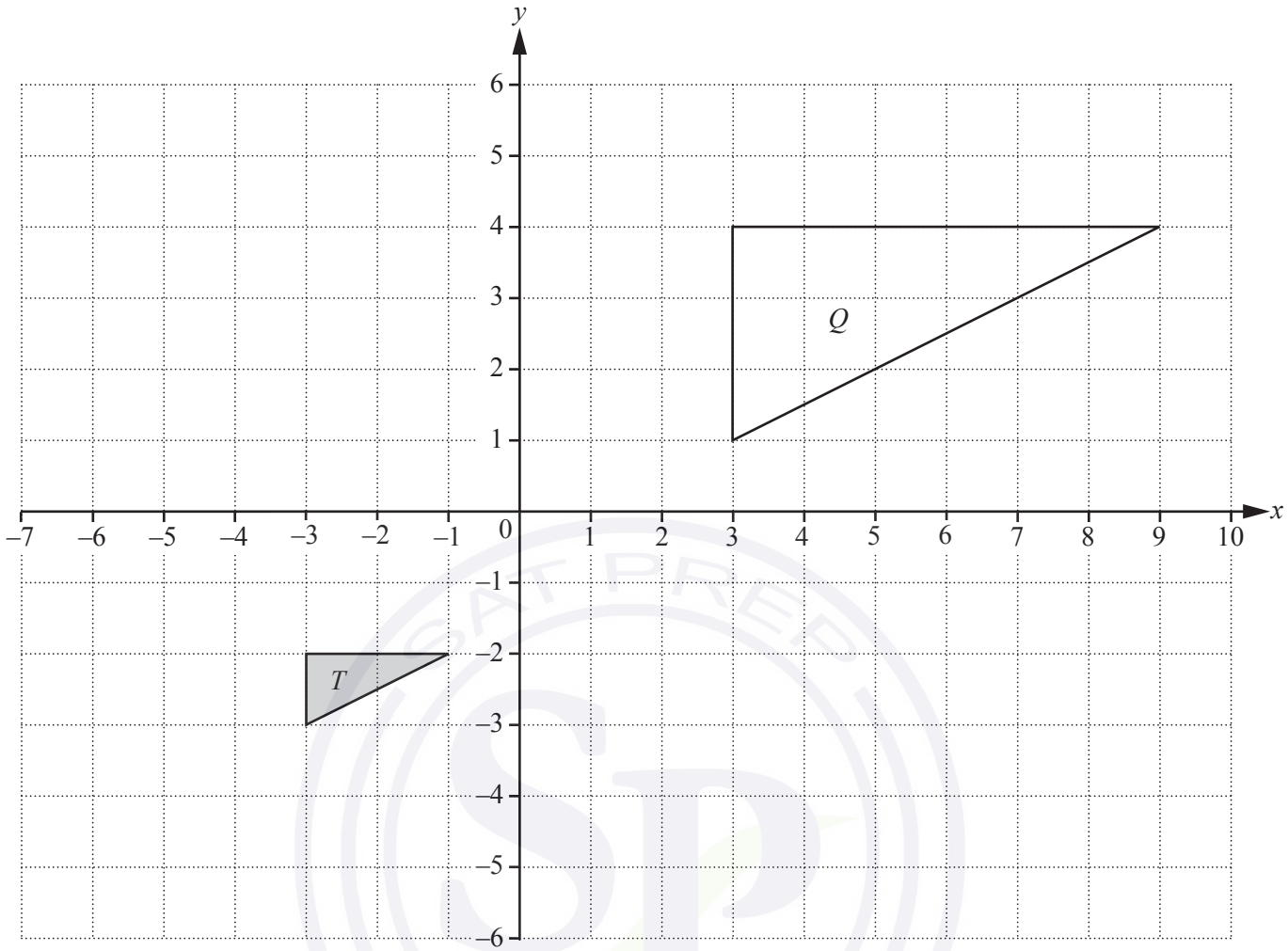
(d) Hans invests $550 at a rate of x% per year compound interest.
At the end of 10 years he has a total amount of $638.30, correct to the nearest cent.

Find the value of x.

$x =$ ..... [3]

[Turn over

2 (a)



(i) Draw the image of triangle T after a translation by the vector $\begin{pmatrix} 5 \\ -2 \end{pmatrix}$. [2]

(ii) Draw the image of triangle T after a reflection in the line $y = 1$. [2]

(iii) Describe fully the **single** transformation that maps triangle T onto triangle Q.

.....

..... [3]

(b) $\mathbf{M} = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ $\mathbf{N} = \begin{pmatrix} 4 & 3 \\ 1 & k \end{pmatrix}$ $\mathbf{P} = \begin{pmatrix} 1 & 3 \\ 0 & 6 \end{pmatrix}$

(i) Work out $\mathbf{M} + \mathbf{P}$.

( ) [1]

(ii) Work out $\mathbf{PM}$.

( ) [2]

(iii) $|\mathbf{M}| = |\mathbf{N}|$

Find the value of k.

$k =$ ..... [3]

(c) **(i)** Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$.

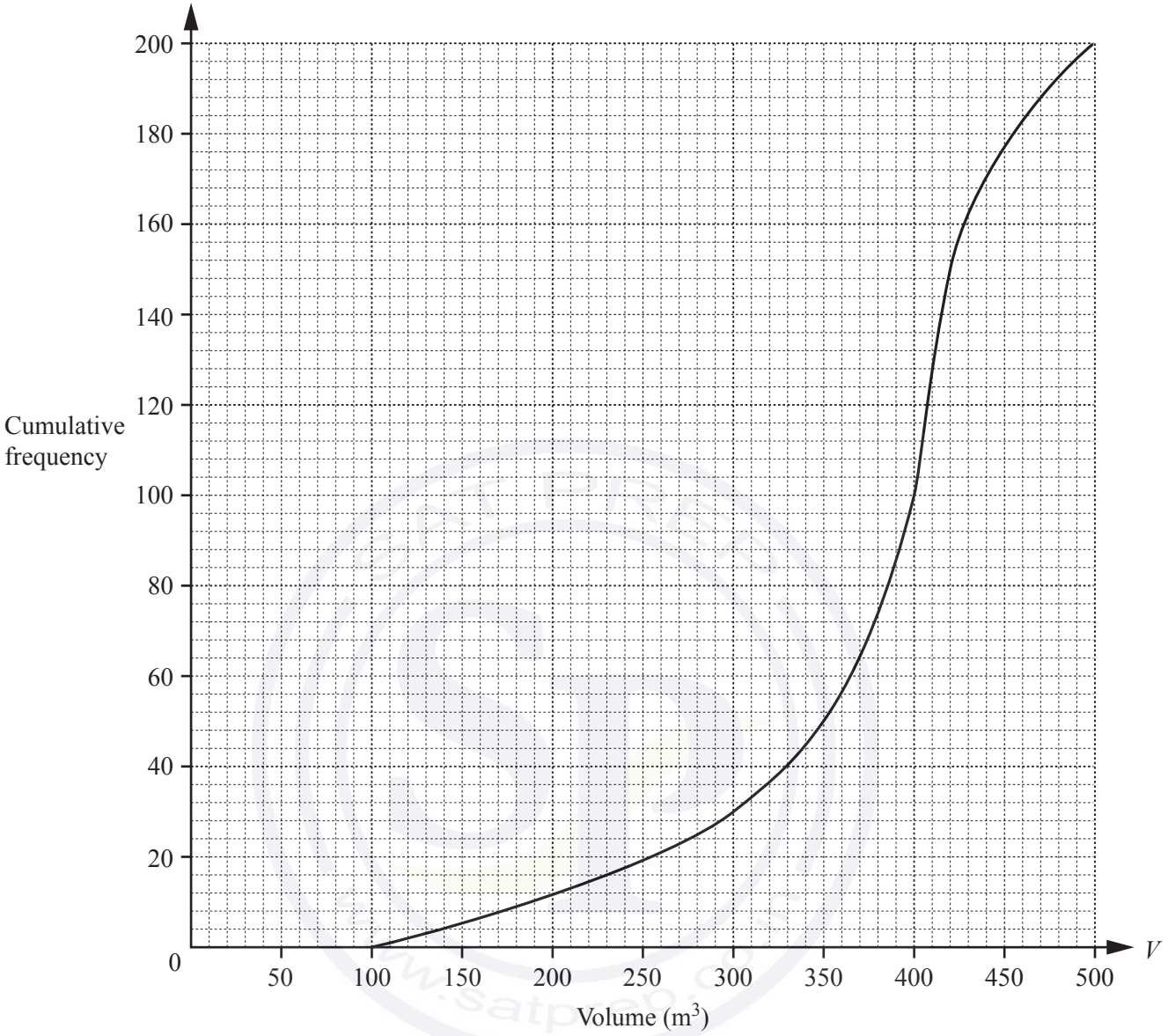
.....

..... [3]

(ii) Find the matrix which represents a reflection in the line $y = x$.

( ) [2]

3 **(a)** 200 students estimate the volume, V m^3, of a classroom.
The cumulative frequency diagram shows their results.



Find

(i) the median,

..... m^3 [1]

(ii) the lower quartile,

..... m^3 [1]

(iii) the inter-quartile range,

..... m^3 [1]

(iv) the number of students who estimate that the volume is greater than 300 m^3.

..... [2]

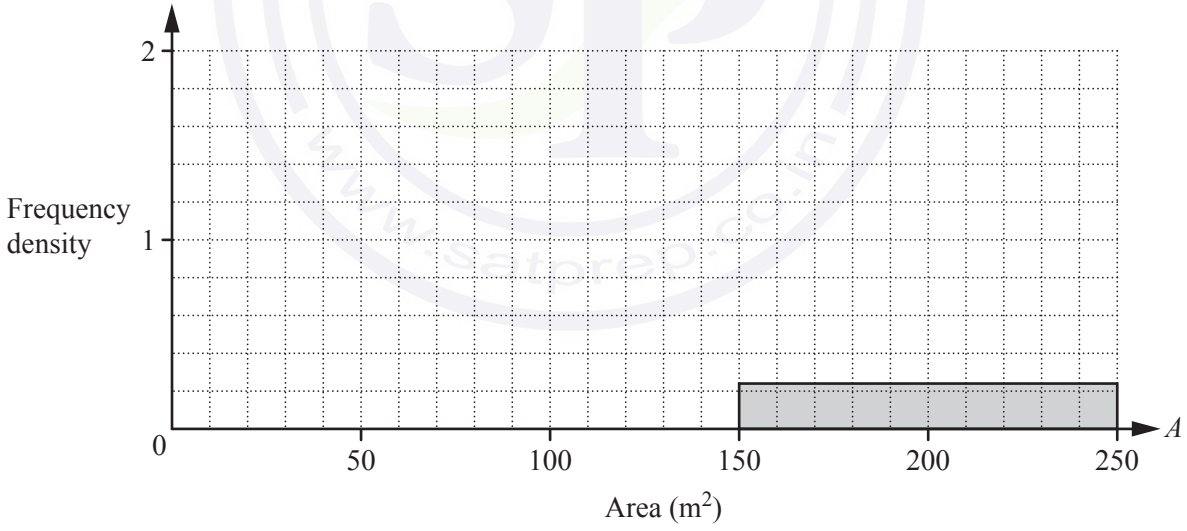
(b) The 200 students also estimate the total area, $A\,m^2$, of the windows in the classroom.
The results are shown in the table.

Area ($A\,m^2$)	$20 < A \leqslant 60$	$60 < A \leqslant 100$	$100 < A \leqslant 150$	$150 < A \leqslant 250$
Frequency	32	64	80	24

(i) Calculate an estimate of the mean.
Show all your working.

..... m^2 [4]

(ii) Complete the histogram to show the information in the table.



[4]

(iii) Two of the 200 students are chosen at random.

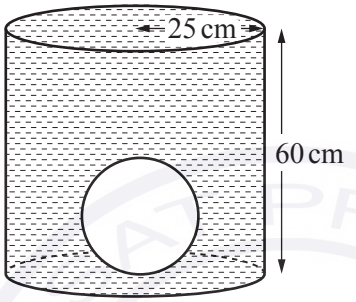
Find the probability that they both estimate that the area is greater than $100\,m^2$.

..... [2]

4 **(a)** Calculate the volume of a metal sphere of radius 15 cm and show that it rounds to 14 140 cm^3, correct to 4 significant figures.
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

[2]

(b) **(i)** The sphere is placed inside an empty cylindrical tank of radius 25 cm and height 60 cm.
The tank is filled with water.

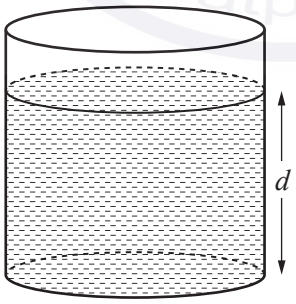


NOT TO SCALE

Calculate the volume of water required to fill the tank.

..... cm^3 [3]

(ii) The sphere is removed from the tank.



NOT TO SCALE

Calculate the depth, d, of water in the tank.

d = ... cm [2]

(c) The sphere is melted down and the metal is made into a solid cone of height 54 cm.

(i) Calculate the radius of the cone.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm [3]

(ii) Calculate the **total** surface area of the cone.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi r l$.]

..... cm^2 [4]

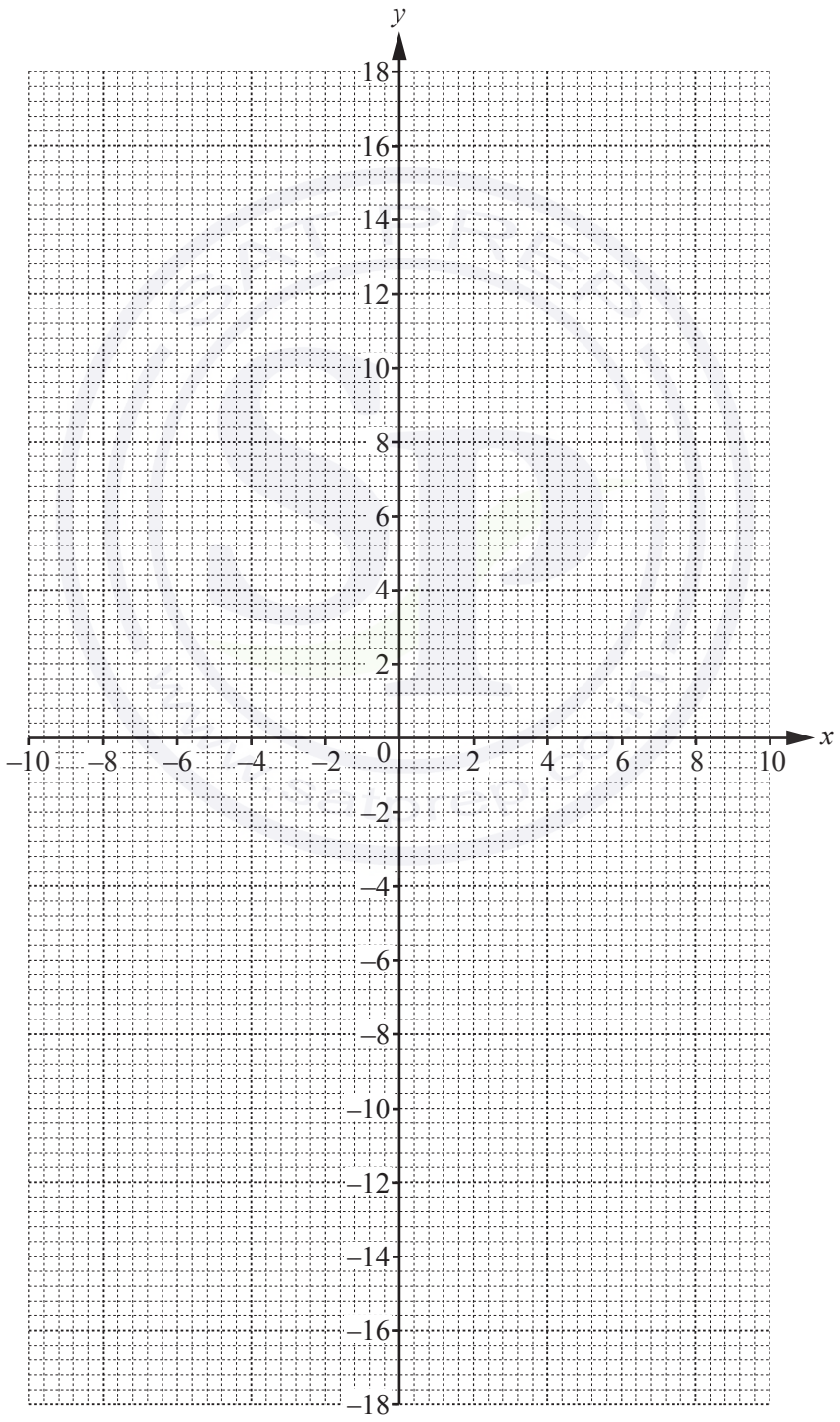
5 $f(x) = \frac{20}{x} + x, \quad x \neq 0$

(a) Complete the table.

x	−10	−8	−5	−2	−1.6		1.6	2	5	8	10
f(x)	−12	−10.5	−9	−12	−14.1		14.1	12			12

[2]

(b) On the grid, draw the graph of $y = f(x)$ for $-10 \leqslant x \leqslant -1.6$ and $1.6 \leqslant x \leqslant 10$.



[5]

(c) Using your graph, solve the equation $f(x) = 11$.

$x =$ ..... or $x =$ ..... [2]

(d) k is a prime number and $f(x) = k$ has no solutions.

Find the possible values of k.

..... [2]

(e) The gradient of the graph of $y = f(x)$ at the point (2, 12) is -4.

Write down the co-ordinates of the other point on the graph of $y = f(x)$ where the gradient is -4.

(..... , ...) [1]

(f) **(i)** The equation $f(x) = x^2$ can be written as $x^3 + px^2 + q = 0$.

Show that $p = -1$ and $q = -20$.

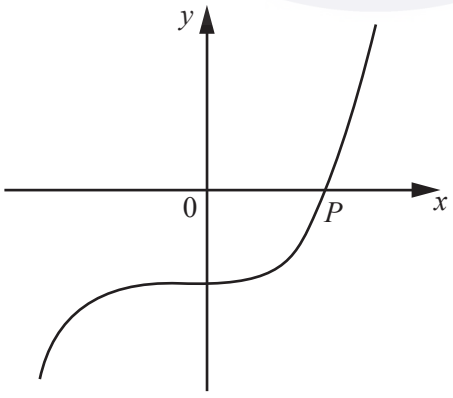
[2]

(ii) On the grid opposite, draw the graph of $y = x^2$ for $-4 \leqslant x \leqslant 4$. [2]

(iii) Using your graphs, solve the equation $x^3 - x^2 - 20 = 0$.

$x =$ ..... [1]

(iv)



NOT TO SCALE

The diagram shows a **sketch** of the graph of $y = x^3 - x^2 - 20$.
P is the point $(n, 0)$.

Write down the value of n.

$n =$ ..... [1]

6 (a)

x cm

NOT TO SCALE

The perimeter of the rectangle is 80 cm.
The area of the rectangle is A cm^2.

(i) Show that $x^2 - 40x + A = 0$.

[3]

(ii) When $A = 300$, solve, by factorising, the equation $x^2 - 40x + A = 0$.

$x =$ ..... or $x =$ .....[3]

(iii) When $A = 200$, solve, by using the quadratic formula, the equation $x^2 - 40x + A = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ .....[4]

(b) A car completes a 200 km journey with an average speed of x km/h.
The car completes the return journey of 200 km with an average speed of $(x + 10)$ km/h.

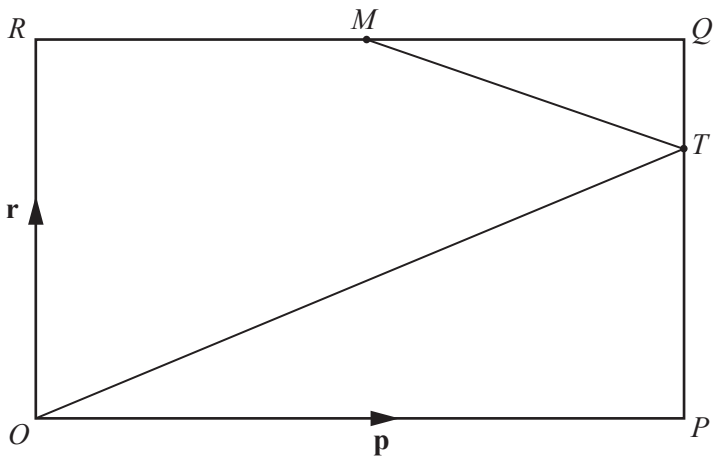
(i) Show that the difference between the time taken for each of the two journeys is $\frac{2000}{x(x+10)}$ hours.

[3]

(ii) Find the difference between the time taken for each of the two journeys when $x = 80$.
Give your answer in **minutes** and **seconds**.

..... min ..... s [3]

7



NOT TO SCALE

$OPQR$ is a rectangle and O is the origin.
M is the midpoint of RQ and $PT : TQ = 2 : 1$.
$\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OR} = \mathbf{r}$.

(a) Find, in terms of **p** and/or **r**, in its simplest form

(i) $\overrightarrow{MQ}$,

$\overrightarrow{MQ} =$ ..... [1]

(ii) $\overrightarrow{MT}$,

$\overrightarrow{MT} =$ ..... [1]

(iii) $\overrightarrow{OT}$.

$\overrightarrow{OT} =$ ..... [1]

(b) RQ and OT are extended to meet at U.

Find the position vector of U in terms of **p** and **r**.
Give your answer in its simplest form.

..... [2]

(c) $\overrightarrow{MT} = \begin{pmatrix} 2k \\ -k \end{pmatrix}$ and $|\overrightarrow{MT}| = \sqrt{180}$.

Find the positive value of k.

$k =$ ..... [3]

8 $f(x) = 2x + 1$ $g(x) = x^2 + 4$ $h(x) = 2^x$

(a) Solve the equation $f(x) = g(1)$.

$x =$ ..... [2]

(b) Find the value of $fh(3)$.

..... [2]

(c) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(d) Find $gf(x)$ in its simplest form.

..... [3]

(e) Solve the equation $h^{-1}(x) = 0.5$.

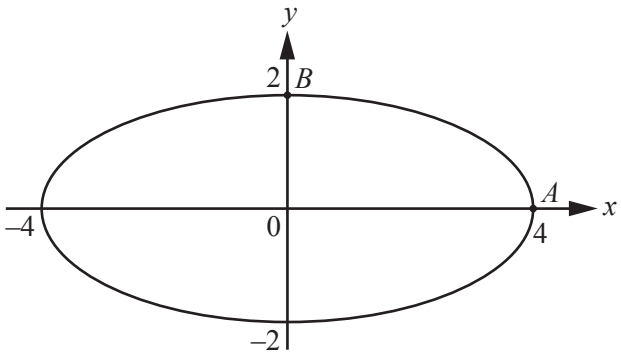
$x =$ ..... [1]

(f) $\dfrac{1}{h(x)} = 2^{kx}$

Write down the value of k.

$k =$ ..... [1]

9



NOT TO SCALE

The diagram shows a curve with equation $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

(a) A is the point (4, 0) and B is the point (0, 2).

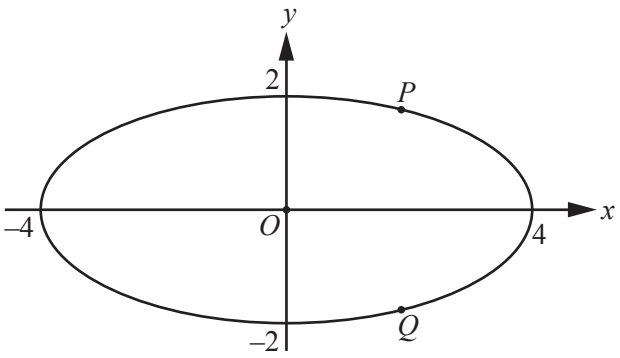
(i) Find the equation of the straight line that passes through A and B. Give your answer in the form $y = mx + c$.

$y =$ ..... [3]

(ii) Show that $a^2 = 16$ and $b^2 = 4$.

[2]

(b)



NOT TO SCALE

$P\,(2, k)$ and $Q\,(2, -k)$ are points on the curve $\frac{x^2}{16} + \frac{y^2}{4} = 1$.

(i) Find the value of k.

$k =$ ..... [3]

(ii) Calculate angle POQ.

Angle $POQ =$ ..... [3]

(c) The area enclosed by a curve with equation $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is πab.

(i) Find the area enclosed by the curve $\frac{x^2}{16} + \frac{y^2}{4} = 1$.

Give your answer as a multiple of π.

..... [1]

(ii) A curve, mathematically similar to the one in the diagrams, intersects the x-axis at $(12, 0)$ and $(-12, 0)$.

Work out the area enclosed by this curve, giving your answer as a multiple of π.

..... [2]

BLANK PAGE

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

4490987798

MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2016**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

CAMBRIDGE International Examinations

[Turn over

1 Mr Chan flies from London to Los Angeles, a distance of 8800 km.
The flight takes 11 hours and 10 minutes.

(a) **(i)** His plane leaves London at 09 35 local time.
The local time in Los Angeles is 8 hours behind the time in London.

Calculate the local time when the plane arrives in Los Angeles.

..... [2]

(ii) Work out the average speed of the plane in km/h.

.....km/h [2]

(b) There are three types of tickets, economy, business and first class.
The price of these tickets is in the ratio economy : business : first class = 2 : 5 : 9.

(i) The price of a business ticket is $2350.

Calculate the price of a first class ticket.

$..... [2]

(ii) Work out the price of an economy ticket as a percentage of the price of a first class ticket.

.....% [1]

(c) The price of a business ticket for the same journey with another airline is $2240.

(i) The price of a first class ticket is 70% more than a business ticket.

Calculate the price of this first class ticket.

$..... [2]

(ii) The price of a business ticket is 180% **more** than an economy ticket.

Calculate the price of this economy ticket.

$..... [3]

(d) Mr Chan hires a car in Los Angeles.
The charges are shown below.

Car Hire

$28.00 per day plus $6.50 per day insurance.

$1.25 for every kilometre travelled after the first 800 km.
The first 800 km are included in the price.

Mr Chan hired the car for 12 days and paid $826.50 .

(i) Find the number of kilometres Mr Chan travelled in this car.

..... km [4]

(ii) The car used fuel at an average rate of 1 litre for every 10 km travelled.
Fuel costs $1.30 per litre.

Calculate the cost of the fuel used by the car during the 12 days.

$..... [2]

2 **(a)** Work out the value of x in each of the following.

(i) $3^x = 243$

$x =$ ..... [1]

(ii) $16^x = 4$

$x =$ ..... [1]

(iii) $8^x = 32$

$x =$ ..... [2]

(iv) $27^x = \frac{1}{9}$

$x =$ ..... [2]

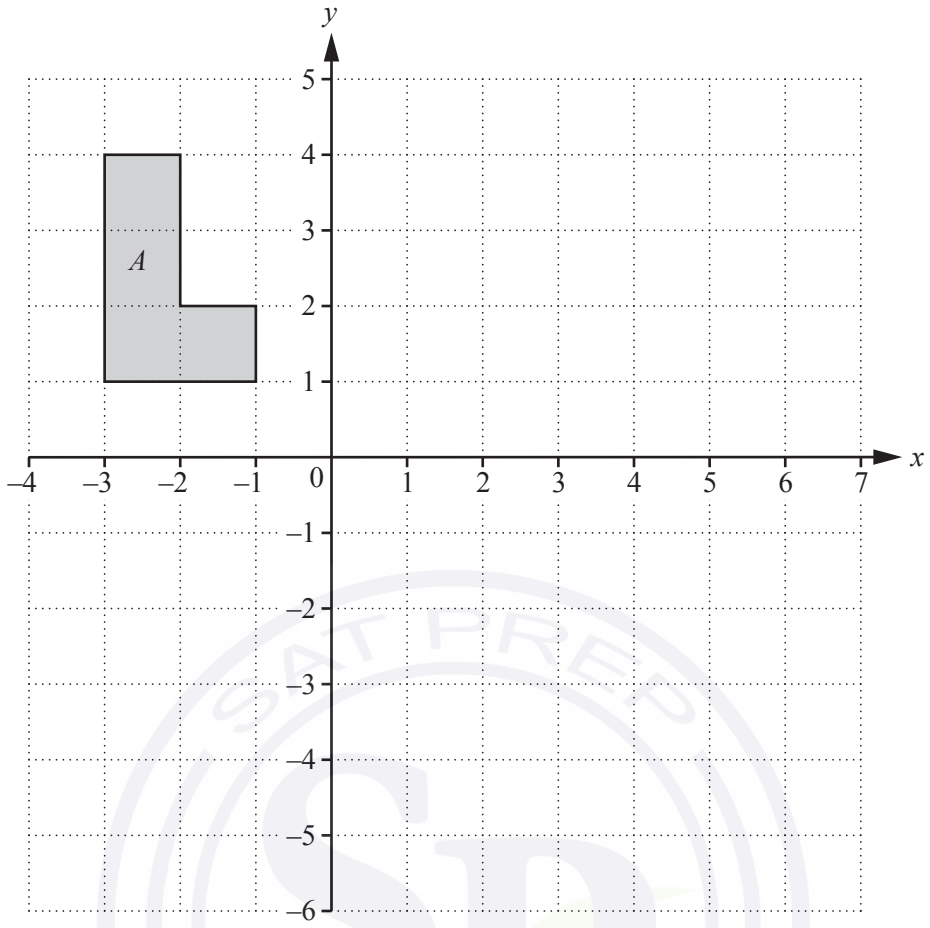
(b) Solve by factorisation.

$$y^2 - 7y - 30 = 0$$

Show your working.

$y =$ ..... or $y =$ ..... [3]

3 (a)



On the grid, draw the image of

(i) shape A after a reflection in the line $x = 1$, [2]

(ii) shape A after an enlargement with scale factor -2, centre $(0, 1)$, [2]

(iii) shape A after the transformation represented by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$. [3]

(b) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$.

.....

..... [3]

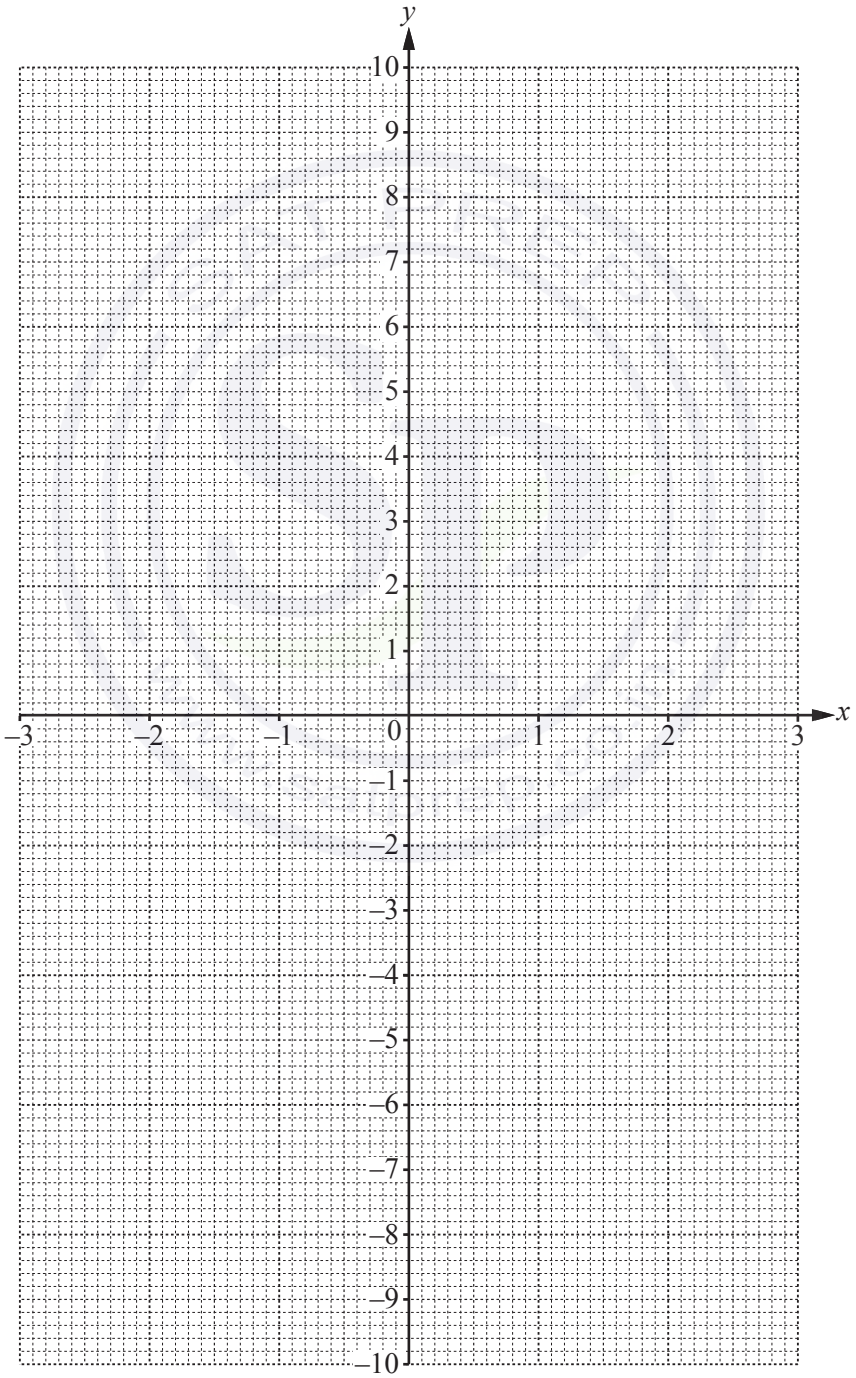
4 $f(x) = x^2 - \frac{1}{x} - 4\,,\ x \neq 0$

(a) (i) Complete the table.

x	–3	–2	–1	–0.5	–0.1		0.2	0.5	1	2	3
$f(x)$	5.3	0.5		–1.8	6.0		–9.0	–5.8	–4		4.7

[2]

(ii) On the grid, draw the graph of $y = f(x)$ for $-3 \leqslant x \leqslant -0.1$ and $0.2 \leqslant x \leqslant 3$.



[5]

(b) Use your graph to solve the equation $f(x) = 0$.

$x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(c) Find an integer k, for which $f(x) = k$ has one solution.

$k =$ ..... [1]

(d) **(i)** By drawing a suitable straight line, solve the equation $f(x) + 2 = -5x$.

$x =$ ..... or $x =$ ..... [4]

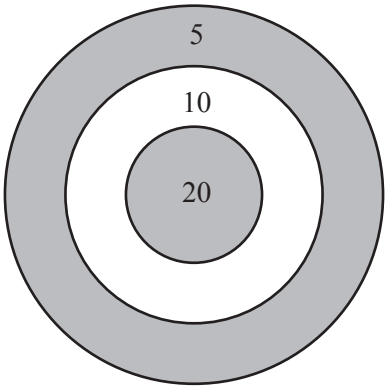
(ii) $f(x) + 2 = -5x$ can be written as $x^3 + ax^2 + bx - 1 = 0$.

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [2]

5 Kiah plays a game.
The game involves throwing a coin onto a circular board.
Points are scored for where the coin lands on the board.



If the coin lands on part of a line or misses the board then 0 points are scored.
The table shows the probabilities of Kiah scoring points on the board with one throw.

Points scored	20	10	5	0
Probability	x	0.2	0.3	0.45

(a) Find the value of x.

$x =$ ..... [2]

(b) Kiah throws a coin fifty times.

Work out the expected number of times she scores 5 points.

..... [1]

(c) Kiah throws a coin two times.

Calculate the probability that

(i) she scores either 5 or 0 with her first throw,

..... [2]

(ii) she scores 0 with her first throw and 5 with her second throw,

..... [2]

(iii) she scores a total of 15 points with her two throws.

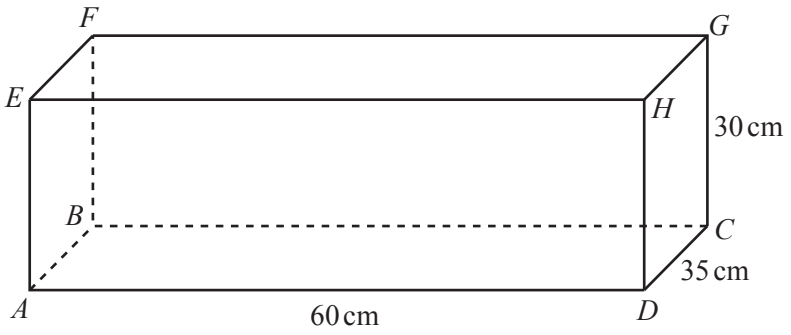
..... [3]

(d) Kiah throws a coin three times.

Calculate the probability that she scores a total of 10 points with her three throws.

..... [5]

6 The diagram shows a cuboid.



NOT TO SCALE

$AD = 60$ cm, $CD = 35$ cm and $CG = 30$ cm.

(a) Write down the number of planes of symmetry of this cuboid.

..... [1]

(b) **(i)** Work out the surface area of the cuboid.

..... cm^2 [3]

(ii) Write your answer to **part (b)(i)** in square metres.

..... m^2 [1]

(c) Calculate

(i) the length AG,

$AG =$ ..... cm [4]

(ii) the angle between AG and the base $ABCD$.

..... [3]

(d) (i) Show that the volume of the cuboid is $63\,000\,cm^3$.

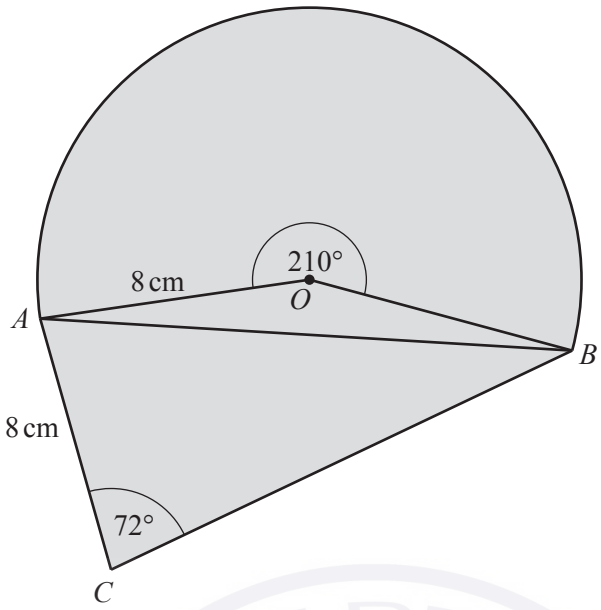
[1]

(ii) A cylinder of height 40 cm has the same volume as the cuboid.

Calculate the radius of the cylinder.

..... cm [3]

7



NOT TO SCALE

The diagram shows a design for a logo made from a sector and two triangles.
The sector, centre O, has radius 8 cm and sector angle 210°.
AC = 8 cm and angle ACB = 72°.

(a) Show that angle OAB = 15°.

[2]

(b) Calculate the length of the straight line AB.

AB = ... cm [4]

(c) Calculate angle *ABC*.

Angle *ABC* = ... [3]

(d) Calculate the total area of the logo design.

.....cm^2 [6]

(e) The logo design is an enlargement with scale factor 4 of the actual logo.

Calculate the area of the actual logo.

.....cm^2 [2]

8 $f(x) = 5x + 7$ $\quad g(x) = \dfrac{4}{x-3}$, $x \neq 3$

(a) Find

(i) $fg(1)$,

..... [2]

(ii) $gf(x)$,

..... [2]

(iii) $g^{-1}(x)$,

$g^{-1}(x) =$ ..... [3]

(iv) $f^{-1}f(2)$.

..... [1]

(b) $f(x) = g(x)$

(i) Show that $5x^2 - 8x - 25 = 0$.

[3]

(ii) Solve $5x^2 - 8x - 25 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

Question 9 is printed on the next page.

9 A line joins the points A (–2, –5) and B (4, 13).

(a) Calculate the length AB.

$AB =$ ..... [3]

(b) Find the equation of the line through A and B.
Give your answer in the form $y = mx + c$.

$y =$ ..... [3]

(c) Another line is parallel to AB and passes through the point (0, –5).

Write down the equation of this line.

..... [2]

(d) Find the equation of the perpendicular bisector of AB.

..... [5]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

5147816051

MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2016**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Geometrical instruments
Tracing paper (optional).

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **15** printed pages and **1** blank page.

1 A football club sells tickets at different prices dependent on age group.

(a) (i) At one game, the club sold tickets in the ratio

under 18 : 18 to 60 : over 60 = 2 : 7 : 3.

There were 6100 tickets sold for people aged under 18.

Calculate the **total** number of tickets sold for the game.

..... [3]

(ii) Calculate the percentage of tickets sold for people aged under 18.

.....% [1]

(b) The table shows the football ticket prices for the different age groups.

Age	Price
Under 18	$15
18 to 60	$35
Over 60	$18

At a **different** game there were 42 600 tickets sold.

- 14% were sold to people aged under 18
- $\frac{2}{3}$ of the tickets were sold to people aged 18 to 60
- The remainder were sold to people aged over 60

Calculate the total amount the football club receives from ticket sales for this game.

$ ..... [5]

(c) In a sale, the football club shop reduced the price of the football shirts to \$23.80 .
An error was made when working out this sale price.
The price was reduced by 30% instead of 20%.

Calculate the correct sale price for the football shirt.

\$..... [5]

2 **(a)** Solve the inequality.

$5x - 3 > 9$

..... [2]

(b) Factorise completely.

(i) $xy - 18 + 3y - 6x$

..... [2]

(ii) $8x^2 - 72y^2$

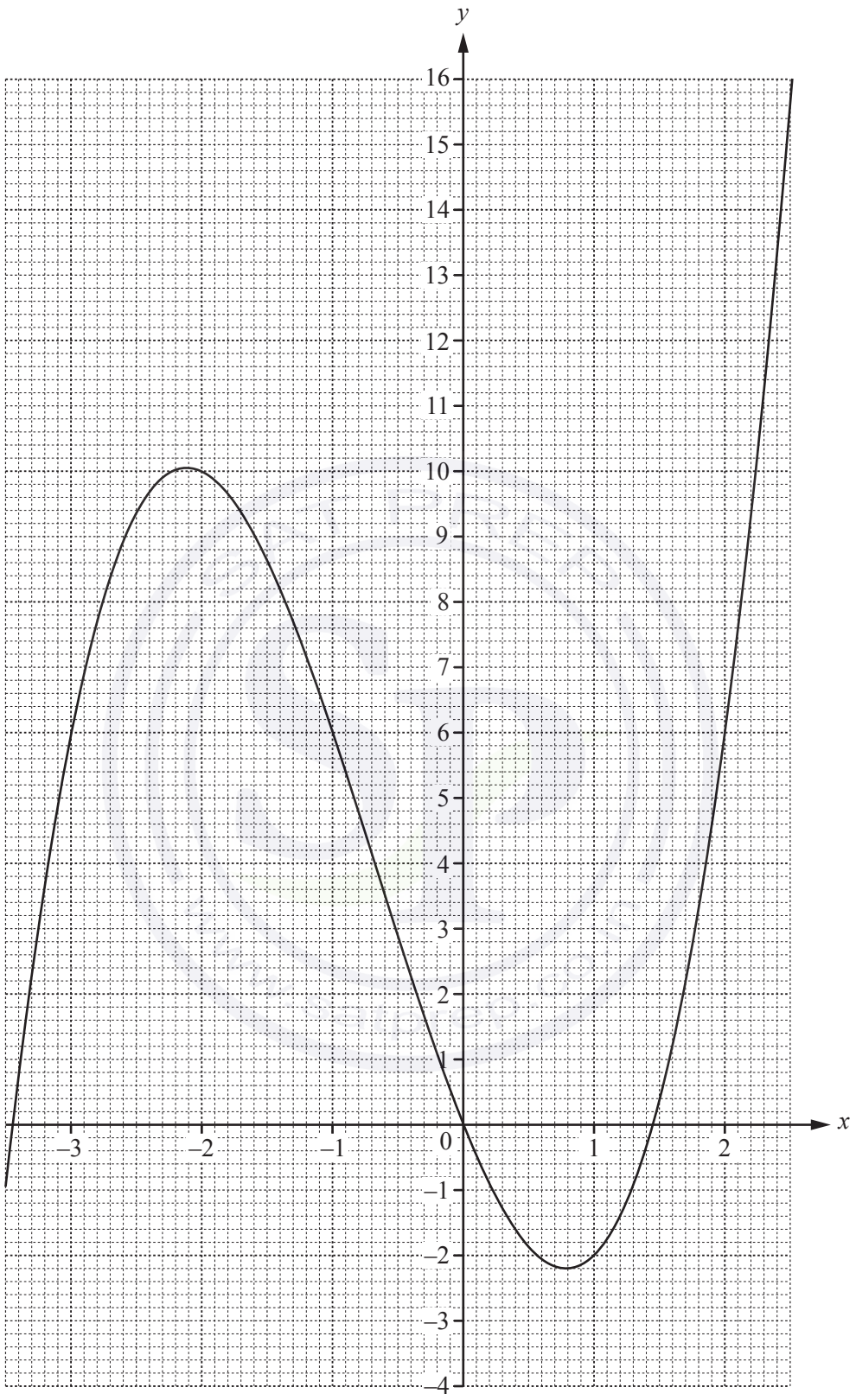
..... [3]

(c) Make r the subject of the formula.

$$p + 5 = \frac{1 - 2r}{r}$$

$r =$ ..... [4]

3 The diagram shows the graph of $y = f(x)$ for $-3.5 \leqslant x \leqslant 2.5$.



(a) (i) Find f(– 2).

..... [1]

(ii) Solve the equation f(x) = 2.

x = ... or x = ... or x = ...[3]

(iii) Two tangents, each with gradient 0, can be drawn to the graph of y = f(x).

Write down the equation of each tangent.

.....

..... [2]

(b) (i) Complete the table for $g(x) = \frac{2}{x} + 3$ for $-3.5 \leqslant x \leqslant -0.5$ and $0.5 \leqslant x \leqslant 2.5$.

x	–3.5	–3	–2	–1	–0.5		0.5	1	2	2.5
g(x)	2.4	2.3		1			7	5		3.8

[3]

(ii) On the grid opposite, draw the graph of y = g(x). [4]

(iii) Use your graph to solve the equation f(x) = g(x).

x = ... or x = ...[2]

(c) Find gf(–2).

..... [2]

(d) Find $g^{-1}(5)$.

..... [1]

4 Coins are put into a machine to pay for parking cars.
The probability that the machine rejects a coin is 0.05 .

(a) Adhira puts 2 coins into the machine.

(i) Calculate the probability that the machine rejects **both** coins.

..... [2]

(ii) Calculate the probability that the machine accepts at **least one** coin.

..... [1]

(b) Raj puts 4 coins into the machine.

Calculate the probability that the machine rejects **exactly one** coin.

..... [3]

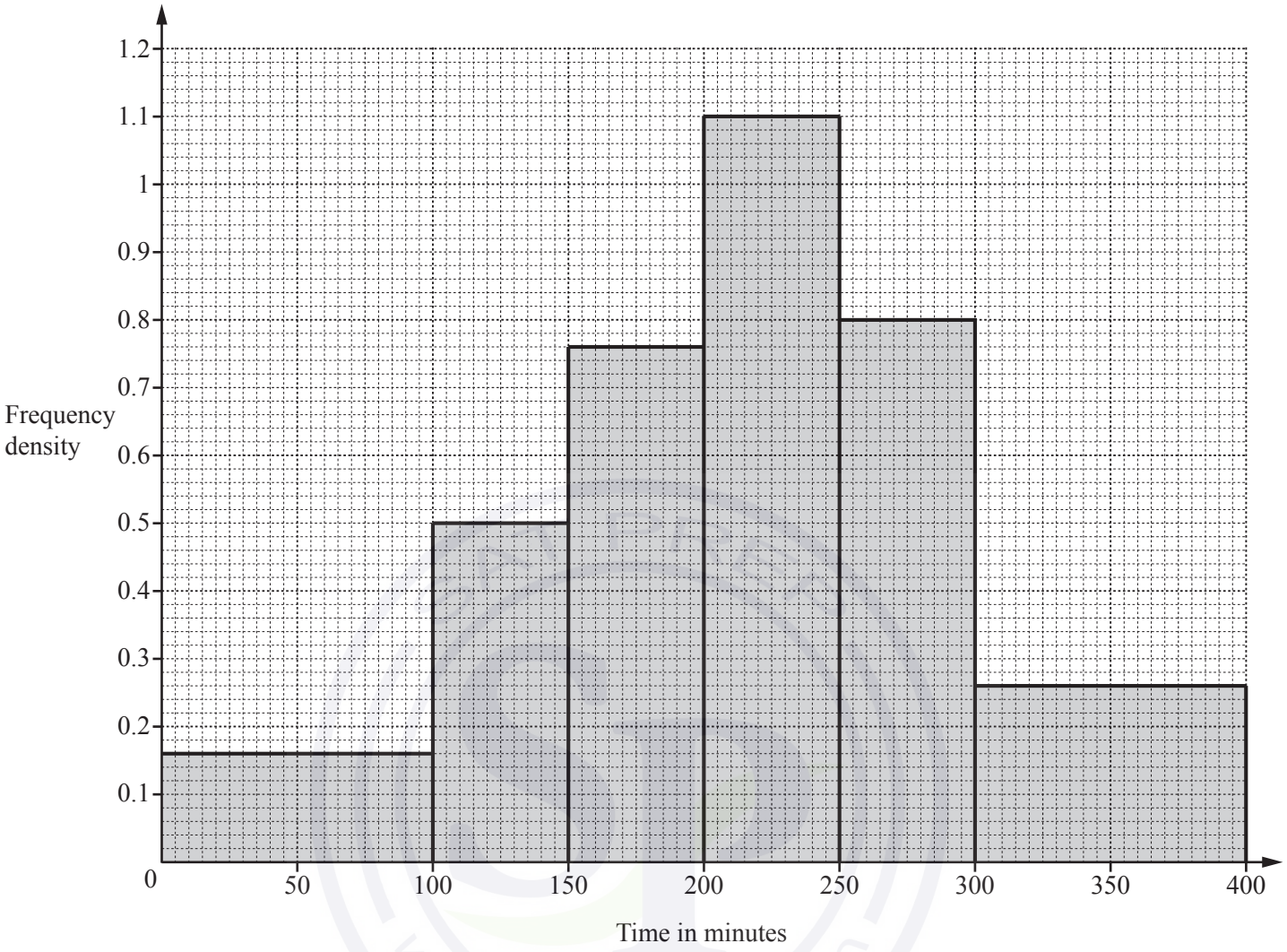
(c) The table shows the amount of money, $\$a$, received for parking each day for 200 days.

Amount ($\$a$)	$200 < a \leqslant 250$	$250 < a \leqslant 300$	$300 < a \leqslant 350$	$350 < a \leqslant 400$	$400 < a \leqslant 450$	$450 < a \leqslant 500$
Frequency	13	19	27	56	62	23

Calculate an estimate of the mean amount of money received each day.

$..... [4]

(d) The histogram shows the length of time that 200 cars were parked.



(i) Calculate the number of cars that were parked for 100 minutes or less.

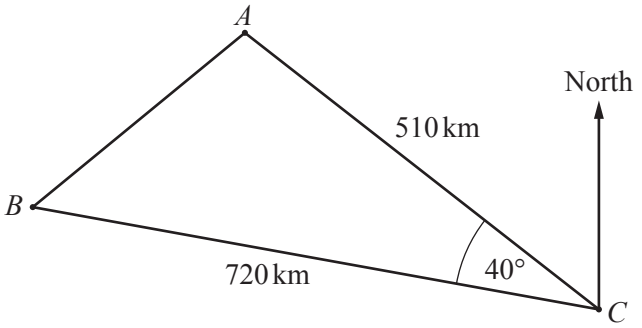
..... [1]

(ii) Calculate the percentage of cars that were parked for more than 250 minutes.

.....% [2]

5

NOT TO SCALE



A plane flies from A to C and then from C to B.
$AC = 510$ km and $CB = 720$ km.
The bearing of C from A is 135° and angle $ACB = 40°$.

(a) Find the bearing of

(i) B from C,

..... [2]

(ii) C from B.

..... [2]

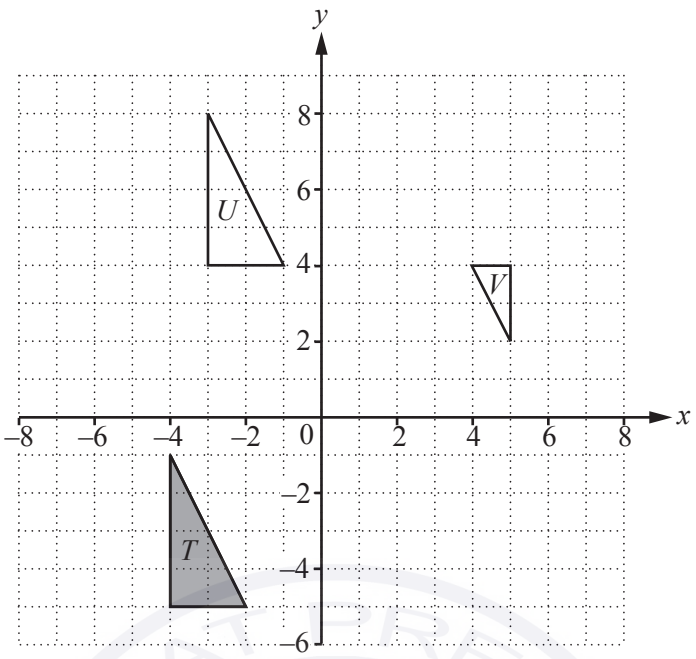
(b) Calculate AB and show that it rounds to 464.7 km, correct to 1 decimal place.

[4]

(c) Calculate angle ABC.

Angle ABC = ... [3]

6



(a) (i) Draw the image of triangle T after a reflection in the line $x = 0$. [2]

(ii) Draw the image of triangle T after a rotation through 90° clockwise about (–2, –1). [2]

(iii) Describe fully the **single** transformation that maps triangle T onto triangle U.

.....

..... [2]

(iv) Describe fully the **single** transformation that maps triangle T onto triangle V.

.....

..... [3]

(b) (i) Find the matrix that represents the transformation in **part (a)(i)**.

$\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(ii) Describe fully the **single** transformation represented by the inverse of the matrix in **part (b)(i)**.

.....

..... [2]

7 Alfonso runs 10 km at an average speed of x km/h.
The next day he runs 12 km at an average speed of $(x - 1)$ km/h.

The time taken for the 10 km run is 30 minutes less than the time taken for the 12 km run.

(a) (i) Write down an equation in x and show that it simplifies to $x^2 - 5x - 20 = 0$.

[4]

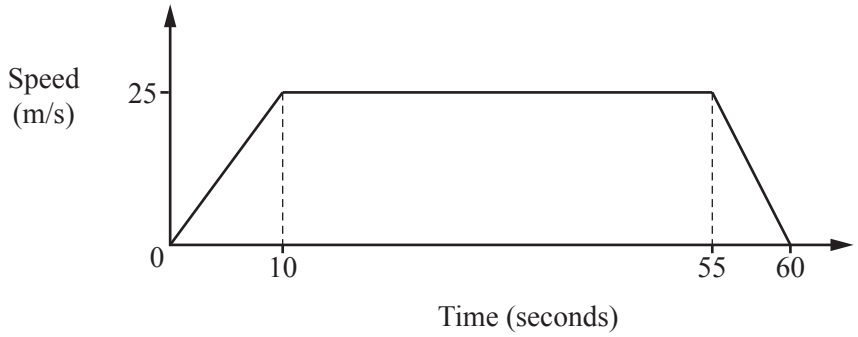
(ii) Use the quadratic formula to solve the equation $x^2 - 5x - 20 = 0$.
Show your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

(iii) Find the time that Alfonso takes to complete the 12 km run.
Give your answer in hours and minutes correct to the nearest minute.

..... hours ..... minutes [2]

(b) A cheetah runs for 60 seconds.
The diagram shows the speed-time graph.



NOT TO SCALE

(i) Work out the acceleration of the cheetah during the first 10 seconds.

..... m/s^2 [1]

(ii) Calculate the distance travelled by the cheetah.

..... m [3]

8 $\mathbf{A} = \begin{pmatrix} 2 & 0 \\ -1 & 5 \\ 3 & -4 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 1 & 3 \\ -1 & 5 \end{pmatrix}$ $\mathbf{C} = \begin{pmatrix} 7 \\ -4 \end{pmatrix}$ $\mathbf{D} = \begin{pmatrix} 2 & 5 \end{pmatrix}$

(a) Work out each of the following if the answer is possible.
If a calculation is not possible, write "not possible" in the answer space.

(i) **BA**

[1]

(ii) 2**A**

[1]

(iii) **CD**

[2]

(iv) **DC**

[2]

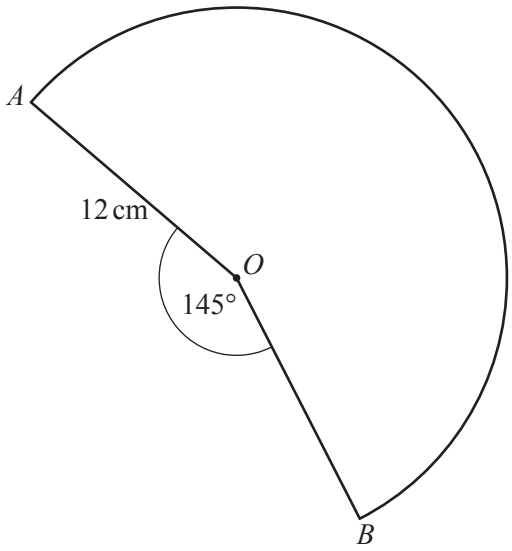
(v) $\mathbf{B}^2$

[2]

(b) Find $\mathbf{B}^{-1}$, the inverse of **B**.

$\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

9



NOT TO SCALE

The diagram shows a sector, centre O, and radius 12 cm.

(a) Calculate the area of the sector.

..... cm^2 [3]

(b) The sector is made into a cone by joining OA to OB.

Calculate the volume of the cone.
[The volume, V, of a cone with base radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [6]

10

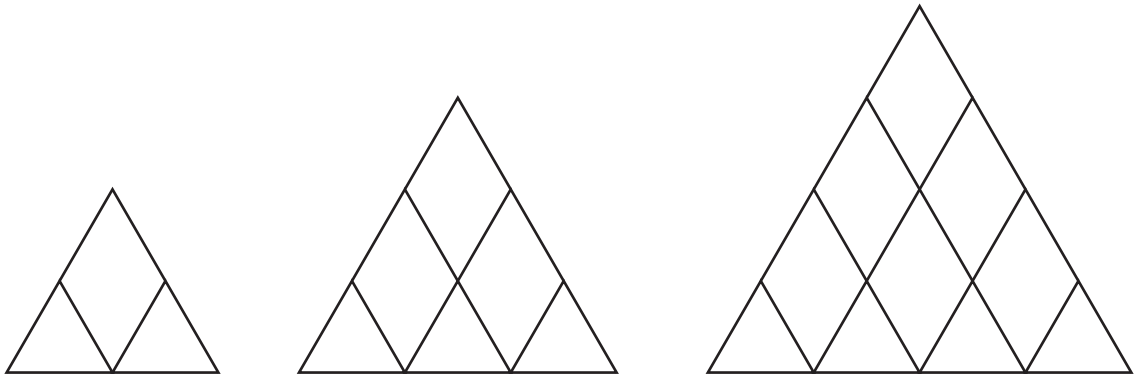


Diagram 1 Diagram 2 Diagram 3

Each diagram is made from tiles in the shape of equilateral triangles and rhombuses.
The length of a side of each tile is 1 unit.

(a) Complete the table below for this sequence of diagrams.

Diagram	1	2	3	4	5
Number of equilateral triangle shaped tiles	2	3	4	5	6
Number of rhombus shaped tiles	1	3	6		
Total number of tiles	3	6	10		
Number of 1 unit lengths	8	15	24		

[6]

(b) **(i)** The number of 1 unit lengths in Diagram n is $n^2 + 4n + p$.

Find the value of p.

$p =$ ..... [2]

(ii) Calculate the number of 1 unit lengths in Diagram 10.

..... [1]

(c) The total number of tiles in Diagram n is $an^2 + bn + 1$.

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [5]

(d) Part of the Louvre museum in Paris is in the shape of a square-based pyramid made from glass tiles. Each of the triangular faces of the pyramid is represented by Diagram 17 in the sequence.

(i) Calculate the total number of glass tiles on one triangular face of this pyramid.

..... [2]

(ii) 11 tiles are removed from one of the triangular faces to create an entrance into the pyramid.

Calculate the total number of glass tiles used to construct this pyramid.

..... [1]

BLANK PAGE

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

2124200984

MATHEMATICS **0580/42**

Paper 4 (Extended) **February/March 2016**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

1 Aasha, Biren and Cemal share \$640 in the ratio 8 : 15 : 9.

(a) Show that Aasha receives \$160.

[1]

(b) Calculate the amount that Biren and Cemal receive.

Biren \$ .....

Cemal \$ ..... [2]

(c) Aasha uses her \$160 to buy some books.
Each book costs \$15.25 .

Find the greatest number of books that she can buy.

..... [2]

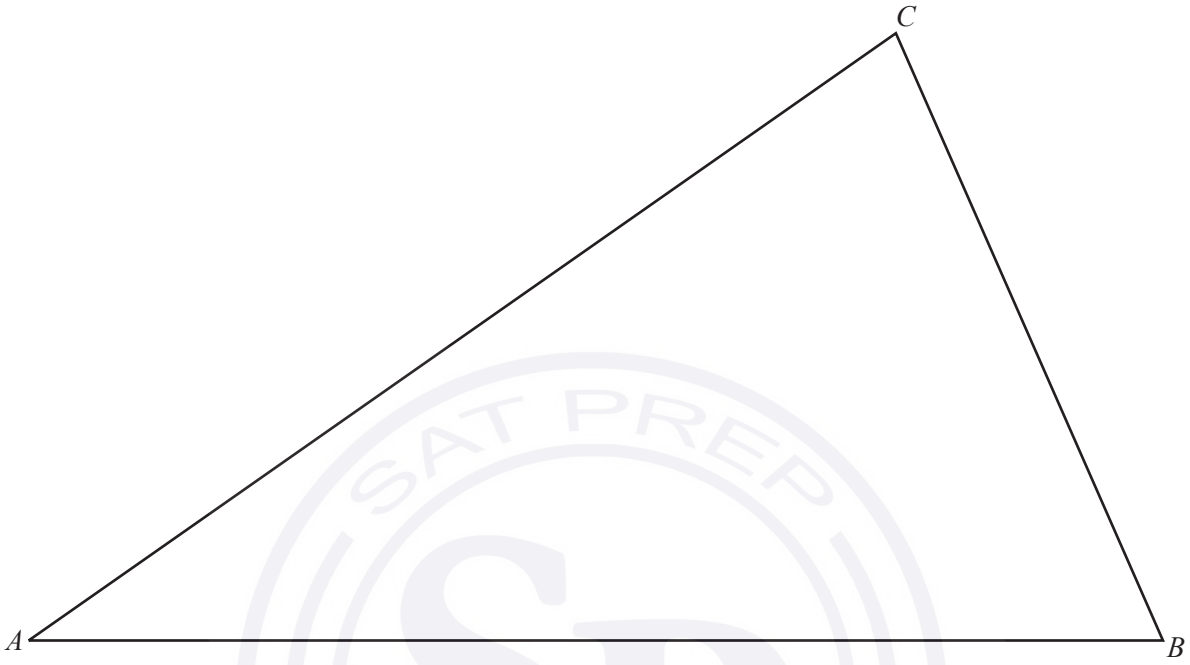
(d) Biren spends $\frac{3}{8}$ of his share on clothes and $\frac{1}{3}$ of his share on a computer.

Find the fraction of his share that he has left.
Write your fraction in its lowest terms.

..... [3]

2 In this question use a ruler and compasses only.
Show all your construction arcs.

The diagram shows a triangular field *ABC*.
The scale is 1 centimetre represents 50 metres.



Scale : 1 cm to 50 m

(a) Construct the locus of points that are equidistant from *A* and *B*. [2]

(b) Construct the locus of points that are equidistant from the lines *AB* and *AC*. [2]

(c) The two loci intersect at the point *E*.

Construct the locus of points that are 250 m from *E*. [2]

(d) Shade any region inside the field *ABC* that is

- more than 250 m from *E*

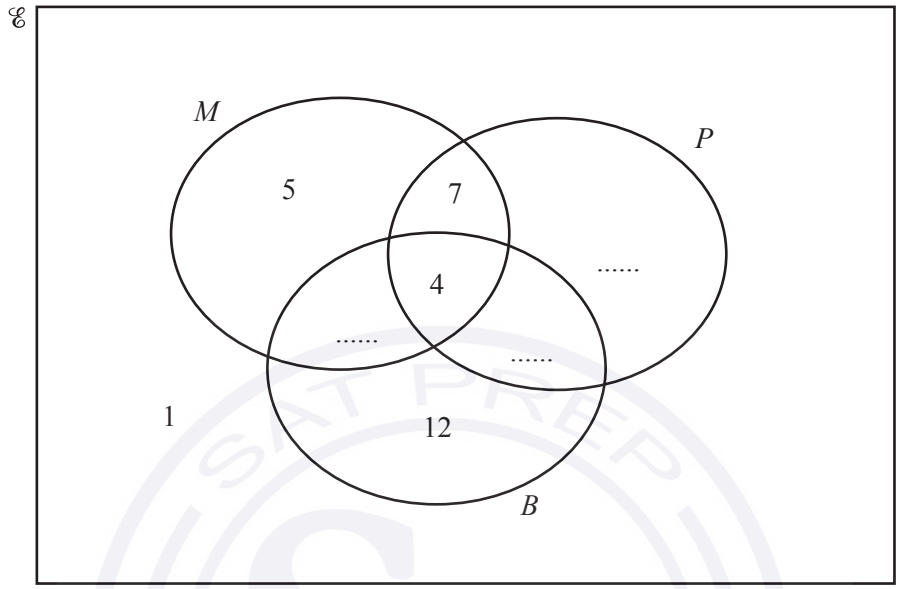
and

- closer to *AC* than to *AB*. [2]

3 **(a)** Davinder asked some people if they ate mangoes, pineapples or bananas last week.

M = { people who ate mangoes }
P = { people who ate pineapples }
B = { people who ate bananas }

The Venn diagram shows some of the information.



19 people said they ate mangoes.
6 people said they ate **only** pineapples.
18 people said they ate **exactly two** of the three types of fruit.

(i) Write the three missing values in the Venn diagram. [3]

(ii) Find the total number of people Davinder asked.

..... [1]

(iii) Find $n(M \cap P)$.

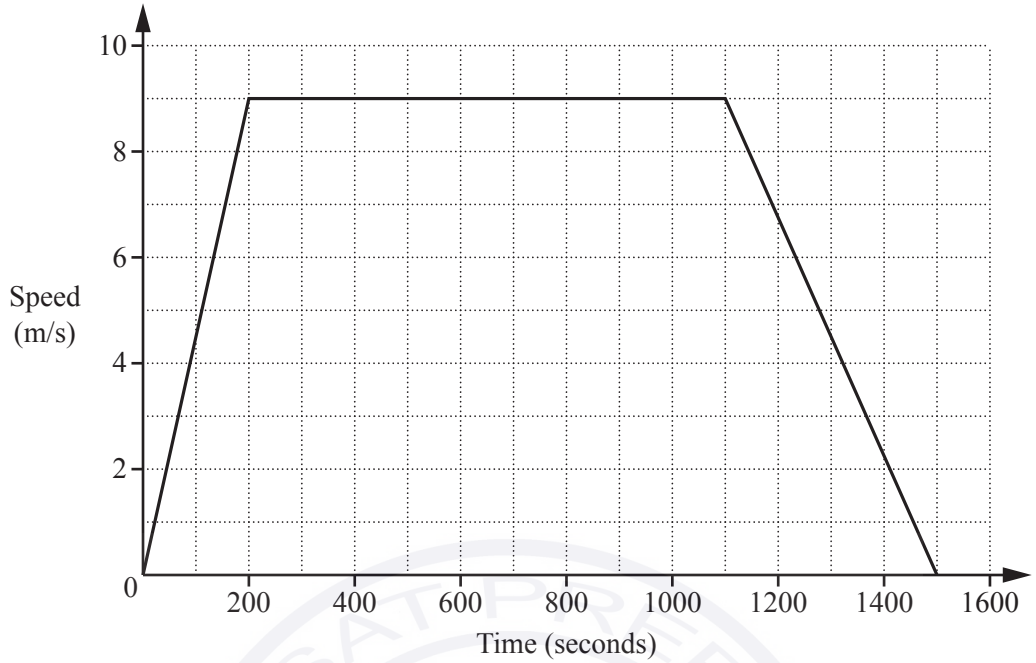
..... [1]

(iv) One person is chosen at random from the people who ate mangoes.

Write down the probability that this person also ate bananas.

..... [2]

(b) Davinder draws a speed-time graph for his bus journey to the market.



Find

(i) the acceleration of the bus during the first 200 seconds,

..... m/s^2 [1]

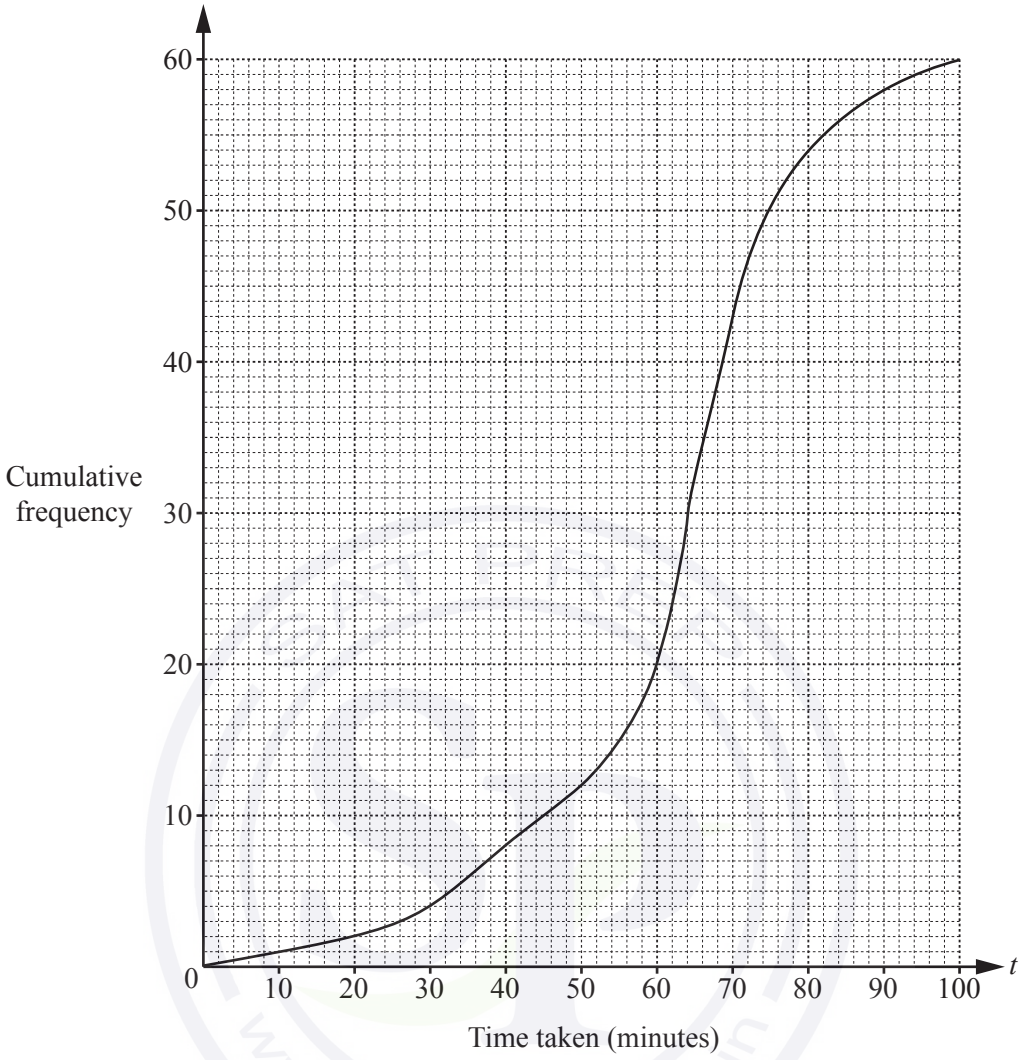
(ii) the total distance travelled by the bus,

..... m [3]

(iii) the average speed of the bus for the whole journey.

..... m/s [1]

4 The cumulative frequency diagram shows information about the time taken, t minutes, by 60 students to complete a test.



(a) Find

(i) the median,

..... min [1]

(ii) the inter-quartile range,

..... min [2]

(iii) the 40th percentile,

..... min [2]

(iv) the number of students who took more than 80 minutes to complete the test.

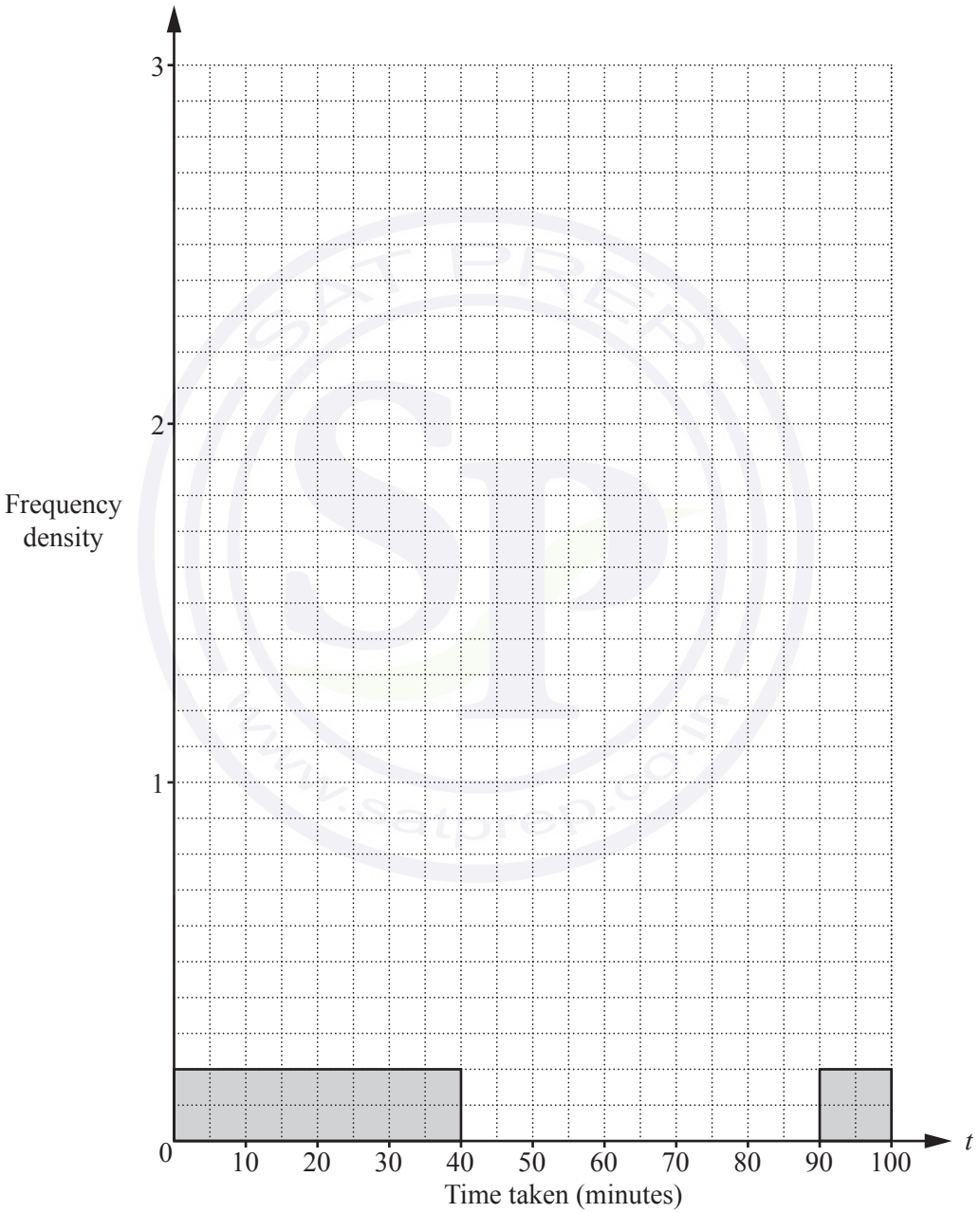
..... [2]

(b) Use the cumulative frequency diagram to complete the frequency table below.

Time taken (t minutes)	$0 < t \leqslant 40$	$40 < t \leqslant 60$	$60 < t \leqslant 70$	$70 < t \leqslant 80$	$80 < t \leqslant 90$	$90 < t \leqslant 100$
Frequency	8				4	

[3]

(c) On the grid below, complete the histogram to show the information in the table in **part (b)**.



[4]

5 **(a)** Meena sells her car for $6000.
This is a loss of 4% on the price she paid.

Calculate the price Meena paid for the car.

$ ..... [3]

(b) Eisha changes some euros (€) into dollars ($) when the exchange rate is €1 = $1.351 .
She receives $6000.

Calculate how many euros Eisha changes.
Give your answer correct to the nearest euro.

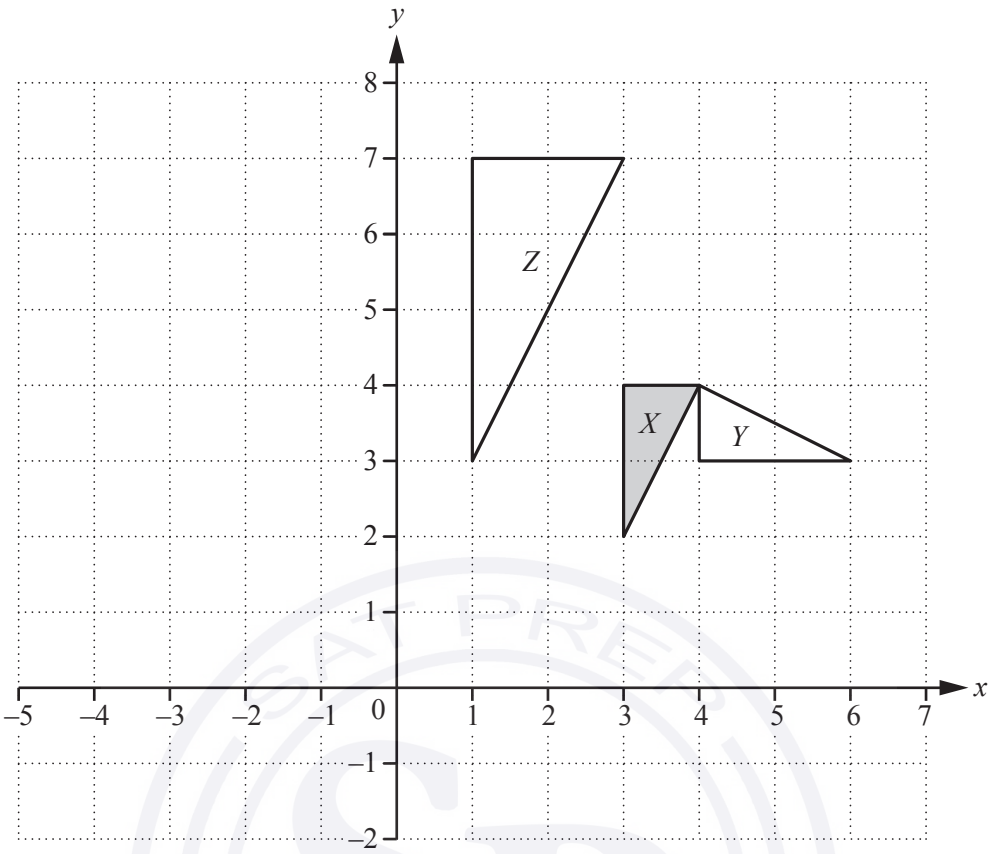
€ ..... [3]

(c) Meena and Eisha both invest their $6000.
Meena invests her $6000 at a rate of 1.5% per year compound interest.
Eisha invests her $6000 in a bank that pays simple interest.
After 8 years, their investments are worth the same amount.

Calculate the rate of simple interest per year that Eisha received.

..... % [5]

6



(a) Describe fully the **single** transformation that maps

(i) triangle X onto triangle Y,

.....

..... [3]

(ii) triangle X onto triangle Z.

.....

..... [3]

(b) **(i)** Draw the image of triangle X after a translation by the vector $\begin{pmatrix} -5 \\ 3 \end{pmatrix}$.

Label this triangle P. [2]

(ii) Draw the reflection of triangle P in the line $y = 3$. [2]

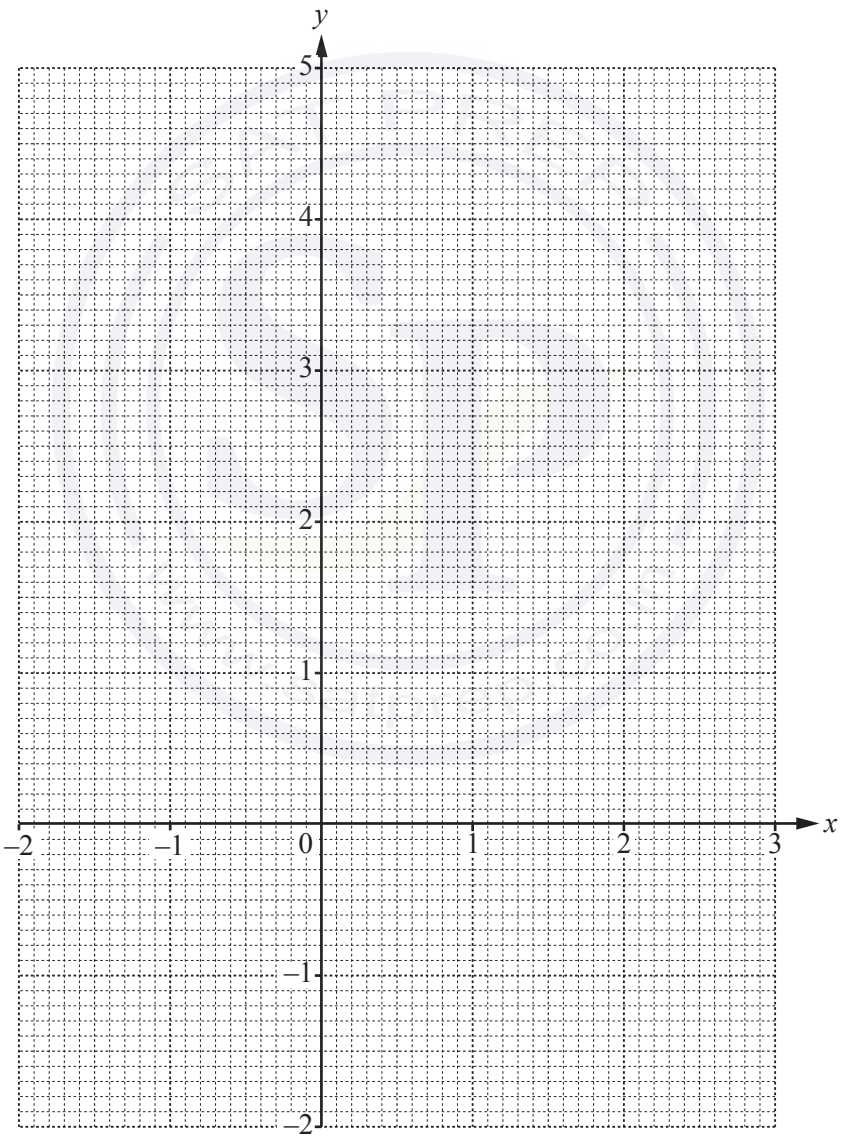
(c) Draw the image of triangle X after the transformation represented by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$. [3]

7 The table shows some values of $y = x + \frac{1}{x^2}, \ x \neq 0$.

x	–2	–1.5	–1	–0.75	–0.5		0.5	0.75	1	1.5	2	3
y	–1.75	–1.06	0	1.03			4.50	2.53	2		2.25	

(a) Complete the table of values. [3]

(b) On the grid, draw the graph of $y = x + \frac{1}{x^2}$ for $-2 \leqslant x \leqslant -0.5$ and $0.5 \leqslant x \leqslant 3$.



[5]

(c) Use your graph to solve the equation $x + \frac{1}{x^2} = 1.5$.

$x =$ ..... [1]

(d) The line $y = ax + b$ can be drawn on the grid to solve the equation $\frac{1}{x^2} = 2.5 - 2x$.

(i) Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [2]

(ii) Draw the line $y = ax + b$ to solve the equation $\frac{1}{x^2} = 2.5 - 2x$.

$x =$ ..... [3]

(e) By drawing a suitable tangent, find an estimate of the gradient of the curve at the point where $x = 2$.

..... [3]

8 **(a)** y is directly proportional to the positive square root of $(x + 2)$.
When $x = 7$, $y = 9$.

Find y when $x = 23$.

$y =$ ..... [3]

(b) Simplify.

$$\frac{x^2 + 12x + 36}{x^2 + 4x - 12}$$

..... [5]

(c) $W = \sqrt{\dfrac{X-a}{a}}$

Make a the subject of the formula.

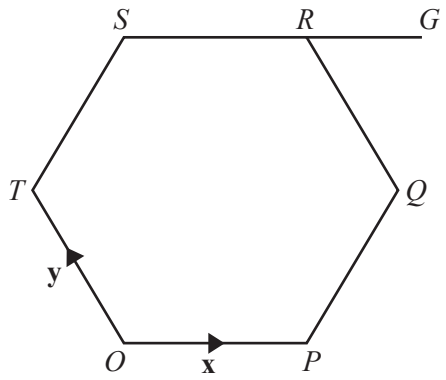
$a =$ ..... [5]

(d) Write as a single fraction in its simplest form.

$$\frac{x-2}{x+1} - \frac{x+3}{x-1}$$

..... [5]

9



NOT TO SCALE

O is the origin and $OPQRST$ is a regular hexagon.

$\overrightarrow{OP} = \mathbf{x}$ and $\overrightarrow{OT} = \mathbf{y}$.

(a) Write down, in terms of **x** and/or **y**, in its simplest form,

(i) $\overrightarrow{QR}$,

$\overrightarrow{QR}$ = ... [1]

(ii) $\overrightarrow{PQ}$,

$\overrightarrow{PQ}$ = ... [1]

(iii) the position vector of S.

..... [2]

(b) The line SR is extended to G so that $SR : RG = 2 : 1$.

Find $\overrightarrow{GQ}$, in terms of **x** and **y**, in its simplest form.

$\overrightarrow{GQ}$ = ... [2]

(c) M is the midpoint of OP.

(i) Find $\overrightarrow{MG}$, in terms of **x** and **y**, in its simplest form.

$\overrightarrow{MG}$ = ... [2]

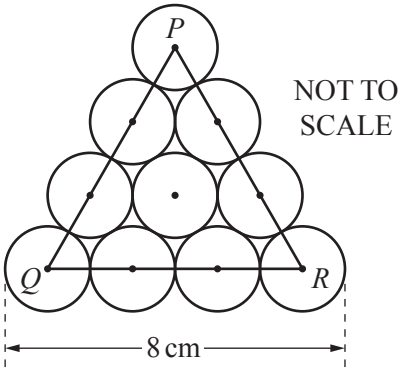
(ii) H is a point on TQ such that $TH : HQ = 3 : 1$.

Use vectors to show that H lies on MG.

[2]

10 **(a)** The ten circles in the diagram each have radius 1 cm.
The centre of each circle is marked with a dot.

Calculate the height of triangle PQR.

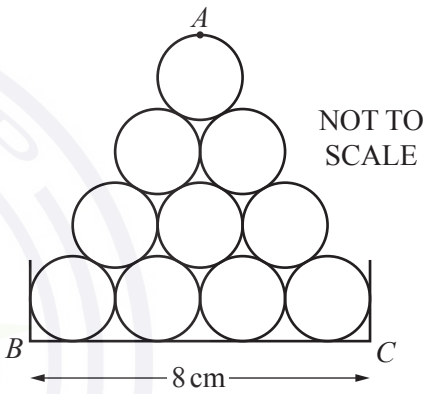


..... cm [3]

(b) Mr Patel uses whiteboard pens that are cylinders of radius 1 cm.

(i) The diagram shows 10 pens stacked in a tray.
The tray is 8 cm wide.
The point A is the highest point in the stack.

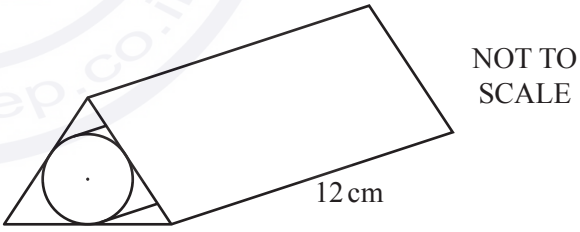
Find the height of A above the base, BC, of the tray.



..... cm [1]

(ii) The diagram shows a box that holds one pen.
The box is a prism of length 12 cm.
The cross section of the prism is an equilateral triangle.
The pen touches each of the three rectangular faces of the box.

Calculate the volume of this box.



..... cm^3 [5]

Question 11 is printed on the next page.

11 $f(x) = 2 - 3x$ $g(x) = 7x + 3$

(a) Find

(i) $f(-3)$,

..... [1]

(ii) $g(2x)$.

..... [1]

(b) Find $gf(x)$ in its simplest form.

..... [2]

(c) Find x when $3f(x) = 7$.

$x =$ ..... [3]

(d) Solve the equation.

$f(x + 4) - g(x) = 0$

$x =$ ..... [3]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

5339410747

MATHEMATICS **0580/41**

Paper 4 (Extended) **October/November 2015**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

1 **(a)** Luc is painting the doors in his house.
He uses $\frac{3}{4}$ of a tin of paint for each door.

Work out the least number of tins of paint Luc needs to paint 7 doors.

Answer(a) ..... [3]

(b) Jan buys tins of paint for \$17.16 each.
He sells the paint at a profit of 25%.

For how much does Jan sell each tin of paint?

Answer(b) \$ ..... [2]

(c) The cost of \$17.16 for each tin of paint is 4% more than the cost in the previous year.

Work out the cost of each tin of paint in the previous year.

Answer(c) \$ ..... [3]

(d) In America a tin of paint costs \$17.16 .
In Italy the same tin of paint costs €13.32 .
The exchange rate is \$1 = €0.72 .

Calculate, in dollars, the difference in the cost of the tin of paint.

Answer(d) \$ ..... [2]

(e) Paint is sold in cylindrical tins of height 11 cm.
Each tin holds 750 ml of paint.

(i) Write 750 ml in cm^3.

Answer(e)(i) ..... cm^3 [1]

(ii) Calculate the radius of the tin.
Give your answer correct to 1 decimal place.

Answer(e)(ii) ..... cm [3]

(iii) A mathematically similar tin has a height of 22 cm.

How many **litres** of paint does this tin hold?

Answer(e)(iii) ..... litres [2]

(f) The mass of a tin of paint is 890 grams, correct to the nearest 10 grams.

Work out the upper bound of the total mass of 10 tins of paint.

Answer(f) ..... g [1]

(g) The probability that a tin of paint is dented is 0.07 .

Out of 3000 tins of paint, how many would you expect to be dented?

Answer(g) ..... [2]

(h) Tins of paint are filled at the rate of 2 m^3 per minute.

How many 750 ml tins of paint can be filled in 1 hour?

Answer(h) ..... [3]

2 **(a)** Calculate $2^{0.7}$.

Answer(a) ..... [1]

(b) Find the value of x in each of the following.

(i) $2^x = 128$

Answer(b)(i) x = ... [1]

(ii) $2^x \times 2^9 = 2^{13}$

Answer(b)(ii) x = ... [1]

(iii) $2^9 \div 2^x = 4$

Answer(b)(iii) x = ... [1]

(iv) $2^x = \sqrt[3]{2}$

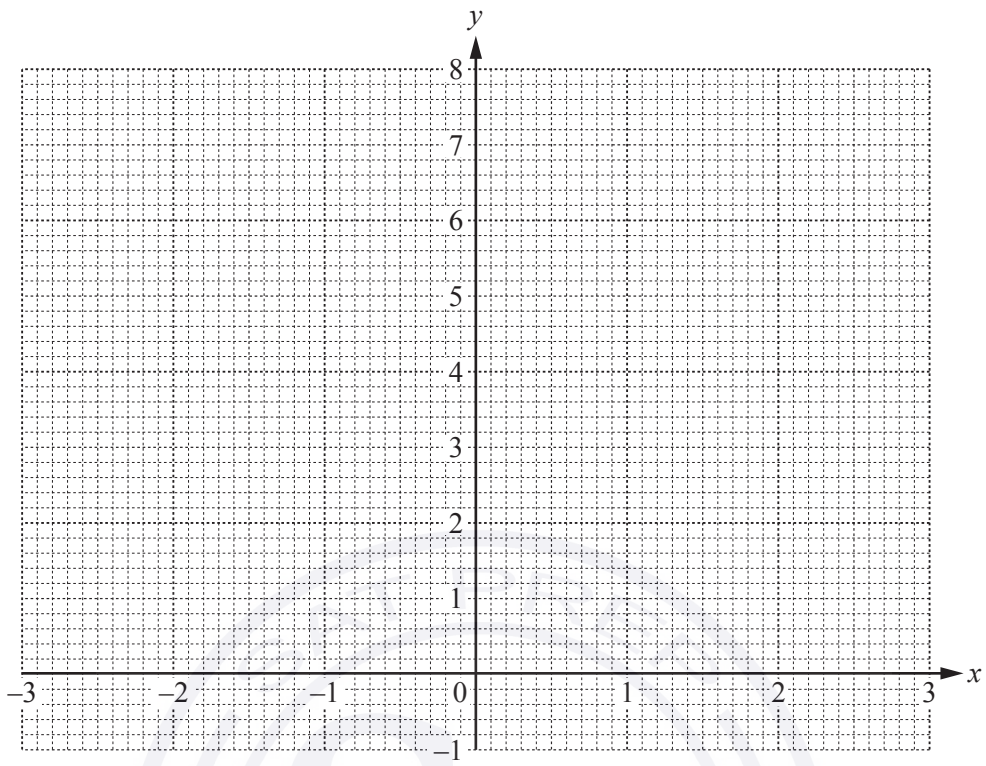
Answer(b)(iv) x = ... [1]

(c) **(i)** Complete this table of values for $y = 2^x$.

x	–3	–2	–1	0	1	2	3
y	0.125		0.5		2	4	8

[2]

(ii) On the grid, draw the graph of $y = 2^x$ for $-3 \leqslant x \leqslant 3$.



[4]

(iii) Use your graph to solve $2^x = 5$.

Answer(c)(iii) $x =$ ..... [1]

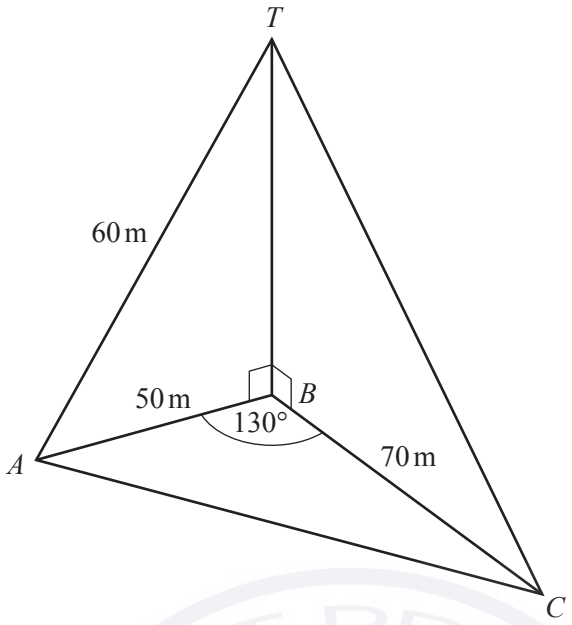
(iv) Find the equation of the line joining the points (1, 2) and (3, 8).

Answer(c)(iv) ..... [3]

(v) By drawing a suitable line on your graph, solve $2^x - 2 - x = 0$.

Answer(c)(v) $x =$ ..... or $x =$ ..... [2]

3 (a)



NOT TO SCALE

A, B and C are points on horizontal ground.
BT is a vertical pole.
$AT = 60$ m, $AB = 50$ m, $BC = 70$ m and angle $ABC = 130°$.

(i) Calculate the angle of elevation of T from C.

Answer(a)(i) ..... [5]

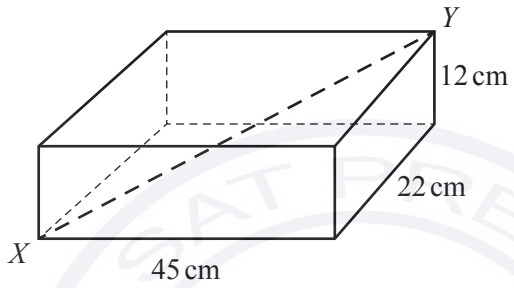
(ii) Calculate the length AC.

Answer(a)(ii) AC = ... m [4]

(iii) Calculate the area of triangle *ABC*.

Answer(a)(iii) ..... m^2 [2]

(b)



NOT TO SCALE

A cuboid has length 45 cm, width 22 cm and height 12 cm.

Calculate the length of the straight line *XY*.

Answer(b) XY = ... cm [4]

4 Ali buys x rose bushes and y lavender bushes.

He buys:
- at least 5 rose bushes
- at most 8 lavender bushes
- at most 15 bushes in total
- more lavender bushes than rose bushes.

(a) (i) Write down four inequalities, in terms of x and/or y, to show this information.

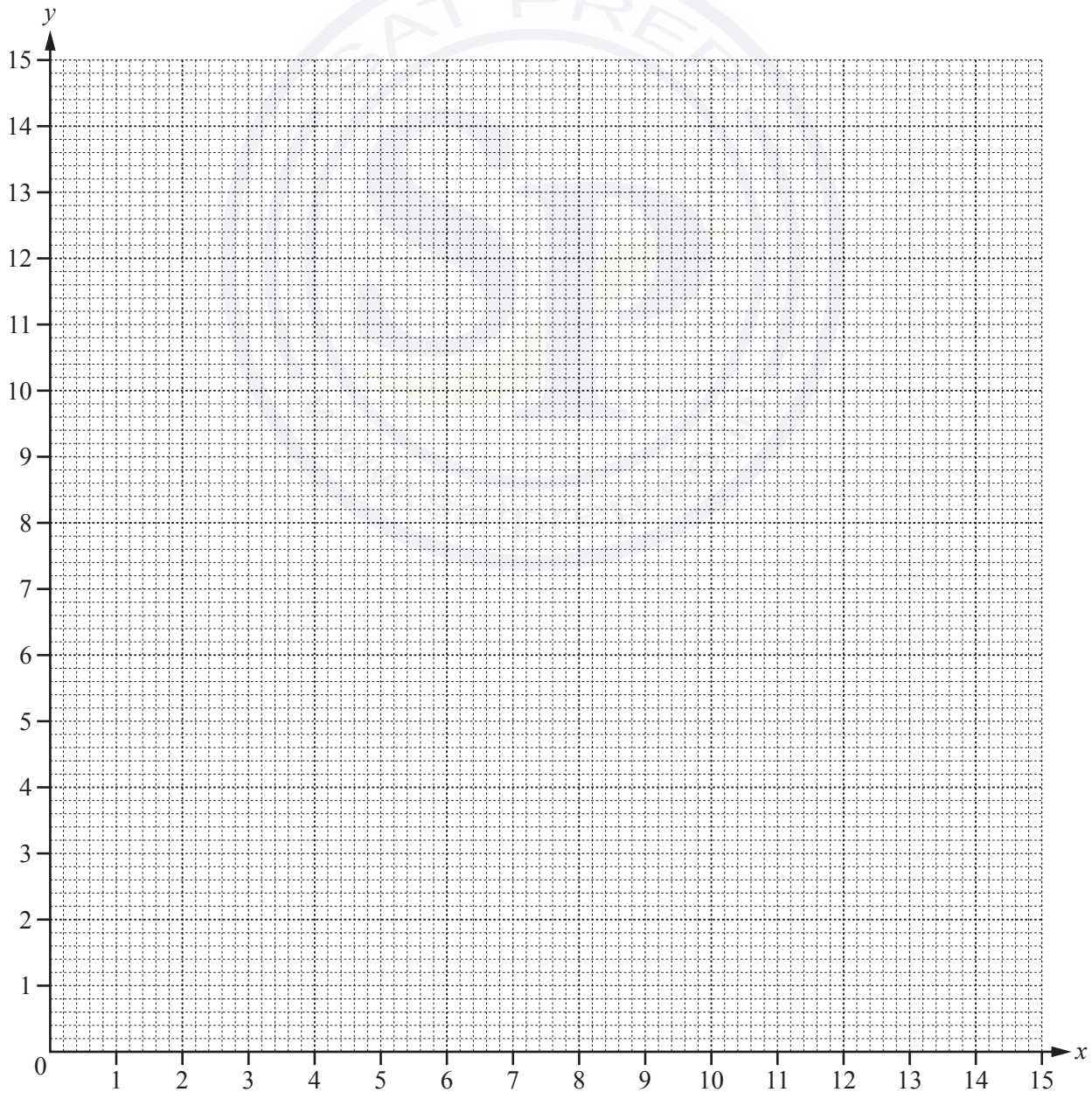
Answer(a)(i) .....

.....

.....

..... [4]

(ii) On the grid, show the information in **part (a)(i)** by drawing four straight lines. Label the region R where all four inequalities are true.



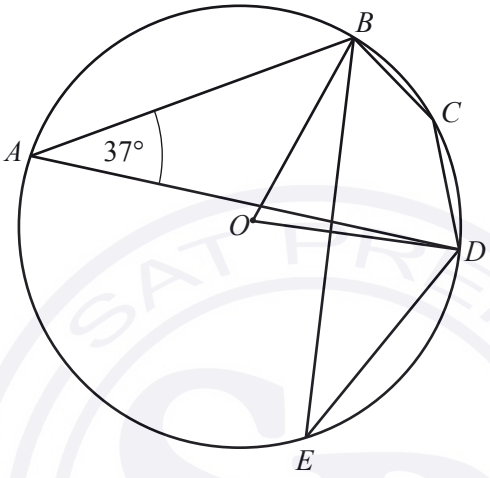
[5]

(b) Rose bushes cost \$6 each and lavender bushes cost \$4.50 each.

What is the greatest amount of money Ali could spend?

Answer(b) \$ ..... [2]

5



NOT TO SCALE

A, *B*, *C*, *D* and *E* are points on the circle, centre *O*.
Angle *BAD* = 37°.

Complete the following statements.

(a) Angle *BED* = ... because .....

..... [2]

(b) Angle *BOD* = ... because .....

..... [2]

(c) Angle *BCD* = ... because .....

..... [2]

---

6 120 students take a mathematics examination.

(a) The time taken, m minutes, for each student to answer question 1 is shown in this table.

Time (m minutes)	$0 < m \leqslant 1$	$1 < m \leqslant 2$	$2 < m \leqslant 3$	$3 < m \leqslant 4$	$4 < m \leqslant 5$	$5 < m \leqslant 6$
Frequency	72	21	9	11	5	2

Calculate an estimate of the mean time taken.

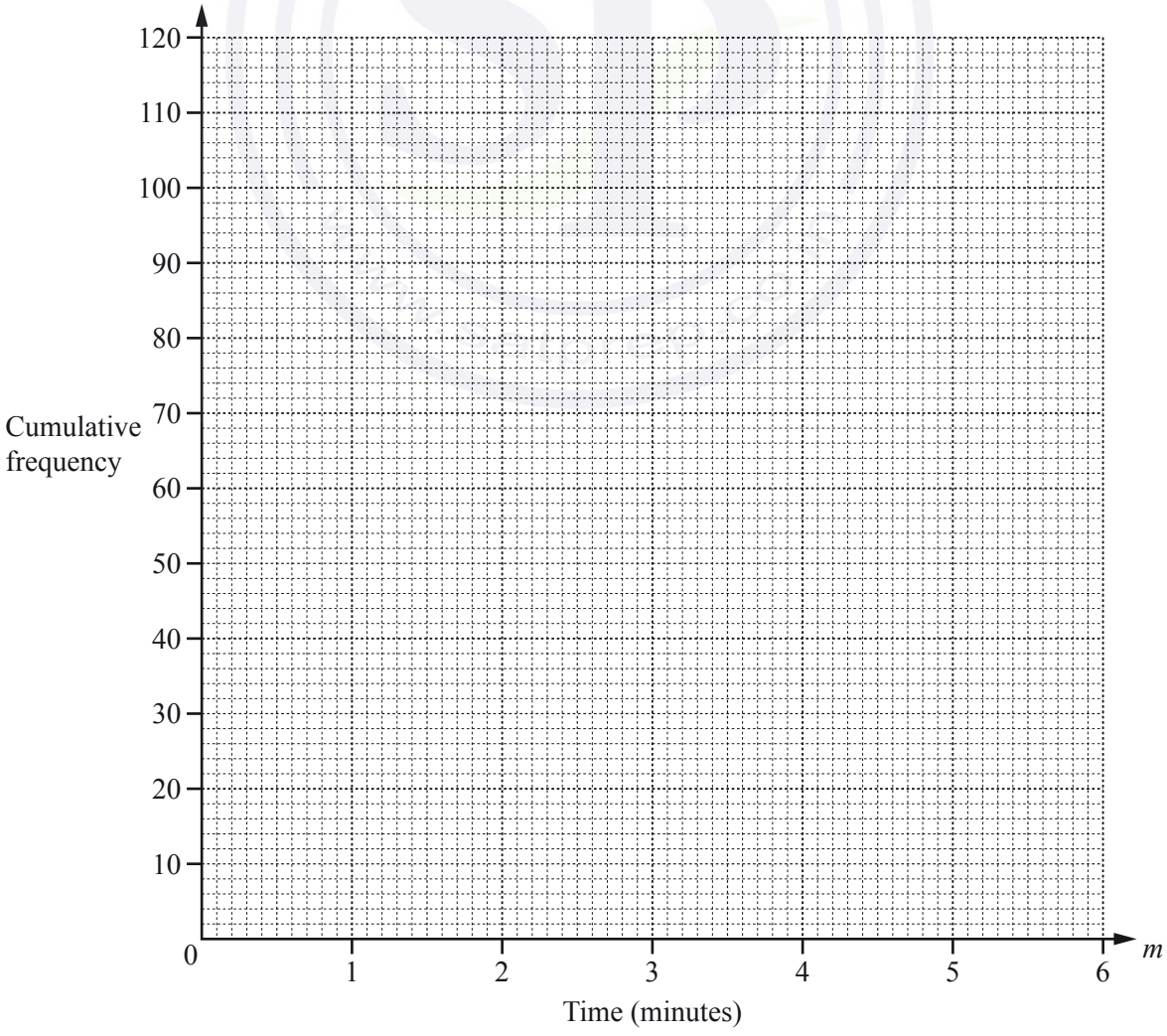
Answer(a) ..... min [4]

(b) **(i)** Using the table in **part (a)**, complete this cumulative frequency table.

Time (m minutes)	$m \leqslant 1$	$m \leqslant 2$	$m \leqslant 3$	$m \leqslant 4$	$m \leqslant 5$	$m \leqslant 6$
Cumulative frequency	72					120

[2]

(ii) Draw a cumulative frequency diagram to show the time taken.



[3]

(iii) Use your cumulative frequency diagram to find

(a) the median,

Answer(b)(iii)(a) ..... min [1]

(b) the inter-quartile range,

Answer(b)(iii)(b) ..... min [2]

(c) the 35th percentile.

Answer(b)(iii)(c) ..... min [2]

(c) A new frequency table is made from the table shown in **part (a)**.

Time (m minutes)	$0 < m \leqslant 1$	$1 < m \leqslant 3$	$3 < m \leqslant 6$
Frequency	72		

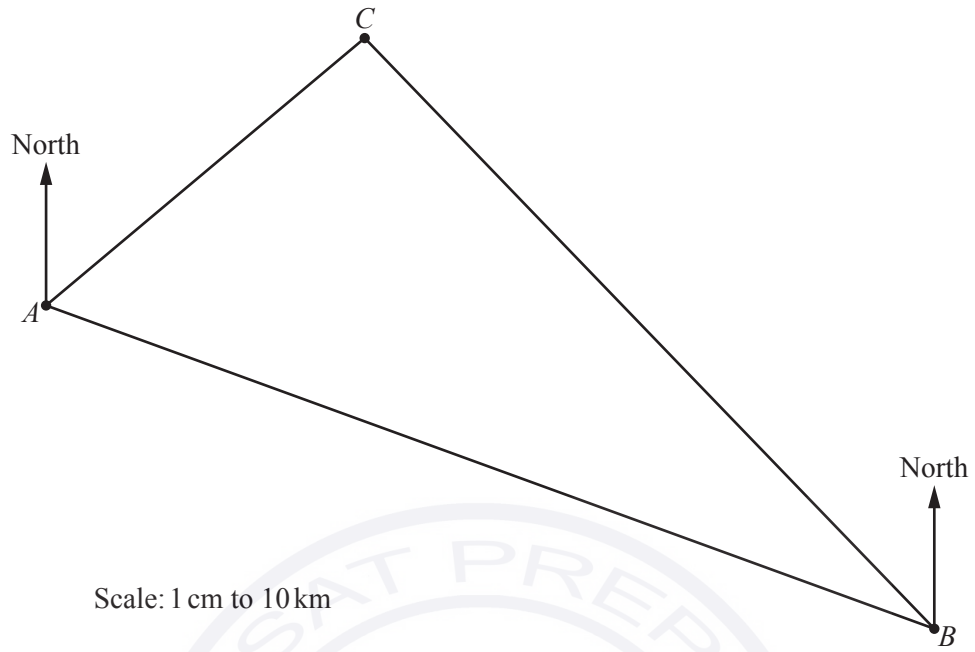
(i) Complete the table above. [2]

(ii) A histogram was drawn and the height of the first block representing the time $0 < m \leqslant 1$ was 3.6 cm.

Calculate the heights of the other two blocks.

Answer(c)(ii) ..... cm and ..... cm [3]

7 The scale drawing shows the positions of three towns A, B and C on a map.
The scale of the map is 1 centimetre represents 10 kilometres.



(a) Find the actual distance AB.

Answer(a) ..... km [1]

(b) Measure the bearing of A from B.

Answer(b) ..... [1]

(c) Write the scale 1 cm to 10 km in the form $1 : n$.

Answer(c) 1 : ..... [1]

(d) A national park lies **inside** the triangle ABC.
The four boundaries of the national park are

- equidistant from C and B
- equidistant from AC and CB
- 15 km from CB
- along AB.

On the scale drawing, shade the region which represents the national park.
Leave in your construction arcs. [7]

(e) On the scale drawing, a lake inside the national park has area 0.4 cm^2.

Calculate the actual area of the lake.

Answer(e) ..... km^2 [2]

8 **(a)** Factorise $x^2 - 3x - 10$.

Answer(a) ..... [2]

(b) **(i)** Show that $\frac{x+2}{x+1} + \frac{3}{x} = 3$ simplifies to $2x^2 - 2x - 3 = 0$.

Answer(b)(i)

[3]

(ii) Solve $2x^2 - 2x - 3 = 0$.
Give your answers correct to 3 decimal places.
Show all your working.

Answer(b)(ii) x = ... or x = ... [4]

(c) Simplify $\frac{2x+3}{x+2} - \frac{x}{x+1}$.

Answer(c) ..... [4]

9 The first three diagrams in a sequence are shown below.
The diagrams are made by drawing lines of length 1 cm.

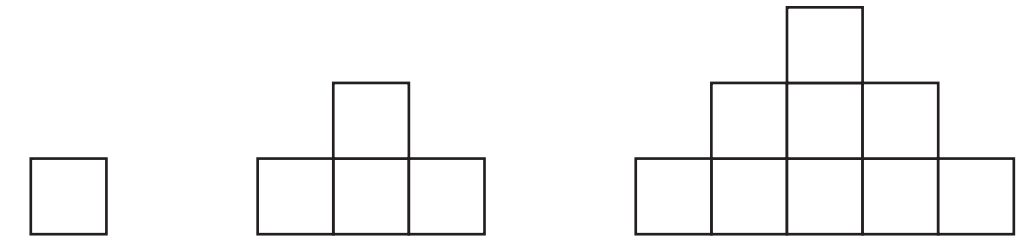


Diagram 1 Diagram 2 Diagram 3

(a) The areas of each of the first three diagrams are shown in this table.

Diagram	1	2	3
Area (cm^2)	1	4	9

(i) Find the area of Diagram 4.

Answer(a)(i) ..... cm^2 [1]

(ii) Find, in terms of n, the area of Diagram n.

Answer(a)(ii) ..... cm^2 [1]

(b) The numbers of 1 cm lines needed to draw each of the first three diagrams are shown in this table.

Diagram	1	2	3
Number of 1 cm lines	4	13	26

(i) Find the number of 1 cm lines needed to draw Diagram 4.

Answer(b)(i) ..... [1]

(ii) In which diagram are 118 lines of length 1 cm needed?

Answer(b)(ii) ..... [1]

(c) The **total** number of 1 cm lines needed to draw both Diagram 1 and Diagram 2 is 17.
The **total** number of 1 cm lines needed to draw all of the first n diagrams is

$$\frac{2}{3}n^3 + an^2 + bn.$$

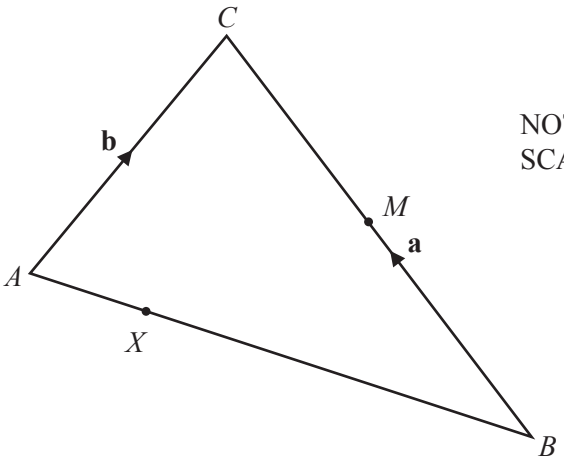
Find the value of a and the value of b.
Show all your working.

Answer(c) a = ...

b = ... [6]

Question 10 is printed on the next page.

10



NOT TO SCALE

$\overrightarrow{BC} = \mathbf{a}$ and $\overrightarrow{AC} = \mathbf{b}$.

(a) Find $\overrightarrow{AB}$ in terms of **a** and **b**.

Answer(a) $\overrightarrow{AB} =$ ..... [1]

(b) M is the midpoint of BC.
X divides AB in the ratio 1 : 4.

Find $\overrightarrow{XM}$ in terms of **a** and **b**.
Show all your working and write your answer in its simplest form.

Answer(b) $\overrightarrow{XM} =$ ..... [4]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2015**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

1 A film company uses 512 actors in a film.
The actors are in the ratio men : women : children = 7 : 11 : 14.

(a) **(i)** Show that there are 224 children in the film.

Answer(a)(i)

[2]

(ii) Find the number of men in the film.

Answer(a)(ii) ..... [1]

(b) Every working day, each child is given $1 to spend.
Each child works for 45 days.

Calculate the total amount that the film company gives the children to spend.
Give your answer correct to the nearest $100.

Answer(b) $..... [2]

(c) The children have lessons every day in groups of no more than 12.

Calculate the smallest possible number of groups.

Answer(c) ..... [2]

(d) The film costs four million and ninety three thousand dollars to make.

(i) Write this number in figures.

Answer(d)(i) ..... [1]

(ii) Write your answer to **part (d)(i)** in standard form.

Answer(d)(ii) ..... [1]

(e) A DVD copy of the film costs $2.75 to make.
The selling price is $8.20 .

Calculate the percentage profit.

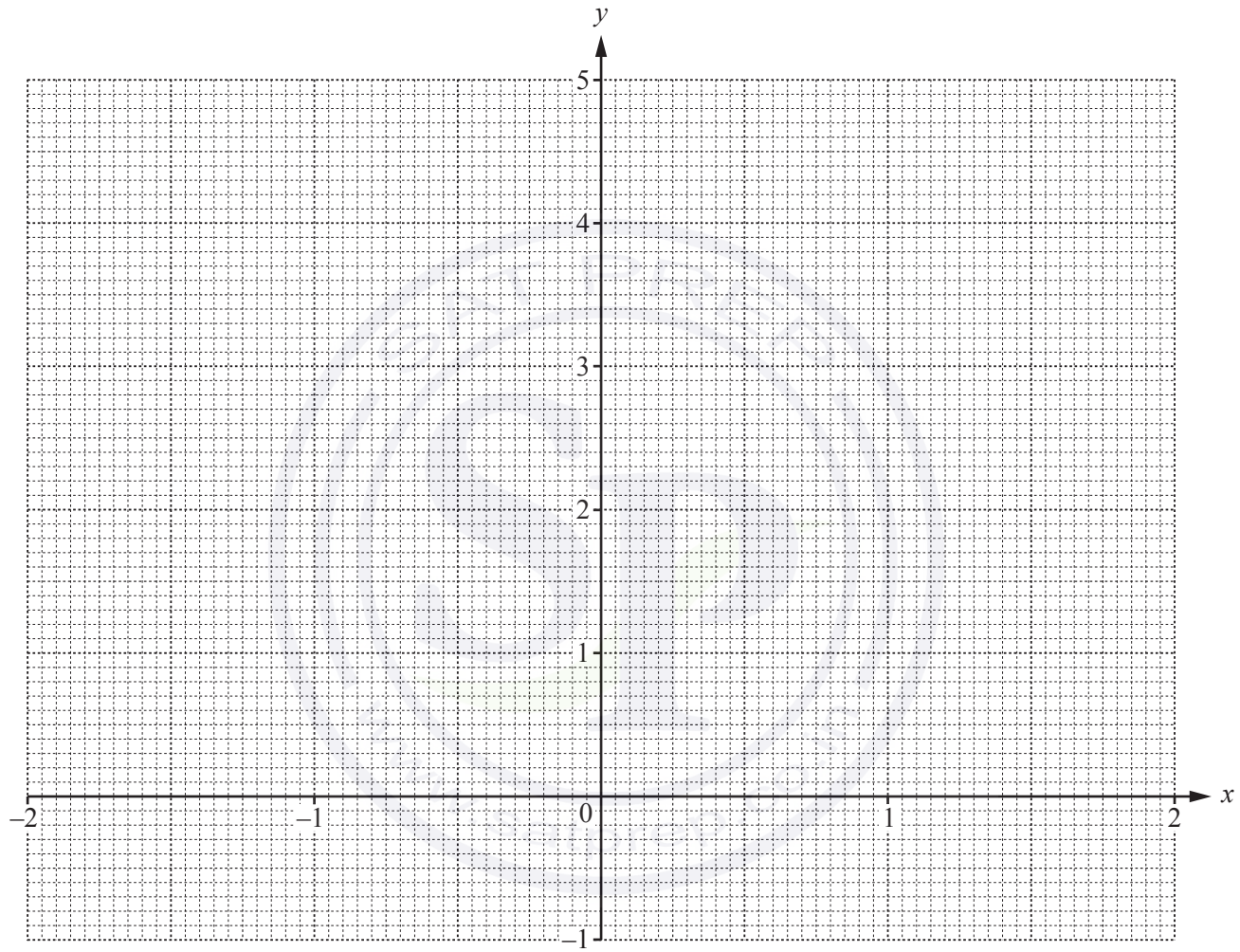
Answer(e) .....% [3]

2 The table shows some values for $y = x^3 - 3x + 2$.

x	–2	–1.5	–1	–0.5	0	0.5	1	1.5	2
y		3.125		3.375	2		0		4

(a) Complete the table of values. [4]

(b) On the grid, draw the graph of $y = x^3 - 3x + 2$ for $-2 \leqslant x \leqslant 2$.



[4]

(c) By drawing a suitable line, solve the equation $x^3 - 3x + 2 = x + 1$ for $-2 \leqslant x \leqslant 2$.

Answer(c) $x =$ ..... or $x =$ ..... [3]

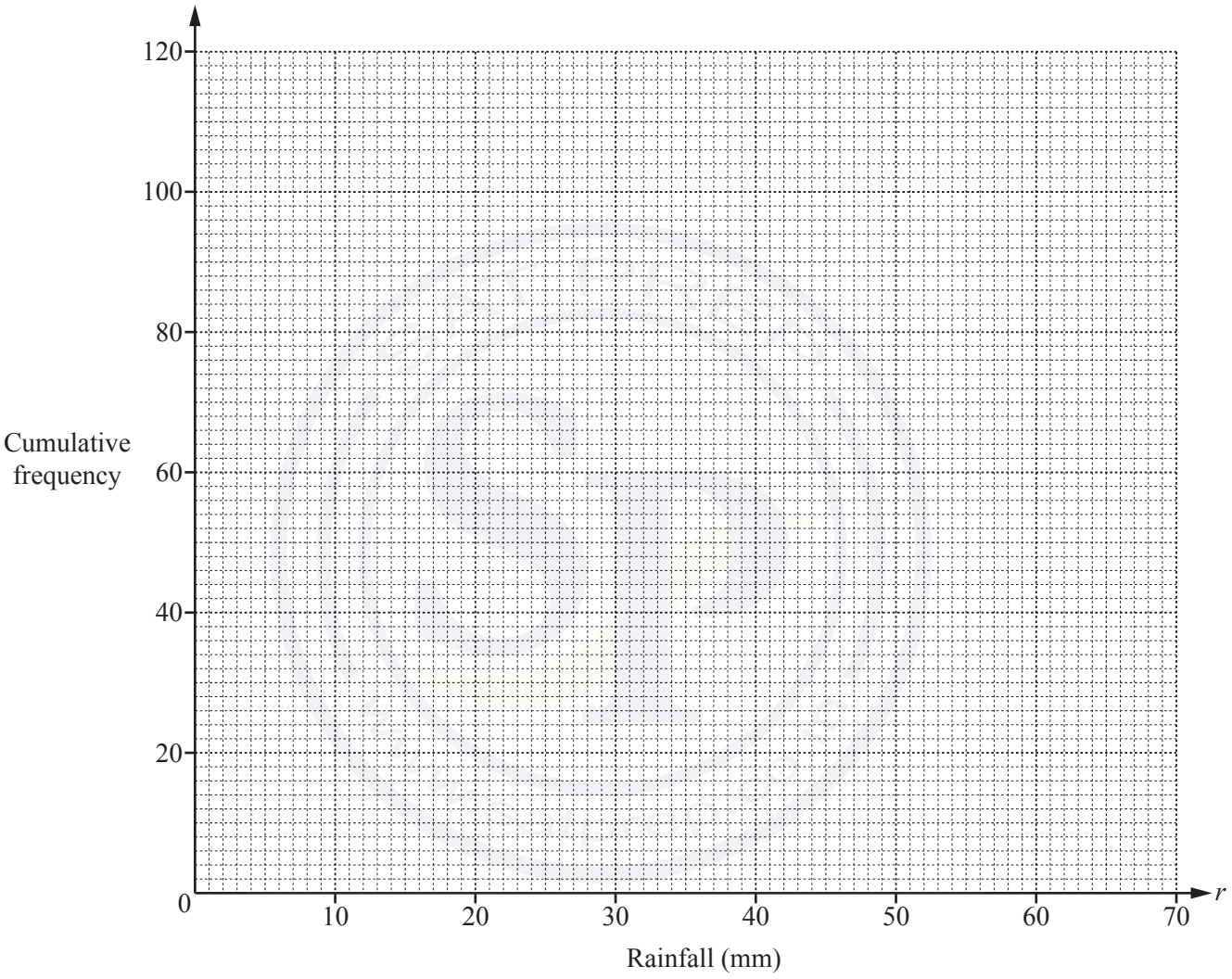
(d) By drawing a suitable tangent, find an estimate of the gradient of the curve at the point where $x = -1.5$.

Answer(d) ..... [3]

3 Leo measured the rainfall each day, in millimetres, for 120 days.
The cumulative frequency table shows the results.

Rainfall (r mm)	$r \leqslant 20$	$r \leqslant 25$	$r \leqslant 35$	$r \leqslant 40$	$r \leqslant 60$	$r \leqslant 70$
Cumulative frequency	5	13	72	90	117	120

(a) On the grid below, draw a cumulative frequency diagram to show these results.



[3]

(b) (i) Find the median.

Answer(b)(i) .....mm [1]

(ii) Use your diagram to find the number of days when the rainfall was more than 50 mm.

Answer(b)(ii) ..... [2]

(c) Use the information in the cumulative frequency table to complete the frequency table below.

Rainfall (r mm)	$0 < r \leqslant 20$	$20 < r \leqslant 25$	$25 < r \leqslant 35$	$35 < r \leqslant 40$	$40 < r \leqslant 60$	$60 < r \leqslant 70$
Frequency	5		59			3

[2]

(d) Use your frequency table to calculate an estimate of the mean.
You must show all your working.

Answer(d) .....mm [4]

(e) In a histogram drawn to show the information in the table in **part (c)**, the frequency density for the interval $25 < r \leqslant 35$ is 5.9 .

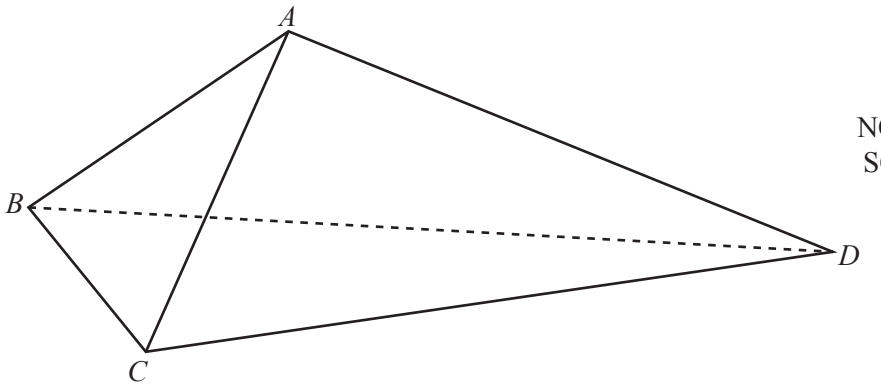
Calculate the frequency density for the intervals $20 < r \leqslant 25$, $40 < r \leqslant 60$ and $60 < r \leqslant 70$.

Answer(e) $20 < r \leqslant 25$ .....

$40 < r \leqslant 60$ .....

$60 < r \leqslant 70$ ..... [4]

4



NOT TO SCALE

The diagram shows a tent *ABCD*.
The front of the tent is an isosceles triangle *ABC*, with $AB = AC$.
The sides of the tent are congruent triangles *ABD* and *ACD*.

(a) $BC = 1.2$ m and angle $ABC = 68°$.

Find *AC*.

Answer(a) $AC =$ ..... m [3]

(b) $CD = 2.3$ m and $AD = 1.9$ m.

Find angle *ADC*.

Answer(b) Angle $ADC =$ ..... [4]

(c) The floor of the tent, triangle *BCD*, is also an isosceles triangle with *BD* = *CD*.

Calculate the area of the floor of the tent.

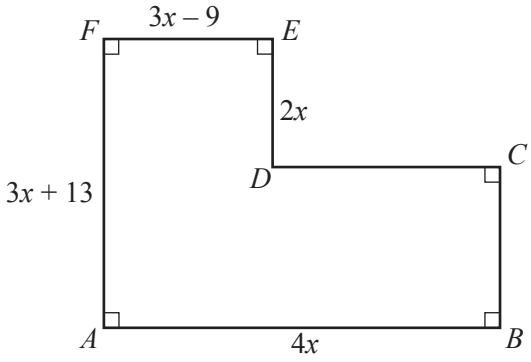
Answer(c) .....m^2 [4]

(d) When the tent is on horizontal ground, *A* is a vertical distance 1.25 m above the ground.

Calculate the angle between *AD* and the ground.

Answer(d) ..... [3]

5 **(a)** The area of shape *ABCDEF* is $24\,\text{cm}^2$.
All lengths are in centimetres.



NOT TO SCALE

(i) Show that $5x^2 + 17x - 12 = 0$.

Answer(a)(i)

[3]

(ii) Solve, by factorising, the equation $5x^2 + 17x - 12 = 0$.
You must show all your working.

Answer(a)(ii) x = ... or x = ... [3]

(b) Solve the simultaneous equations.
You must show all your working.

$$3x - 2y = 23$$
$$-4x - y = -5$$

Answer(b) $x =$ .....

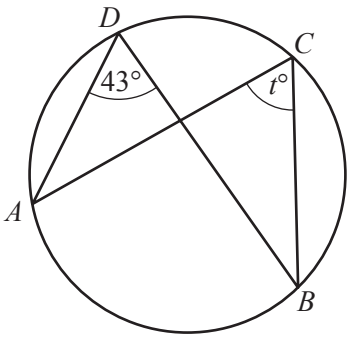
$y =$ ..... [3]

(c) Solve the equation.

$$\frac{2(t+3)}{t} - \frac{t}{t+3} = 1$$

Answer(c) $t =$ ..... [5]

6 (a) (i) *A*, *B*, *C* and *D* lie on the circumference of the circle.

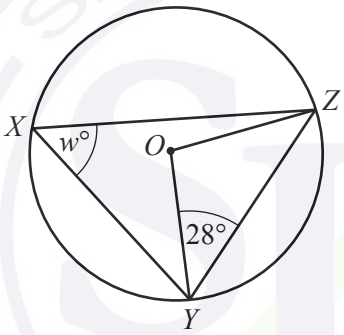


NOT TO SCALE

Find the value of *t*.

Answer(a)(i) *t* = ... [1]

(ii) *X*, *Y* and *Z* lie on the circumference of the circle, centre *O*.



NOT TO SCALE

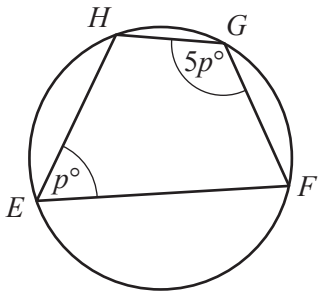
Find the value of *w*, giving reasons for your answer.

Answer(a)(ii) *w* = ... because .....

.....

..... [3]

(iii) E, F, G and H lie on the circumference of the circle.



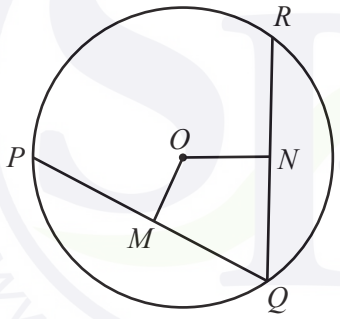
NOT TO SCALE

Find the value of p, giving a reason for your answer.

Answer(a)(iii) p = ... because .....

..... [3]

(b)



NOT TO SCALE

The diagram shows a circle, centre O.
PQ and QR are chords.
OM is the perpendicular from O to PQ.

(i) Complete the statement.

$PM : PQ$ = ... : ..... [1]

(ii) ON is the perpendicular from O to QR and $PQ = QR$.

Complete the statements to show that triangle OMQ is congruent to triangle ONQ.

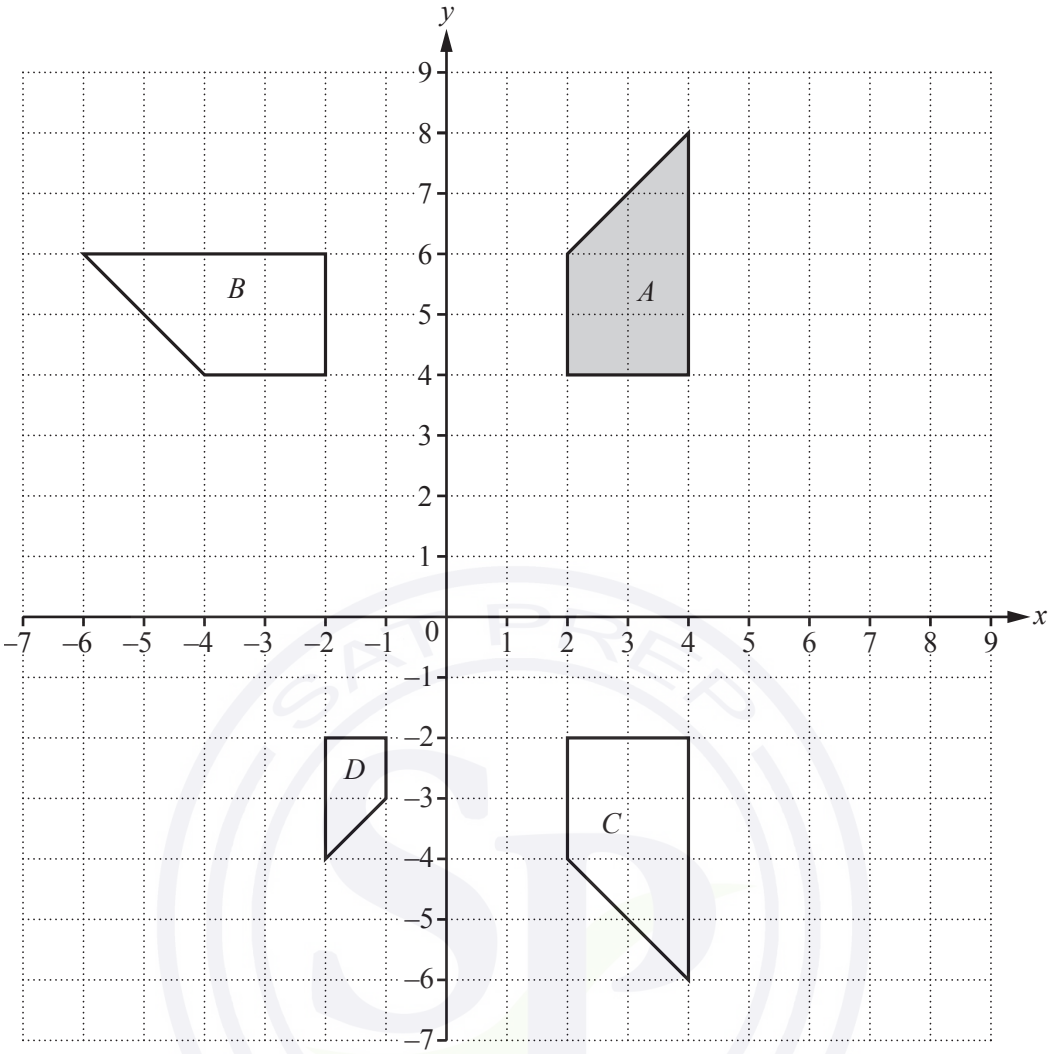
..... is a common side.

..... = ... because M is the midpoint of PQ and N is the midpoint of RQ.

..... = ... because equal chords are equidistant from .....

[4]

7



(a) Describe fully the **single** transformation that maps

(i) shape *A* onto shape *B*,

Answer(a)(i) .....

..... [3]

(ii) shape *A* onto shape *C*,

Answer(a)(ii) .....

..... [2]

(iii) shape *A* onto shape *D*.

Answer(a)(iii) .....

..... [3]

(b) Find the 2 × 2 matrix that represents the transformation in **part (a)(iii)**.

Answer(b) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(c) On the grid, draw the image of shape *A* after a translation by the vector $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$. [2]

(d) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$.

Answer(d) .....

..... [2]

8 A line AB joins the points A (3, 4) and B (5, 8).

(a) Write down the co-ordinates of the midpoint of the line AB.

Answer(a) (..... , ...) [2]

(b) Calculate the distance AB.

Answer(b) AB = ... [3]

(c) Find the equation of the line AB.

Answer(c) ..... [3]

(d) A line perpendicular to AB passes through the origin and through the point (6, r).

Find the value of r.

Answer(d) r = ... [3]

9 $f(x) = 2x + 5$ $g(x) = 2^x$ $h(x) = 7 - 3x$

(a) Find

(i) f(3),

Answer(a)(i) ..... [1]

(ii) gg(3).

Answer(a)(ii) ..... [2]

(b) Find $f^{-1}(x)$.

Answer(b) $f^{-1}(x) =$ ..... [2]

(c) Find fh(x), giving your answer in its simplest form.

Answer(c) ..... [2]

(d) Find the integer values of x which satisfy this inequality.

$$1 < f(x) \leqslant 9$$

Answer(d) ..... [3]

Question 10 is printed on the next page.

10 The table shows the first five terms of sequences A, B and C.

Sequence	1st term	2nd term	3rd term	4th term	5th term	6th term
A	3	4	5	6	7	
B	0	1	4	9	16	
C	–3	–3	–1	3	9	

(a) Complete the table for the 6th term of each sequence. [2]

(b) Write down the *n*th term of sequence A.

Answer(b) ..... [1]

(c) **(i)** Find the *n*th term of sequence B.

Answer(c)(i) ..... [2]

(ii) Find the value of *n* when the *n*th term of sequence B is 8281.

Answer(c)(ii) $n =$ ..... [2]

(d) **(i)** Find the *n*th term of sequence C in its simplest form.

Answer(d)(i) ..... [2]

(ii) Find the 8th term of sequence C.

Answer(d)(ii) ..... [1]

(e) The *n*th term of another sequence D is $\left(-\frac{1}{2}\right)^{n-1}$.

Complete the table for the first four terms of sequence D.

Sequence	1st term	2nd term	3rd term	4th term
D				

[3]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

3733324853

MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2015**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **20** printed pages.

1 **(a)** Kolyan buys water for \$2.60 .
He also buys biscuits.

(i) The ratio cost of biscuits : cost of water = 3 : 2.

Find the cost of the biscuits.

Answer(a)(i) \$..... [2]

(ii) Kolyan has \$9 to spend.

Work out the total amount Kolyan spends on water and biscuits as a fraction of the \$9.
Give your answer in its lowest terms.

Answer(a)(ii) ..... [2]

(iii) The \$9 is 62.5% less than the amount Kolyan had to spend last week.

Calculate the amount Kolyan had to spend last week.

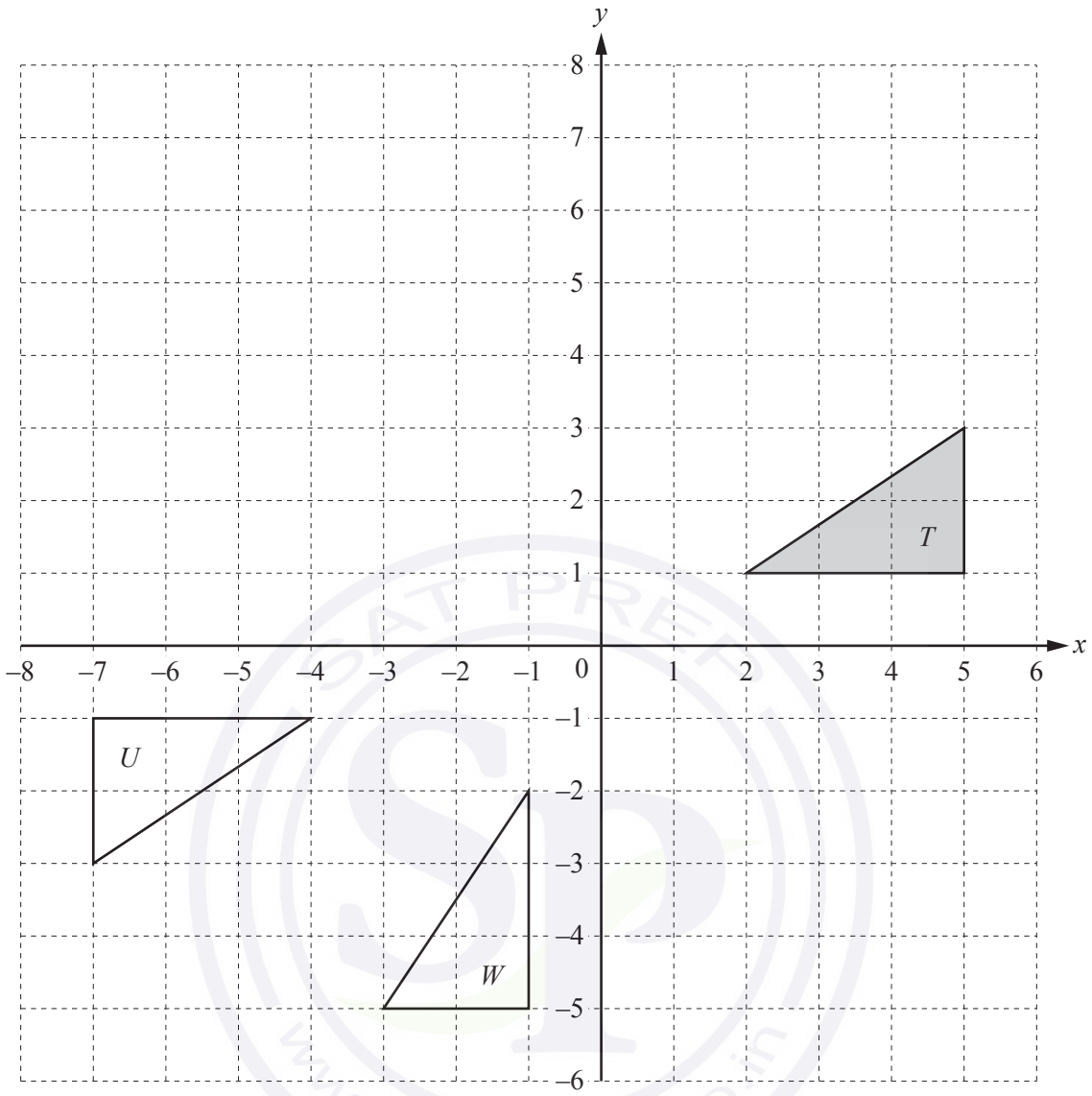
Answer(a)(iii) \$..... [3]

(b) Priya buys a bicycle for $250.
Each year the value of the bicycle decreases by 8% of its value at the beginning of that year.

Calculate the value of Priya's bicycle after 10 years.
Give your answer correct to the nearest dollar.

Answer(b) $..... [3]

2



(a) On the grid, draw the image of

(i) triangle T after a translation by the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$, [2]

(ii) triangle T after a reflection in the line $y = -1$. [2]

(b) Describe fully the **single** transformation that maps triangle T onto triangle U.

Answer(b) .....

..... [3]

(c) (i) Describe fully the **single** transformation that maps triangle T onto triangle W.

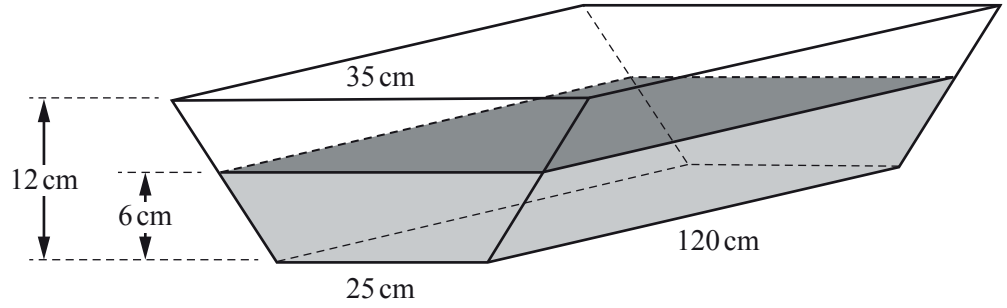
Answer(c)(i) .....

..... [2]

(ii) Find the 2×2 matrix that represents the transformation in **part (c)(i)**.

Answer(c)(ii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

3 The diagram shows a horizontal water trough in the shape of a prism.



NOT TO SCALE

The cross section of this prism is a trapezium.
The trapezium has parallel sides of lengths 35 cm and 25 cm and a perpendicular height of 12 cm.
The length of the prism is 120 cm.

(a) Calculate the volume of the trough.

Answer(a) ..... cm^3 [3]

(b) The trough contains water to a depth of 6 cm.

(i) Show that the volume of water is 19 800 cm^3.

Answer (b)(i)

[2]

(ii) Calculate the percentage of the trough that contains water.

Answer(b)(ii) ..... % [1]

(c) The water is drained from the trough at a rate of 12 litres per hour.

Calculate the time it takes to empty the trough.
Give your answer in hours and minutes.

Answer(c) ..... h ..... min [4]

(d) The water from the trough just fills a cylinder of radius r cm and height $3r$ cm.

Calculate the value of r.

Answer(d) r = ... [3]

(e) The cylinder has a mass of 1.2 kg.
1 cm^3 of water has a mass of 1 g.

Calculate the total mass of the cylinder and the water.
Give your answer in kilograms.

Answer(e) ..... kg [2]

[Turn over

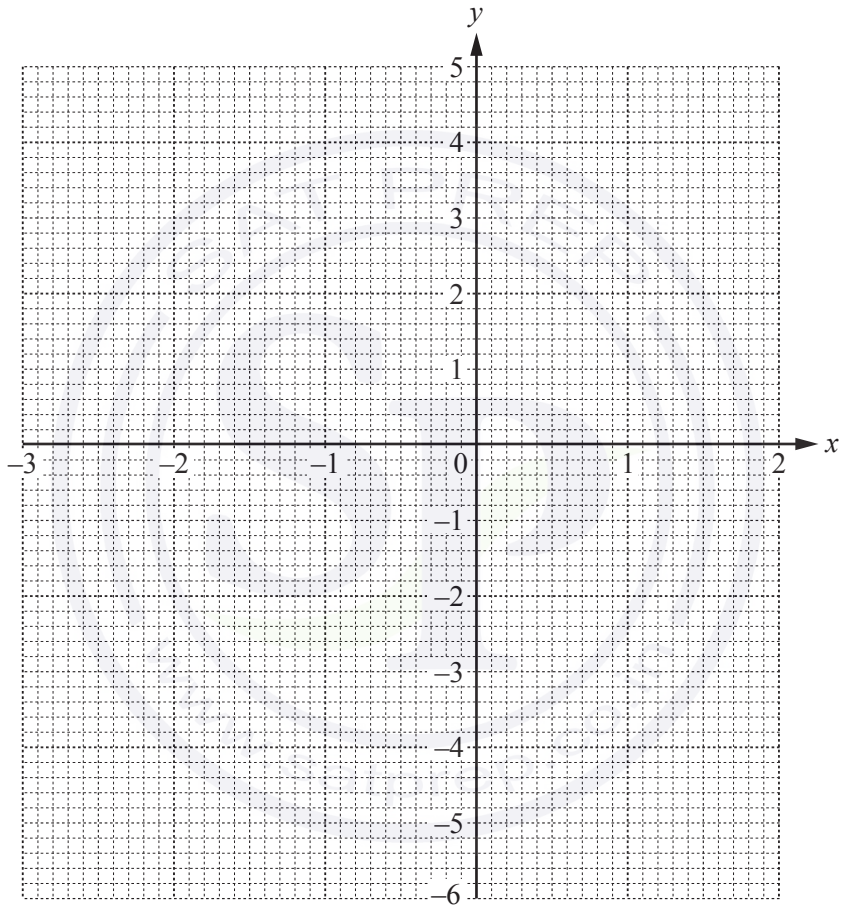
4 $f(x) = x - \frac{1}{2x^2}, \quad x \neq 0$

(a) Complete the table of values.

x	–3	–2	–1.5	–1	–0.5	–0.3		0.3	0.5	1	1.5	2
$f(x)$	–3.1	–2.1	–1.7		–2.5	–5.9		–5.3	–1.5		1.3	1.9

[2]

(b) On the grid, draw the graph of $y = f(x)$ for $-3 \leqslant x \leqslant -0.3$ and $0.3 \leqslant x \leqslant 2$.



[5]

(c) Use your graph to solve the equation $f(x) = 1$.

Answer(c) $x =$ ..... [1]

(d) There is only one negative integer value, k, for which $f(x) = k$ has only one solution for all real x.

Write down this value of k.

Answer(d) k = ... [1]

(e) The equation $2x - \frac{1}{2x^2} - 2 = 0$ can be solved using the graph of $y = f(x)$ and a straight line graph.

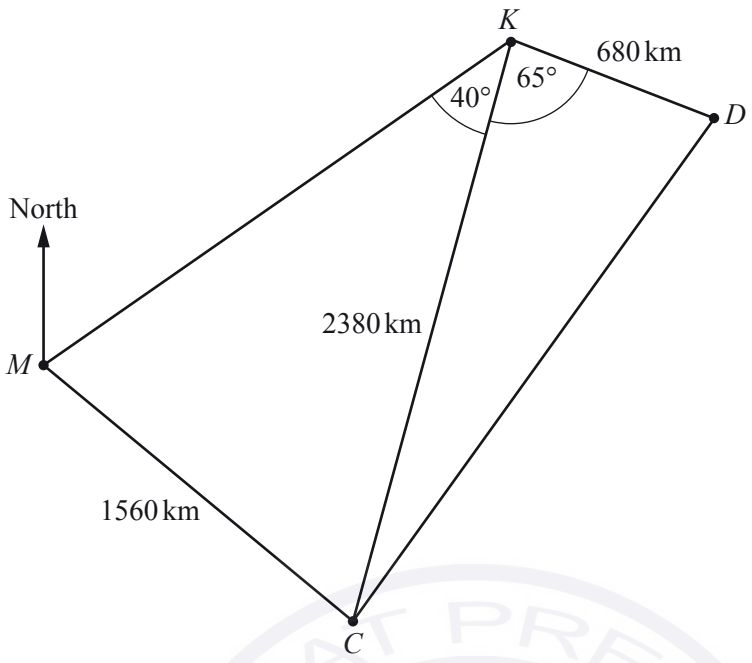
(i) Find the equation of this straight line.

Answer(e)(i) y = ... [1]

(ii) On the grid, draw this straight line and solve the equation $2x - \frac{1}{2x^2} - 2 = 0$.

Answer(e)(ii) x = ... [3]

5



NOT TO SCALE

The diagram shows some distances between Mumbai (*M*), Kathmandu (*K*), Dhaka (*D*) and Colombo (*C*).

(a) Angle *CKD* = 65°.

Use the cosine rule to calculate the distance *CD*.

Answer(a) CD = ... km [4]

(b) Angle $MKC = 40°$.

Use the sine rule to calculate the acute angle KMC.

Answer(b) Angle KMC = ... [3]

(c) The bearing of K from M is 050°.

Find the bearing of M from C.

Answer(c) ..... [2]

(d) A plane from Colombo to Mumbai leaves at 21 15 and the journey takes 2 hours 24 minutes.

(i) Find the time the plane arrives at Mumbai.

Answer(d)(i) ..... [1]

(ii) Calculate the average speed of the plane.

Answer(d)(ii) ..... km/h [2]

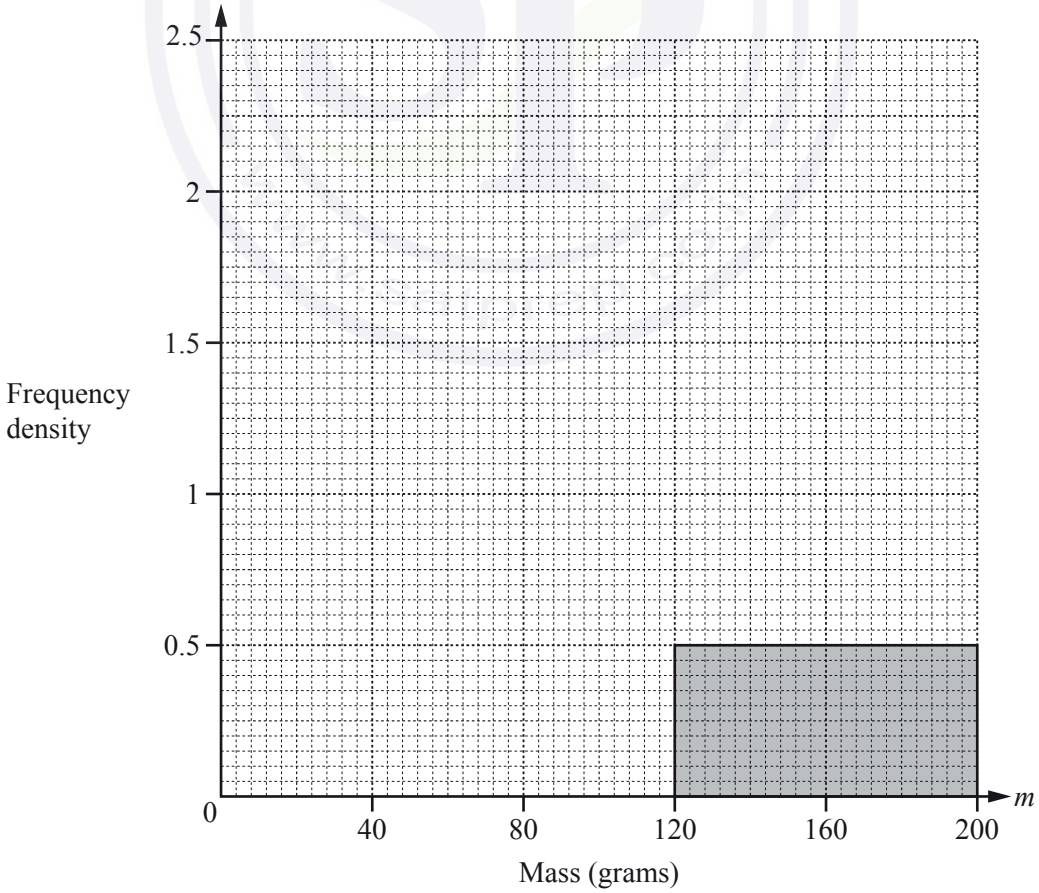
6 The table shows information about the masses, m grams, of 160 apples.

Mass (m grams)	$30 < m \leqslant 80$	$80 < m \leqslant 100$	$100 < m \leqslant 120$	$120 < m \leqslant 200$
Frequency	50	30	40	40

(a) Calculate an estimate of the mean.

Answer(a) ..... g [4]

(b) On the grid, complete the histogram to show the information in the frequency table.



[3]

(c) An apple is chosen at random from the 160 apples.

Find the probability that its mass is more than 120 g.

Answer(c) ..... [1]

(d) Two apples are chosen at random from the 160 apples, without replacement.

Find the probability that

(i) they both have a mass of more than 120 g,

Answer(d)(i) ..... [2]

(ii) one has a mass of more than 120 g and one has a mass of 80 g or less.

Answer(d)(ii) ..... [3]

7 **(a)** The cost of a loaf of bread is x cents.
The cost of a cake is $(x - 5)$ cents.
The total cost of 6 loaves of bread and 11 cakes is \$13.56 .

Find the value of x.

Answer(a) $x =$ ..... [4]

(b)

NOT TO SCALE

The area of the rectangle and the area of the triangle are equal.

Find the value of y.

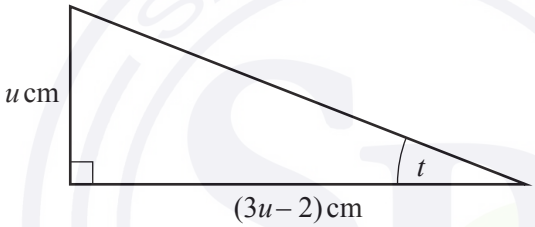
Answer(b) $y =$ ..... [4]

(c) The cost of a bottle of water is $(w - 1)$ cents.
The cost of a bottle of milk is $(2w - 11)$ cents.
A certain number of bottles of water costs \$4.80 .
The same number of bottles of milk costs \$7.80 .

Find the value of w.

Answer(c) $w =$ ..... [4]

(d)



NOT TO SCALE

The area of the triangle is $2.5\,\text{cm}^2$.

(i) Show that $3u^2 - 2u - 5 = 0$.

Answer(d)(i)

[2]

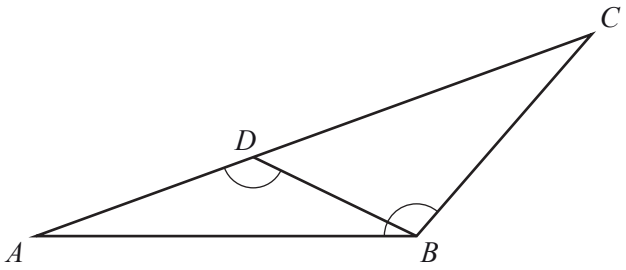
(ii) Factorise $3u^2 - 2u - 5$.

Answer(d)(ii) ..... [2]

(iii) Find the size of angle t.

Answer(d)(iii) $t =$ ..... [3]

8 (a)



NOT TO SCALE

In the diagram, D is on AC so that angle ADB = angle ABC.

(i) Show that angle ABD is equal to angle ACB.

Answer(a)(i)

[2]

(ii) Complete the statement.

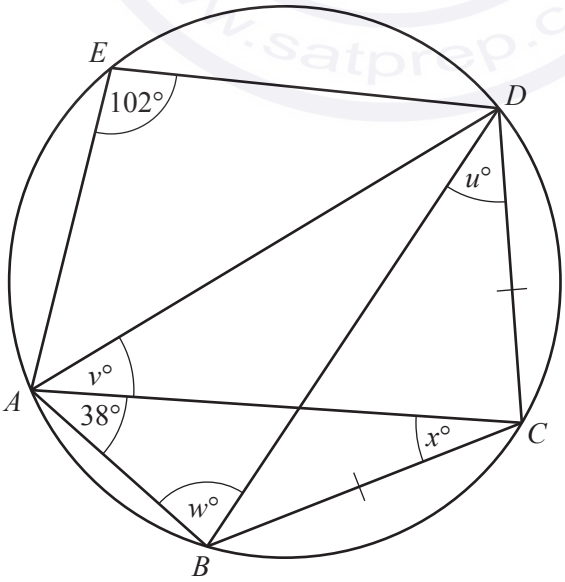
Triangles ABD and ACB are ..... . [1]

(iii) $AB = 12$ cm, $BC = 11$ cm and $AC = 16$ cm.

Calculate the length of BD.

Answer(a)(iii) BD = ... cm [2]

(b)



NOT TO SCALE

A, B, C, D and E lie on the circle.
Angle $AED = 102°$ and angle $BAC = 38°$.
$BC = CD$.

Find the value of

(i) u,

Answer(b)(i) u = ... [1]

(ii) v,

Answer(b)(ii) v = ... [1]

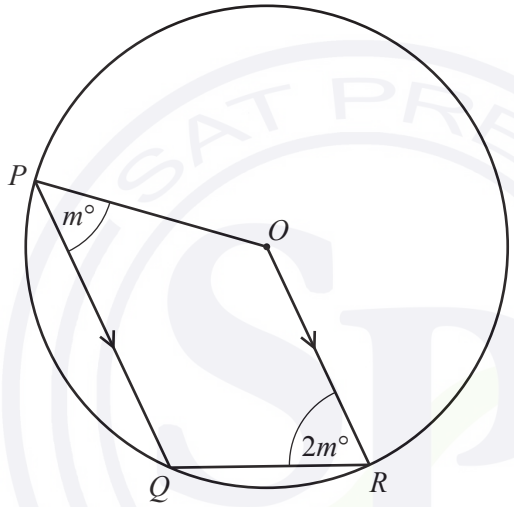
(iii) w,

Answer(b)(iii) w = ... [1]

(iv) x.

Answer(b)(iv) x = ... [1]

(c)



NOT TO SCALE

In the diagram, P, Q and R lie on the circle, centre O.
PQ is parallel to OR.
Angle $QPO = m°$ and angle $QRO = 2m°$.

Find the value of m.

Answer(c) m = ... [5]

9 $f(x) = 2x - 1$ $g(x) = \frac{1}{x}, \quad x \neq 0$ $h(x) = 2^x$

(a) Find h(3).

Answer(a) ..... [1]

(b) Find fg(0.5).

Answer(b) ..... [2]

(c) Find $f^{-1}(x)$.

Answer(c) $f^{-1}(x) =$ ..... [2]

(d) Find ff(x), giving your answer in its simplest form.

Answer(d) ..... [2]

(e) Find $(f(x))^2 + 6$, giving your answer in its simplest form.

Answer(e) ..... [2]

(f) Simplify $hh^{-1}(x)$.

Answer(f) ..... [1]

(g) Which of the following statements is true?

$f^{-1}(x) = f(x)$
$g^{-1}(x) = g(x)$
$h^{-1}(x) = h(x)$

Answer(g) ..... [1]

(h) Use two of the functions $f(x)$, $g(x)$ and $h(x)$ to find the composite function which is equal to $2^{x+1} - 1$.

Answer(h) ..... [1]

Question 10 is printed on the next page.

10 Complete the table for each sequence.

Sequence	1st term	2nd term	3rd term	4th term	5th term	6th term		*n*th term
A	15	8	1	–6				
B	$\frac{5}{18}$	$\frac{6}{19}$	$\frac{7}{20}$	$\frac{8}{21}$				
C	2	5	10	17				
D	2	6	18	54				

[11]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2015**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Geometrical instruments
Tracing paper (optional).

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **20** printed pages.

CAMBRIDGE International Examinations

1 12 000 vehicles drive through a road toll on one day.
The ratio cars : trucks : motorcycles = 13 : 8 : 3.

(a) (i) Show that 6500 cars drive through the road toll on that day.

Answer(a)(i)

[1]

(ii) Calculate the number of trucks that drive through the road toll on that day.

Answer(a)(ii) ..... [1]

(b) The toll charges in 2014 are shown in the table.

Vehicle	Charge
Cars	$2
Trucks	$5
Motorcycles	$1

Show that the total amount paid in tolls on that day is $34 500.

Answer(b)

[2]

(c) This total amount is a decrease of 8% on the total amount paid on the same day in 2013.

Calculate the total amount paid on that day in 2013.

Answer(c) $..... [3]

(d) 2750 of the 6500 car drivers pay their toll using a credit card.

Write down, in its simplest terms, the fraction of car drivers who pay using a credit card.

Answer(d) ..... [2]

(e) To the nearest thousand, 90 000 cars drive through the road toll in one week.

Write down the lower bound for this number of cars.

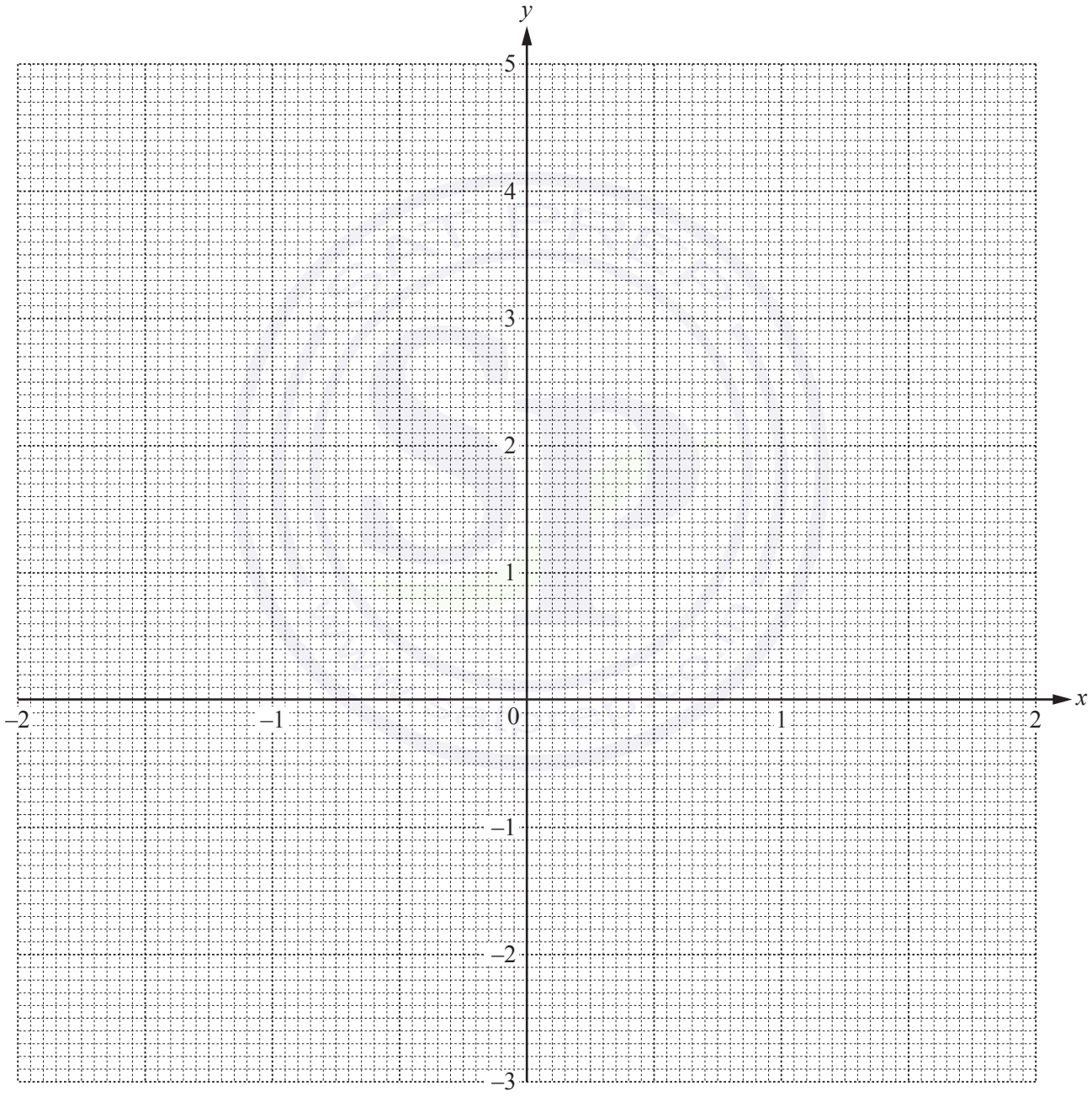
Answer(e) ..... [1]

2 The table shows some values for $y = x^2 - \frac{1}{2x}$, $x \neq 0$.

x	–2	–1.5	–1	–0.5	–0.25	–0.2	0.2	0.25	0.5	1	1.5	2
y	4.25	2.58			2.06	2.54	–2.46	–1.94			1.92	3.75

(a) Complete the table of values. [4]

(b) On the grid, draw the graph of $y = x^2 - \frac{1}{2x}$ for $-2 \leqslant x \leqslant -0.2$ and $0.2 \leqslant x \leqslant 2$.



[5]

(c) By drawing a suitable line, use your graph to solve the equation $x^2 - \frac{1}{2x} = 2$.

Answer(c) $x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(d) The equation $x^2 - \frac{1}{2x} = k$ has only one solution.

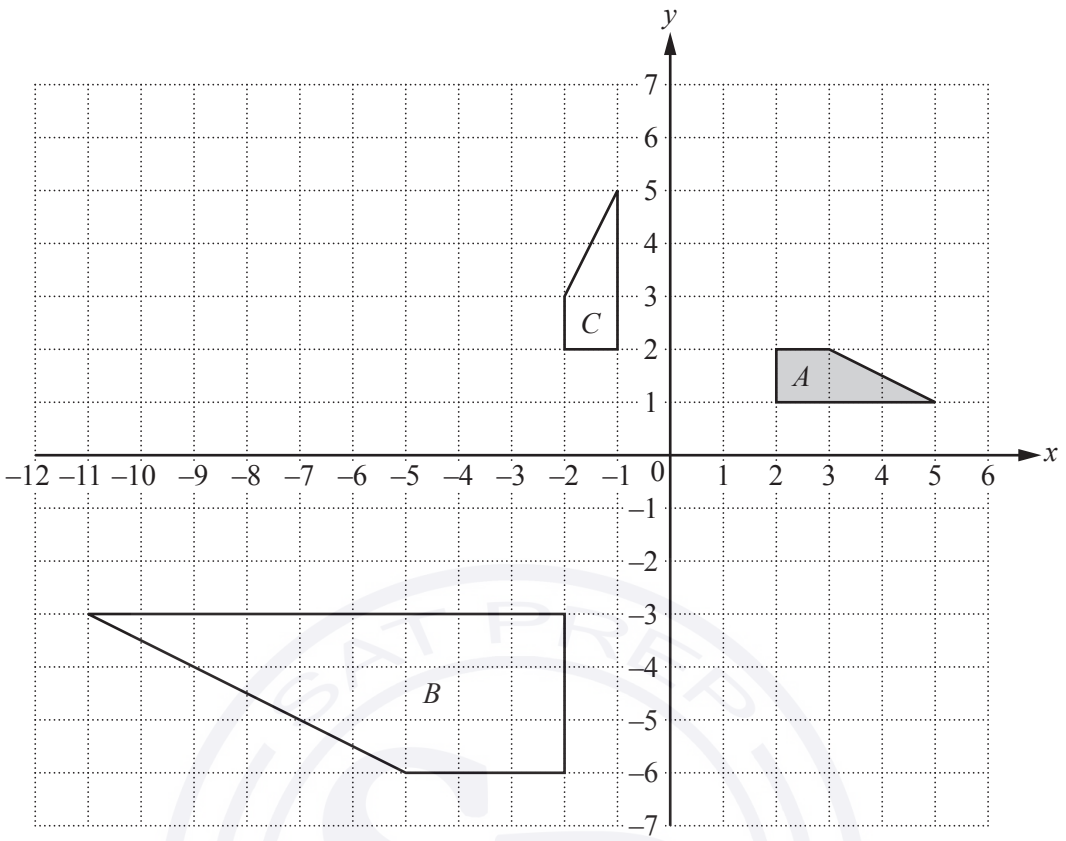
Write down the range of values of k for which this is possible.

Answer(d) ..... [2]

(e) By drawing a suitable tangent, find an estimate of the gradient of the curve at the point where $x = -1$.

Answer(e) ..... [3]

3



(a) Draw the image of

(i) shape A after a translation by $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$, [2]

(ii) shape A after a rotation through 180° about the point (0, 0), [2]

(iii) shape A after the transformation represented by the matrix $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$. [3]

(b) Describe fully the **single** transformation that maps shape A onto shape B.

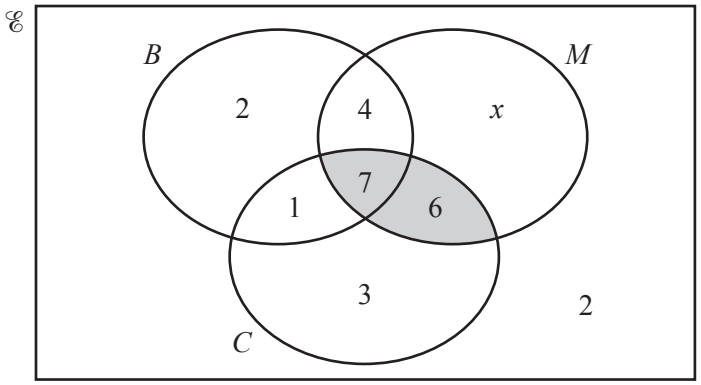
Answer(b) .....

..... [3]

(c) Find the matrix which represents the transformation that maps shape A onto shape C.

Answer(c) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

4 30 students were asked if they had a bicycle (B), a mobile phone (M) and a computer (C).
The results are shown in the Venn diagram.



(a) Work out the value of x.

Answer(a) $x =$ ..... [1]

(b) Use set notation to describe the shaded region in the Venn diagram.

Answer(b) ..... [1]

(c) Find $n(C \cap (M \cup B)')$.

Answer(c) ..... [1]

(d) A student is chosen at random.

(i) Write down the probability that the student is a member of the set M'.

Answer(d)(i) ..... [1]

(ii) Write down the probability that the student has a bicycle.

Answer(d)(ii) ..... [1]

(e) Two students are chosen at random from the students who have computers.

Find the probability that each of these students has a mobile phone but no bicycle.

Answer(e) ..... [3]

5 **(a)** Andrei stands on level horizontal ground, 294 m from the foot of a vertical tower which is 55 m high.

(i) Calculate the angle of elevation of the top of the tower.

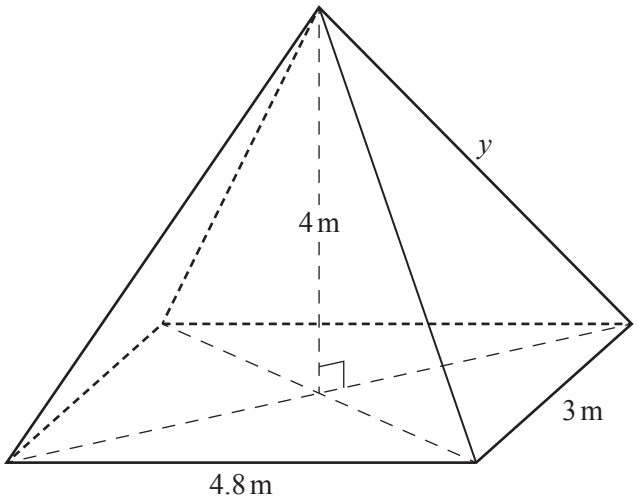
Answer(a)(i) ..... [2]

(ii) Andrei walks a distance x metres directly towards the tower.
The angle of elevation of the top of the tower is now 24.8°.

Calculate the value of x.

Answer(a)(ii) x = ... [4]

(b) The diagram shows a pyramid with a horizontal rectangular base.



NOT TO SCALE

The rectangular base has length 4.8 m and width 3 m and the height of the pyramid is 4 m.

Calculate

(i) y, the length of a sloping edge of the pyramid,

Answer(b)(i) y = ... m [4]

(ii) the angle between a sloping edge and the rectangular base of the pyramid.

Answer(b)(ii) ..... [2]

6 The table shows the time, t minutes, that 400 people take to complete a test.

Time taken (t mins)	$0 < t \leqslant 10$	$10 < t \leqslant 24$	$24 < t \leqslant 30$	$30 < t \leqslant 40$	$40 < t \leqslant 60$	$60 < t \leqslant 70$
Frequency	10	90	135	85	70	10

(a) (i) Write down the modal time interval.

Answer(a)(i) ..... min [1]

(ii) Calculate an estimate of the mean time taken to complete the test.

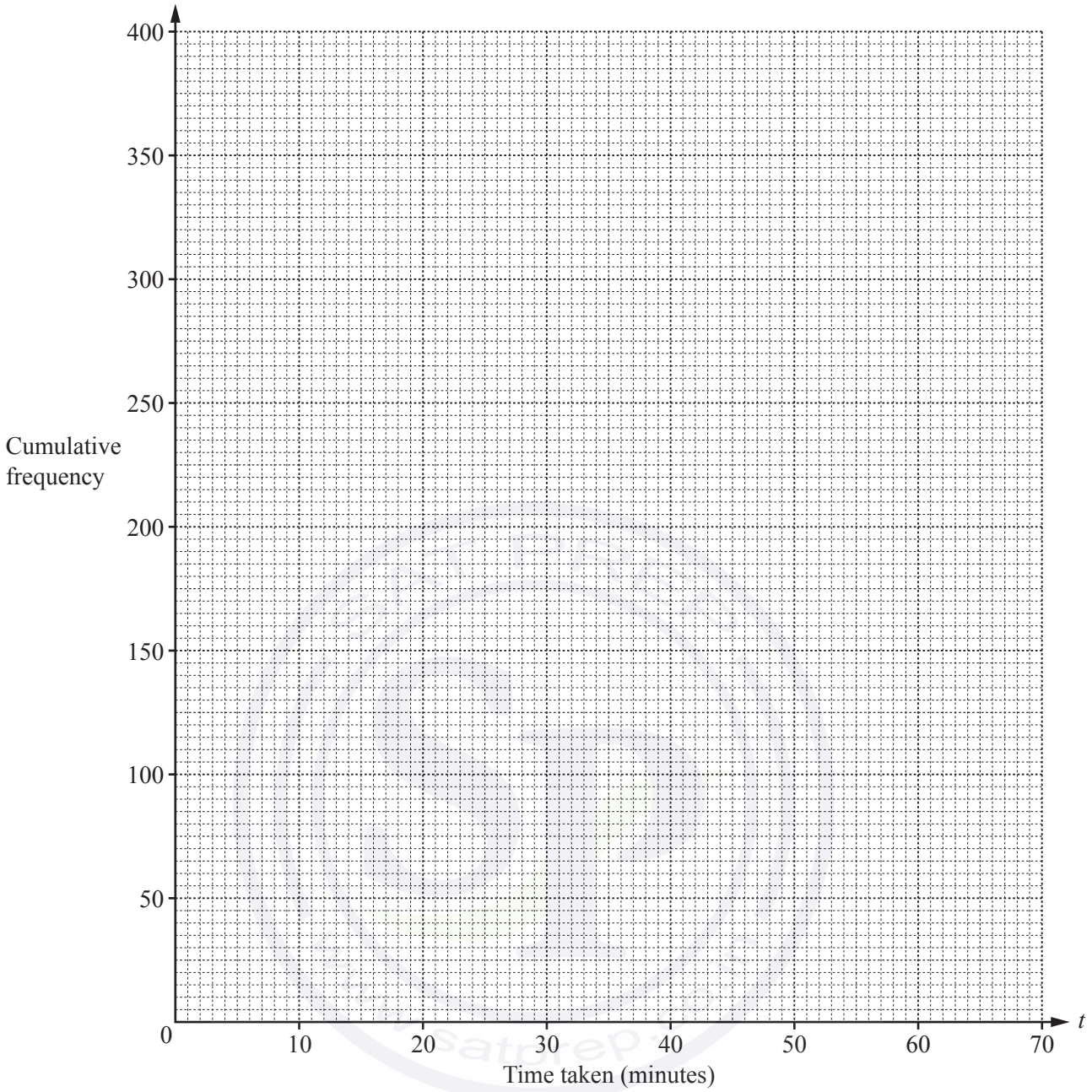
Answer(a)(ii) ..... min [4]

(b) (i) Complete the table of cumulative frequencies.

Time taken (t mins)	$t \leqslant 10$	$t \leqslant 24$	$t \leqslant 30$	$t \leqslant 40$	$t \leqslant 60$	$t \leqslant 70$
Cumulative frequency	10	100				400

[2]

(ii) On the grid opposite, draw a cumulative frequency diagram to show this information.



[3]

(c) Use your graph to estimate

(i) the median time,

Answer(c)(i) ..... min [1]

(ii) the inter-quartile range,

Answer(c)(ii) ..... min [2]

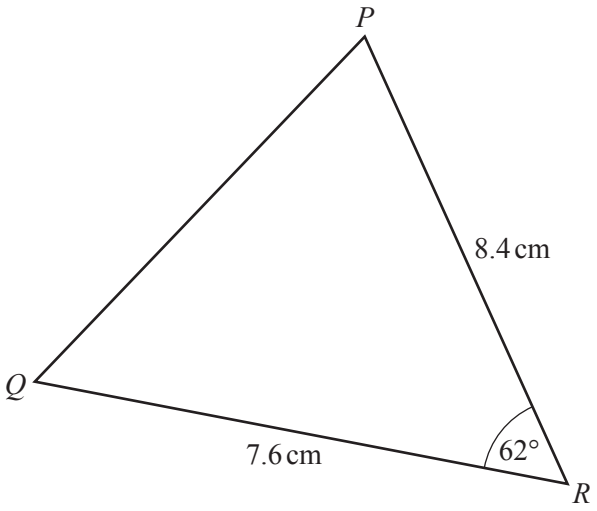
(iii) the 15th percentile,

Answer(c)(iii) ..... min [2]

(iv) the number of people who took more than 50 minutes.

Answer(c)(iv) ..... [2]

7 (a)



NOT TO SCALE

In the triangle PQR, $QR = 7.6$ cm and $PR = 8.4$ cm.
Angle $QRP = 62°$.

Calculate

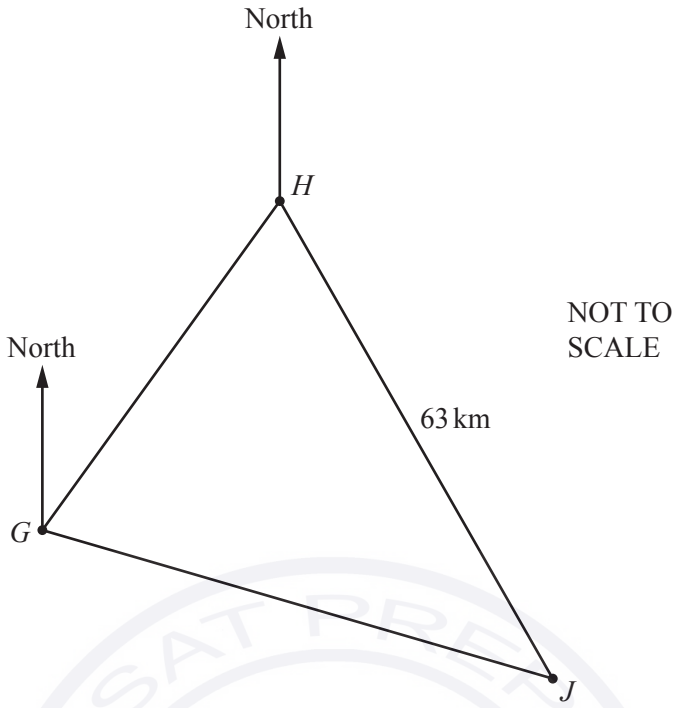
(i) PQ,

Answer(a)(i) $PQ =$ ..... cm [4]

(ii) the area of triangle PQR.

Answer(a)(ii) ..... cm^2 [2]

(b)



The diagram shows the positions of three small islands G, H and J.
The bearing of H from G is 045°.
The bearing of J from G is 126°.
The bearing of J from H is 164°.
The distance HJ is 63 km.

Calculate the distance GJ.

Answer(b) GJ = ... km [5]

8 **(a)** Jamil, Kiera and Luther collect badges.
Jamil has x badges.
Kiera has 12 badges more than Jamil.
Luther has 3 times as many badges as Kiera.
Altogether they have 123 badges.

Form an equation and solve it to find the value of x.

Answer(a) $x =$ ..... [3]

(b) Find the integer values of t which satisfy the inequalities.

$$4t + 7 < 39 \leqslant 7t + 2$$

Answer(b) ..... [3]

(c) Solve the following equations.

(i) $\dfrac{21 - x}{x + 3} = 4$

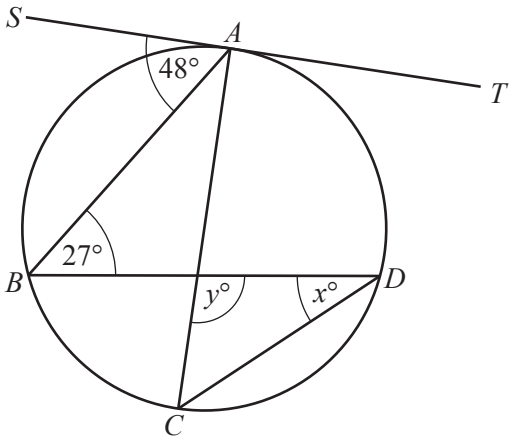
Answer(c)(i) $x =$ ..... [3]

(ii) $3x^2 + 7x - 5 = 0$

Show all your working and give your answers correct to 2 decimal places.

Answer(c)(ii) x = ... or x = ... [4]

9 **(a)** The points A, B, C and D lie on a circle.
AC is a diameter of the circle.
ST is the tangent to the circle at A.



NOT TO SCALE

Find the value of

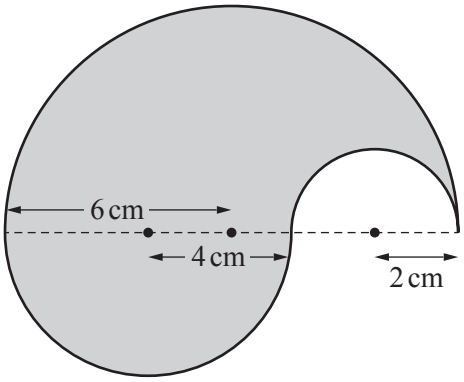
(i) x,

Answer(a)(i) x = ... [2]

(ii) y.

Answer(a)(ii) y = ... [2]

(b) The diagram shows a shaded shape formed by three semi-circular arcs.
The radius of each semi-circle is shown in the diagram.



NOT TO SCALE

(i) Calculate the perimeter of the shaded shape.

Answer(b)(i) ..... cm [2]

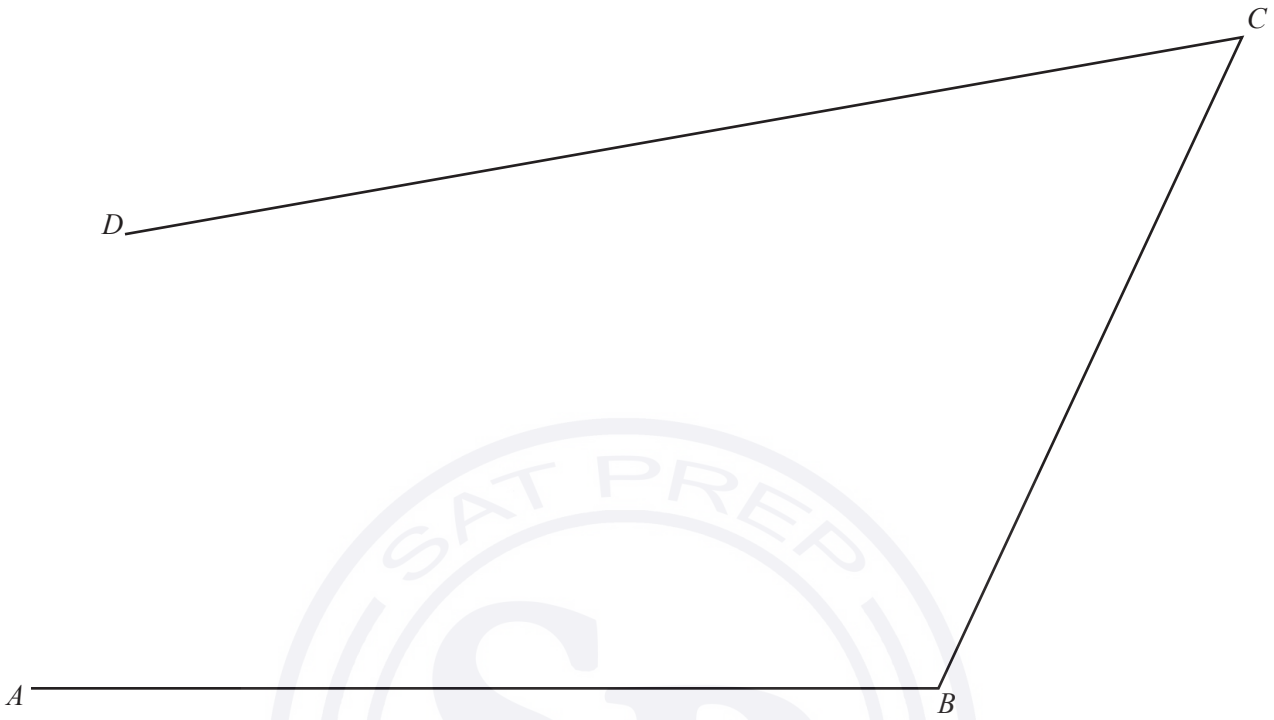
(ii) The shaded shape is made from metal 1.6 mm thick.

Calculate the volume of metal used to make this shape.
Give your answer in cubic millimetres.

Answer(b)(ii) ..... mm^3 [5]

[Turn over

10 The diagram is a scale drawing of three straight roads, *AB*, *BC* and *CD*.
The scale is 1 : 5000.



Scale 1 : 5000

(a) Find the actual length of the road *BC*.
Give your answer in metres.

Answer(a) ..... m [2]

(b) Another straight road starts at *M*, the midpoint of *AB*.
This road is perpendicular to *AB* and it meets the road *CD* at *X*.

Using a straight edge and compasses only, construct *MX*. [2]

(c) There is a park in the area enclosed by the four roads.

The park is

- less than 290 m from B

and

- nearer to CD than to CB.

Using a ruler and compasses only, construct the boundaries of the park.

Leave in all your construction arcs and label the park P. [5]

Question 11 is printed on the next page.

11 **(a)** Make x the subject of the formula.

$$A - x = \frac{xr}{t}$$

Answer(a) $x =$ ..... [4]

(b) Find the value of a and the value of b when $x^2 - 16x + a = (x + b)^2$.

Answer(b) $a =$ .....

$b =$ ..... [3]

(c) Write as a single fraction in its simplest form.

$$\frac{6}{x-4} - \frac{5}{3x-2}$$

Answer(c) ..... [3]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

8042599440

MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2015**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **20** printed pages.

1 **(a)** Last year a golf club charged \$1650 for a family membership.
This year the cost increased by 12%.

Calculate the cost of a family membership this year.

Answer(a) \$ ..... [2]

(b) The golf club runs a competition.
The total prize money is shared in the ratio 1st prize : 2nd prize = 9 : 5.
The 1st prize is \$500 more than the 2nd prize.

(i) Calculate the total prize money for the competition.

Answer(b)(i) \$ ..... [2]

(ii) What percentage of the total prize money is given as the 1st prize?

Answer(b)(ii) .....% [1]

(c) For the members of the golf club the ratio men : children = 11 : 2.
The ratio women : children = 10 : 3.

(i) Find the ratio men : women.

Answer(c)(i) ..... : ..... [2]

(ii) The golf club has 24 members who are children.

Find the total number of members.

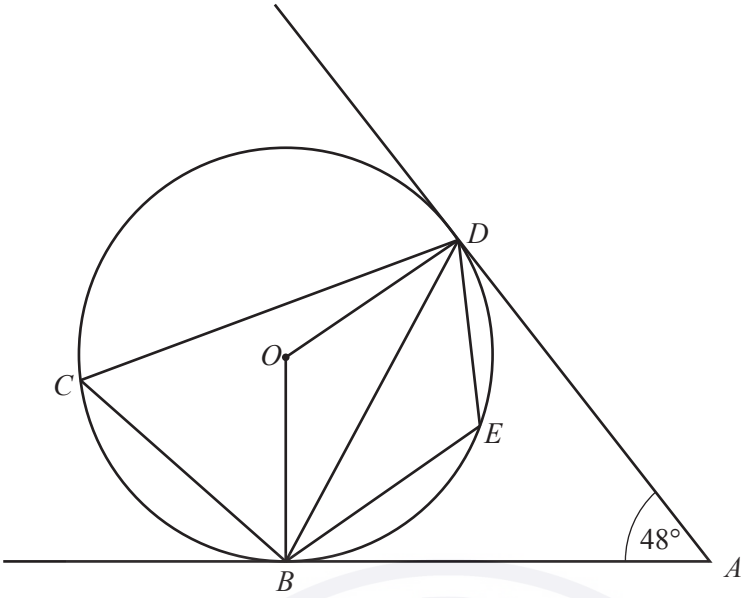
Answer(c)(ii) ..... [3]

(d) The club shop sold a box of golf balls for \$20.40 .
The shop made a profit of 20% on the cost price.

Calculate the cost price of the golf balls.

Answer(d) \$ ..... [3]

2



NOT TO SCALE

In the diagram, B, C, D and E lie on the circle, centre O.
AB and AD are tangents to the circle.
Angle $BAD = 48°$.

(a) Find

(i) angle ABD,

Answer(a)(i) Angle ABD = ... [1]

(ii) angle OBD,

Answer(a)(ii) Angle OBD = ... [1]

(iii) angle BCD,

Answer(a)(iii) Angle BCD = ... [2]

(iv) angle BED.

Answer(a)(iv) Angle BED = ... [1]

(b) The radius of the circle is 15 cm.

Calculate the area of triangle BOD.

Answer(b) ..... cm^2 [2]

(c) Give a reason why $ABOD$ is a cyclic quadrilateral.

Answer(c) .....

..... [1]

3 On the first part of a journey, Alan drove a distance of x km and his car used 6 litres of fuel.

The rate of fuel used by his car was $\frac{600}{x}$ litres per 100 km.

(a) Alan then drove another $(x + 20)$ km and his car used another 6 litres of fuel.

(i) Write down an expression, in terms of x, for the rate of fuel used by his car on this part of the journey.
Give your answer in litres per 100 km.

Answer(a)(i) ..... litres per 100 km [1]

(ii) On this part of the journey the rate of fuel used by the car **decreased** by 1.5 litres per 100 km.

Show that $x^2 + 20x - 8000 = 0$.

Answer(a)(ii)

[4]

(b) Solve the equation $x^2 + 20x - 8000 = 0$.

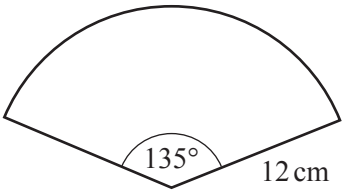
Answer(b) x = ... or x = ... [3]

(c) Find the rate of fuel used by Alan's car for the complete journey.
Give your answer in litres per 100 km.

Answer(c) ..... litres per 100 km [2]

4 **(a)** A sector of a circle has radius 12 cm and an angle of 135°.

(i) Calculate the length of the arc of this sector.
Give your answer as a multiple of π.

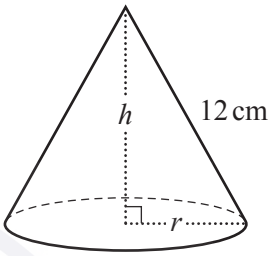


NOT TO SCALE

Answer(a)(i) ..... cm [2]

(ii) The sector is used to make a cone.

(a) Calculate the base radius, *r*.



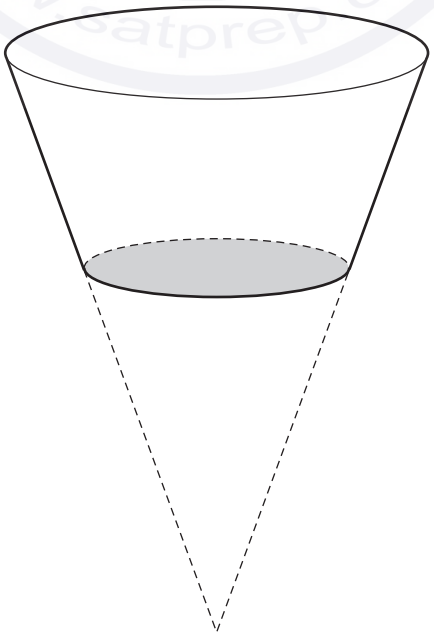
NOT TO SCALE

Answer(a)(ii)(a) *r* = ... cm [2]

(b) Calculate the height of the cone, *h*.

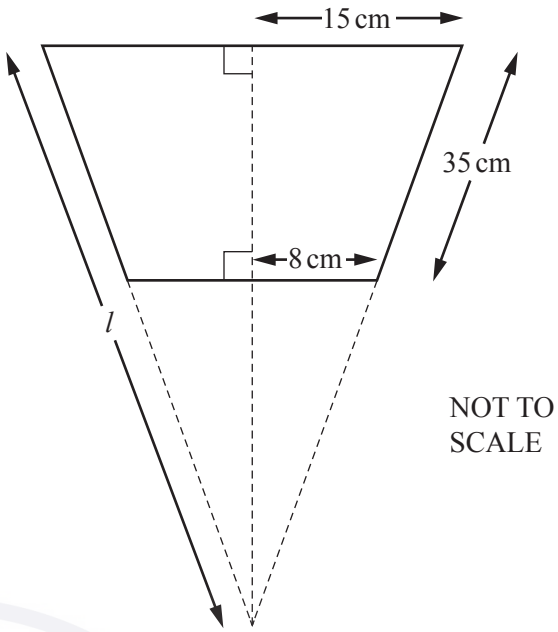
Answer(a)(ii)(b) *h* = ... cm [3]

(b) The diagram shows a plant pot.
It is made by removing a small cone from a larger cone and adding a circular base.



NOT TO SCALE

This is the cross section of the plant pot.



(i) Find l.

Answer(b)(i) l = ... cm [3]

(ii) Calculate the total surface area of the outside of the plant pot.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]

Answer(b)(ii) ..... cm^2 [3]

(c) Some cones are mathematically similar.
For these cones, the mass, M grams, is proportional to the cube of the base radius, r cm.
One of the cones has mass 1458 grams and base radius 4.5 cm.

(i) Find an expression for M in terms of r.

Answer(c)(i) M = ... [2]

(ii) Two of the cones have radii in the ratio 2 : 3.

Write down the ratio of their masses.

Answer(c)(ii) ..... : ..... [1]

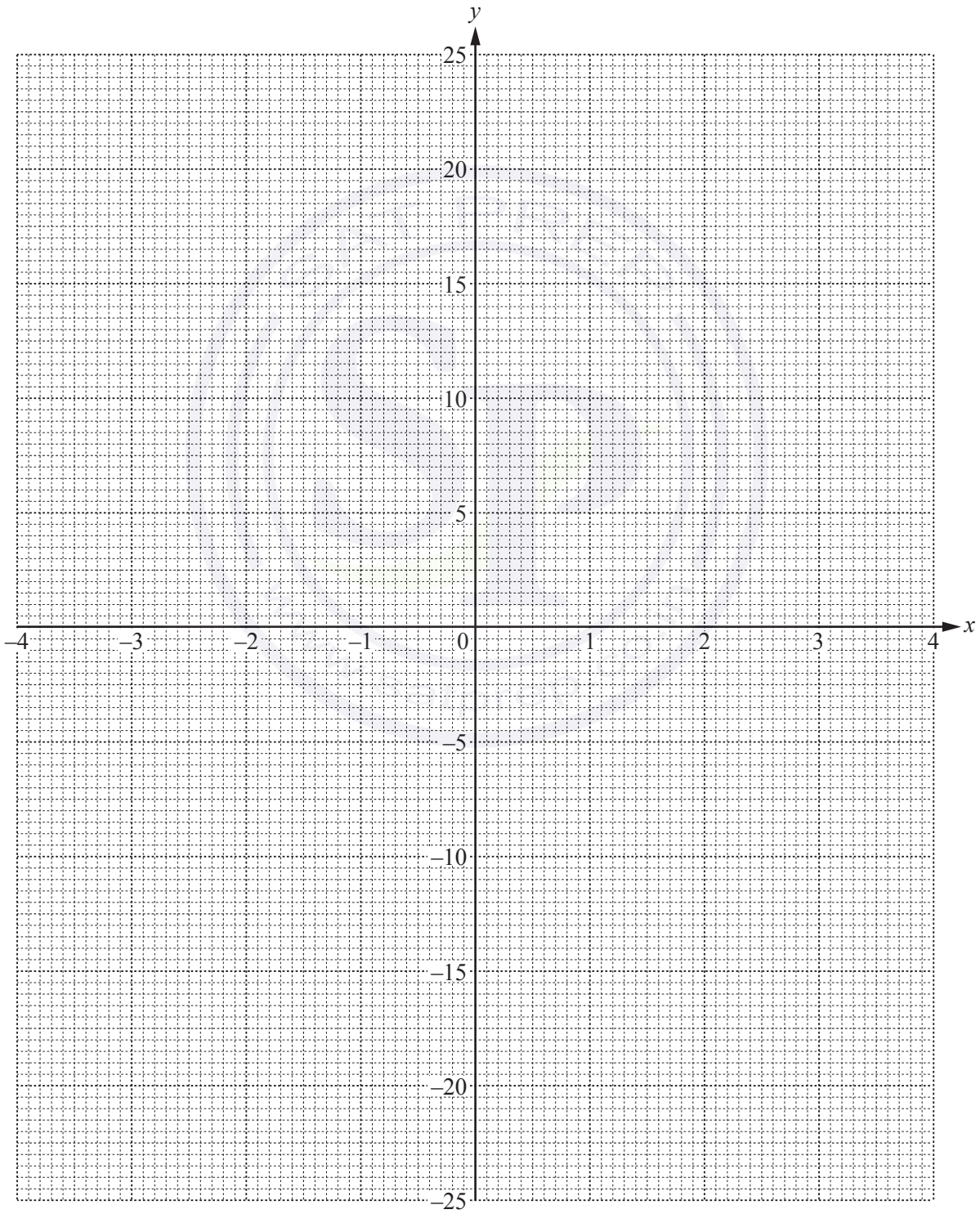
5 $y = x^2 - 2x + \frac{12}{x}, \ x \neq 0$

(a) Complete the table of values.

x	–4	–3	–2	–1	–0.5		0.5	1	2	3	4
y	21	11		–9	–22.75		23.25	11	6		11

[2]

(b) On the grid, draw the graph of $y = x^2 - 2x + \frac{12}{x}$ for $-4 \leqslant x \leqslant -0.5$ and $0.5 \leqslant x \leqslant 4$.



[5]

(c) By drawing a suitable tangent, find an estimate of the gradient of the graph at the point (1, 11).

Answer(c) ..... [3]

(d) The equation $x^2 - 2x + \frac{12}{x} = k$ has exactly two distinct solutions.

Use the graph to find

(i) the value of k,

Answer(d)(i) k = ... [1]

(ii) the solutions of $x^2 - 2x + \frac{12}{x} = k$.

Answer(d)(ii) x = ... or x = ... [2]

(e) The equation $x^3 + ax^2 + bx + c = 0$ can be solved by drawing the line $y = 3x + 1$ on the grid.

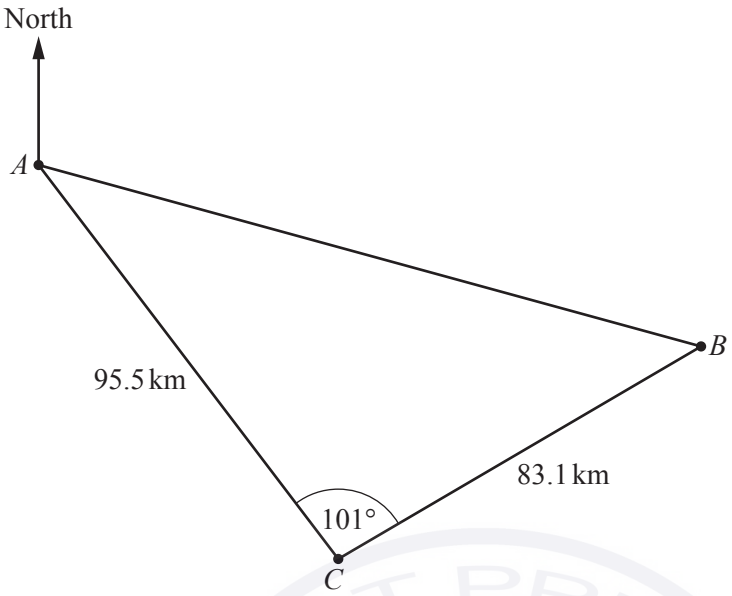
Find the value of a, the value of b and the value of c.

Answer(e) a = ...

b = ...

c = ... [3]

6 The diagram shows the positions of two ships, A and B, and a coastguard station, C.



NOT TO SCALE

(a) Calculate the distance, AB, between the two ships.
Show that it rounds to 138 km, correct to the nearest kilometre.

Answer(a)

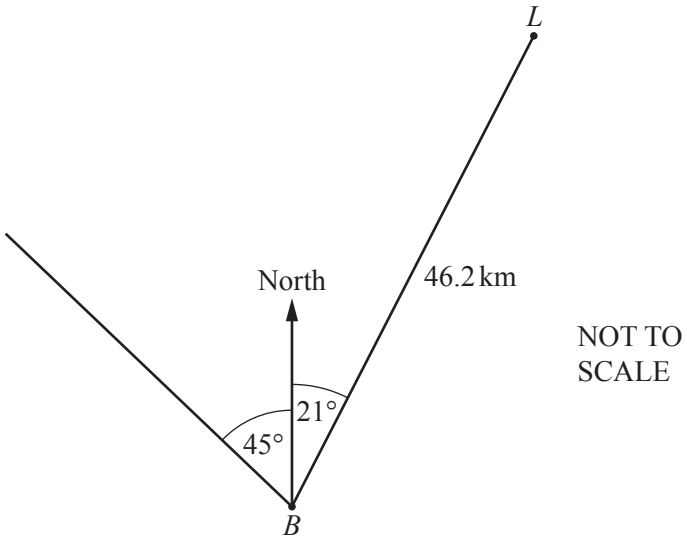
[4]

(b) The bearing of the coastguard station C from ship A is 146°.

Calculate the bearing of ship B from ship A.

Answer(b) ..... [4]

(c)



At noon, a lighthouse, L, is 46.2 km from ship B on the bearing 021°.
Ship B sails north west.

Calculate the distance ship B must sail from its position at noon to be at its closest distance to the lighthouse.

Answer(c) ..... km [2]

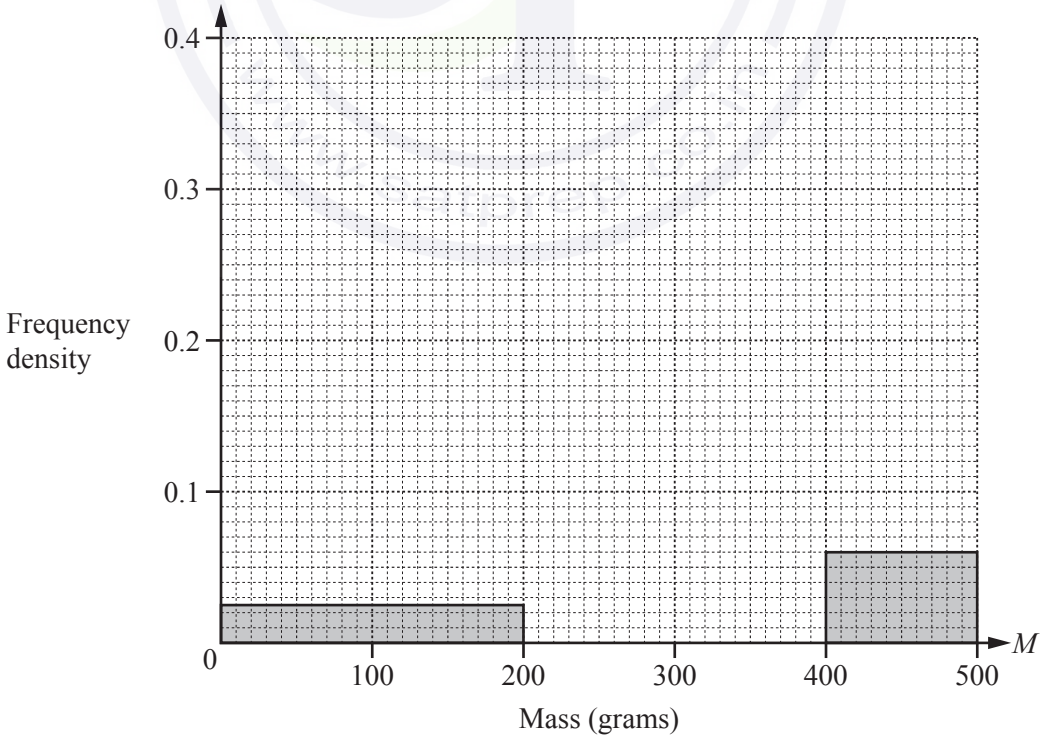
7 **(a)** A group of 50 students estimated the mass, M grams, of sweets in a jar.
The results are shown in the table.

Mass (M grams)	Number of students
$0 < M \leqslant 200$	5
$200 < M \leqslant 300$	9
$300 < M \leqslant 350$	18
$350 < M \leqslant 400$	12
$400 < M \leqslant 500$	6

(i) Calculate an estimate of the mean.

Answer(a)(i) ..... grams [4]

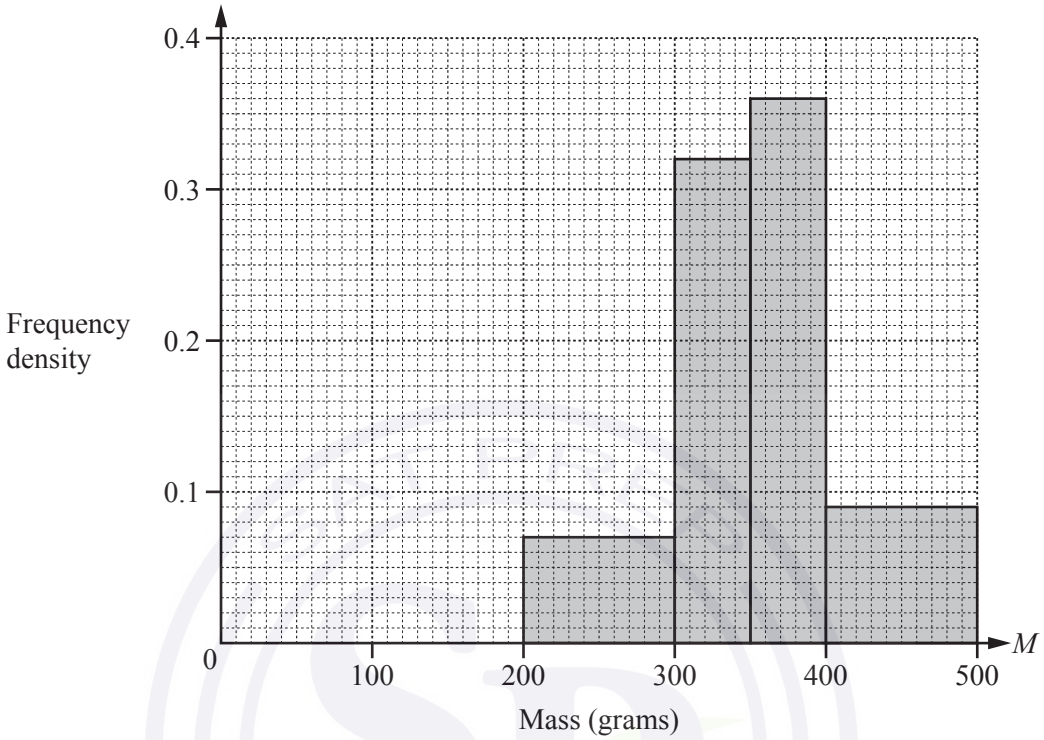
(ii) Complete this histogram to show the information in the table.



[3]

(b) A group of 50 adults also estimated the mass, M grams, of the sweets in the jar.
The histogram below shows information about their estimates.

Use the histograms to make two comparisons between the distributions of the estimates of the students and the adults.



Answer(b)

1 .....

.....

2 .....

..... [2]

8 Sima sells x biscuits and y cakes.

(a) (i) She sells at least 100 biscuits.

Write down an inequality in x.

Answer(a)(i) ..... [1]

(ii) She sells at least 120 cakes.

Write down an inequality in y.

Answer(a)(ii) ..... [1]

(iii) She sells a maximum of 300 biscuits and cakes altogether.

Write down an inequality in x and y.

Answer(a)(iii) ..... [1]

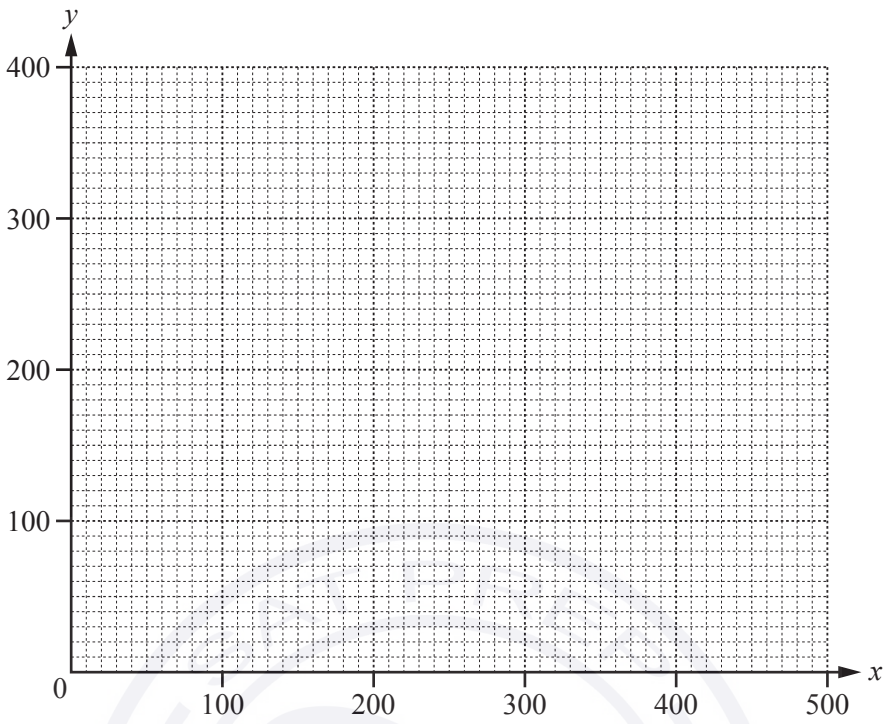
(iv) Sima makes a profit of 40 cents on each biscuit and 80 cents on each cake.
Her total profit is at least \$160.

Show that $x + 2y \geqslant 400$.

Answer(a)(iv)

[1]

(b) On the grid, draw four lines to show the four inequalities and shade the unwanted regions.



[6]

(c) Calculate Sima's maximum profit.
Give your answer in dollars.

Answer(c) $ ..... [2]

9 **(a)** Expand and simplify.

$$3x(x - 2) - 2x(3x - 5)$$

Answer(a) ..... [3]

(b) Factorise the following completely.

(i) $6w + 3wy - 4x - 2xy$

Answer(b)(i) ..... [2]

(ii) $4x^2 - 25y^2$

Answer(b)(ii) ..... [2]

(c) Simplify.

$$\left(\frac{16}{9x^4}\right)^{-\frac{3}{2}}$$

Answer(c) ..... [2]

(d) n is an integer.

(i) Explain why $2n - 1$ is an odd number.

Answer(d)(i) .....

..... [1]

(ii) Write down, in terms of n, the next odd number after $2n - 1$.

Answer(d)(ii) ..... [1]

(iii) Show that the difference between the squares of two consecutive odd numbers is a multiple of 8.

Answer(d)(iii)

[3]

10 **(a)** $\overrightarrow{PQ} = \begin{pmatrix} 5 \\ -8 \end{pmatrix}$

(i) Find the value of $|\overrightarrow{PQ}|$.

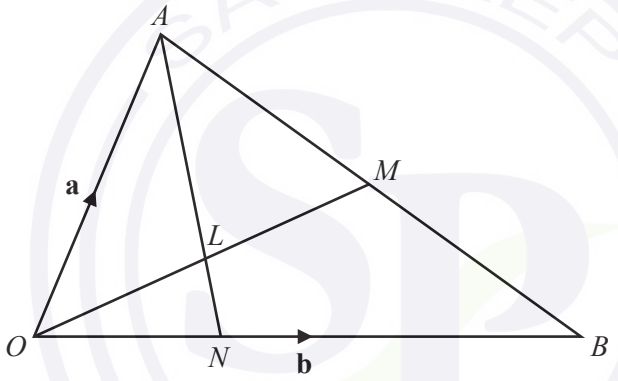
Answer(a)(i) $|\overrightarrow{PQ}|$ = ... [2]

(ii) Q is the point (2, –3).

Find the co-ordinates of the point P.

Answer(a)(ii) (..... , ...) [1]

(b)



NOT TO SCALE

In the diagram, M is the midpoint of AB and L is the midpoint of OM.
The lines OM and AN intersect at L and $ON = \frac{1}{3}OB$.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

(i) Find, in terms of **a** and **b**, in its simplest form,

(a) $\overrightarrow{OM}$,

Answer(b)(i)(a) $\overrightarrow{OM}$ = ... [2]

(b) $\overrightarrow{OL}$,

Answer(b)(i)(b) $\overrightarrow{OL}$ = ... [1]

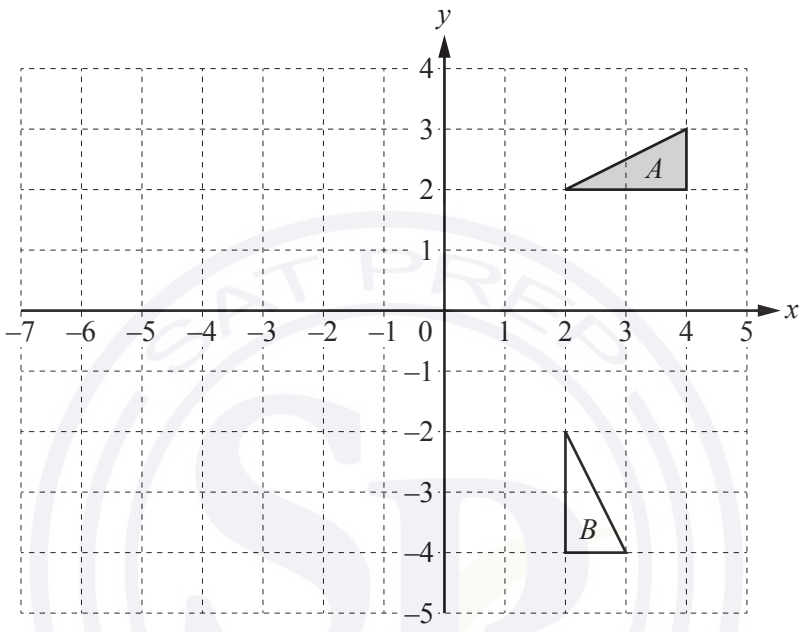
(c) $\overrightarrow{AL}$.

Answer(b)(i)(c) $\overrightarrow{AL}$ = ... [2]

(ii) Find the ratio $AL : AN$ in its simplest form.

Answer(b)(ii) ..... : ..... [3]

(c)



(i) On the grid, draw the image of triangle A after the transformation represented by the matrix $\begin{pmatrix} -1.5 & 0 \\ 0 & -1.5 \end{pmatrix}$. [3]

(ii) Find the 2×2 matrix which represents the transformation that maps triangle A onto triangle B.

Answer(c)(ii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

Question 11 is printed on the next page.

[Turn over

11 Gareth has 8 sweets in a bag.
4 sweets are orange flavoured, 3 are lemon flavoured and 1 is strawberry flavoured.

(a) He chooses two of the sweets at random.

Find the probability that the two sweets have different flavours.

Answer(a) ..... [4]

(b) Gareth now chooses a third sweet.

Find the probability that **none** of the three sweets is lemon flavoured.

Answer(b) ..... [2]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

9205519979

MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2015**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Geometrical instruments
Tracing paper (optional).

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

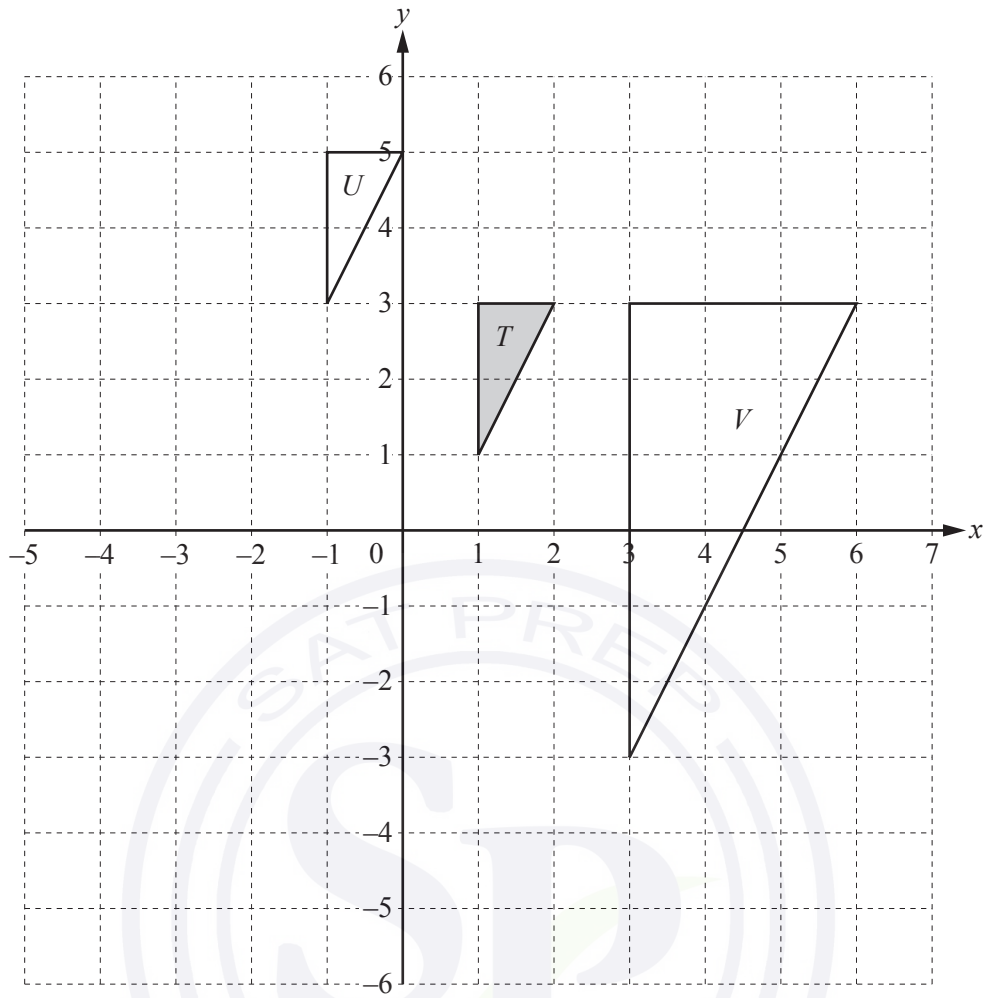
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

CAMBRIDGE International Examinations

1



(a) On the grid, draw the image of

(i) triangle T after a reflection in the line $x = -1$, [2]

(ii) triangle T after a rotation through 180° about (0, 0). [2]

(b) Describe fully the **single** transformation that maps

(i) triangle T onto triangle U,

Answer(b)(i) .....

..... [2]

(ii) triangle T onto triangle V.

Answer(b)(ii) .....

..... [3]

2 **(a)** **(i)** Eduardo invests \$640 at a rate of 2% per year compound interest.

Show that, at the end of 6 years, Eduardo has \$721, correct to the nearest dollar.

Answer(a)(i)

[2]

(ii) Manuela also invests \$640.
At the end of 4 years, Manuela has \$721.

Find the yearly compound interest rate.

Answer(a)(ii) ..... % [4]

(b) Carlos buys a motor scooter for \$1200.
Each year the value of the scooter decreases by 10% of its value at the beginning of that year.

Find the value of the scooter after 3 years.

Answer(b) \$ ..... [2]

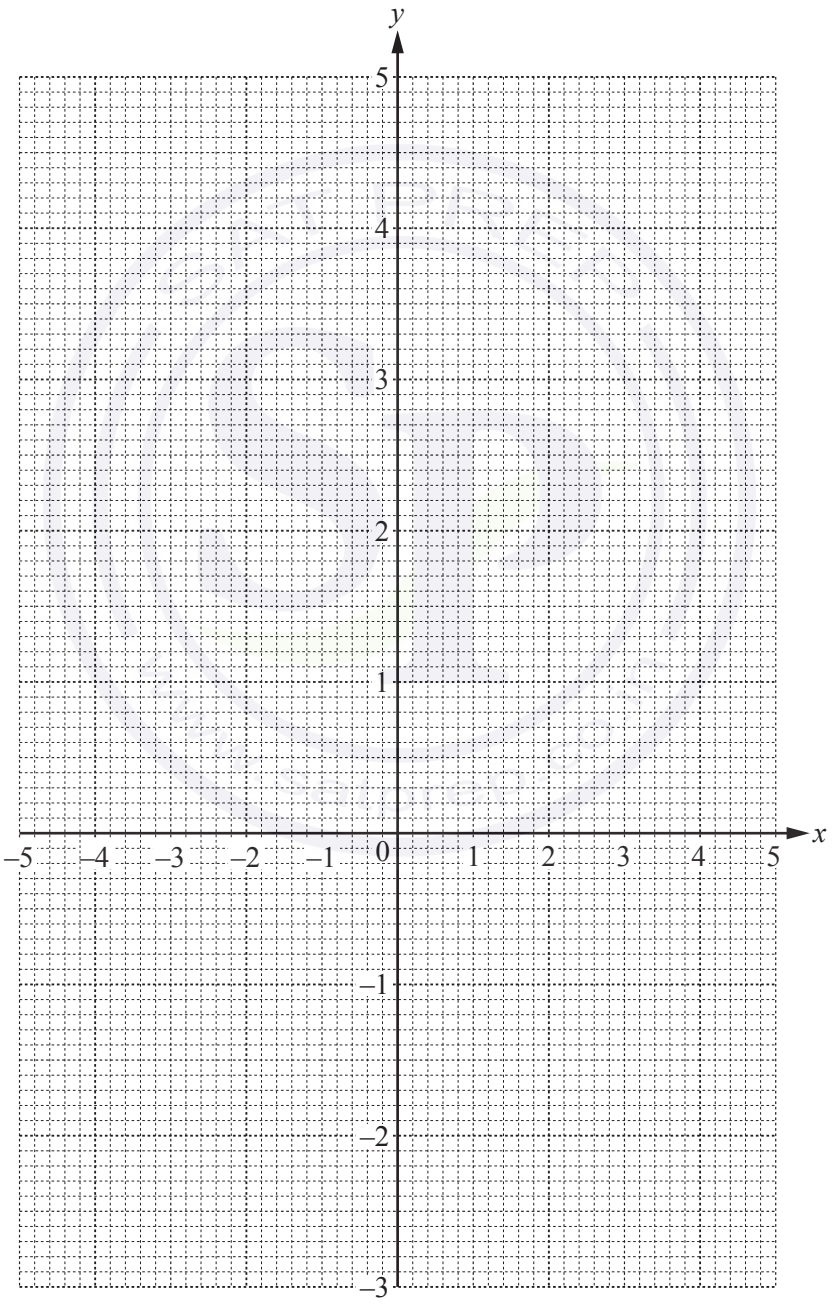
3 $f(x) = \frac{8}{x^2} + \frac{x}{2}, \quad x \neq 0.$

(a) Complete the table of values for f(x).

x	–5	–4	–3	–2	–1.5		1.5	2	2.5	3	3.5	4	5
f(x)	–2.2	–1.5	–0.6		2.8		4.3		2.5	2.4	2.4		2.8

[3]

(b) On the grid, draw the graph of y = f(x) for $-5 \leqslant x \leqslant -1.5$ and $1.5 \leqslant x \leqslant 5$.



[5]

(c) Solve f(x) = 0.

Answer(c) x = ... [1]

(d) By drawing a suitable line on the grid, solve the equation f(x) = 1 – x.

Answer(d) x = ... [3]

(e) By drawing a tangent at the point (–3, –0.6), estimate the gradient of the graph of y = f(x) when x = –3.

Answer(e) ..... [3]

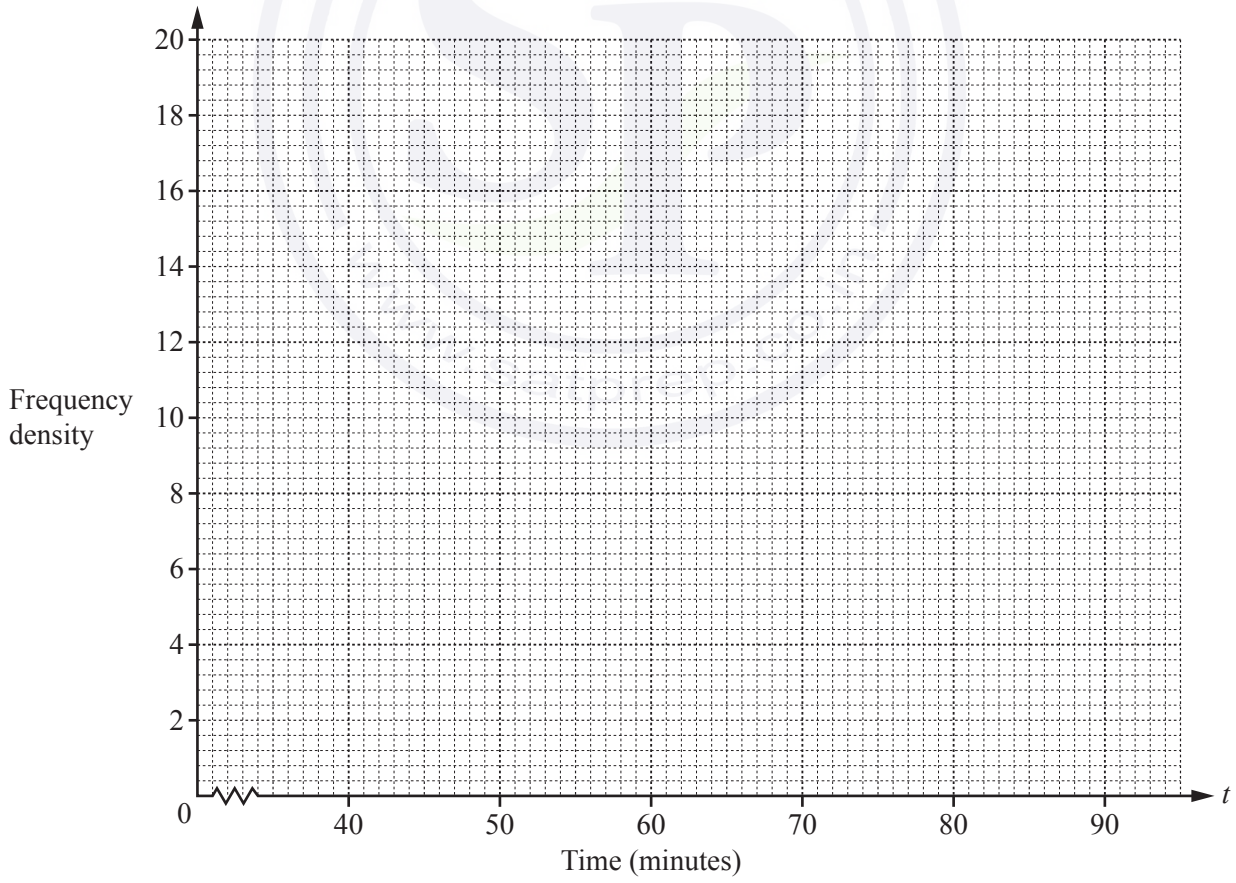
4 The table shows the times, t minutes, taken by 200 students to complete an IGCSE paper.

Time (t minutes)	$40 < t \leqslant 60$	$60 < t \leqslant 70$	$70 < t \leqslant 75$	$75 < t \leqslant 90$
Frequency	10	50	80	60

(a) By using mid-interval values, calculate an estimate of the mean time.

Answer(a) ..... min [3]

(b) On the grid, draw a histogram to show the information in the table.



[4]

5

(a) One of these 7 cards is chosen at random.

Write down the probability that the card

(i) shows the letter *A*,

Answer(a)(i) ..... [1]

(ii) shows the letter *A* or *B*,

Answer(a)(ii) ..... [1]

(iii) does not show the letter *B*.

Answer(a)(iii) ..... [1]

(b) Two of the cards are chosen at random, without replacement.

Find the probability that

(i) both show the letter *A*,

Answer(b)(i) ..... [2]

(ii) the two letters are different.

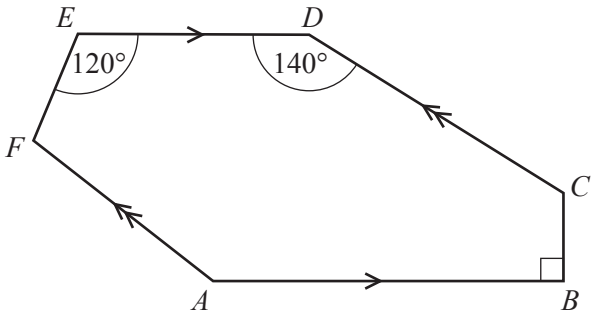
Answer(b)(ii) ..... [3]

(c) Three of the cards are chosen at random, without replacement.

Find the probability that the cards do not show the letter *C*.

Answer(c) ..... [2]

6 (a)



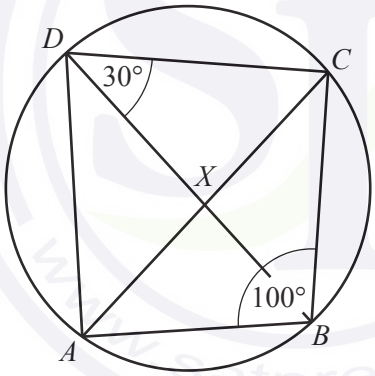
NOT TO SCALE

In the hexagon *ABCDEF*, *AB* is parallel to *ED* and *AF* is parallel to *CD*.
Angle *ABC* = 90°, angle *CDE* = 140° and angle *DEF* = 120°.

Calculate angle *EFA*.

Answer(a) Angle *EFA* = ... [4]

(b)



NOT TO SCALE

In the cyclic quadrilateral *ABCD*, angle *ABC* = 100° and angle *BDC* = 30°.
The diagonals intersect at *X*.

(i) Calculate angle *ACB*.

Answer(b)(i) Angle *ACB* = ... [2]

(ii) Angle *BXC* = 89°.

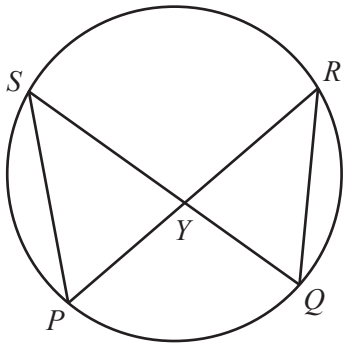
Calculate angle *CAD*.

Answer(b)(ii) Angle *CAD* = ... [2]

(iii) Complete the statement.

Triangles *AXD* and *BXC* are ..... . [1]

(c)



NOT TO SCALE

P, Q, R and S lie on a circle.
PR and QS intersect at Y.
$PS = 11$ cm, $QR = 10$ cm and the area of triangle $QRY = 23$ cm^2.

Calculate the area of triangle PYS.

Answer(c) ..... cm^2 [2]

(d) A regular polygon has n sides.
Each exterior angle is equal to $\frac{n}{10}$ degrees.

(i) Find the value of n.

Answer(d)(i) $n =$ ..... [3]

(ii) Find the size of an interior angle of this polygon.

Answer(d)(ii) ..... [2]

7 **(a)** The total surface area of a cone is given by the formula $A = \pi rl + \pi r^2$.

(i) Find A when $r = 6.2$ cm and $l = 10.8$ cm.

Answer(a)(i) ..... cm^2 [2]

(ii) Rearrange the formula to make l the subject.

Answer(a)(ii) $l =$ ..... [2]

(b) **(i)** Irina walks 10 km at 4 km/h and then a further 8 km at 5 km/h.

Calculate Irina's average speed for the whole journey.

Answer(b)(i) ..... km/h [3]

(ii) Dariella walks x km at 5 km/h and then runs $(x + 4)$ km at 10 km/h.
The average speed of this journey is 7 km/h.

Find the value of x.
Show all your working.

Answer(b)(ii) $x =$ ..... [5]

(c) (i) Priyantha sells her model car for \$19.80 at a profit of 20%.

Calculate the original price of the model car.

Answer(c)(i) \$..... [3]

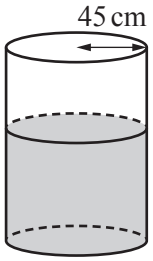
(ii) Dev sells his model car for \$$x$ at a profit of y%.

Find an expression, in terms of x and y, for the original price of this model car.
Write your answer as a single fraction.

Answer(c)(ii) \$..... [3]

8 **(a)** A cylindrical tank contains 180 000 cm^3 of water.
The radius of the tank is 45 cm.

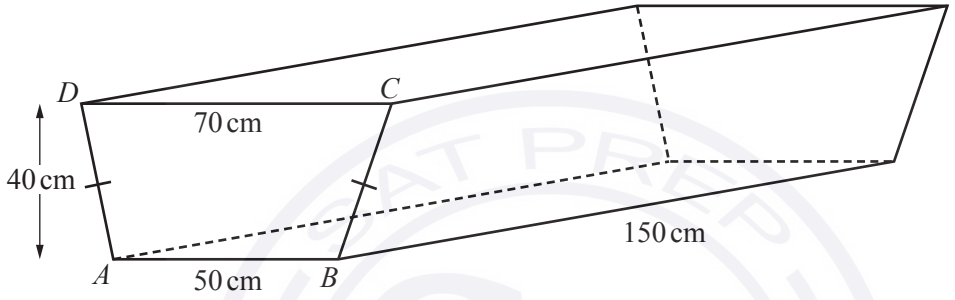
Calculate the height of water in the tank.



NOT TO SCALE

Answer(a) ..... cm [2]

(b)



NOT TO SCALE

The diagram shows an empty tank in the shape of a horizontal prism of length 150 cm.
The cross section of the prism is an isosceles trapezium *ABCD*.
AB = 50 cm, *CD* = 70 cm and the vertical height of the trapezium is 40 cm.

(i) Calculate the volume of the tank.

Answer(b)(i) ..... cm^3 [3]

(ii) Write your answer to **part (b)(i)** in litres.

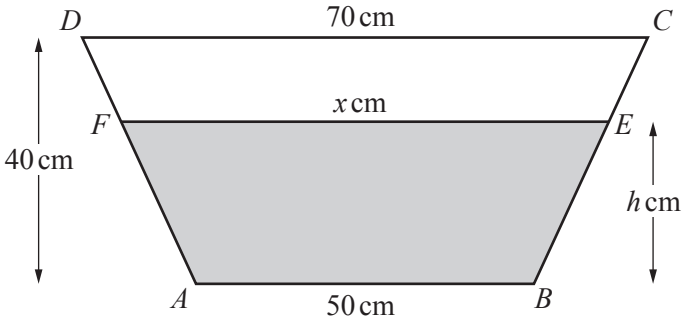
Answer(b)(ii) ..... litres [1]

(c) The 180 000 cm^3 of water flows from the tank in **part (a)** into the tank in **part (b)** at a rate of 15 cm^3/s.

Calculate the time this takes.
Give your answer in hours and minutes.

Answer(c) ..... h ..... min [3]

(d)



NOT TO SCALE

The 180 000 cm^3 of water reaches the level EF as shown above.
$EF = x$ cm and the height of the water is h cm.

(i) Using the properties of similar triangles, show that $h = 2(x - 50)$.

Answer(d)(i)

[2]

(ii) Using $h = 2(x - 50)$, show that the shaded area, in cm^2, is $x^2 - 2500$.

Answer(d)(ii)

[1]

(iii) Find the value of x.

Answer(d)(iii) x = ... [2]

(iv) Find the value of h.

Answer(d)(iv) h = ... [1]

9 $\mathbf{P} = \begin{pmatrix} 2 & 3 \\ 1 & 4 \end{pmatrix}$ $\mathbf{Q} = \begin{pmatrix} 1 & 2 \\ 0 & 3 \end{pmatrix}$ $\mathbf{R} = \begin{pmatrix} 0 & u \\ 1 & v \end{pmatrix}$ $\mathbf{S} = \begin{pmatrix} w & 3 \\ 8 & 2 \end{pmatrix}$

(a) Work out **PQ**.

Answer(a) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(b) Find $\mathbf{Q}^{-1}$.

Answer(b) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(c) **PR** = **RP**

Find the value of u and the value of v.

Answer(c) u = ...

v = ... [3]

(d) The determinant of **S** is 0.

Find the value of w.

Answer(d) w = ... [2]

10 $f(x) = 2x - 1$ $g(x) = x^2 + x$ $h(x) = \frac{2}{x}$, $x \neq 0$

(a) Find ff(3).

Answer(a) ..... [2]

(b) Find gf(x), giving your answer in its simplest form.

Answer(b) ..... [3]

(c) Find $f^{-1}(x)$.

Answer(c) $f^{-1}(x) =$ ..... [2]

(d) Find $h(x) + h(x + 2)$, giving your answer as a single fraction.

Answer(d) ..... [4]

Question 11 is printed on the next page.

11 The first four terms of sequences A, B, C and D are shown in the table.

Sequence	1st term	2nd term	3rd term	4th term	5th term		*n*th term
A	$\frac{1}{3}$	$\frac{2}{4}$	$\frac{3}{5}$	$\frac{4}{6}$			
B	3	4	5	6			
C	–1	0	1	2			
D	–3	0	5	12			

(a) Complete the table.

[8]

(b) Which term in sequence A is equal to $\frac{36}{37}$?

Answer(b) ..... [2]

(c) Which term in sequence D is equal to 725?

Answer(c) ..... [2]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

1169064282

MATHEMATICS **0580/42**

Paper 4 (Extended) **February/March 2015**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

1 Jaideep builds a house and sells it for $450 000.

(a) He pays a tax of 1.5% of the selling price of the house.

Show that he pays $6750 in tax.

Answer(a)

[1]

(b) $6750 is 12.5% more than the tax Jaideep paid on the first house he built.

Calculate the tax Jaideep paid on the first house he built.

Answer(b) $..... [3]

(c) The house is built on a rectangular plot of land, 21 m by 17 m, both correct to the nearest metre.

Calculate the upper bound for the area of the plot.

Answer(c) ..... m^2 [2]

(d) On a plan of the house, the area of the kitchen is 5.6 cm^2.
The scale of the plan is 1 : 200.

Calculate the actual area of the kitchen in square metres.

Answer(d) ..... m^2 [2]

(e) The house was built using cuboid blocks each measuring 12 cm by 16 cm by 27 cm.

Calculate the volume of one block.

Answer(e) ..... cm^3 [2]

(f) Jaideep changes \$12 000 into euros (€) to buy land in another country.
The exchange rate is €1 = \$1.33 .

Calculate the number of euros Jaideep receives.
Give your answer correct to the nearest euro.

Answer(f) €..... [3]

2 **(a)** x is an integer.

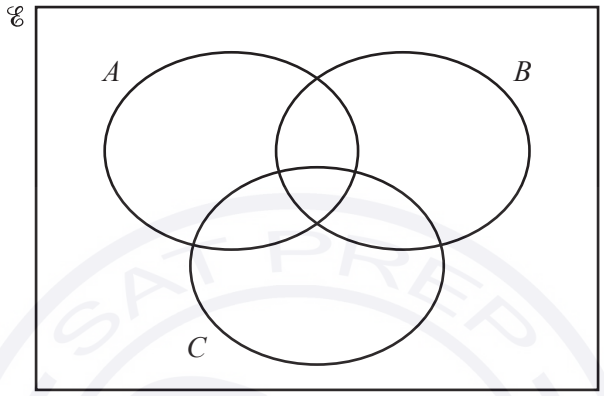
$\mathscr{E} = \{x: 1 \leqslant x \leqslant 10\}$

$A = \{x: x \text{ is a factor of } 12\}$

$B = \{x: x \text{ is an odd number}\}$

$C = \{x: x \text{ is a prime number}\}$

(i) Complete the Venn diagram to show this information.



[3]

(ii) Use set notation to complete each statement.

6 ..... A

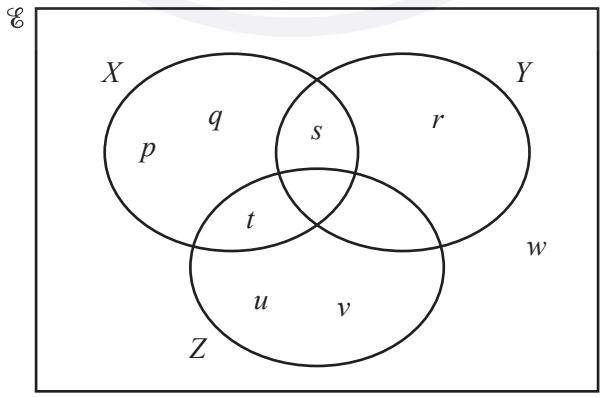
$A \cap B \cap C =$ .....

$A \cap A' =$ ..... [3]

(iii) Find n(B).

Answer(a)(iii) ..... [1]

(b)



(i) Use set notation to complete the statement.

$\{u, v\}$ ..... Z [1]

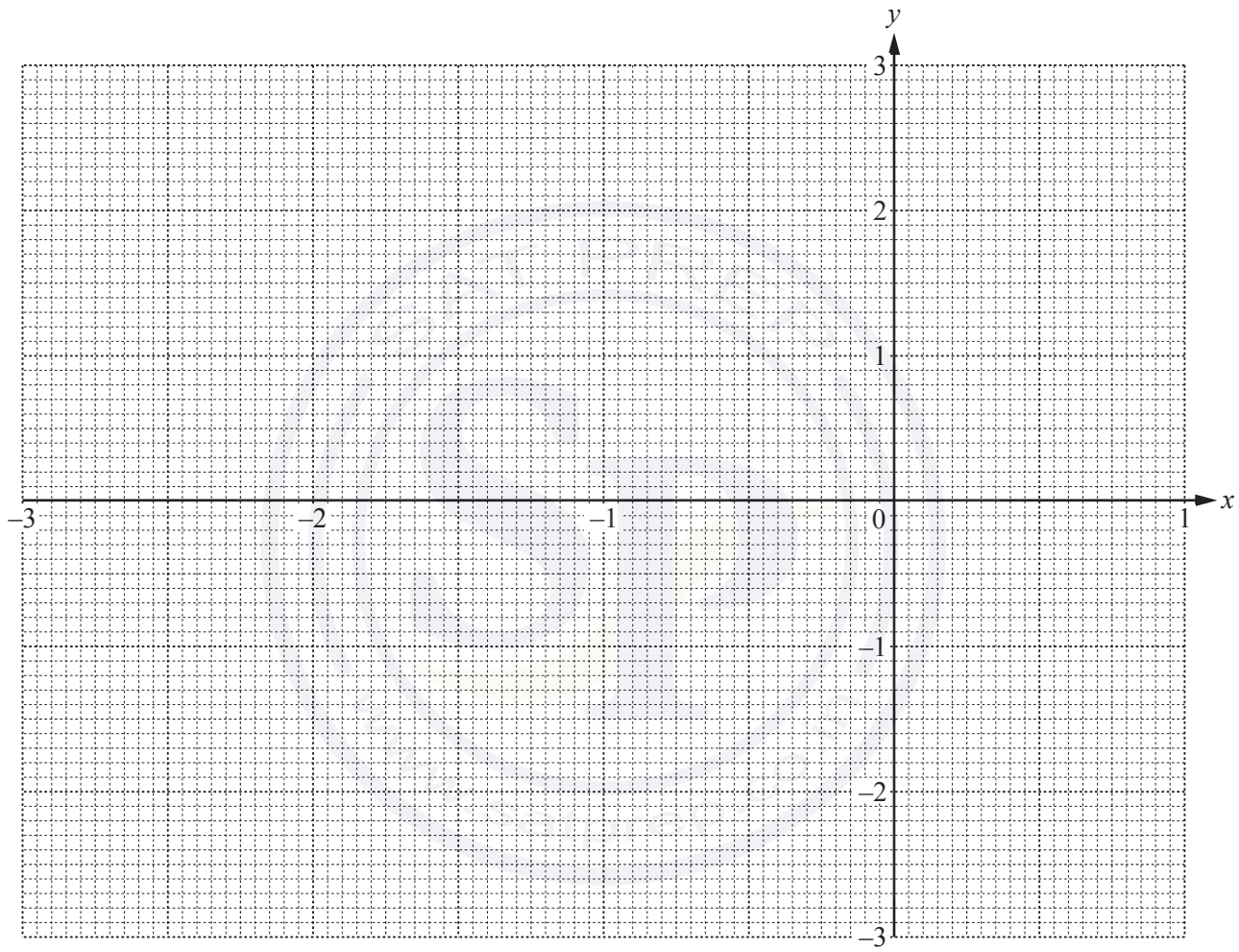
(ii) Shade $X \cap (Z \cup Y)'$. [1]

3 The table shows some values of $y = x^3 + 3x^2 - 2$.

x	–3	–2.5	–2	–1.5	–1	–0.5	0	0.5	1
y	–2	1.13		1.38		–1.38		–1.13	

(a) Complete the table of values. [3]

(b) On the grid, draw the graph of $y = x^3 + 3x^2 - 2$ for $-3 \leqslant x \leqslant 1$.



[4]

(c) By drawing a suitable line, solve the equation $x^3 + 3x^2 - 2 = \frac{1}{2}(x + 1)$.

Answer(c) $x =$ ..... or $x =$ ..... or $x =$ ..... [4]

(d) By drawing a suitable tangent, find an estimate of the gradient of the curve at the point where $x = -1.75$.

Answer(d) ..... [3]

4 **(a)** Factorise $121y^2 - m^2$.

Answer(a) ..... [2]

(b) Write as a single fraction in its simplest form.

$$\frac{4}{3x - 5} + \frac{x + 2}{x - 1}$$

Answer(b) ..... [3]

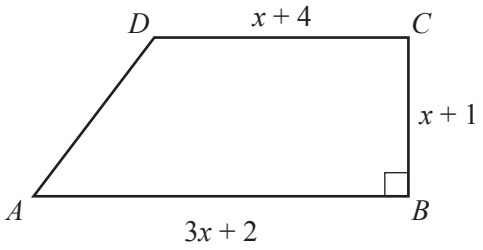
(c) Solve the equation.

$$3x^2 + 2x - 7 = 0$$

Show all your working and give your answers correct to 2 decimal places.

Answer(c) x = ... or x = ... [4]

(d) In this part, all lengths are in centimetres.



NOT TO SCALE

ABCD is a trapezium with area 15 cm^2.

(i) Show that $2x^2 + 5x - 12 = 0$.

Answer(d)(i)

[3]

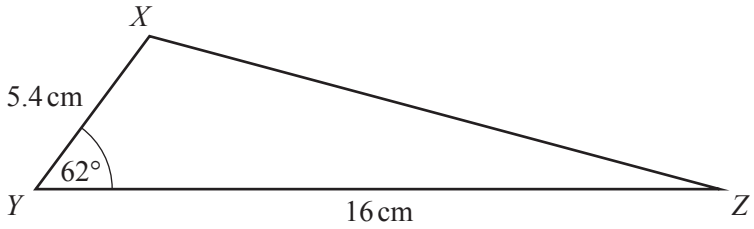
(ii) Solve the equation $2x^2 + 5x - 12 = 0$.

Answer(d)(ii) x = ... or x = ... [3]

(iii) Write down the length of *AB*.

Answer(d)(iii) *AB* = ... cm [1]

5 (a)



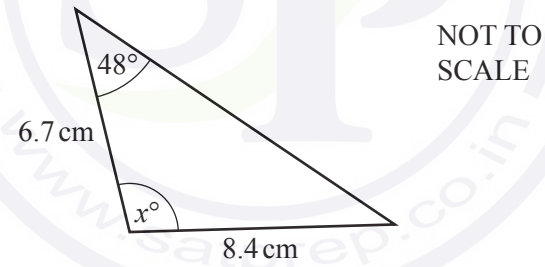
NOT TO SCALE

Show that the area of triangle XYZ is 38.1 cm^2, correct to 1 decimal place.

Answer(a)

[2]

(b)

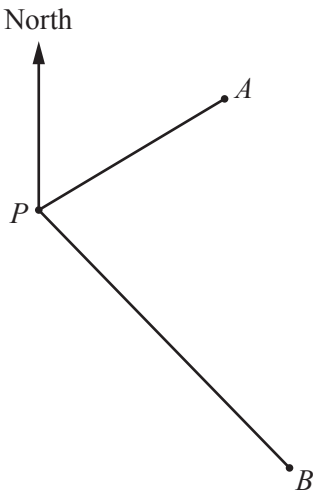


NOT TO SCALE

Calculate the value of x.

Answer(b) x = ... [4]

(c)



NOT TO SCALE

Ship *A* is 180 kilometres from port *P* on a bearing of 063°.
Ship *B* is 245 kilometres from *P* on a bearing of 146°.

Calculate *AB*, the distance between the two ships.

Answer(c) ..... km [5]

6 In this question write any probability as a fraction.

Navpreet has 15 cards with a shape drawn on each card.
5 cards have a square, 6 cards have a triangle and 4 cards have a circle drawn on them.

(a) Navpreet selects a card at random.

Write down the probability that the card has a circle drawn on it.

Answer(a) ..... [1]

(b) Navpreet selects a card at random and replaces it.
She does this 300 times.

Calculate the number of times she expects to select a card with a circle drawn on it.

Answer(b) ..... [1]

(c) Navpreet selects a card at random, replaces it and then selects another card.

Calculate the probability that

(i) one card has a square drawn on it and the other has a circle drawn on it,

Answer(c)(i) ..... [3]

(ii) neither card has a circle drawn on it.

Answer(c)(ii) ..... [3]

(d) Navpreet selects two cards at random, without replacement.

Calculate the probability that

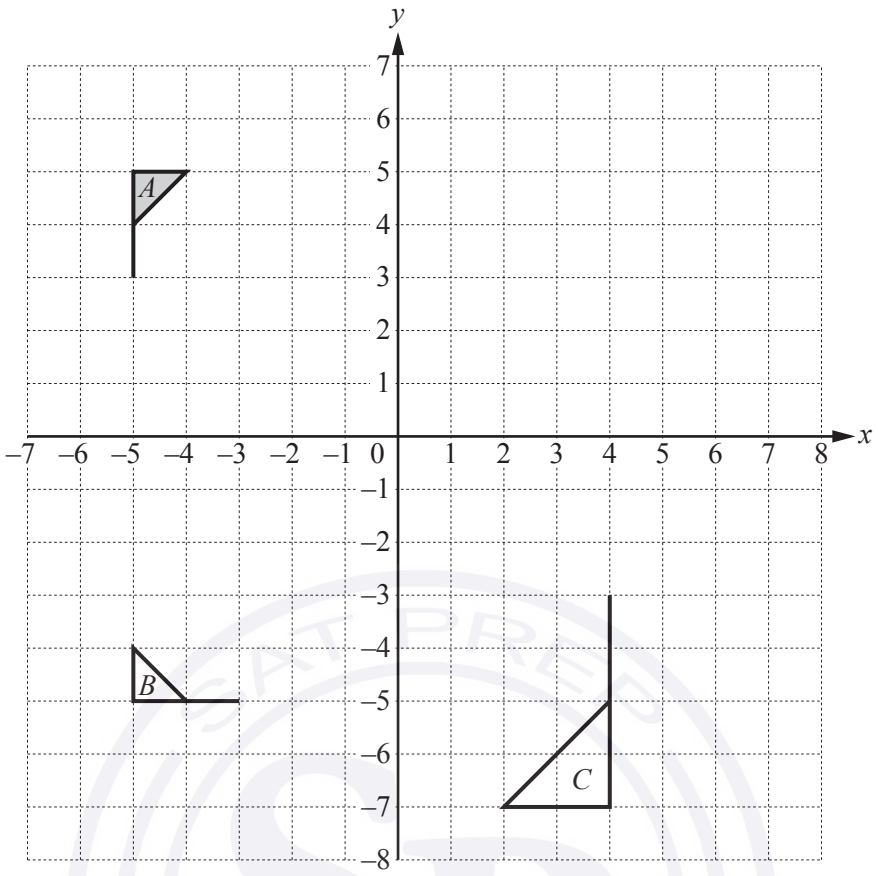
(i) only one card has a triangle drawn on it,

Answer(d)(i) ..... [3]

(ii) the two cards have different shapes drawn on them.

Answer(d)(ii) ..... [4]

7



(a) Describe fully the **single** transformation that maps

(i) flag *A* onto flag *B*,

Answer(a)(i) .....

..... [3]

(ii) flag *A* onto flag *C*.

Answer(a)(ii) .....

..... [3]

(b) Draw the image of flag *A* after a translation by the vector $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$. [2]

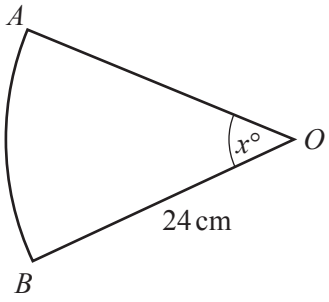
(c) Draw the image of flag *A* after a reflection in the line $x = 1$. [2]

(d) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$.

Answer(d) .....

..... [2]

8 **(a)** The diagram shows a sector of a circle with centre O and radius 24 cm.



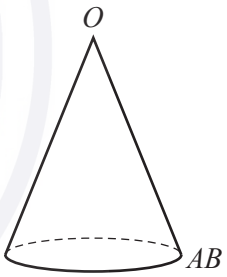
NOT TO SCALE

(i) The total perimeter of the sector is 68 cm.

Calculate the value of x.

Answer(a)(i) x = ... [3]

(ii) The points A and B of the sector are joined together to make a hollow cone.
The arc AB becomes the circumference of the base of the cone.



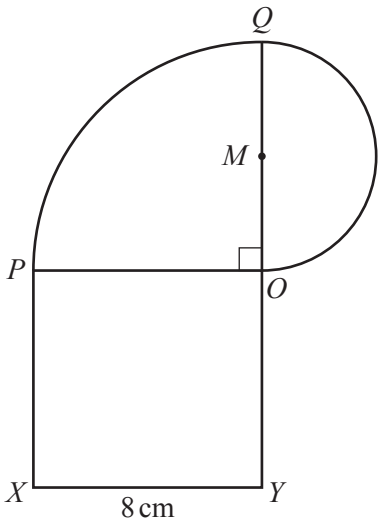
NOT TO SCALE

Calculate the volume of the cone.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

Answer(a)(ii) ..... cm^3 [6]

(b)



NOT TO SCALE

The diagram shows a shape made from a square, a quarter circle and a semi-circle.
OPXY is a square of side 8 cm.
OPQ is a quarter circle, centre *O*.
The line *OMQ* is the diameter of the semi-circle.

Calculate the area of the shape.

Answer(b) ..... cm^2 [5]

9 The table shows the height, h cm, of 40 children in a class.

Height (h cm)	$120 < h \leqslant 130$	$130 < h \leqslant 140$	$140 < h \leqslant 144$	$144 < h \leqslant 150$	$150 < h \leqslant 170$
Frequency	3	14	4	6	13

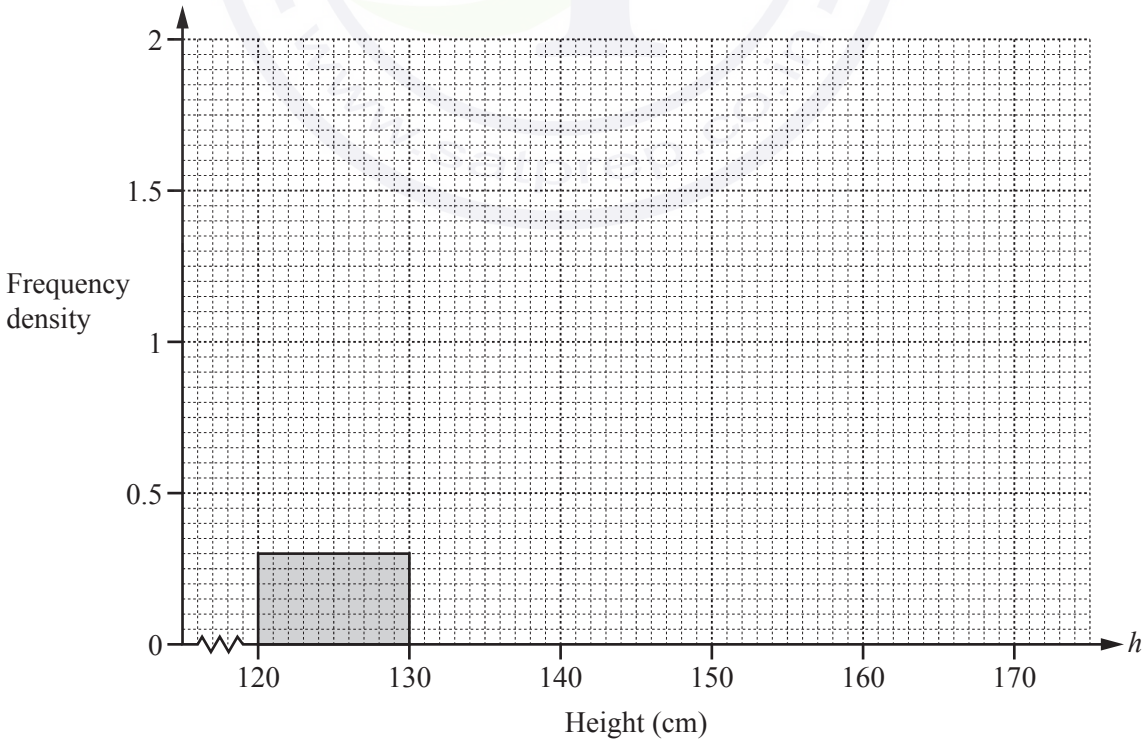
(a) Write down the class interval containing the median.

Answer(a) ..... $< h \leqslant$ ..... [1]

(b) Calculate an estimate of the mean height.

Answer(b) ..... cm [4]

(c) Complete the histogram.



[4]

10 The school cook buys potatoes in small sacks, each of mass 4 kg, and large sacks, each of mass 10 kg.
He buys x small sacks and y large sacks.
Today, he buys less than 80 kg of potatoes.

(a) Show that $2x + 5y < 40$.

Answer(a)

[1]

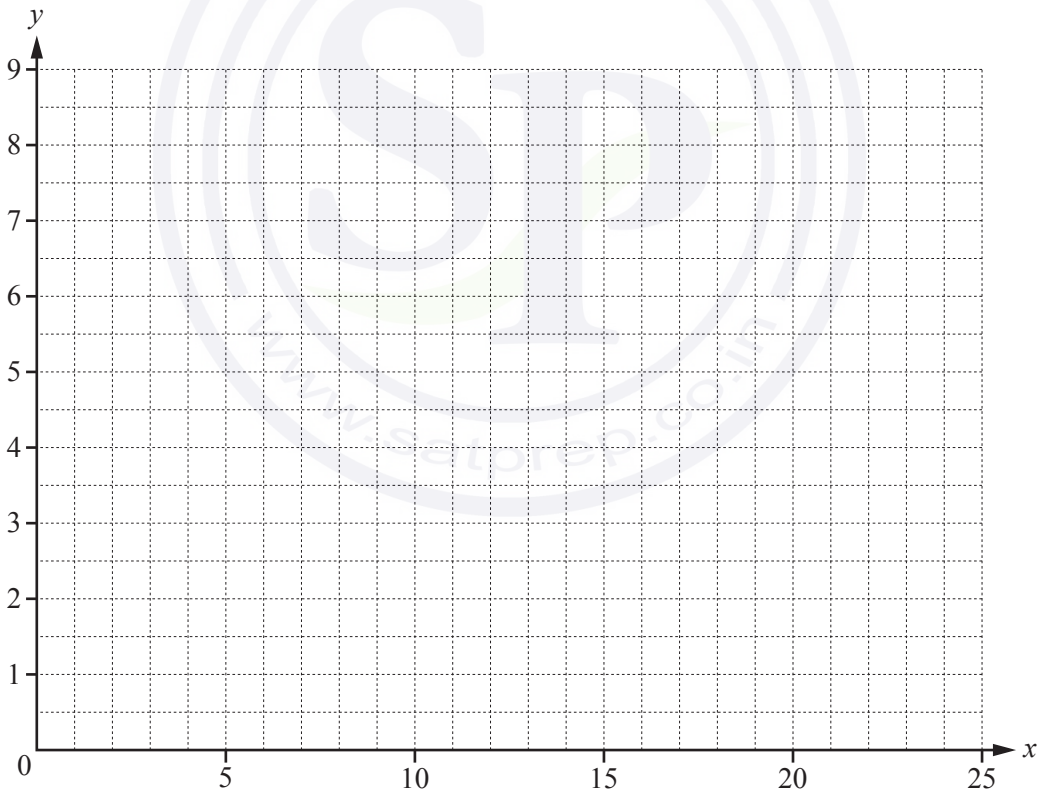
(b) He buys more large sacks than small sacks.
He buys no more than 6 large sacks.

Write down two inequalities to show this information.

Answer(b) .....

..... [2]

(c) On the grid, show the information in **part (a)** and **part (b)** by drawing three straight lines and shading the unwanted regions.



[5]

(d) Find the greatest mass of potatoes the cook can buy today.

Answer(d) ..... kg [2]

Question 11 is printed on the next page.

11

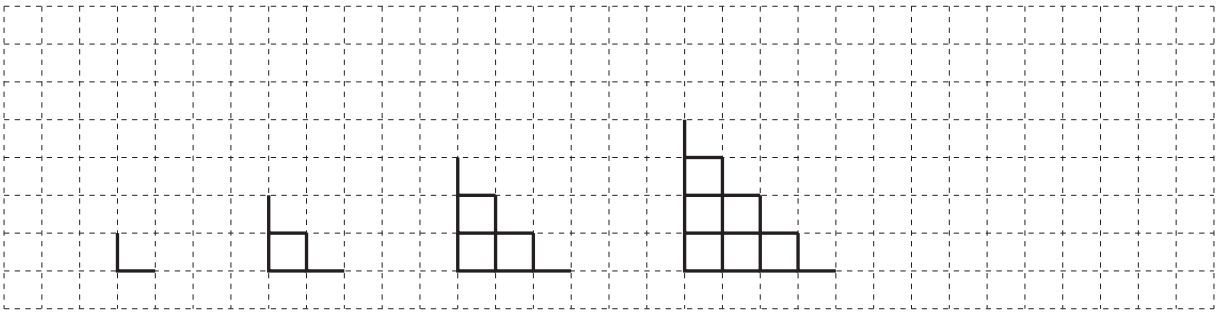


Diagram 1 Diagram 2 Diagram 3 Diagram 4 Diagram 5

Diagram 1 shows two lines of length 1 unit at right angles forming an L.

Two Ls are added to Diagram 1 to make Diagram 2. This forms one small square.

Three Ls are added to Diagram 2 to make Diagram 3. This forms three small squares.
The sequence of Diagrams continues.

(a) Draw Diagram 5. [1]

(b) Complete the table.

	Diagram 1	Diagram 2	Diagram 3	Diagram 4	Diagram 5
Number of lines of length 1 unit	2	6	12	20	
Number of small squares	0	1	3	6	

[2]

(c) Find an expression, in terms of n, for the number of lines of length 1 unit in Diagram n.

Answer(c) ..... [2]

(d) Find an expression, in terms of n, for the number of small squares in Diagram n.

Answer(d) ..... [2]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

6498228295

MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2014**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **19** printed pages and **1** blank page.

1 **(a)** Alfonso has \$75 to spend on the internet.
He spends some of the money on music, films and books.

(i) The money he spends on music, films and books is in the ratio

music : films : books = 5 : 3 : 7.

He spends \$16.50 on music.

Calculate the **total** amount he spends on music, films and books.

Answer(a)(i) \$ ..... [3]

(ii) Find this total amount as a percentage of the \$75.

Answer(a)(ii) ..... % [1]

(b) The download times for the music, films and books are in the ratio

music : films : books = 2 : 9 : 1.

The **total** download time is 3 hours and 33 minutes.

Calculate the download time for the films.
Give your answer in hours, minutes and seconds.

Answer(b) ..... hours ..... minutes ..... seconds [3]

(c) The cost of \$16.50 for the music was a reduction of 12% on the original cost.

Calculate the original cost of the music.

Answer(c) \$..... [3]

2 **(a)** Solve the inequality.

$$7x - 5 > 3(2 - 5x)$$

Answer(a) ..... [3]

(b) **(i)** Factorise completely.

$$pq - 2q - 8 + 4p$$

Answer(b)(i) ..... [2]

(ii) Factorise.

$$9p^2 - 25$$

Answer(b)(ii) ..... [1]

(c) Solve this equation by factorising.

$$5x^2 + x - 18 = 0$$

Answer(c) $x =$ ..... or $x =$ ..... [3]

3 The time, t seconds, taken for each of 50 chefs to cook an omelette is recorded.

Time (t seconds)	$20 < t \leqslant 25$	$25 < t \leqslant 30$	$30 < t \leqslant 35$	$35 < t \leqslant 40$	$40 < t \leqslant 45$	$45 < t \leqslant 50$
Frequency	2	6	7	19	9	7

(a) Write down the modal time interval.

Answer(a) ..... s [1]

(b) Calculate an estimate of the mean time.
Show all your working.

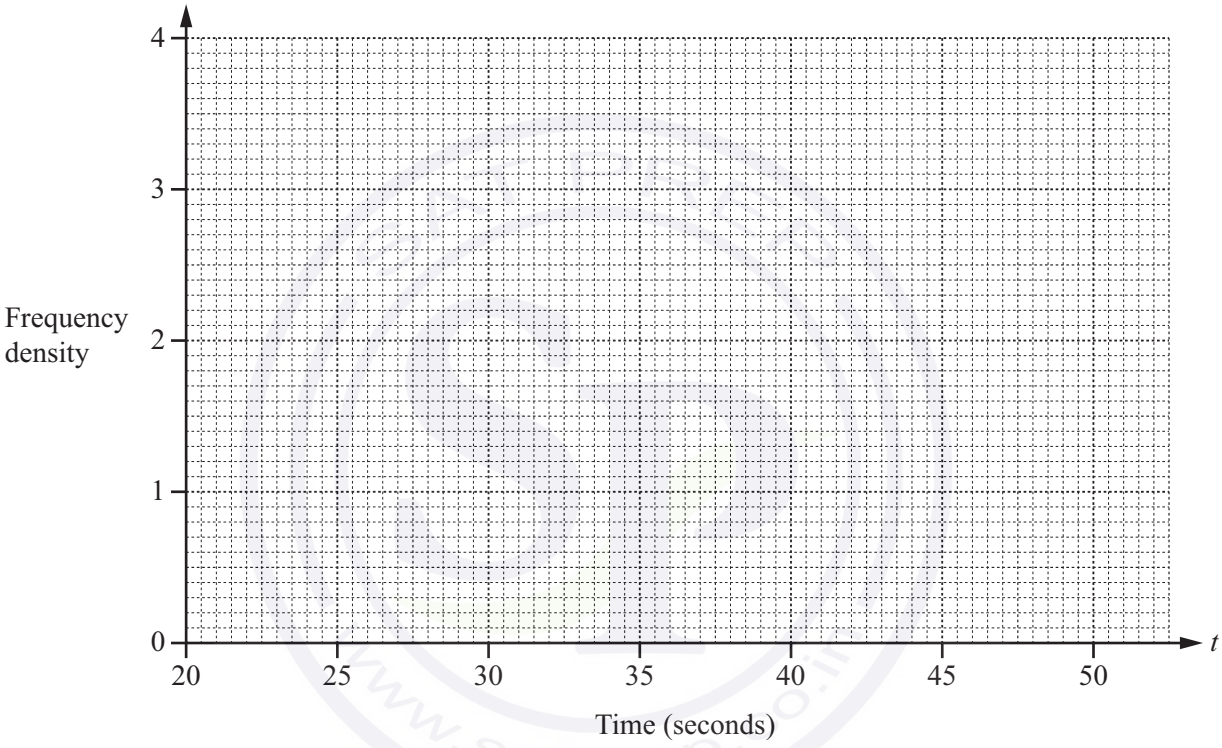
Answer(b) ..... s [4]

(c) A new frequency table is made from the results shown in the table opposite.

Time (t seconds)	$20 < t \leqslant 35$	$35 < t \leqslant 40$	$40 < t \leqslant 50$
Frequency			

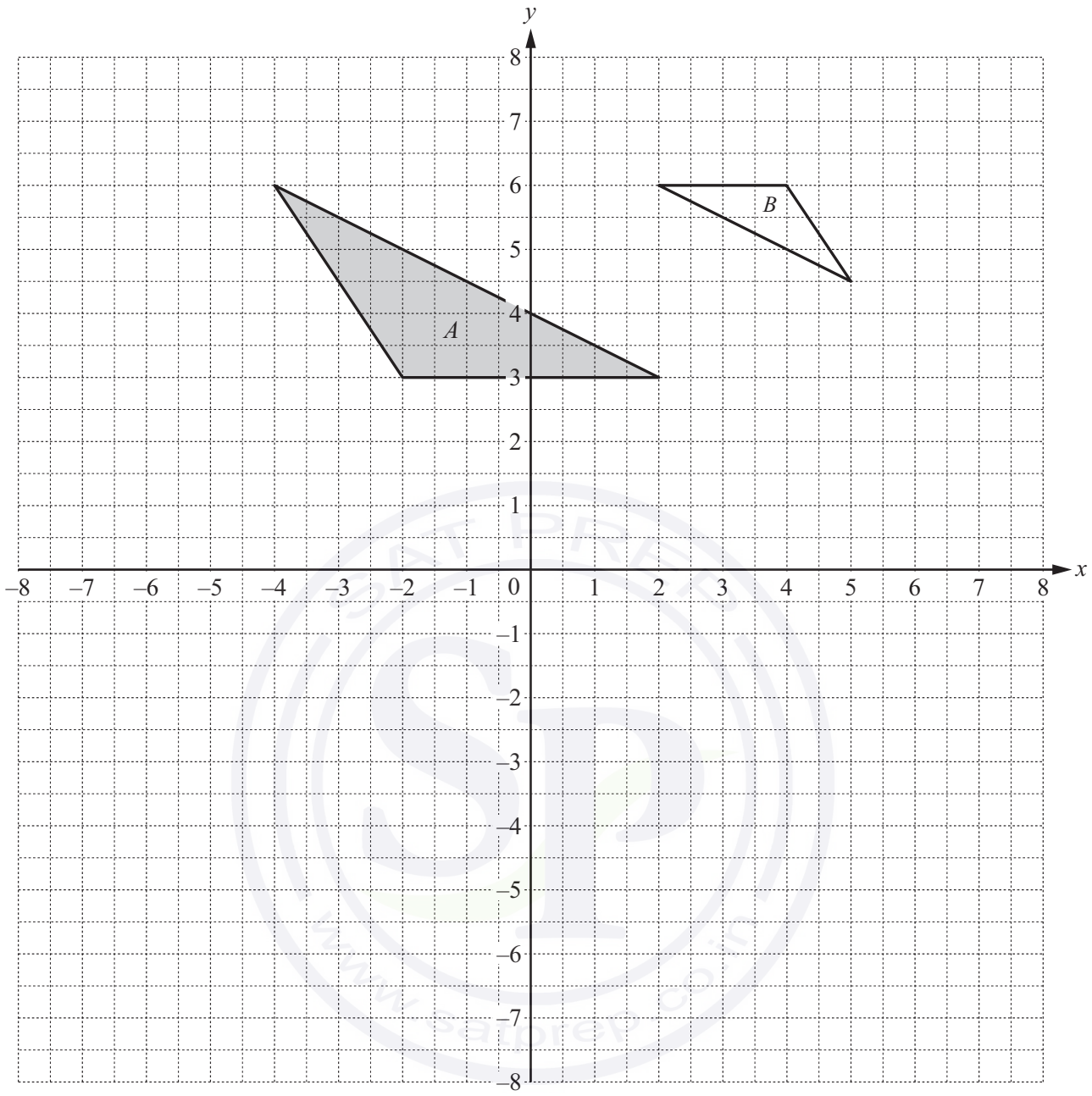
(i) Complete the table. [1]

(ii) On the grid, draw a histogram to show the information in this new table.



[3]

4



(a) Describe fully the **single** transformation that maps triangle *A* onto triangle *B*.

Answer(a) .....

..... [3]

(b) On the grid, draw the image of

(i) triangle A after a reflection in the line $x = -3$, [2]

(ii) triangle A after a rotation about the origin through 270° anticlockwise, [2]

(iii) triangle A after a translation by the vector $\begin{pmatrix} -1 \\ -5 \end{pmatrix}$. [2]

(c) **M** is the matrix that represents the transformation in **part (b)(ii)**.

(i) Find **M**.

Answer(c)(i) **M** = $\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

(ii) Describe fully the **single** transformation represented by $\mathbf{M}^{-1}$, the inverse of **M**.

Answer(c)(ii) .....

..... [2]

5 $f(x) = 5x - 2$ $g(x) = \dfrac{7}{x-3}$, $x \neq 3$ $h(x) = 2x^2 + 7x$

(a) Work out

(i) f(2),

Answer(a)(i) ..... [1]

(ii) hg(17).

Answer(a)(ii) ..... [2]

(b) Solve $g(x) = x + 3$.

Answer(b) $x =$ ..... or $x =$ ..... [3]

(c) Solve $h(x) = 11$, showing all your working and giving your answers correct to 2 decimal places.

Answer(c) $x =$ ..... or $x =$ ..... [5]

(d) Find $f^{-1}(x)$.

Answer(d) $f^{-1}(x) =$ ..... [2]

(e) Solve $g^{-1}(x) = -0.5$.

Answer(e) $x =$ ..... [1]

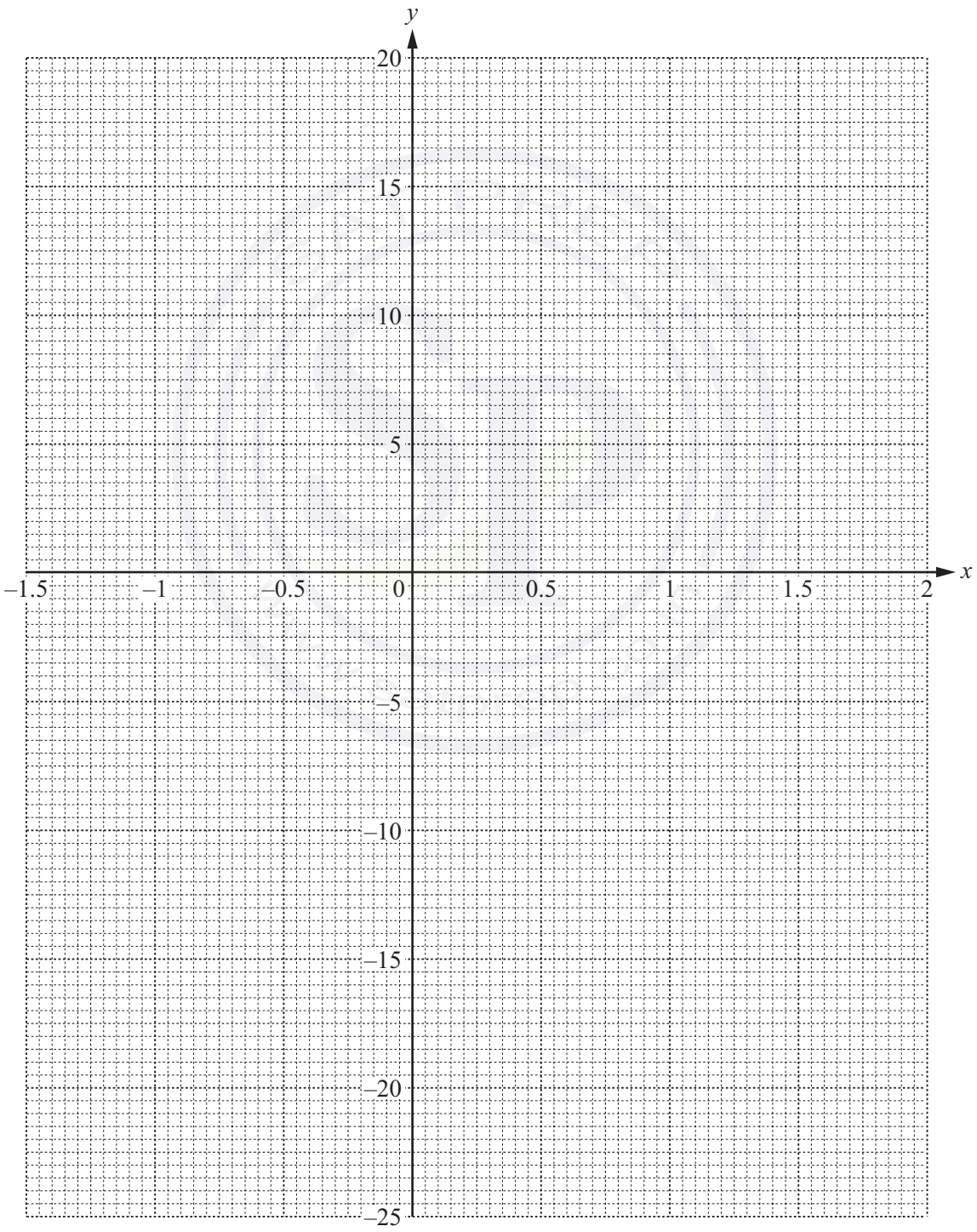
6 $f(x) = 5x^3 - 8x^2 + 10$

(a) Complete the table of values.

x	–1.5	–1	–0.5	0	0.5	0.75	1	1.5	2
$f(x)$	–24.9			10	8.6	7.6	7		18

[3]

(b) Draw the graph of $y = f(x)$ for $-1.5 \leqslant x \leqslant 2$.



[4]

(c) Use your graph to find an **integer** value of k so that $f(x) = k$ has

(i) exactly one solution,

Answer(c)(i) k = ... [1]

(ii) three solutions.

Answer(c)(ii) k = ... [1]

(d) By drawing a suitable straight line on the graph, solve the equation $f(x) = 15x + 2$ for $-1.5 \leqslant x \leqslant 2$.

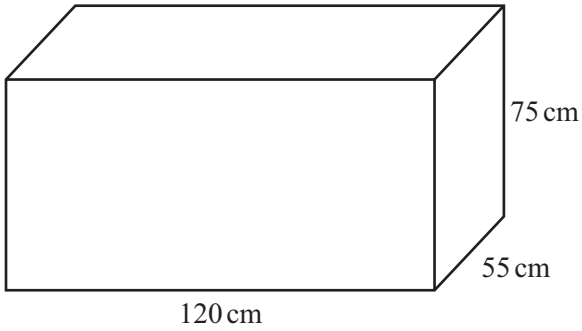
Answer(d) x = ... or x = ... [4]

(e) Draw a tangent to the graph of $y = f(x)$ at the point where $x = 1.5$.

Use your tangent to estimate the gradient of $y = f(x)$ when $x = 1.5$.

Answer(e) ..... [3]

7



NOT TO SCALE

The diagram shows a water tank in the shape of a cuboid measuring 120 cm by 55 cm by 75 cm.
The tank is filled completely with water.

(a) Show that the capacity of the water tank is 495 litres.

Answer(a)

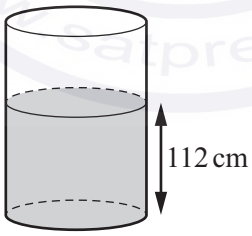
[2]

(b) (i) The water from the tank flows into an empty cylinder at a uniform rate of 750 millilitres per second.

Calculate the length of time, in minutes, for the water to be completely emptied from the tank.

Answer(b)(i) ..... min [2]

(ii) When the tank is completely empty, the height of the water in the cylinder is 112 cm.

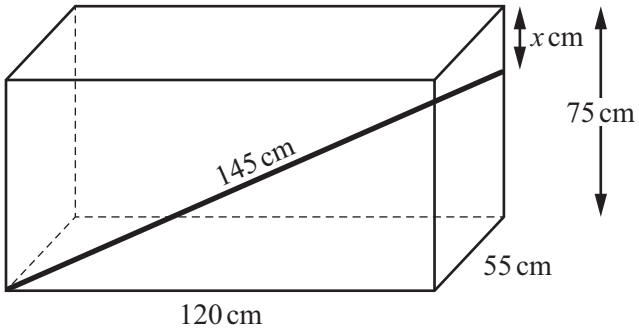


NOT TO SCALE

Calculate the radius of the cylinder.

Answer(b)(ii) ..... cm [3]

(c)



NOT TO SCALE

A rod of length 145 cm is placed inside the water tank.
One end of the rod is in the bottom corner of the tank as shown.
The other end of the rod is x cm below the top corner of the tank as shown.

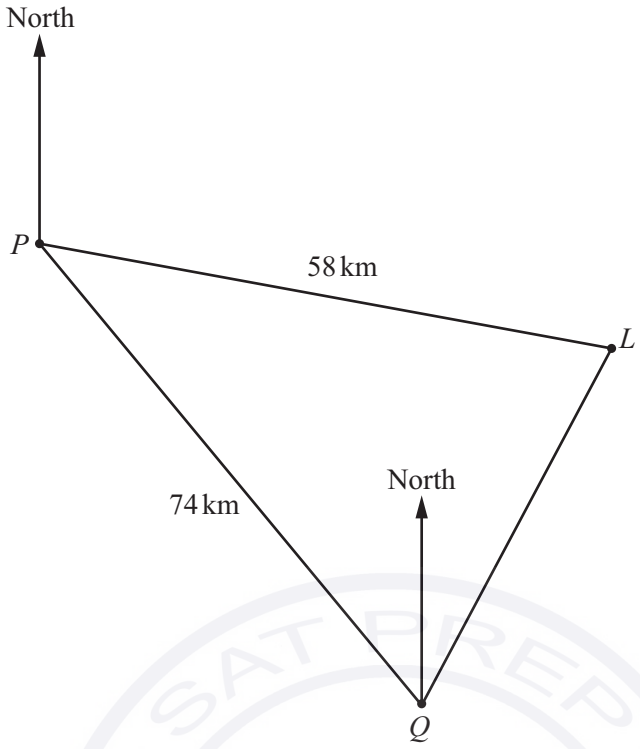
Calculate the value of x.

Answer(c) x = ... [4]

(d) Calculate the angle that the rod makes with the base of the tank.

Answer(d) ..... [3]

8



A ship sails from port P to port Q.
Q is 74 km from P on a bearing of 142°.
A lighthouse, L, is 58 km from P on a bearing of 110°.

(a) Show that the distance LQ is 39.5 km correct to 1 decimal place.

Answer(a)

[5]

(b) Use the sine rule to calculate angle PQL.

Answer(b) Angle PQL = ... [3]

(c) Find the bearing of

(i) P from Q,

Answer(c)(i) ..... [2]

(ii) L from Q.

Answer(c)(ii) ..... [1]

(d) The ship takes 2 hours and 15 minutes to sail the 74 km from P to Q.

Calculate the average speed in knots.
[1 knot = 1.85 km/h]

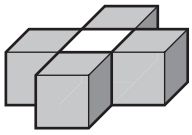
Answer(d) ..... knots [3]

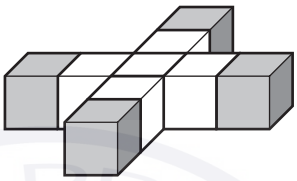
(e) Calculate the shortest distance from the lighthouse to the path of the ship.

Answer(e) ..... km [3]

9

Layer 1 

Layer 2 

Layer 3 

The diagrams show layers of white and grey cubes.
Khadega places these layers on top of each other to make a tower.

(a) Complete the table for towers with 5 and 6 layers.

Number of layers	1	2	3	4	5	6
Total number of **white** cubes	0	1	6	15		
Total number of **grey** cubes	1	5	9	13		
Total number of cubes	1	6	15	28		

[4]

(b) (i) Find, in terms of n, the **total** number of **grey** cubes in a tower with n layers.

Answer(b)(i) ..... [2]

(ii) Find the total number of grey cubes in a tower with 60 layers.

Answer(b)(ii) ..... [1]

(iii) Khadega has plenty of white cubes but only 200 grey cubes.
How many layers are there in the highest tower that she can build?

Answer(b)(iii) ..... [2]

(c) The expression for the **total** number of **white** cubes in a tower with n layers is $pn^2 + qn + 3$.

Find the value of p and the value of q.
Show all your working.

Answer(c) $p =$ .....

$q =$ ..... [5]

(d) Find an expression, in terms of n, for the **total** number of cubes in a tower with n layers.
Give your answer in its simplest form.

Answer(d) ..... [2]

10 Kenwyn plays a board game.
Two cubes (dice) each have faces numbered 1, 2, 3, 4, 5 and 6.
In the game, a **throw** is rolling the **two** fair 6-sided dice and then adding the numbers on their top faces.
This total is the number of spaces to move on the board.
For example, if the numbers are 4 and 3, he moves 7 spaces.

(a) Giving each of your answers as a fraction in its simplest form, find the probability that he moves

(i) two spaces with his next throw,

Answer(a)(i) ..... [2]

(ii) ten spaces with his next throw.

Answer(a)(ii) ..... [3]

(b) What is the most likely number of spaces that Kenwyn will move with his next throw?
Explain your answer.

Answer(b) ..... because .....

..... [2]

(c)

95	96	97	98	99 Go back 3 spaces	100 WIN

To win the game he must move **exactly** to the 100th space.
Kenwyn is on the 97th space.
If his next throw takes him to 99, he has to move back to 96.
If his next throw takes him over 100, he stays on 97.

Find the probability that he reaches 100 in either of his next two throws.

Answer(c) ..... [5]

BLANK PAGE

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2401571107

MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2014**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

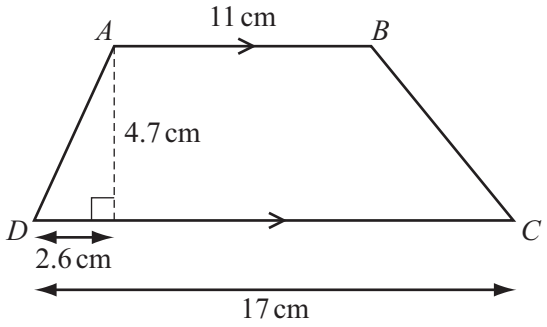
Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

1 **(a)** *ABCD* is a trapezium.



NOT TO SCALE

(i) Calculate the length of *AD*.

Answer(a)(i) *AD* = ... cm [2]

(ii) Calculate the size of angle *BCD*.

Answer(a)(ii) Angle *BCD* = ... [3]

(iii) Calculate the area of the trapezium *ABCD*.

Answer(a)(iii) ..... cm^2 [2]

(b) A **similar** trapezium has perpendicular height 9.4 cm.

Calculate the area of this trapezium.

Answer(b) ..... cm^2 [3]

2 There are three different areas, A, B and C, for seating in a theatre.
The numbers of seats in each area are in the ratio $A : B : C = 11 : 8 : 7$.
There are 920 seats in area B.

(a) (i) Show that there are 805 seats in area C.

Answer(a)(i)

[1]

(ii) Write the number of seats in area B as a percentage of the total number of seats.

Answer(a)(ii) ..... % [2]

(b) The cost of a ticket for a seat in each area of the theatre is shown in the table.

Area A	\$11.50
Area B	\$15
Area C	\$22.50

For a concert 80% of area B tickets were sold and $\frac{3}{5}$ of area C tickets were sold.
The total amount of money taken from ticket sales was \$35 834.

Calculate the number of area A tickets that were sold.

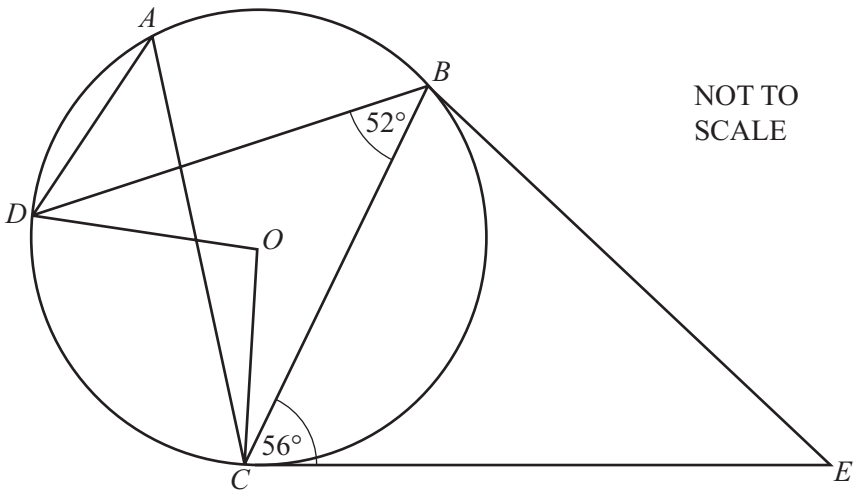
Answer(b) ..... [5]

(c) The total ticket sales of \$35 834 was 5% less than the ticket sales at the previous concert.

Calculate the ticket sales at the previous concert.

Answer(c) \$..... [3]

3



A, *B*, *C* and *D* are points on a circle, centre *O*.
CE is a tangent to the circle at *C*.

(a) Find the sizes of the following angles and give a reason for each answer.

(i) Angle *DAC* = ... because .....

..... [2]

(ii) Angle *DOC* = ... because .....

..... [2]

(iii) Angle *BCO* = ... because .....

..... [2]

(b) $CE = 8.9$ cm and $CB = 7$ cm.

(i) Calculate the length of BE.

Answer(b)(i) BE = ... cm [4]

(ii) Calculate angle BEC.

Answer(b)(ii) Angle BEC = ... [3]

4 Yeung and Ariven compete in a triathlon race.

The probability that Yeung finishes this race is $\frac{3}{5}$.

The probability that Ariven finishes this race is $\frac{2}{3}$.

(a) (i) Which of them is more likely to finish this race?
Give a reason for your answer.

Answer(a)(i) ..... because .....

..... [1]

(ii) Find the probability that they both finish this race.

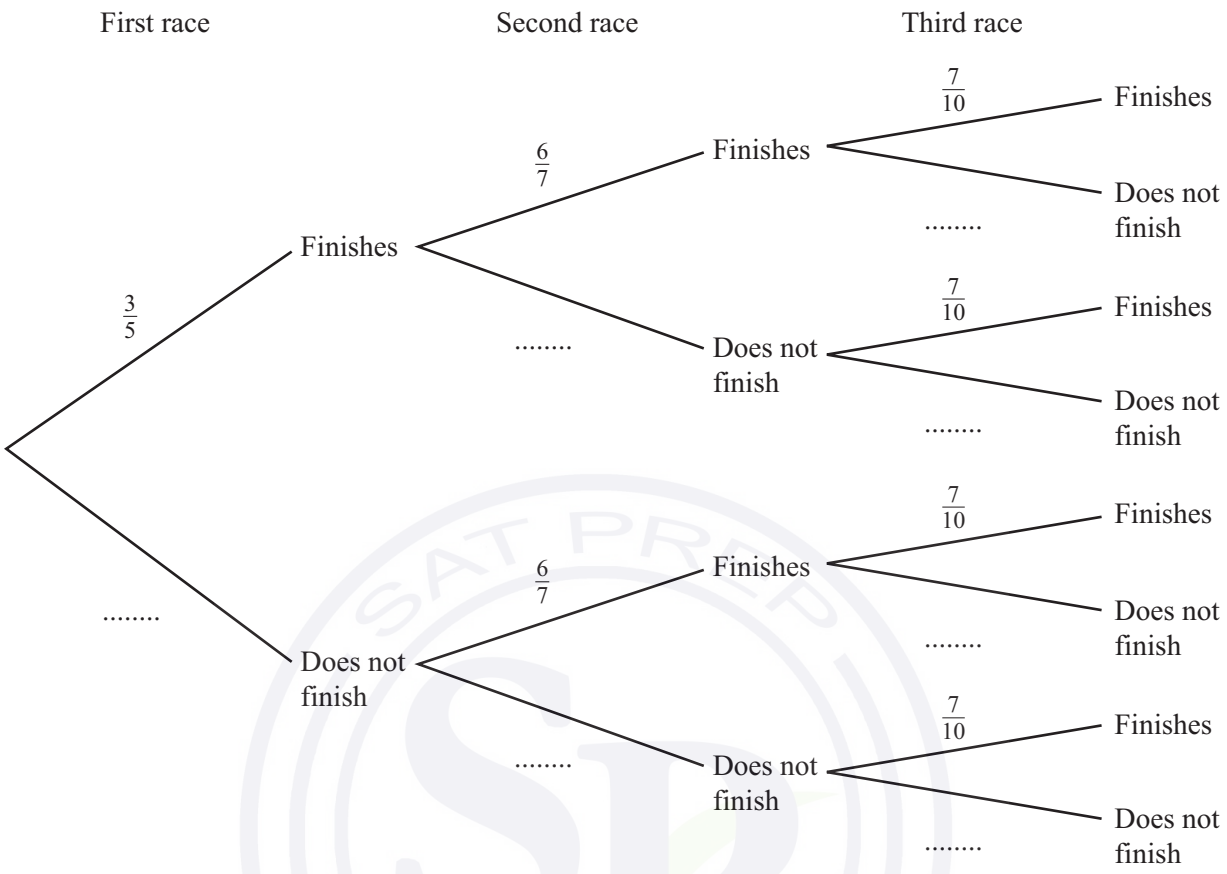
Answer(a)(ii) ..... [2]

(iii) Find the probability that only one of them finishes this race.

Answer(a)(iii) ..... [3]

(b) After the first race, **Yeung** competes in two further triathlon races.

(i) Complete the tree diagram.



[3]

(ii) Calculate the probability that Yeung finishes all three of his races.

Answer(b)(ii) ..... [2]

(iii) Calculate the probability that Yeung finishes at least one of his races.

Answer(b)(iii) ..... [3]

5 $\mathbf{P} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ $\mathbf{Q} = \begin{pmatrix} 1 & -2 \\ 0 & 1 \end{pmatrix}$ $\mathbf{R} = \begin{pmatrix} -3 \\ 5 \end{pmatrix}$

(a) Work out

(i) $4\mathbf{P}$,

Answer(a)(i) [1]

(ii) $\mathbf{P} - \mathbf{Q}$,

Answer(a)(ii) [1]

(iii) $\mathbf{P}^2$,

Answer(a)(iii) [2]

(iv) $\mathbf{QR}$.

Answer(a)(iv) [2]

(b) Find the matrix $\mathbf{S}$, so that $\mathbf{QS} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$.

Answer(b) [3]

6 **(a)** Simplify.

(i) $x^3 \div \frac{3}{x^5}$

Answer(a)(i) ..... [1]

(ii) $5xy^8 \times 3x^6y^{-5}$

Answer(a)(ii) ..... [2]

(iii) $(64x^{12})^{\frac{2}{3}}$

Answer(a)(iii) ..... [2]

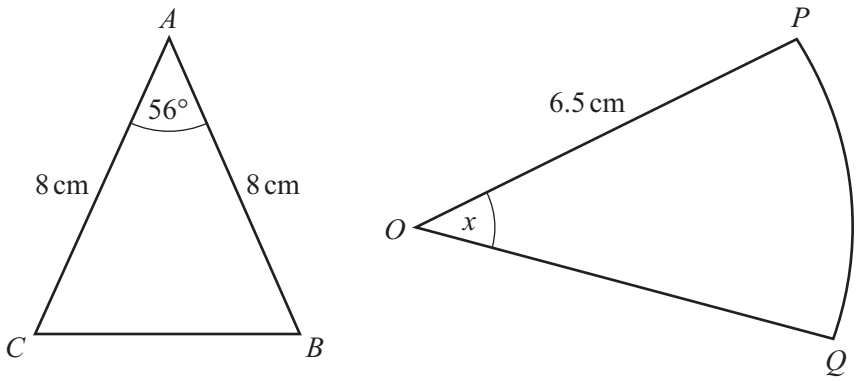
(b) Solve $3x^2 - 7x - 12 = 0$.
Show your working and give your answers correct to 2 decimal places.

Answer(b) x = ... or x = ... [4]

(c) Simplify $\frac{x^2 - 25}{x^3 - 5x^2}$.

Answer(c) ..... [3]

7



NOT TO SCALE

The diagram shows a triangle and a sector of a circle.
In triangle ABC, $AB = AC = 8$ cm and angle $BAC = 56°$.
Sector OPQ has centre O, sector angle x and radius 6.5 cm.

(a) Show that the area of triangle ABC is 26.5 cm^2 correct to 1 decimal place.

Answer(a)

[2]

(b) The area of sector OPQ is equal to the area of triangle ABC.

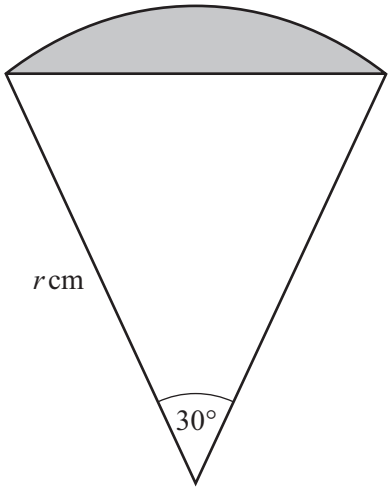
(i) Calculate the sector angle x.

Answer(b)(i) ..... [3]

(ii) Calculate the perimeter of the sector OPQ.

Answer(b)(ii) ..... cm [3]

(c) The diagram shows a sector of a circle, radius r cm.



NOT TO SCALE

(i) Show that the area of the shaded segment is $\frac{1}{4}r^2\left(\frac{1}{3}\pi - 1\right)$ cm^2.

Answer(c)(i)

[4]

(ii) The area of the segment is 5 cm^2.

Find the value of r.

Answer(c)(ii) r = ... [3]

8 **(a)** A straight line joins the points (–1, –4) and (3, 8).

(i) Find the midpoint of this line.

Answer(a)(i) (..... , ...) [2]

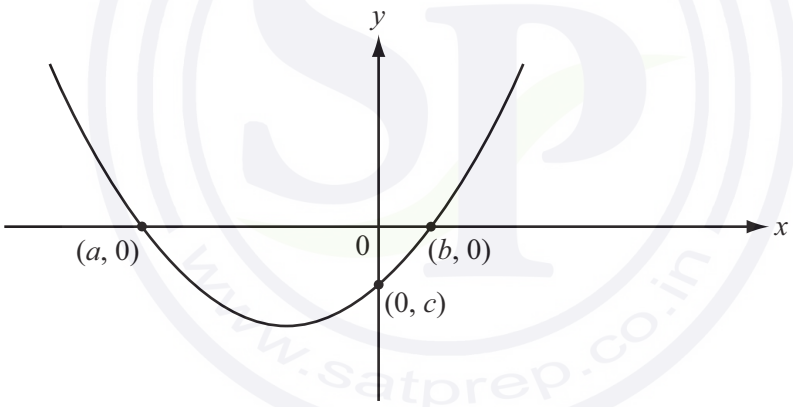
(ii) Find the equation of this line.
Give your answer in the form $y = mx + c$.

Answer(a)(ii) y = ... [3]

(b) **(i)** Factorise $x^2 + 3x - 10$.

Answer(b)(i) ..... [2]

(ii) The graph of $y = x^2 + 3x - 10$ is sketched below.



NOT TO SCALE

Write down the values of a, b and c.

Answer(b)(ii) a = ...

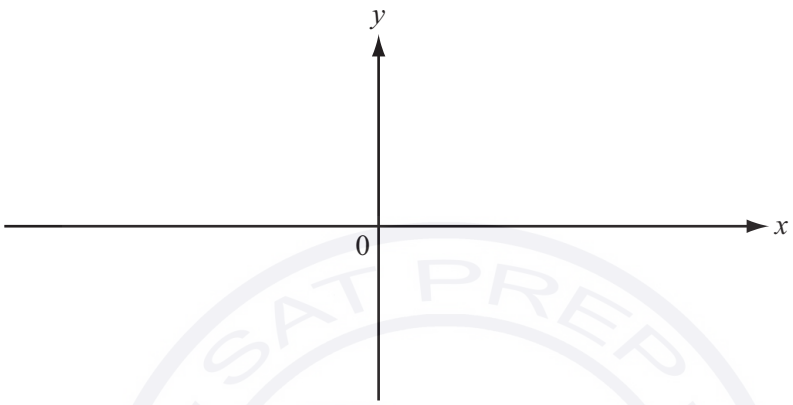
b = ...

c = ... [3]

(iii) Write down the equation of the line of symmetry of the graph of $y = x^2 + 3x - 10$.

Answer(b)(iii) ..... [1]

(c) Sketch the graph of $y = 18 + 7x - x^2$ on the axes below.
Indicate clearly the values where the graph crosses the x and y axes.



NOT TO SCALE

[4]

(d) (i) $x^2 + 12x - 7 = (x + p)^2 - q$

Find the value of p and the value of q.

Answer(d)(i) p = ...

q = ... [3]

(ii) Write down the minimum value of y for the graph of $y = x^2 + 12x - 7$.

Answer(d)(ii) ..... [1]

9 **(a)** Ricardo asks some motorists how many litres of fuel they use in one day.
The numbers of litres, correct to the nearest litre, are shown in the table.

Number of litres	16	17	18	19	20
Number of motorists	11	10	p	4	8

(i) For this table, the mean number of litres is 17.7 .

Calculate the value of p.

Answer(a)(i) p = ... [4]

(ii) Find the median number of litres.

Answer(a)(ii) ..... litres [1]

(b) Manuel completed a journey of 320 km in his car.
The fuel for the journey cost \$1.28 for every 6.4 km travelled.

(i) Calculate the cost of fuel for this journey.

Answer(b)(i) \$..... [2]

(ii) When Manuel travelled 480 km in his car it used 60 litres of fuel.
Manuel's car used fuel at the same rate for the journey of 320 km.

Calculate the number of litres of fuel the car used for the journey of 320 km.

Answer(b)(ii) ..... litres [2]

(iii) Calculate the cost per litre of fuel used for the journey of 320 km.

Answer(b)(iii) \$..... [2]

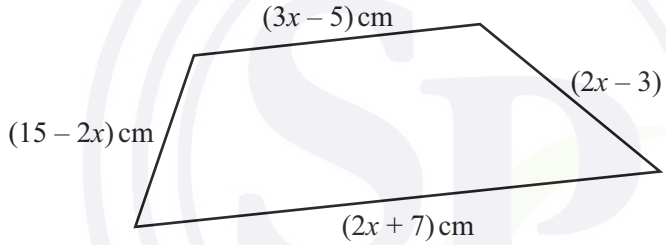
(c) Ellie drives a car at a constant speed of 30 m/s correct to the nearest 5 m/s.
She maintains this speed for 5 minutes correct to the nearest 10 seconds.

Calculate the upper bound of the distance in **kilometres** that Ellie could have travelled.

Answer(c) ..... km [5]

---

10 (a)



NOT TO SCALE

(i) Write an expression, in terms of x, for the perimeter of the quadrilateral.
Give your answer in its simplest form.

Answer(a)(i) ..... cm [2]

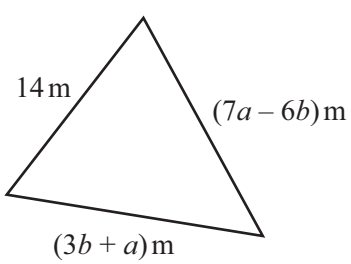
(ii) The perimeter of the quadrilateral is 32 cm.

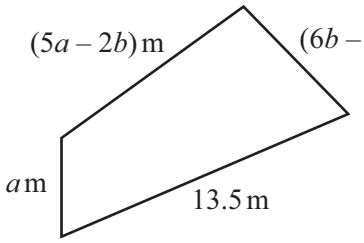
Find the length of the longest side of the quadrilateral.

Answer(a)(ii) ..... cm [3]

Question 10(b) is printed on the next page.

(b)





NOT TO SCALE

The triangle has a perimeter of 32.5 m.
The quadrilateral has a perimeter of 39.75 m.

Write two equations in terms of a and b and simplify them.
Use an algebraic method to find the values of a and b.
Show all your working.

Answer(b) a = ...

b = ... [6]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

3415255704

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2014**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **19** printed pages and **1** blank page.

1 $\mathbf{A} = \begin{pmatrix} 3 & 2 \\ -1 & 1 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} -2 & 5 \end{pmatrix}$ $\mathbf{C} = \begin{pmatrix} -2 \\ 5 \end{pmatrix}$ $\mathbf{D} = \begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$

(a) Work out, when possible, each of the following.
If it is not possible, write 'not possible' in the answer space.

(i) $2\mathbf{A}$

Answer(a)(i) [1]

(ii) $\mathbf{B} + \mathbf{C}$

Answer(a)(ii) [1]

(iii) $\mathbf{AD}$

Answer(a)(iii) [2]

(iv) $\mathbf{A}^{-1}$, the inverse of $\mathbf{A}$.

Answer(a)(iv) [2]

(b) Explain why it is not possible to work out $\mathbf{CD}$.

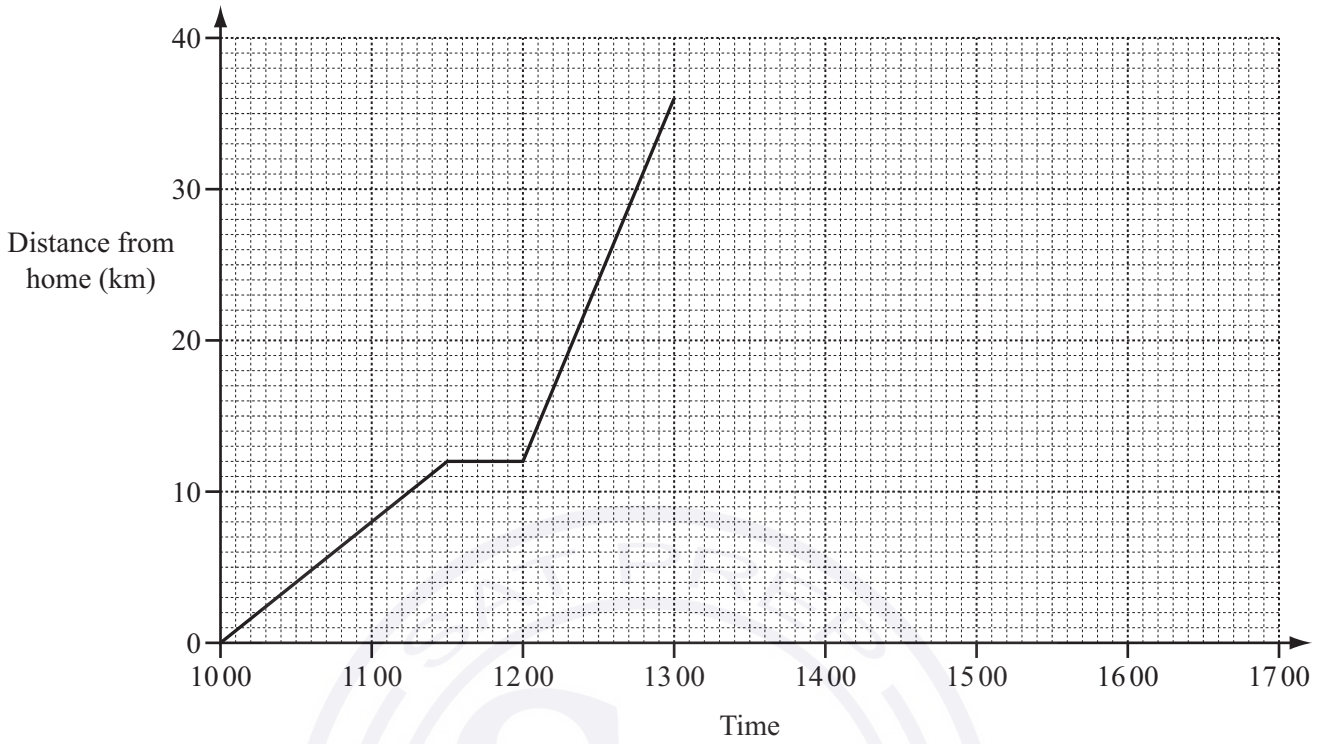
Answer(b) ..... [1]

(c) Describe fully the **single** transformation represented by the matrix $\mathbf{D}$.

Answer(c) .....

..... [3]

2 Ali leaves home at 10 00 to cycle to his grandmother's house. He arrives at 13 00.
The distance-time graph represents his journey.



(a) Calculate Ali's speed between 10 00 and 11 30.
Give your answer in kilometres per hour.

Answer(a) ..... km/h [2]

(b) Show that Ali's average speed for the whole journey to his grandmother's house is 12 km/h.

Answer(b)

[2]

(c) Change 12 kilometres per hour into metres per minute.

Answer(c) ..... m/min [2]

(d) Ali stays for 45 minutes at his grandmother's house and then returns home.
He arrives home at 16 42.

Complete the distance-time graph. [2]

[Turn over

3 **(a)** The running costs for a papermill are \$75 246.
This amount is divided in the ratio labour costs : materials = 5 : 1.

Calculate the labour costs.

Answer(a) \$ ..... [2]

(b) In 2012 the company made a profit of \$135 890.
In 2013 the profit was \$150 675.

Calculate the percentage increase in the profit from 2012 to 2013.

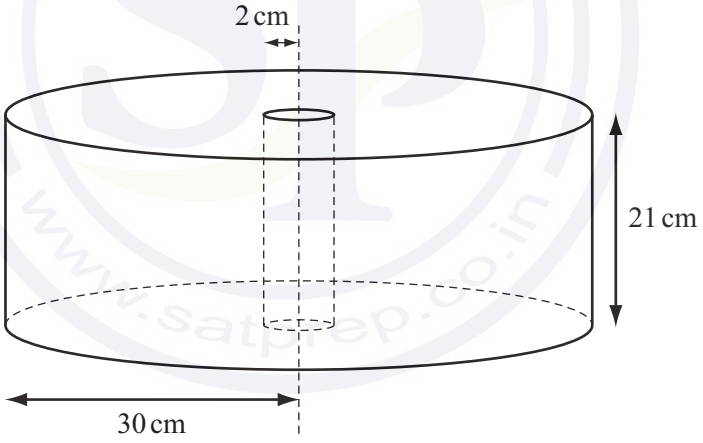
Answer(b) ..... % [3]

(c) The profit of \$135 890 in 2012 was an increase of 7% on the profit in 2011.

Calculate the profit in 2011.

Answer(c) \$ ..... [3]

(d)



Paper is sold in cylindrical rolls.
There is a wooden cylinder of radius 2 cm and height 21 cm in the centre of each roll.
The outer radius of a roll of paper is 30 cm.

(i) Calculate the volume of paper in a roll.

Answer(d)(i) ..... cm^3 [3]

(ii) The paper is cut into sheets which measure 21 cm by 29.7 cm.
The thickness of each sheet is 0.125 mm.

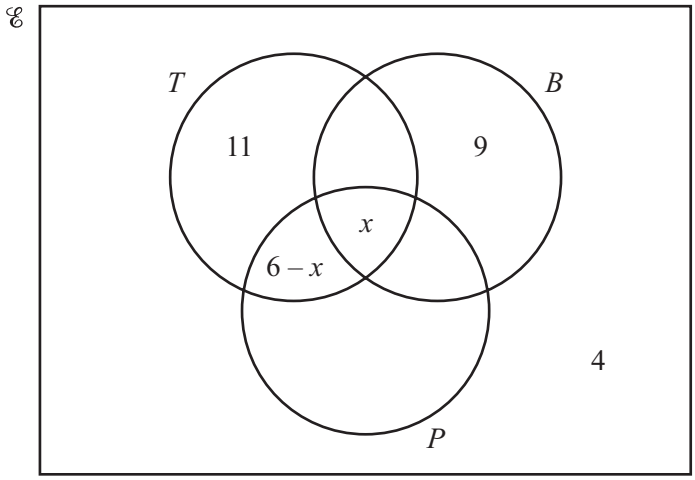
(a) Change 0.125 millimetres into centimetres.

Answer(d)(ii)(a) ..... cm [1]

(b) Work out how many whole sheets of paper can be cut from a roll.

Answer(d)(ii)(b) ..... [4]

4



In the Venn diagram, $\mathscr{E}$ = {children in a nursery}

B = {children who received a book for their birthday}
T = {children who received a toy for their birthday}
P = {children who received a puzzle for their birthday}

x children received a book and a toy and a puzzle.
6 children received a toy and a puzzle.

(a) 4 children received a book and a toy.
5 children received a book and a puzzle.
7 children received a puzzle but not a book and not a toy.

Complete the Venn diagram above. [3]

(b) There are 40 children in the nursery.

Using the Venn diagram, write down and solve an equation in x.

Answer(b)

[3]

(c) Work out

(i) the probability that a child, chosen at random, received a book but not a toy and not a puzzle,

Answer(c)(i) ..... [1]

(ii) the number of children who received a book and a puzzle but not a toy,

Answer(c)(ii) ..... [1]

(iii) n(B),

Answer(c)(iii) ..... [1]

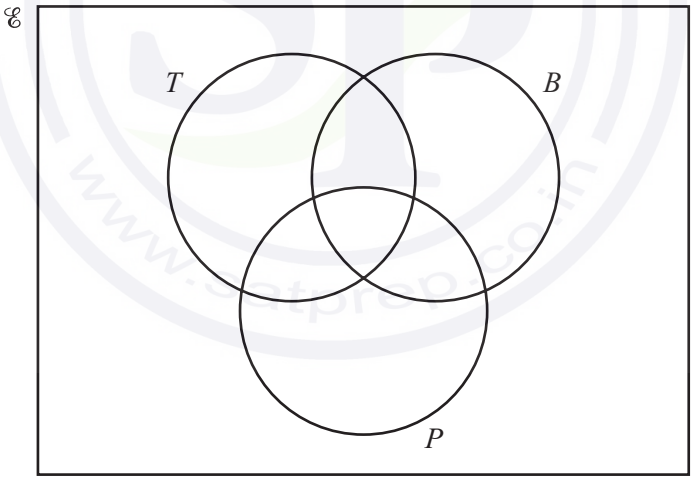
(iv) n($B \cup P$),

Answer(c)(iv) ..... [1]

(v) n($B \cup T \cup P$)'.

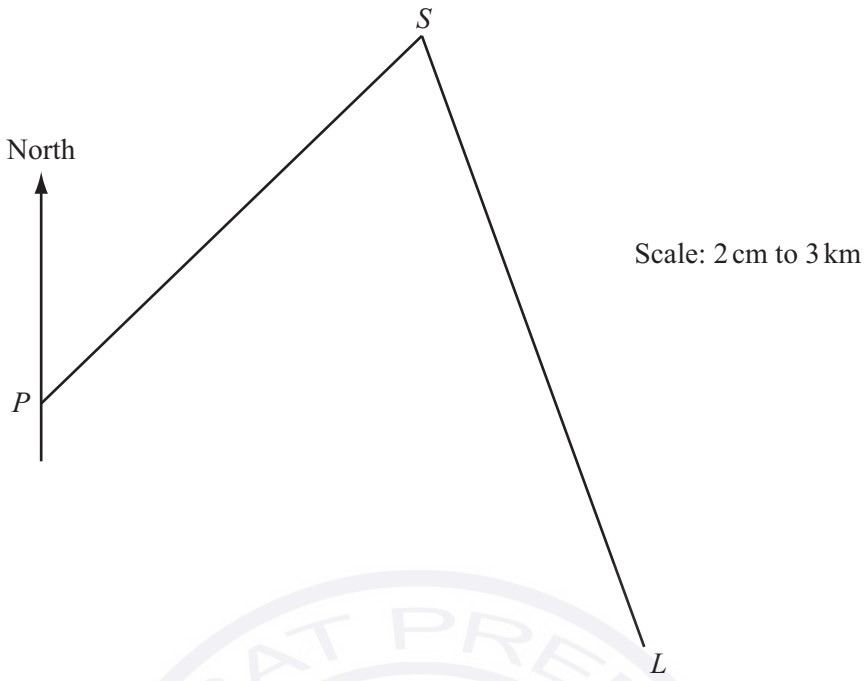
Answer(c)(v) ..... [1]

(d)



Shade the region $B \cap (T \cup P)'$. [1]

5



Scale: 2 cm to 3 km

In the scale drawing, P is a port, L is a lighthouse and S is a ship.
The scale is 2 centimetres represents 3 kilometres.

(a) Measure the bearing of S from P.

Answer(a) ..... [1]

(b) Find the actual distance of S from L.

Answer(b) ..... km [2]

(c) The bearing of L from S is 160°.

Calculate the bearing of S from L.

Answer(c) ..... [1]

(d) Work out the scale of the map in the form $1 : n$.

Answer(d) 1 : ..... [2]

(e) A boat B is

- equidistant from S and L

and

- equidistant from the lines PS and SL.

On the diagram, **using a straight edge and compasses only**, construct the position of B. [5]

(f) The lighthouse stands on an island of area $1.5\,cm^2$ on the scale drawing.

Work out the actual area of the island.

Answer(f) ..... km^2 [2]

6 **(a)** A square spinner is biased.
The probabilities of obtaining the scores 1, 2, 3 and 4 when it is spun are given in the table.

Score	1	2	3	4
Probability	0.1	0.2	0.4	0.3

(i) Work out the probability that on one spin the score is 2 or 3.

Answer(a)(i) ..... [2]

(ii) In 5000 spins, how many times would you expect to score 4 with this spinner?

Answer(a)(ii) ..... [1]

(iii) Work out the probability of scoring 1 on the first spin and 4 on the second spin.

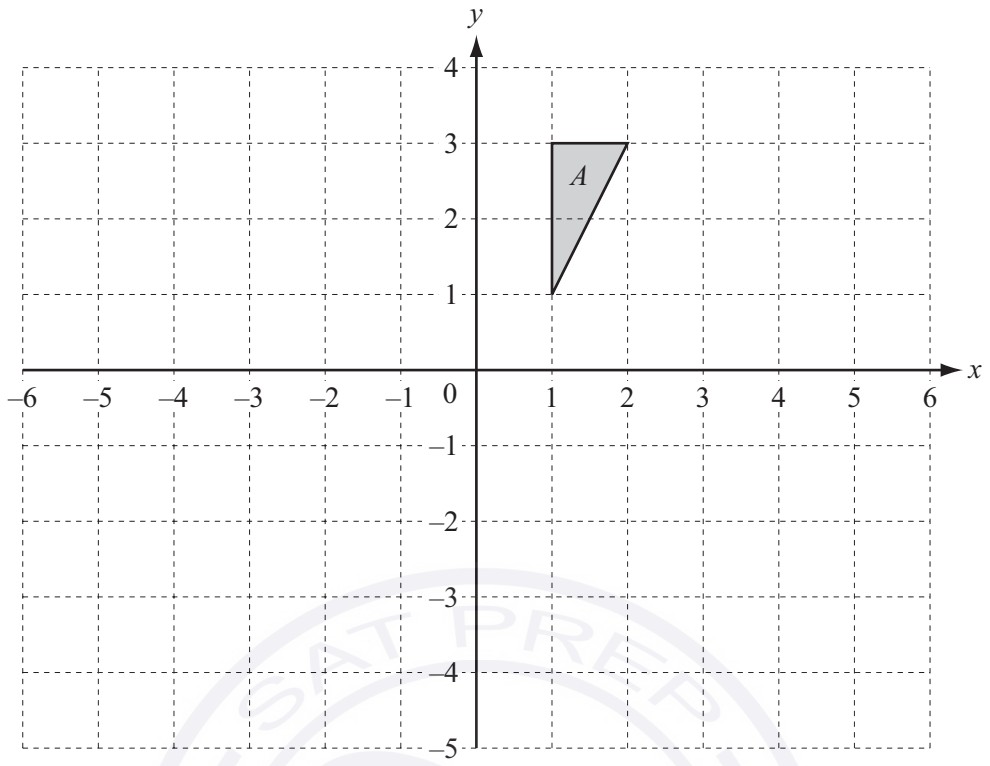
Answer(a)(iii) ..... [2]

(b) In a bag there are 7 red discs and 5 blue discs.
From the bag a disc is chosen at random and not replaced.
A second disc is then chosen at random.

Work out the probability that at least one of the discs is red.
Give your answer as a fraction.

Answer(b) ..... [3]

7



(a) On the grid,

(i) draw the image of shape A after a translation by the vector $\begin{pmatrix} -5 \\ -4 \end{pmatrix}$, [2]

(ii) draw the image of shape A after a rotation through 90° clockwise about the origin. [2]

(b) **(i)** On the grid, draw the image of shape A after the transformation represented by the matrix $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$.

[3]

(ii) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$.

Answer(b)(ii) .....

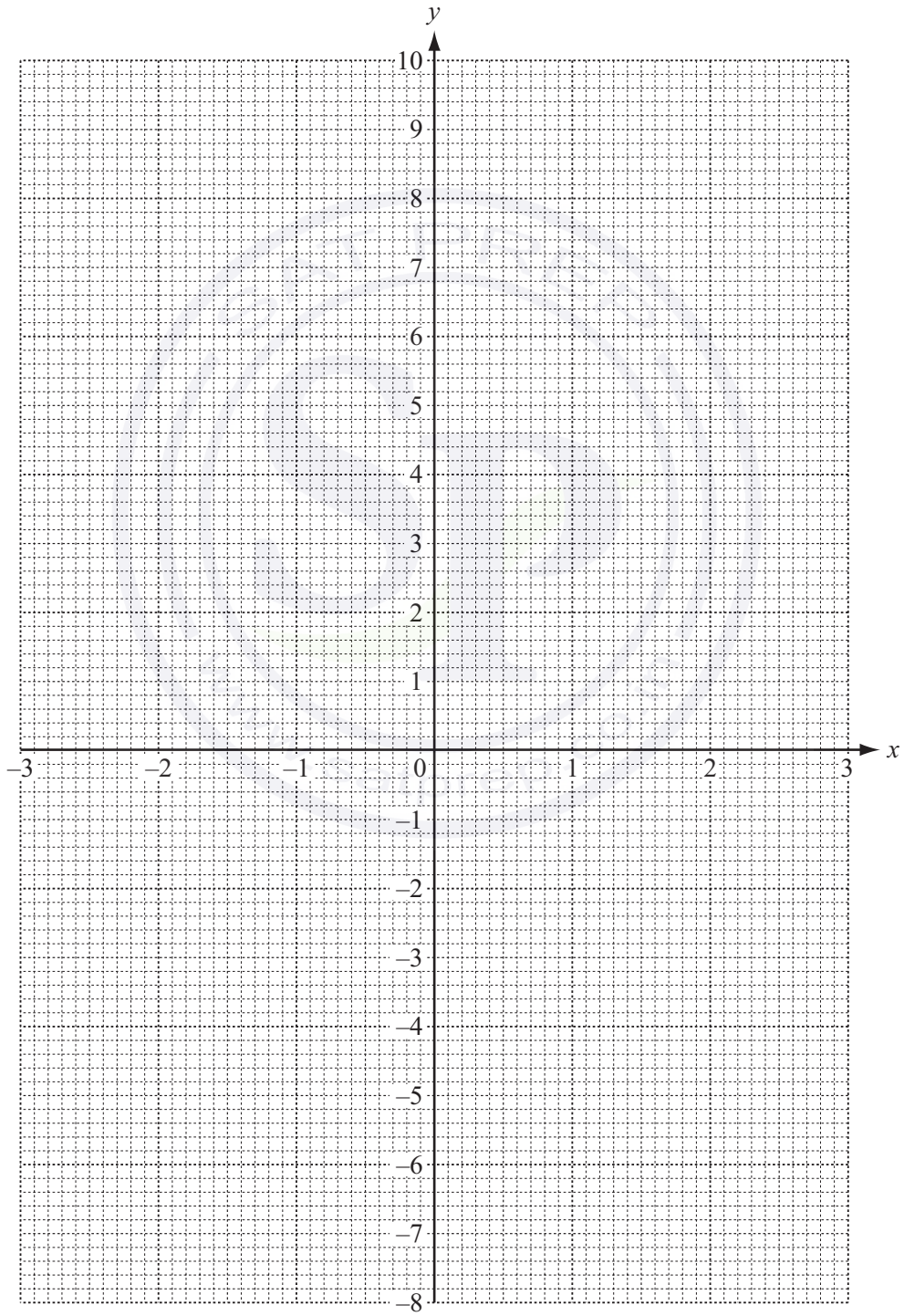
..... [3]

8 **(a)** Complete the table of values for $y = x^3 - 3x + 1$.

x	–2.5	–2	–1.5	–1	–0.5	0	0.5	1	1.5	2	2.5
y	–7.125	–1		3		1	–0.375	–1	–0.125	3	9.125

[2]

(b) Draw the graph of $y = x^3 - 3x + 1$ for $-2.5 \leqslant x \leqslant 2.5$.



[4]

(c) By drawing a suitable tangent, estimate the gradient of the curve at the point where $x = 2$.

Answer(c) ..... [3]

(d) Use your graph to solve the equation $x^3 - 3x + 1 = 1$.

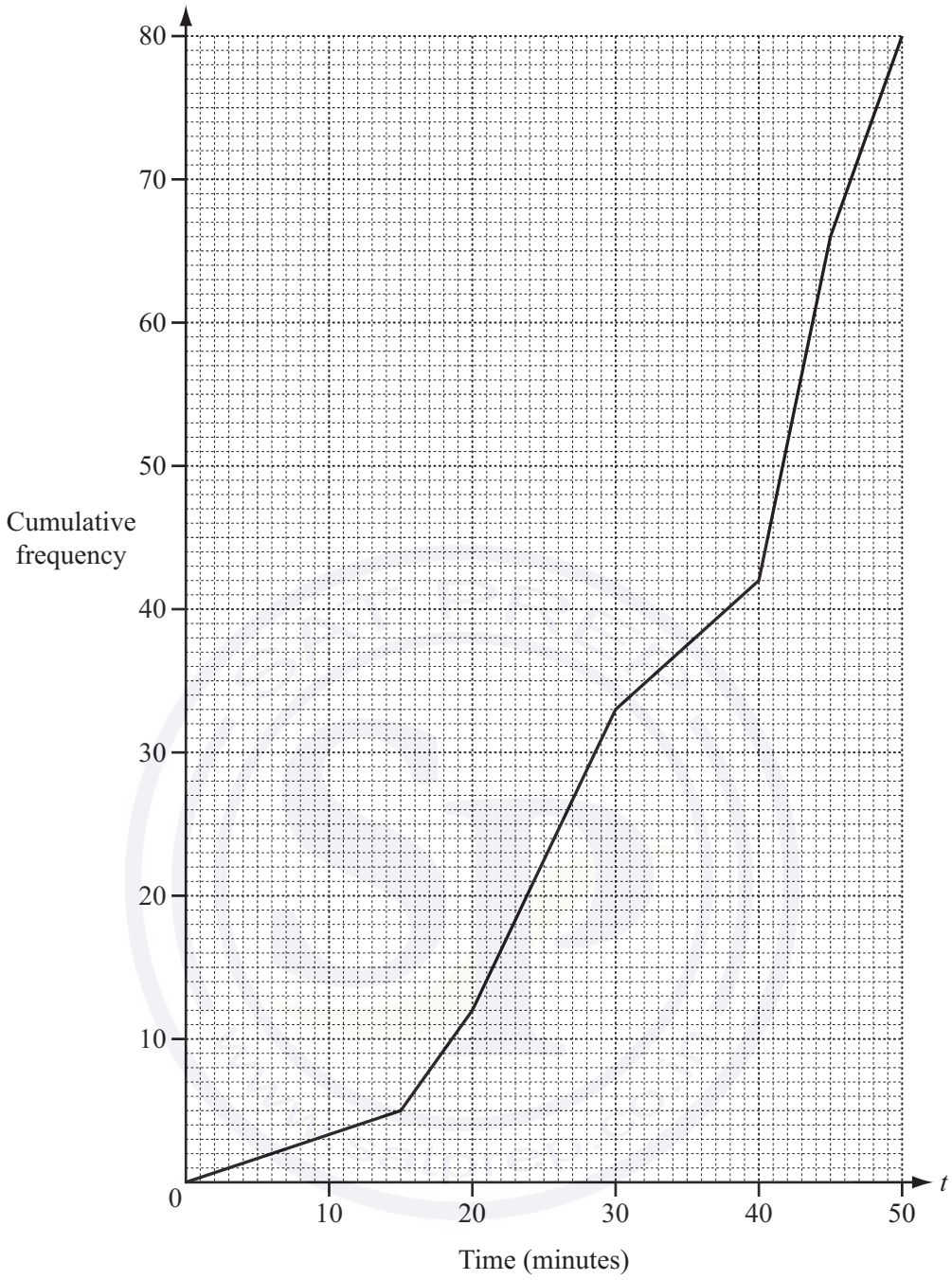
Answer(d) $x =$ ..... or $x =$ ..... or $x =$ ..... [2]

(e) Use your graph to complete the inequality in k for which the equation

$x^3 - 3x + 1 = k$ has three different solutions.

Answer(e) ..... $< k <$ ..... [2]

9



The times (t minutes) taken by 80 people to complete a charity swim were recorded.
The results are shown in the cumulative frequency diagram above.

(a) Find

(i) the median,

Answer(a)(i) ..... min [1]

(ii) the inter-quartile range,

Answer(a)(ii) ..... min [2]

(iii) the 70th percentile.

Answer(a)(iii) ..... min [2]

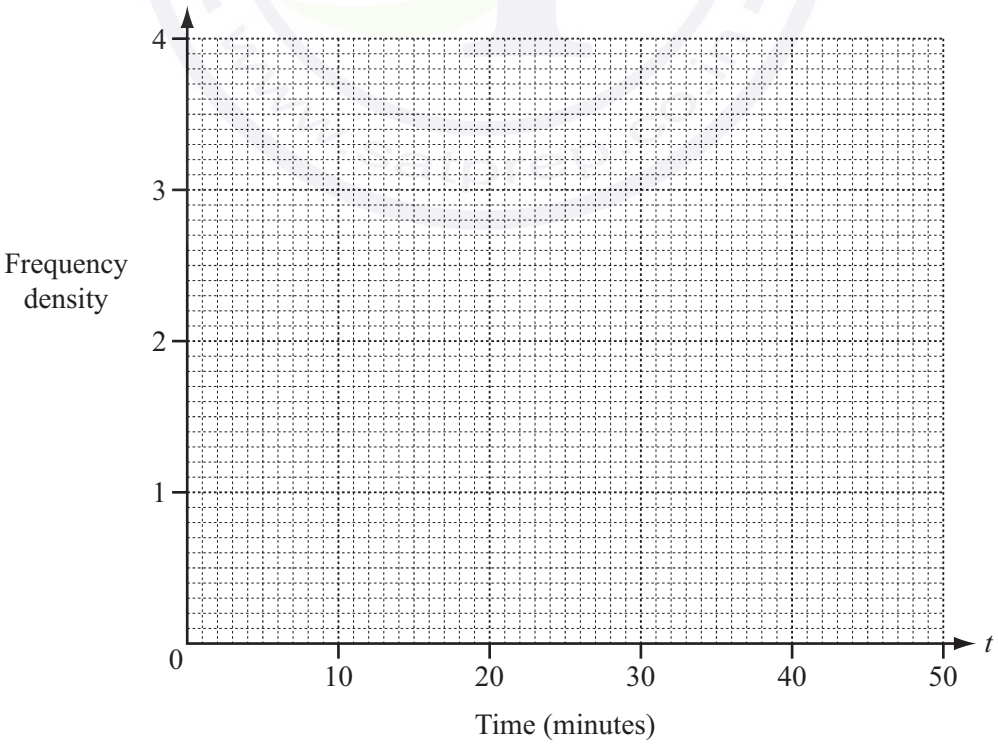
(b) The times taken by the 80 people are shown in this grouped frequency table.

Time (t minutes)	$0 < t \leqslant 20$	$20 < t \leqslant 30$	$30 < t \leqslant 45$	$45 < t \leqslant 50$
Frequency	12	21	33	14

(i) Calculate an estimate of the mean time.

Answer(b)(i) ..... min [4]

(ii) Draw a histogram to represent the grouped frequency table.



[4]

10 (a) $f(x) = 2x - 3$ $\quad g(x) = \dfrac{1}{x+1} + 2$ $\quad h(x) = 3^x$

(i) Work out f(4).

Answer(a)(i) ..... [1]

(ii) Work out fh(–1).

Answer(a)(ii) ..... [2]

(iii) Find $f^{-1}(x)$, the inverse of $f(x)$.

Answer(a)(iii) $f^{-1}(x)$ = ... [2]

(iv) Find $ff(x)$ in its simplest form.

Answer(a)(iv) $ff(x)$ = ... [2]

(v) Show that the equation $f(x) = g(x)$ simplifies to $2x^2 - 3x - 6 = 0$.

Answer(a)(v)

[3]

(vi) Solve the equation $2x^2 - 3x - 6 = 0$.

Give your answers correct to 2 decimal places.
Show all your working.

Answer(a)(vi) $x =$ ..... or $x =$ ..... [4]

(b) Simplify $\dfrac{x^2 - 3x + 2}{x^2 + 3x - 10}$.

Answer(b) ..... [4]

11 **(a)** $\overrightarrow{PQ} = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$

(i) P is the point (–2, 3).

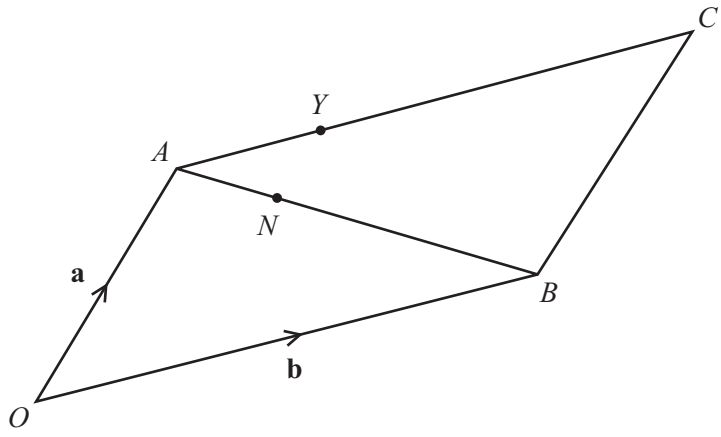
Work out the co-ordinates of Q.

Answer(a)(i) (..... , ...) [1]

(ii) Work out $|\overrightarrow{PQ}|$, the magnitude of $\overrightarrow{PQ}$.

Answer(a)(ii) ..... [2]

(b)



NOT TO SCALE

$OACB$ is a parallelogram.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
$AN : NB = 2 : 3$ and $AY = \frac{2}{5}AC$.

(i) Write each of the following in terms of **a** and/or **b**.
Give your answers in their simplest form.

(a) $\overrightarrow{ON}$

Answer(b)(i)(a) $\overrightarrow{ON}$ = ... [2]

(b) $\overrightarrow{NY}$

Answer(b)(i)(b) $\overrightarrow{NY}$ = ... [2]

(ii) Write down two conclusions you can make about the line segments NY and BC.

Answer(b)(ii) .....

..... [2]

BLANK PAGE

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

0048475967

MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2014**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

1 Jane and Kate share \$240 in the ratio $5 : 7$.

(a) Show that Kate receives \$140.

Answer(a)

[2]

(b) Jane and Kate each spend \$20.

Find the new ratio Jane's remaining money : Kate's remaining money.
Give your answer in its simplest form.

Answer(b) ..... : ..... [2]

(c) Kate invests \$120 for 5 years at 4% per year simple interest.

Calculate the total amount Kate has after 5 years.

Answer(c) \$ ..... [3]

(d) Jane invests \$80 for 3 years at 4% per year compound interest.

Calculate the total amount Jane has after 3 years.
Give your answer correct to the nearest cent.

Answer(d) \$ ..... [3]

(e) An investment of \$200 for 2 years at 4% per year compound interest is the same as an investment of \$200 for 2 years at r% per year simple interest.

Find the value of r.

Answer(e) r = ... [3]

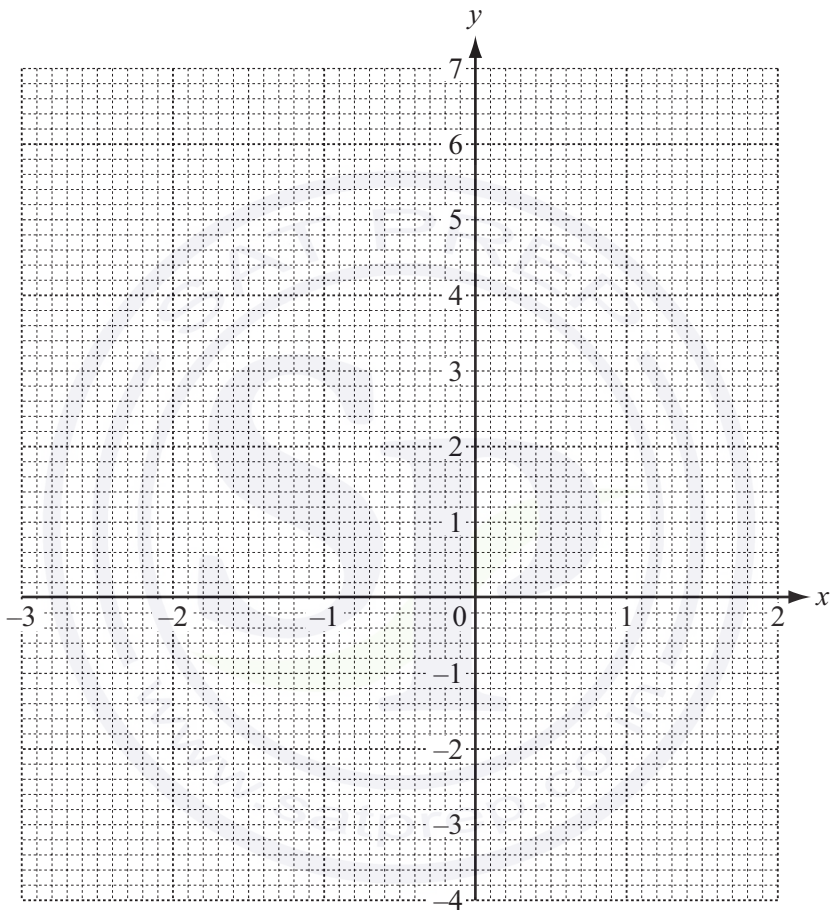
2 $f(x) = \frac{1}{x^2} - 2x$, $x \neq 0$

(a) Complete the table of values for $f(x)$.

x	–3	–2.5	–2	–1.5	–1	–0.5	0.4	0.5	1	1.5	2
$f(x)$	6.1	5.2	4.3	3.4		5	5.5			–2.6	–3.8

[3]

(b) On the grid, draw the graph of $y = f(x)$ for $-3 \leqslant x \leqslant -0.5$ and $0.4 \leqslant x \leqslant 2$.



[5]

(c) Solve the equation $f(x) = 2$.

Answer(c) $x =$ ..... [1]

(d) Solve the equation $f(x) = 2x + 3$.

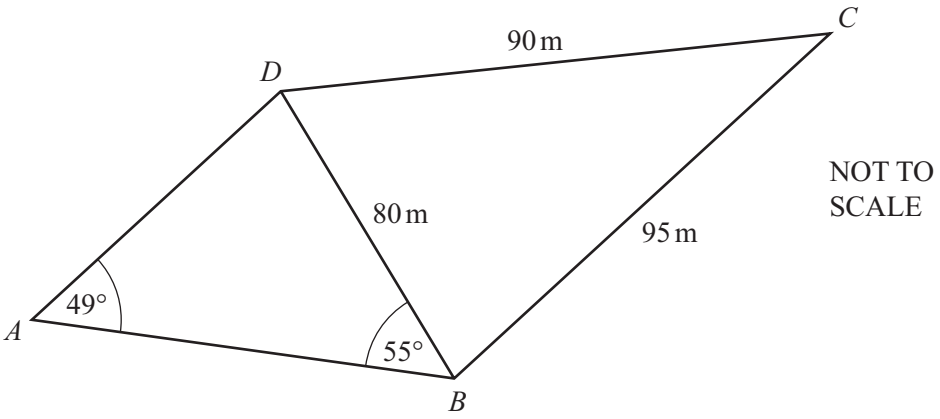
Answer(d) $x =$ ..... [3]

(e) **(i)** Draw the tangent to the graph of $y = f(x)$ at the point where $x = -1.5$. [1]

(ii) Use the tangent to estimate the gradient of the graph of $y = f(x)$ where $x = -1.5$.

Answer(e)(ii) ..... [2]

3



The diagram shows a quadrilateral $ABCD$.
Angle $BAD = 49°$ and angle $ABD = 55°$.
$BD = 80$ m, $BC = 95$ m and $CD = 90$ m.

(a) Use the sine rule to calculate the length of AD.

Answer(a) $AD =$ ..... m [3]

(b) Use the cosine rule to calculate angle BCD.

Answer(b) Angle $BCD =$ ..... [4]

(c) Calculate the area of the quadrilateral *ABCD*.

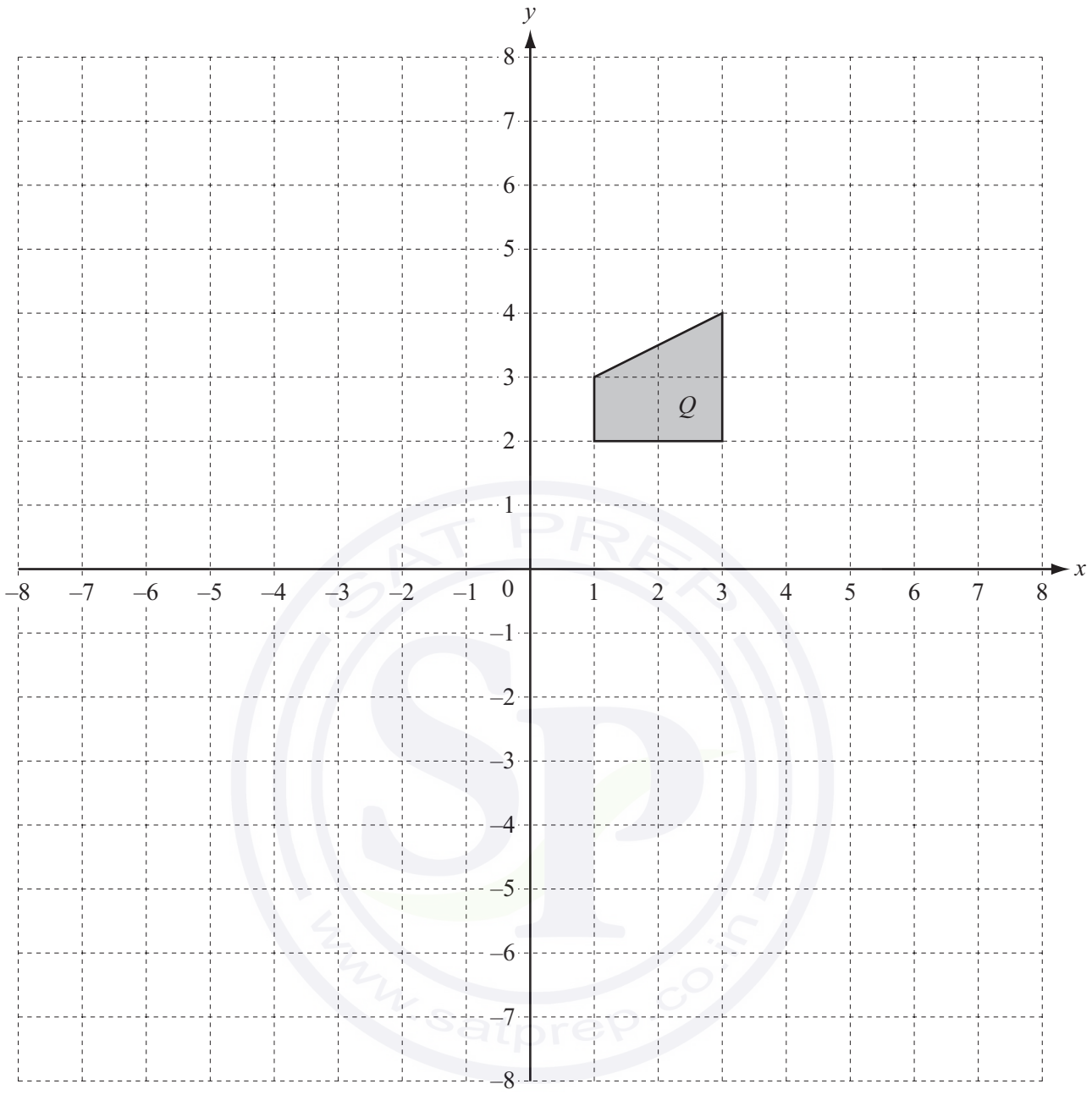
Answer(c) ..... m^2 [3]

(d) The quadrilateral represents a field.
Corn seeds are sown across the whole field at a cost of \$3250 per hectare.

Calculate the cost of the corn seeds used.
1 hectare = 10 000 m^2

Answer(d) \$ ..... [3]

4



(a) Draw the reflection of shape Q in the line $x = -1$. [2]

(b) **(i)** Draw the enlargement of shape Q, centre (0, 0), scale factor -2. [2]

(ii) Find the 2×2 matrix that represents an enlargement, centre (0, 0), scale factor -2.

Answer(b)(ii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(c) **(i)** Draw the stretch of shape Q, factor 2, x-axis invariant. [2]

(ii) Find the 2×2 matrix that represents a stretch, factor 2, x-axis invariant.

Answer(c)(ii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(iii) Find the inverse of the matrix in **part (c)(ii)**.

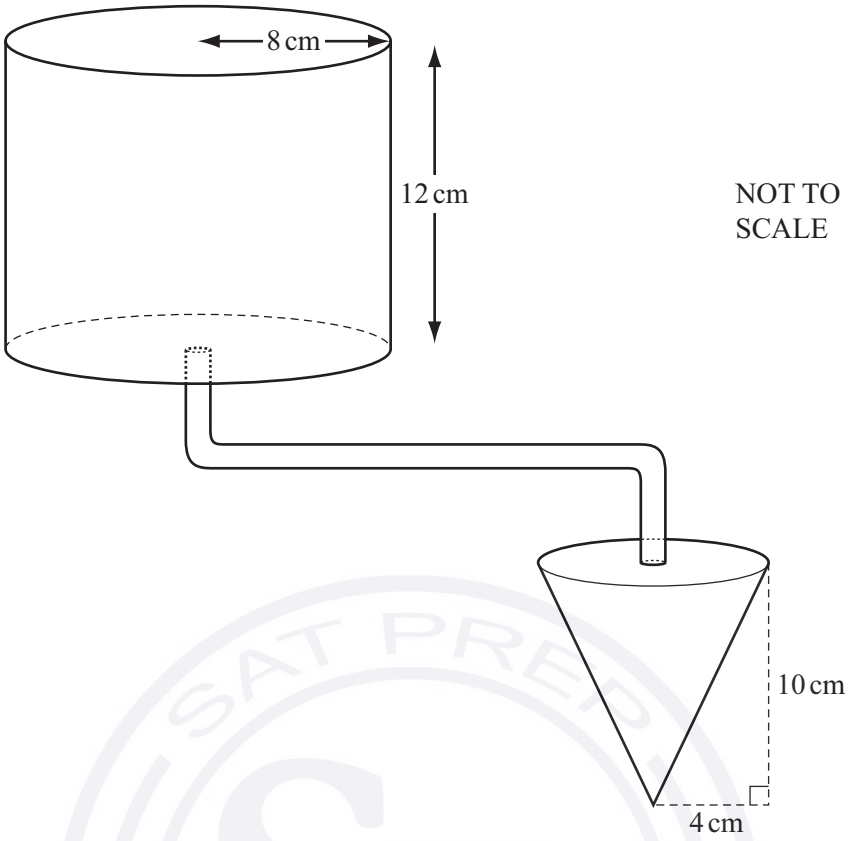
Answer(c)(iii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(iv) Describe fully the **single** transformation represented by the matrix in **part (c)(iii)**.

Answer(c)(iv) .....

..... [3]

5



The diagram shows a cylinder with radius 8 cm and height 12 cm which is full of water.
A pipe connects the cylinder to a cone.
The cone has radius 4 cm and height 10 cm.

(a) (i) Calculate the volume of water in the cylinder.
Show that it rounds to 2410 cm^3 correct to 3 significant figures.

Answer(a)(i)

[2]

(ii) Change 2410 cm^3 into litres.

Answer(a)(ii) ..... litres [1]

(b) Water flows from the cylinder along the pipe into the cone at a rate of $2\,cm^3$ per second.

Calculate the time taken to fill the empty cone.
Give your answer in minutes and seconds correct to the nearest second.

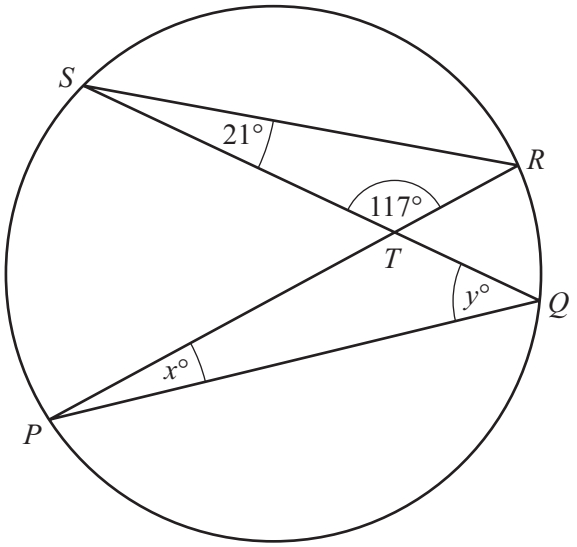
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

Answer(b) ..... min ..... s [4]

(c) Find the number of empty cones which can be filled completely from the full cylinder.

Answer(c) ..... [3]

6



NOT TO SCALE

(a) The chords PR and SQ of the circle intersect at T.
Angle $RST = 21°$ and angle $STR = 117°$.

(i) Find the values of x and y.

Answer(a)(i) x = ...

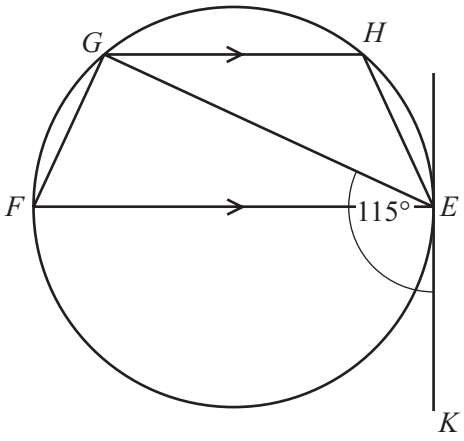
y = ... [2]

(ii) $SR = 8.23$ cm, $RT = 3.31$ cm and $PQ = 9.43$ cm.

Calculate the length of TQ.

Answer(a)(ii) TQ = ... cm [2]

(b) *EFGH* is a cyclic quadrilateral.
EF is a diameter of the circle.
KE is the tangent to the circle at *E*.
GH is parallel to *FE* and angle *KEG* = 115°.

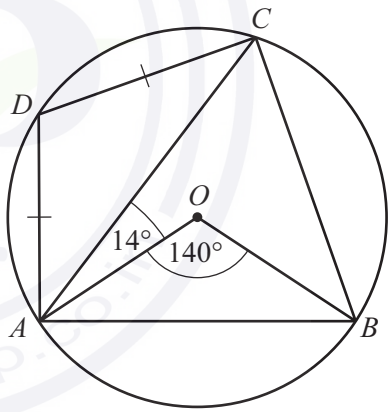


NOT TO SCALE

Calculate angle *GEH*.

Answer(b) Angle *GEH* = ... [4]

(c) *A*, *B*, *C* and *D* are points on the circle centre *O*.
Angle *AOB* = 140° and angle *OAC* = 14°.
AD = *DC*.

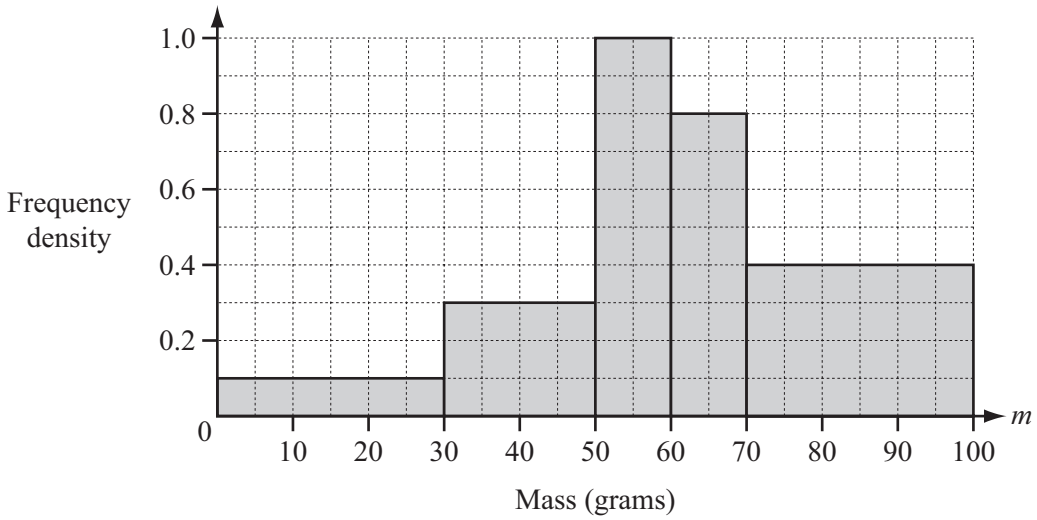


NOT TO SCALE

Calculate angle *ACD*.

Answer(c) Angle *ACD* = ... [5]

7 (a)



The histogram shows some information about the masses (m grams) of 39 apples.

(i) Show that there are 12 apples in the interval $70 < m \leqslant 100$.

Answer(a)(i)

[1]

(ii) Calculate an estimate of the mean mass of the 39 apples.

Answer(a)(ii) ..... g [5]

(b) The mean mass of 20 oranges is 70 g.
One orange is eaten.
The mean mass of the remaining oranges is 70.5 g.

Find the mass of the orange that was eaten.

Answer(b) ..... g [3]

8 The distance a train travels on a journey is 600 km.

(a) Write down an expression, in terms of x, for the average speed of the train when

(i) the journey takes x hours,

Answer(a)(i) ..... km/h [1]

(ii) the journey takes $(x + 1)$ hours.

Answer(a)(ii) ..... km/h [1]

(b) The difference between the average speeds in **part(a)(i)** and **part(a)(ii)** is 20 km/h.

(i) Show that $x^2 + x - 30 = 0$.

Answer(b)(i)

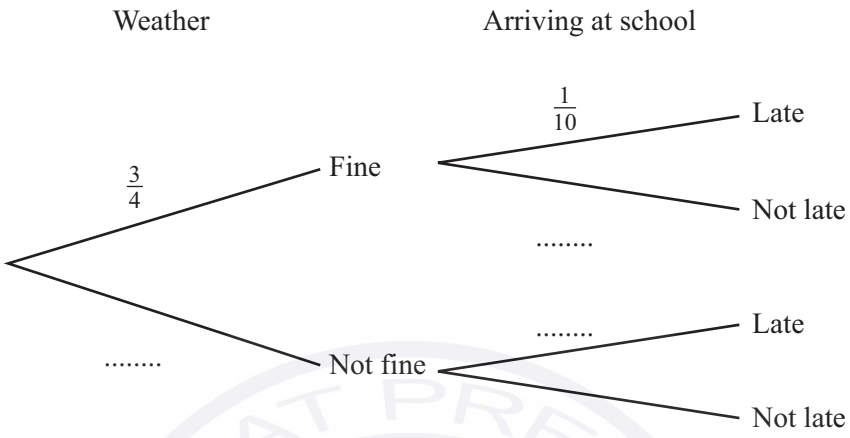
[3]

(ii) Find the average speed of the train for the journey in **part(a)(ii)**.
Show all your working.

Answer(b)(ii) ..... km/h [4]

9 If the weather is fine the probability that Carlos is late arriving at school is $\frac{1}{10}$.
If the weather is not fine the probability that he is late arriving at school is $\frac{1}{3}$.
The probability that the weather is fine on any day is $\frac{3}{4}$.

(a) Complete the tree diagram to show this information.



[3]

(b) In a school term of 60 days, find the number of days the weather is expected to be fine.

Answer(b) ..... [1]

(c) Find the probability that the weather is fine and Carlos is late arriving at school.

Answer(c) ..... [2]

(d) Find the probability that Carlos is not late arriving at school.

Answer(d) ..... [3]

(e) Find the probability that the weather is not fine on at least one day in a school week of 5 days.

Answer(e) ..... [2]

10 $f(x) = \frac{1}{x}$, $x \neq 0$ $g(x) = 1 - x$ $h(x) = x^2 + 1$

(a) Find $fg\left(\frac{1}{2}\right)$.

Answer(a) ..... [2]

(b) Find $g^{-1}(x)$, the inverse of $g(x)$.

Answer(b) $g^{-1}(x) =$ ..... [1]

(c) Find $hg(x)$, giving your answer in its simplest form.

Answer(c) $hg(x) =$ ..... [3]

(d) Find the value of x when $g(x) = 7$.

Answer(d) $x =$ ..... [1]

(e) Solve the equation $h(x) = 3x$.
Show your working and give your answers correct to 2 decimal places.

Answer(e) $x =$ ..... or $x =$ ..... [4]

(f) A function $k(x)$ is its own inverse when $k^{-1}(x) = k(x)$.

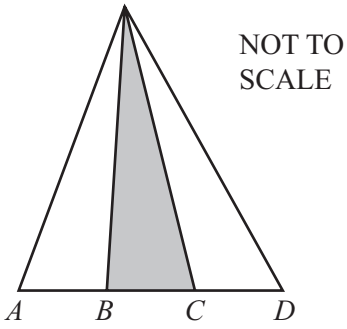
For which of the functions $f(x)$, $g(x)$ and $h(x)$ is this true?

Answer(f) ..... [1]

Question 11 is printed on the next page.

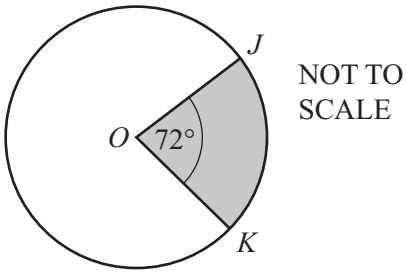
11 The total area of each of the following shapes is X.
The area of the shaded part of each shape is kX.

For each shape, find the value of k and write your answer below each diagram.



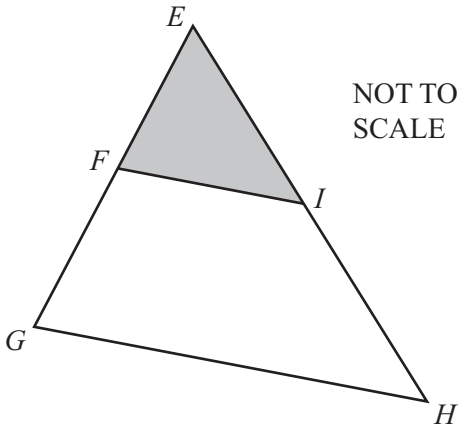
$AB = BC = CD$

$k =$ .....



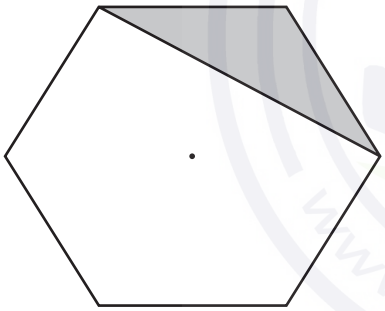
Angle $JOK = 72°$

$k =$ .....



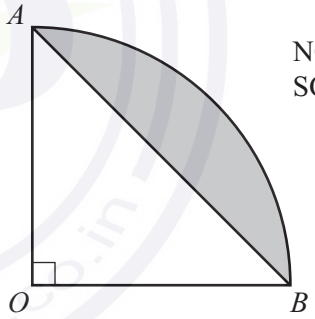
$EF = FG$ and $EI = IH$

$k =$ .....



The shape is a regular hexagon.

$k =$ .....



The diagram shows a sector of a circle centre O.
Angle $AOB = 90°$

$k =$ .....

[10]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

9468931136

MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2014**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

1 In July, a supermarket sold 45 981 bottles of fruit juice.

(a) The cost of a bottle of fruit juice was \$1.35 .

Calculate the amount received from the sale of the 45 981 bottles.
Give your answer correct to the nearest hundred dollars.

Answer(a) \$ ..... [2]

(b) The number of bottles sold in July was 17% more than the number sold in January.

Calculate the number of bottles sold in January.

Answer(b) ..... [3]

(c) There were 3 different flavours of fruit juice.
The number of bottles sold in each flavour was in the ratio apple : orange : cherry = 3 : 4 : 2.
The total number of bottles sold was 45 981.

Calculate the number of bottles of orange juice sold.

Answer(c) ..... [2]

(d) One bottle contains 1.5 litres of fruit juice.

Calculate the number of 330 ml glasses that can be filled completely from one bottle.

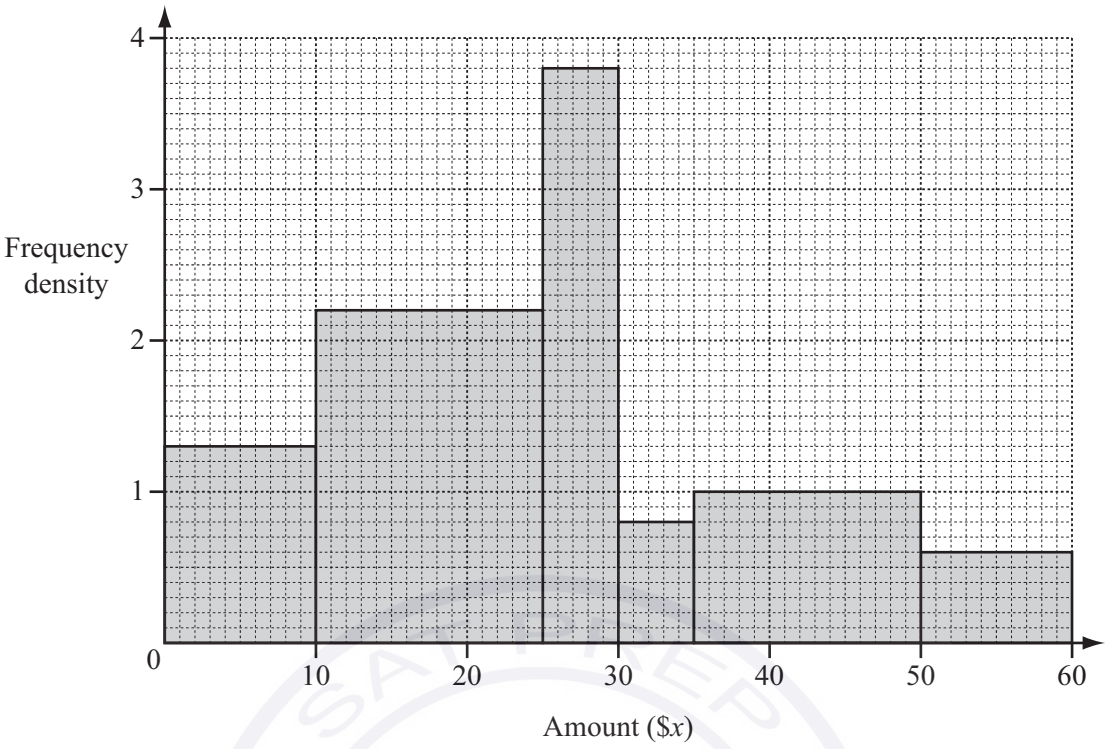
Answer(d) ..... [3]

(e) $\frac{5}{9}$ of the 45 981 bottles are recycled.

Calculate the number of bottles that are recycled.

Answer(e) ..... [2]

2



A survey asked 90 people how much money they gave to charity in one month.
The histogram shows the results of the survey.

(a) Complete the frequency table for the six columns in the histogram.

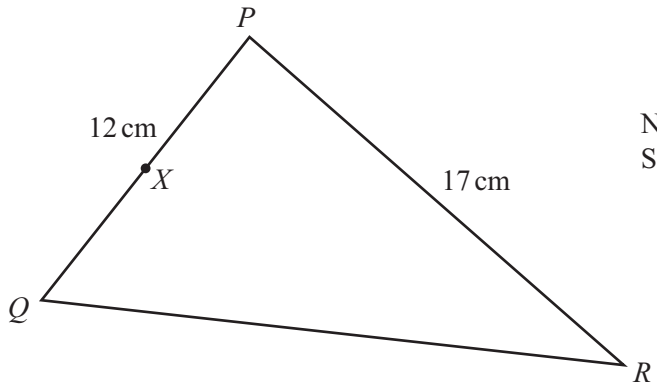
Amount ($x)	$0 < x \leqslant 10$					
Frequency				4		

[5]

(b) Use your frequency table to calculate an estimate of the mean amount these 90 people gave to charity.

Answer(b) $ ..... [4]

3 (a)



NOT TO SCALE

The diagram shows triangle PQR with $PQ = 12$ cm and $PR = 17$ cm.
The area of triangle PQR is 97 cm^2 and angle QPR is acute.

(i) Calculate angle QPR.

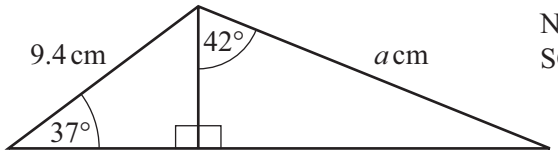
Answer(a)(i) Angle QPR = ... [3]

(ii) The midpoint of PQ is X.

Use the cosine rule to calculate the length of XR.

Answer(a)(ii) XR = ... cm [4]

(b)



NOT TO SCALE

Calculate the value of a.

Answer(b) a = ... [4]

(c) $\sin x = \cos 40°, \quad 0° \leqslant x \leqslant 180°$

Find the two values of x.

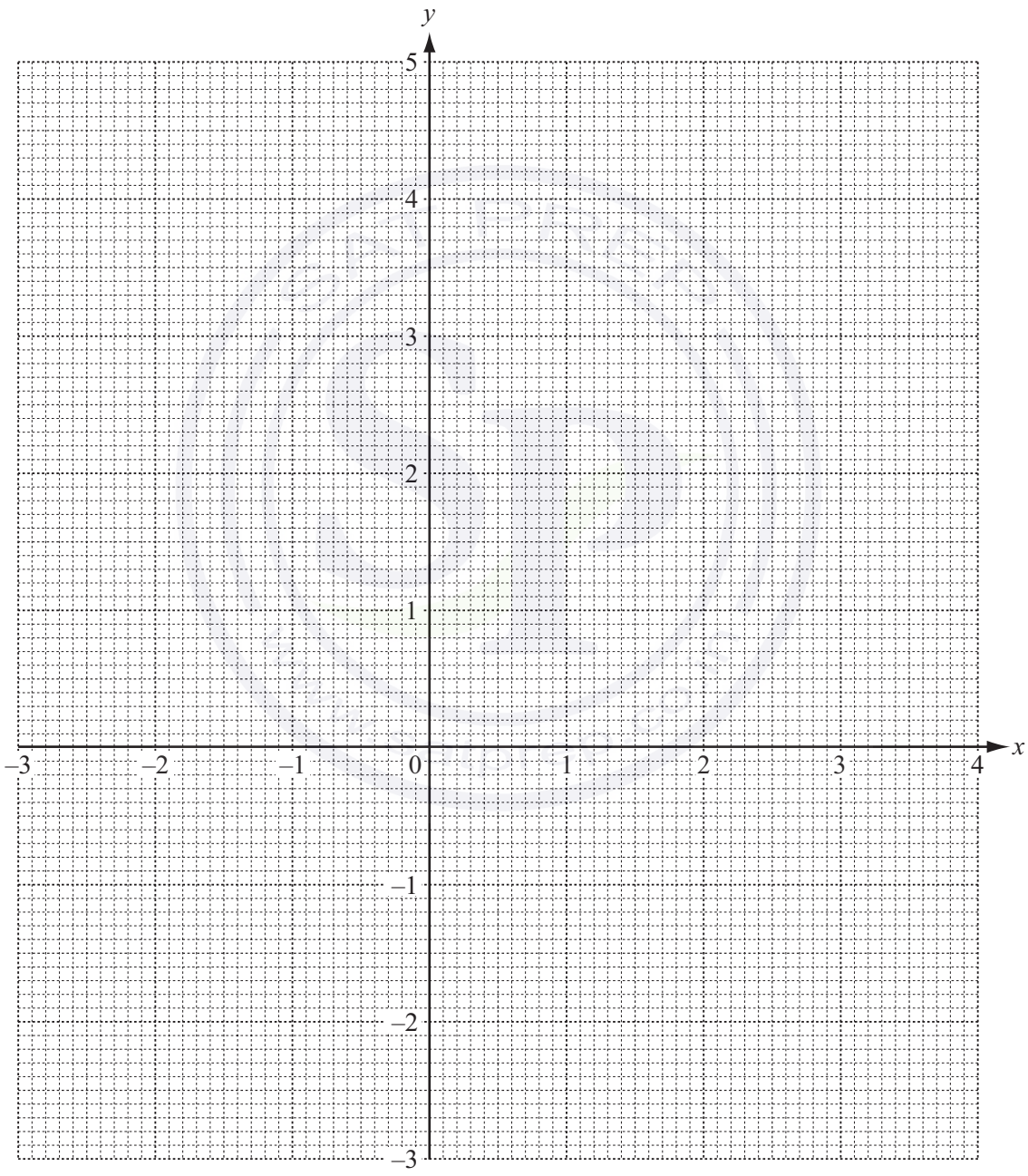
Answer(c) x = ... or x = ... [2]

4 The table shows some values for the function $y = \frac{1}{x^2} + x$, $x \neq 0$.

x	–3	–2	–1	–0.5		0.5	1	2	3	4
y	–2.89	–1.75		3.5			2	2.25		4.06

(a) Complete the table of values. [3]

(b) On the grid, draw the graph of $y = \frac{1}{x^2} + x$ for $-3 \leqslant x \leqslant -0.5$ and $0.5 \leqslant x \leqslant 4$.



[5]

(c) Use your graph to solve the equation $\frac{1}{x^2} + x - 3 = 0$.

Answer(c) $x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(d) Use your graph to solve the equation $\frac{1}{x^2} + x = 1 - x$.

Answer(d) $x =$ ..... [3]

(e) By drawing a suitable tangent, find an estimate of the gradient of the curve at the point where $x = 2$.

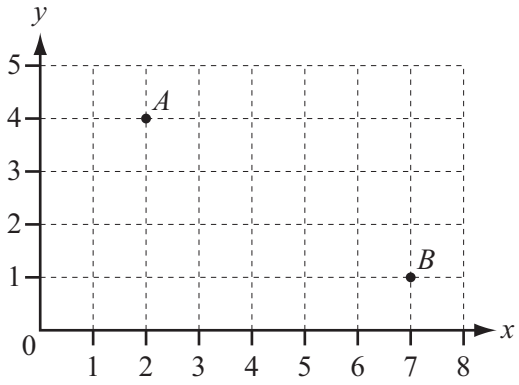
Answer(e) ..... [3]

(f) Using algebra, show that you can use the graph at $y = 0$ to find $\sqrt[3]{-1}$.

Answer(f)

[3]

5 (a)



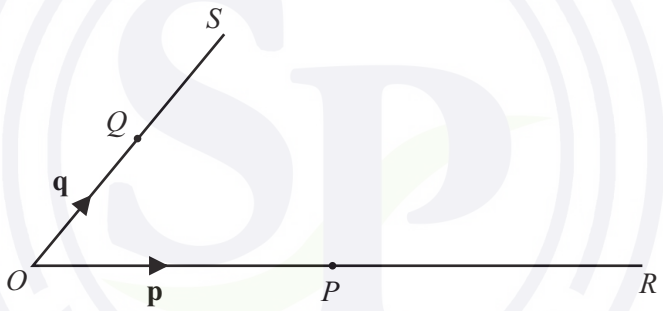
(i) Write down the position vector of A.

Answer(a)(i) $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(ii) Find $|\overrightarrow{AB}|$, the magnitude of $\overrightarrow{AB}$.

Answer(a)(ii) ..... [2]

(b)



NOT TO SCALE

O is the origin, $\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OQ} = \mathbf{q}$.
OP is extended to R so that $OP = PR$.
OQ is extended to S so that $OQ = QS$.

(i) Write down $\overrightarrow{RQ}$ in terms of **p** and **q**.

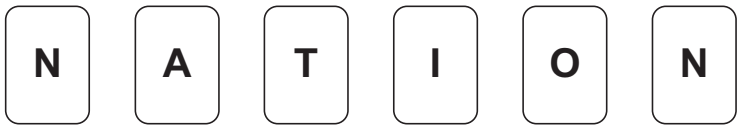
Answer(b)(i) $\overrightarrow{RQ}$ = ... [1]

(ii) PS and RQ intersect at M and $RM = 2MQ$.

Use vectors to find the ratio $PM : PS$, showing all your working.

Answer(b)(ii) $PM : PS$ = ... : ..... [4]

6 In this question, give all your answers as fractions.



The letters of the word **NATION** are printed on 6 cards.

(a) A card is chosen at random.

Write down the probability that

(i) it has the letter **T** printed on it,

Answer(a)(i) ..... [1]

(ii) it does not have the letter **N** printed on it,

Answer(a)(ii) ..... [1]

(iii) the letter printed on it has no lines of symmetry.

Answer(a)(iii) ..... [1]

(b) Lara chooses a card at random, replaces it, then chooses a card again.

Calculate the probability that only **one** of the cards she chooses has the letter **N** printed on it.

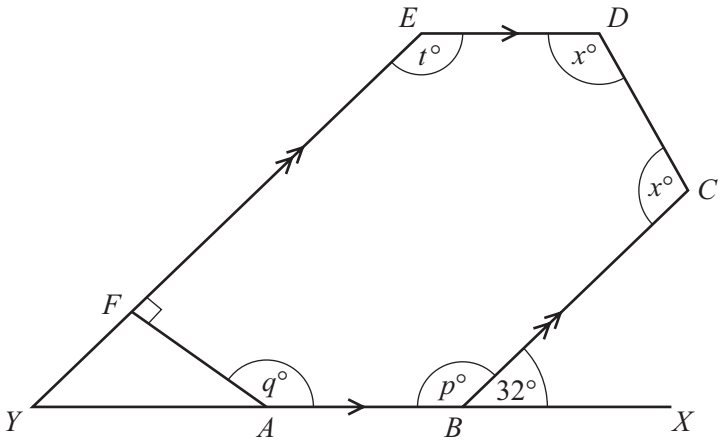
Answer(b) ..... [3]

(c) Jacob chooses a card at random and does not replace it.
He continues until he chooses a card with the letter **N** printed on it.

Find the probability that this happens when he chooses the 4th card.

Answer(c) ..... [3]

7 (a)



NOT TO SCALE

ABCDEF is a hexagon.
AB is parallel to *ED* and *BC* is parallel to *FE*.
YFE and *YABX* are straight lines.
Angle *CBX* = 32° and angle *EFA* = 90°.

Calculate the value of

(i) p,

Answer(a)(i) p = ... [1]

(ii) q,

Answer(a)(ii) q = ... [2]

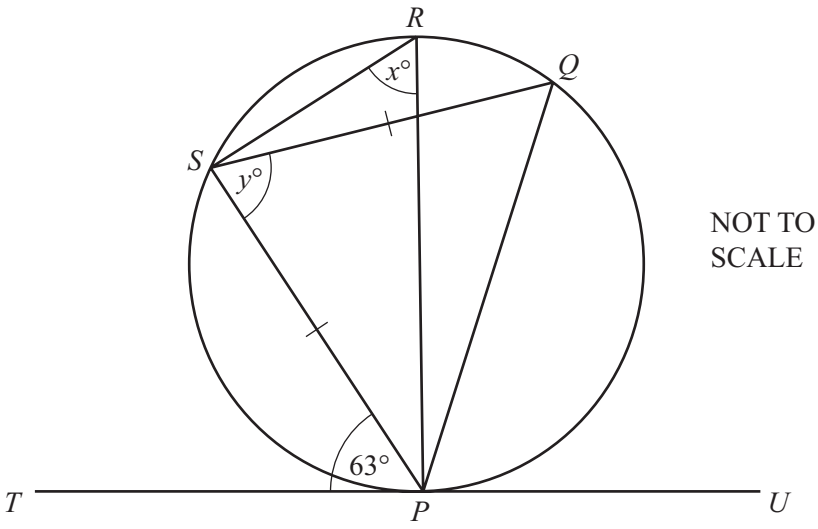
(iii) t,

Answer(a)(iii) t = ... [1]

(iv) x.

Answer(a)(iv) x = ... [3]

(b)



P, Q, R and S are points on a circle and $PS = SQ$.
PR is a diameter and TPU is the tangent to the circle at P.
Angle $SPT = 63°$.

Find the value of

(i) x,

Answer(b)(i) x = ... [2]

(ii) y.

Answer(b)(ii) y = ... [2]

8 **(a)** **(i)** Show that the equation $\frac{7}{x+4} + \frac{2x-3}{2} = 1$ can be simplified to $2x^2 + 3x - 6 = 0$.

Answer(a)(i)

[3]

(ii) Solve the equation $2x^2 + 3x - 6 = 0$.

Show all your working and give your answers correct to 2 decimal places.

Answer(a)(ii) $x =$ ..... or $x =$ ..... [4]

(b) The **total** surface area of a cone with radius x and slant height $3x$ is equal to the area of a circle with radius r.

Show that $r = 2x$.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]

Answer(b)

[4]

9 $f(x) = 4 - 3x$ $g(x) = 3^{-x}$

(a) Find $f(2x)$ in terms of x.

Answer(a) $f(2x) =$ ..... [1]

(b) Find $ff(x)$ in its simplest form.

Answer(b) $ff(x) =$ ..... [2]

(c) Work out $gg(-1)$.
Give your answer as a fraction.

Answer(c) ..... [3]

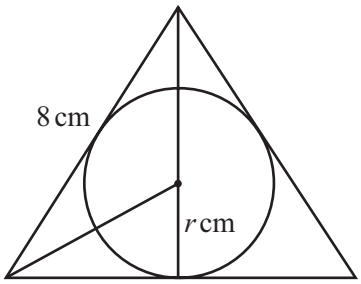
(d) Find $f^{-1}(x)$, the inverse of $f(x)$.

Answer(d) $f^{-1}(x) =$ ..... [2]

(e) Solve the equation $gf(x) = 1$.

Answer(e) $x =$ ..... [3]

10 (a)



NOT TO SCALE

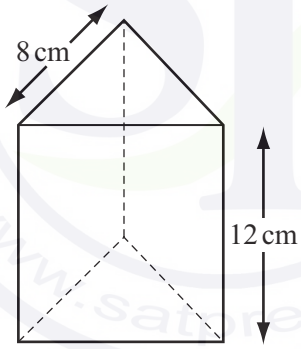
The three sides of an equilateral triangle are tangents to a circle of radius r cm.
The sides of the triangle are 8 cm long.

Calculate the value of r.
Show that it rounds to 2.3, correct to 1 decimal place.

Answer(a)

[3]

(b)



NOT TO SCALE

The diagram shows a box in the shape of a triangular prism of height 12 cm.
The cross section is an equilateral triangle of side 8 cm.

Calculate the volume of the box.

Answer(b) ..... cm^3 [4]

(c) The box contains biscuits.
Each biscuit is a cylinder of radius 2.3 centimetres and height 4 millimetres.

Calculate

(i) the largest number of biscuits that can be placed in the box,

Answer(c)(i) ..... [3]

(ii) the volume of one biscuit in cubic centimetres,

Answer(c)(ii) ..... cm^3 [2]

(iii) the percentage of the volume of the box **not** filled with biscuits.

Answer(c)(iii) ..... % [3]

Question 11 is printed on the next page.

11

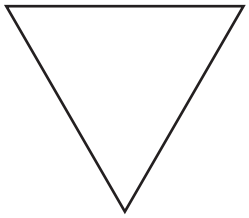


Diagram 1

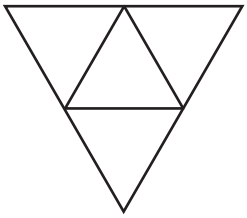


Diagram 2

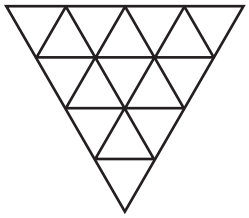


Diagram 3

The first three diagrams in a sequence are shown above.
Diagram 1 shows an equilateral triangle with sides of length 1 unit.

In Diagram 2, there are 4 triangles with sides of length $\frac{1}{2}$ unit.

In Diagram 3, there are 16 triangles with sides of length $\frac{1}{4}$ unit.

(a) Complete this table for Diagrams 4, 5, 6 and *n*.

	Diagram 1	Diagram 2	Diagram 3	Diagram 4	Diagram 5	Diagram 6		Diagram *n*
Length of side	1	$\frac{1}{2}$	$\frac{1}{4}$					
Length of side as a power of 2	2^0	2^{-1}	2^{-2}					

[6]

(b) (i) Complete this table for the number of the smallest triangles in Diagrams 4, 5 and 6.

	Diagram 1	Diagram 2	Diagram 3	Diagram 4	Diagram 5	Diagram 6
Number of smallest triangles	1	4	16			
Number of smallest triangles as a power of 2	2^0	2^2	2^4			

[2]

(ii) Find the number of the smallest triangles in Diagram *n*, giving your answer as a power of 2.

Answer(b)(ii) ..... [1]

(c) Calculate the number of the smallest triangles in the diagram where the smallest triangles have sides of length $\frac{1}{128}$ unit.

Answer(c) ..... [2]

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

6296615356

MATHEMATICS **0580/41**

Paper 4 (Extended) **October/November 2013**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **19** printed pages and **1** blank page.

For Examiner's Use

1 David sells fruit at the market.

(a) In one week, David sells 120 kg of tomatoes and 80 kg of grapes.

(i) Write 80 kg as a fraction of the total mass of tomatoes and grapes.
Give your answer in its lowest terms.

Answer(a)(i) ..... [1]

(ii) Write down the ratio mass of tomatoes : mass of grapes.
Give your answer in its simplest form.

Answer(a)(ii) ..... : ..... [1]

(b) **(i)** One day he sells 28 kg of oranges at \$1.56 per kilogram.
He also sells 35 kg of apples.
The total he receives from selling the oranges and the apples is \$86.38 .

Calculate the price of 1 kilogram of apples.

Answer(b)(i) \$ ..... [2]

(ii) The price of 1 kilogram of oranges is \$1.56 .
This is 20% more than the price two weeks ago.

Calculate the price two weeks ago.

Answer(b)(ii) \$ ..... [3]

(c) On another day, David received a total of \$667 from all the fruit he sold.
The cost of the fruit was \$314.20 .
David worked for $10\frac{1}{2}$ hours on this day.

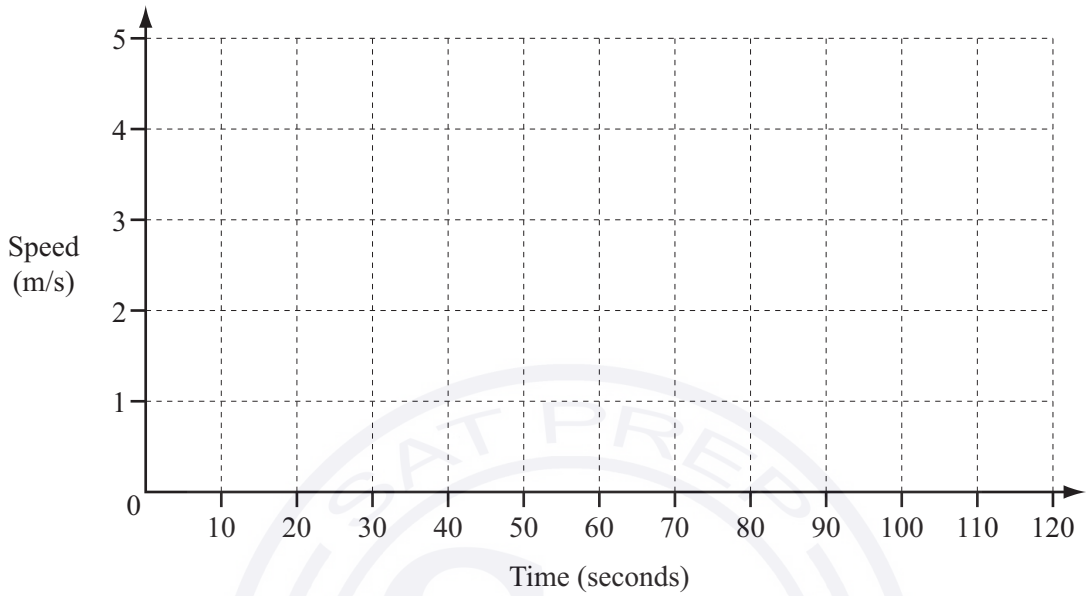
Calculate David's rate of profit in dollars per hour.

Answer(c) ..... dollars/h [2]

For Examiner's Use

2 Emily cycles along a path for 2 minutes.
She starts from rest and accelerates at a constant rate until she reaches a speed of 5 m/s after 40 seconds.
She continues cycling at 5 m/s for 60 seconds.
She then decelerates at a constant rate until she stops after a further 20 seconds.

(a) On the grid, draw a speed-time graph to show Emily's journey.



[2]

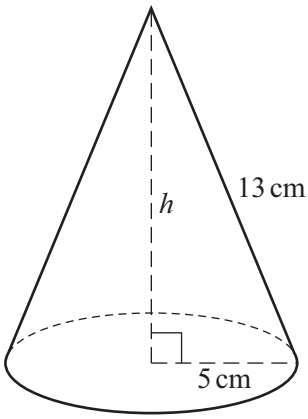
(b) Find Emily's acceleration.

Answer(b) ..... m/s^2 [1]

(c) Calculate Emily's average speed for the journey.

Answer(c) ..... m/s [4]

3



NOT TO SCALE

(a) The diagram shows a cone of radius 5 cm and slant height 13 cm.

(i) Calculate the curved surface area of the cone.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]

Answer(a)(i) ..... cm^2 [2]

(ii) Calculate the perpendicular height, h, of the cone.

Answer(a)(ii) $h =$ ..... cm [3]

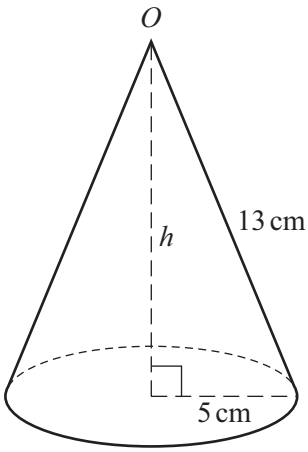
(iii) Calculate the volume of the cone.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

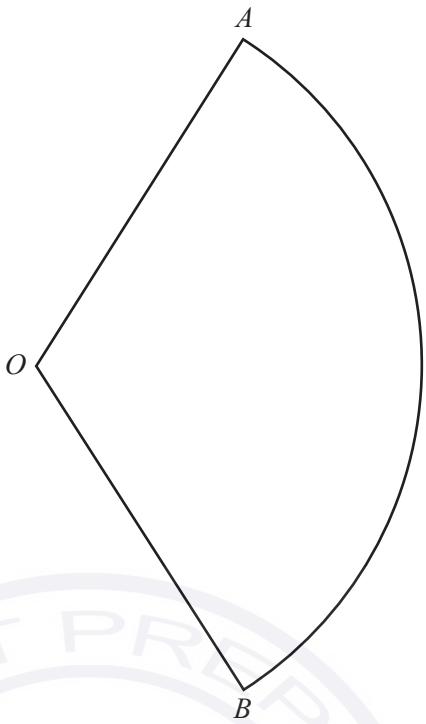
Answer(a)(iii) ..... cm^3 [2]

(iv) Write your answer to **part (a)(iii)** in cubic metres.
Give your answer in standard form.

Answer(a)(iv) ..... m^3 [2]

(b)





NOT TO SCALE

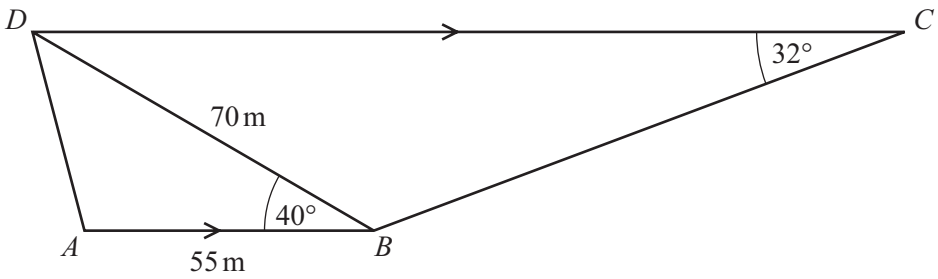
The cone is now cut along a slant height and it opens out to make the sector AOB of a circle.

Calculate angle AOB.

Answer(b) Angle AOB = ... [4]

For Examiner's Use

4



NOT TO SCALE

The diagram shows a school playground *ABCD*.
ABCD is a trapezium.
AB = 55 m, *BD* = 70 m, angle *ABD* = 40° and angle *BCD* = 32°.

(a) Calculate *AD*.

Answer(a) AD = ... m [4]

(b) Calculate *BC*.

Answer(b) BC = ... m [4]

For Examiner's Use

(c) (i) Calculate the area of the playground *ABCD*.

Answer(c)(i) ..... m^2 [3]

(ii) An accurate plan of the school playground is to be drawn to a scale of 1 : 200 .

Calculate the area of the school playground on the plan.
Give your answer in cm^2.

Answer(c)(ii) ..... cm^2 [2]

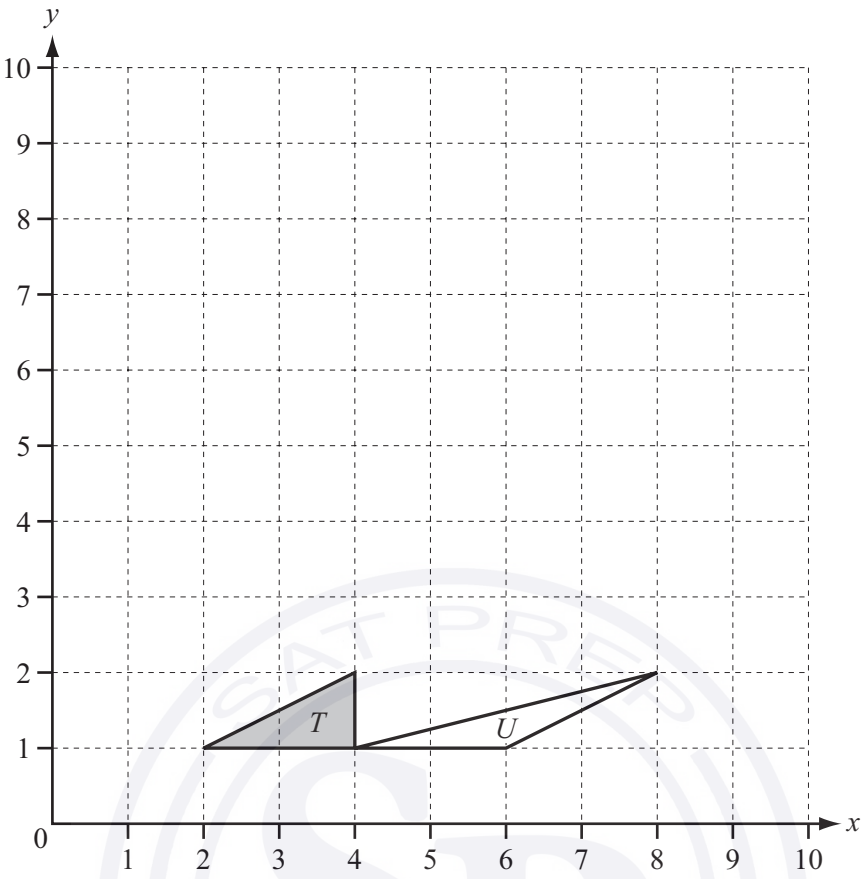
(d) A fence, *BD*, divides the playground into two areas.

Calculate the shortest distance from *A* to *BD*.

Answer(d) ..... m [2]

[Turn over

5 (a)



(i) Draw the reflection of triangle T in the line $y = 5$. [2]

(ii) Draw the rotation of triangle T about the point (4, 2) through 180°. [2]

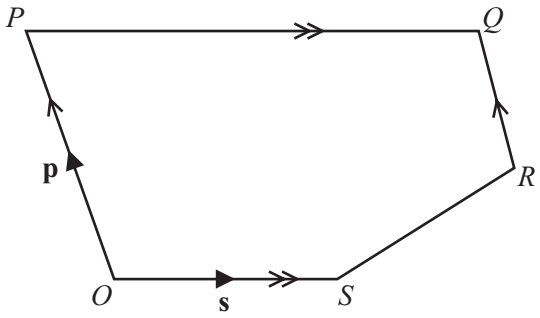
(iii) Describe fully the **single** transformation that maps triangle T onto triangle U.

Answer(a)(iii) ..... [3]

(iv) Find the 2×2 matrix which represents the transformation in **part (a)(iii)**.

Answer(a)(iv) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(b)



NOT TO SCALE

In the pentagon $OPQRS$, OP is parallel to RQ and OS is parallel to PQ.
$PQ = 2OS$ and $OP = 2RQ$.
O is the origin, $\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OS} = \mathbf{s}$.

Find, in terms of **p** and **s**, in their simplest form,

(i) the position vector of Q,

Answer(b)(i) ..... [2]

(ii) $\overrightarrow{SR}$.

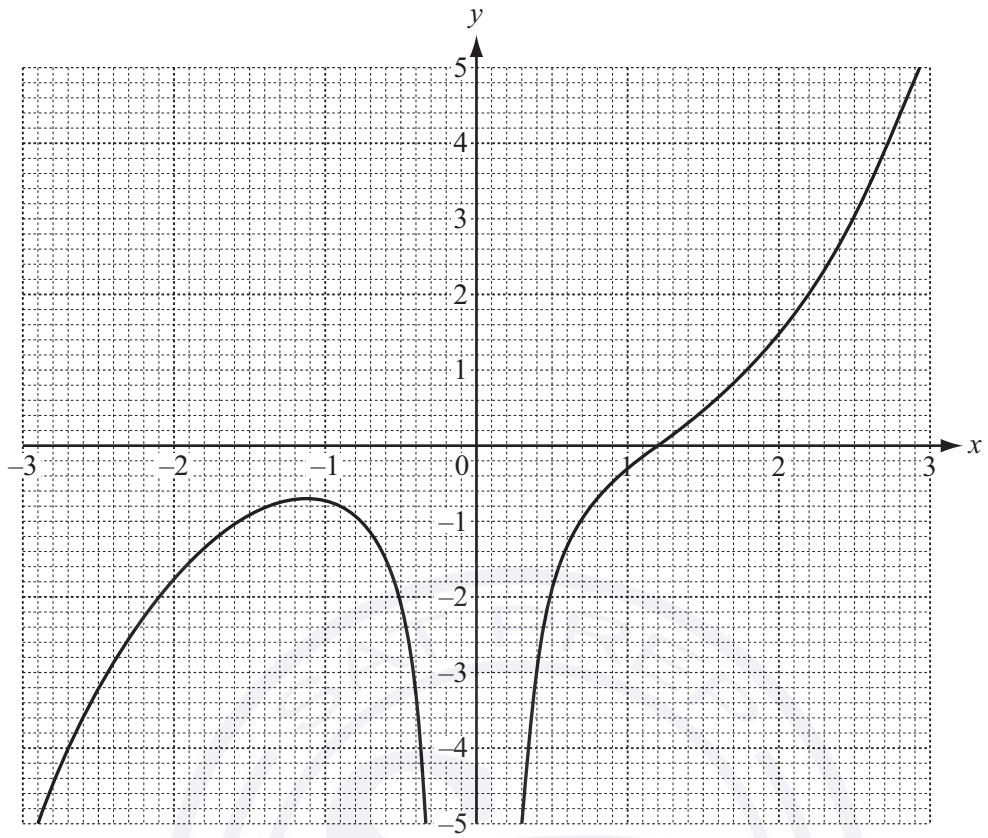
Answer(b)(ii) $\overrightarrow{SR}$ = ... [2]

(c) Explain what your answers in **part (b)** tell you about the lines OQ and SR.

Answer(c) ..... [1]

For Examiner's Use

6 (a)



The diagram shows the graph of $y = f(x)$ for $-3 \leqslant x \leqslant 3$.

(i) Find f(2).

Answer(a)(i) ..... [1]

(ii) Solve the equation $f(x) = 0$.

Answer(a)(ii) $x =$ ..... [1]

(iii) Write down the value of the largest **integer**, k, for which the equation $f(x) = k$ has 3 solutions.

Answer(a)(iii) $k =$ ..... [1]

(iv) By drawing a suitable straight line, solve the equation $f(x) = x$.

Answer(a)(iv) $x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(b) $g(x) = 1 - 2x$ $h(x) = x^2 - 1$

(i) Find $gh(3)$.

Answer(b)(i) ..... [2]

(ii) Find $g^{-1}(x)$.

Answer(b)(ii) $g^{-1}(x)$ = ... [2]

(iii) Solve the equation $h(x) = 3$.

Answer(b)(iii) x = ... or x = ... [3]

(iv) Solve the equation $g(3x) = 2x$.

Answer(b)(iv) x = ... [3]

For Examiner's Use

7 120 students are asked to answer a question.
The time, t seconds, taken by each student to answer the question is measured.
The frequency table shows the results.

Time	$0 < t \leqslant 10$	$10 < t \leqslant 20$	$20 < t \leqslant 30$	$30 < t \leqslant 40$	$40 < t \leqslant 50$	$50 < t \leqslant 60$
Frequency	6	44	40	14	10	6

(a) Calculate an estimate of the mean time.

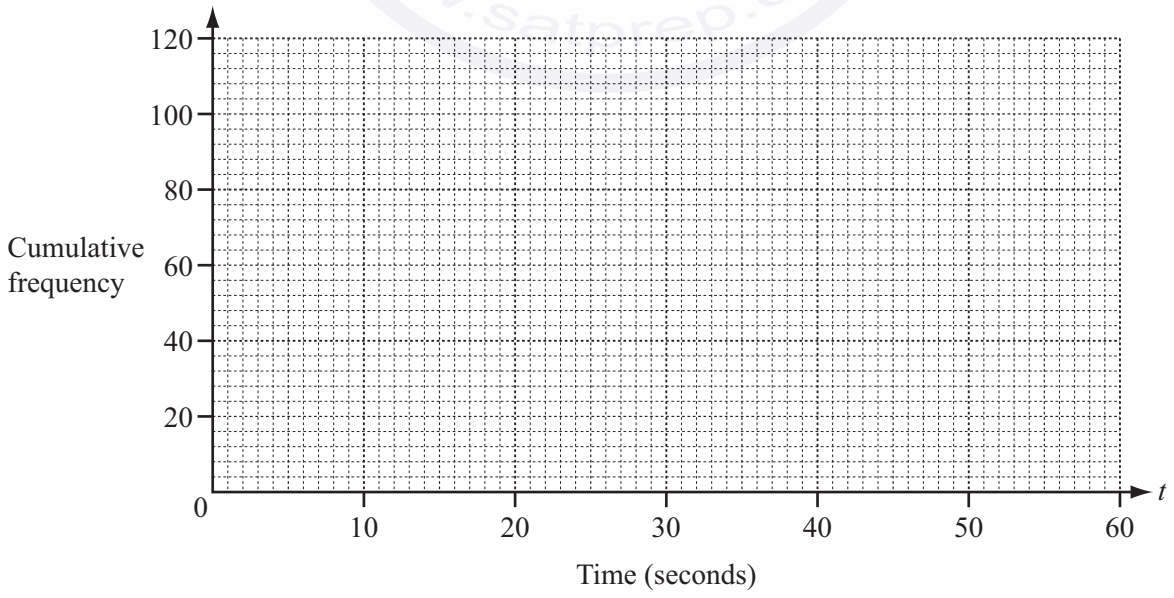
Answer(a) ..... s [4]

(b) **(i)** Complete the cumulative frequency table.

Time	$t \leqslant 10$	$t \leqslant 20$	$t \leqslant 30$	$t \leqslant 40$	$t \leqslant 50$	$t \leqslant 60$
Cumulative frequency	6			104		120

[2]

(ii) On the grid below, draw a cumulative frequency diagram to show this information.



[3]

(iii) Use your cumulative frequency diagram to find the median, the lower quartile and the 60th percentile.

Answer(b)(iii) Median ..... s

Lower quartile ..... s

60th percentile ..... s [4]

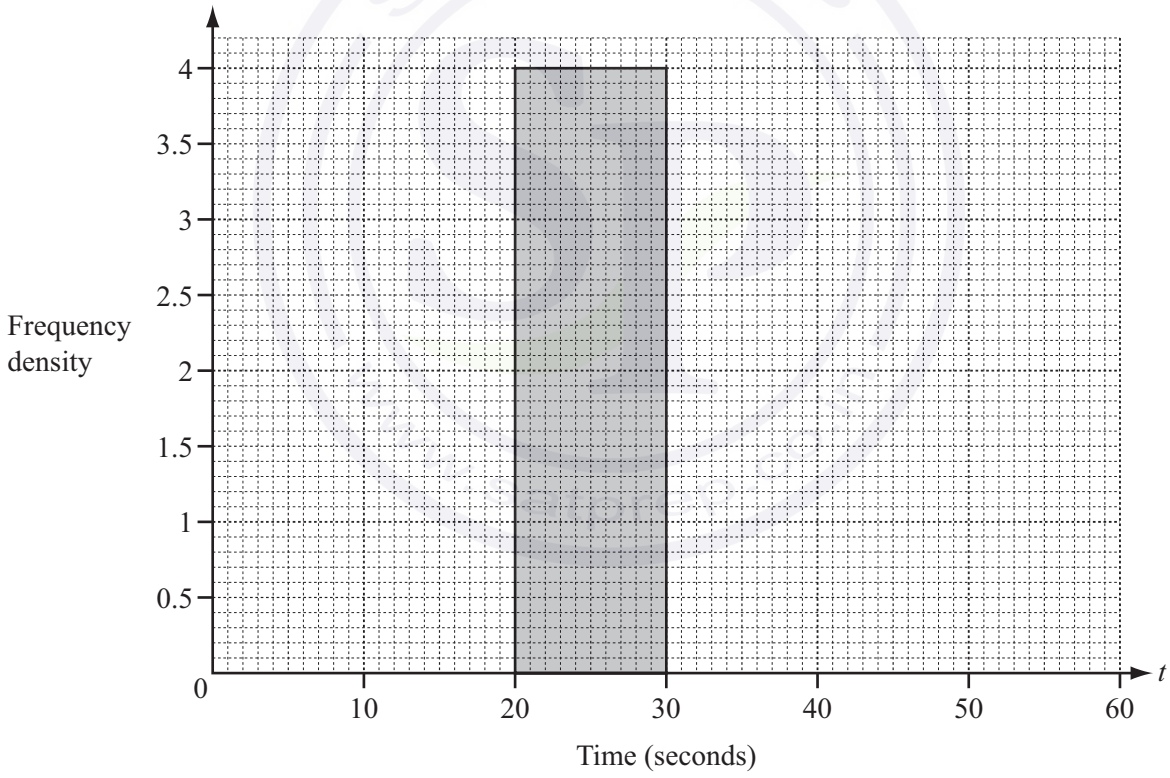
(c) The intervals for the times taken are changed.

(i) Use the information in the **frequency table** on the opposite page to complete this new table.

Time	$0 < t \leqslant 20$	$20 < t \leqslant 30$	$30 < t \leqslant 60$
Frequency		40	

[2]

(ii) On the grid below, complete the histogram to show the information in the new table. One column has already been drawn for you.



[3]

For Examiner's Use

8 **(a)** Solve the equation $8x^2 - 11x - 11 = 0$.
Show all your working and give your answers correct to 2 decimal places.

Answer(a) $x =$ ..... or $x =$ ..... [4]

(b) y varies directly as the square root of x.
$y = 18$ when $x = 9$.

Find y when $x = 484$.

Answer(b) $y =$ ..... [3]

For Examiner's Use

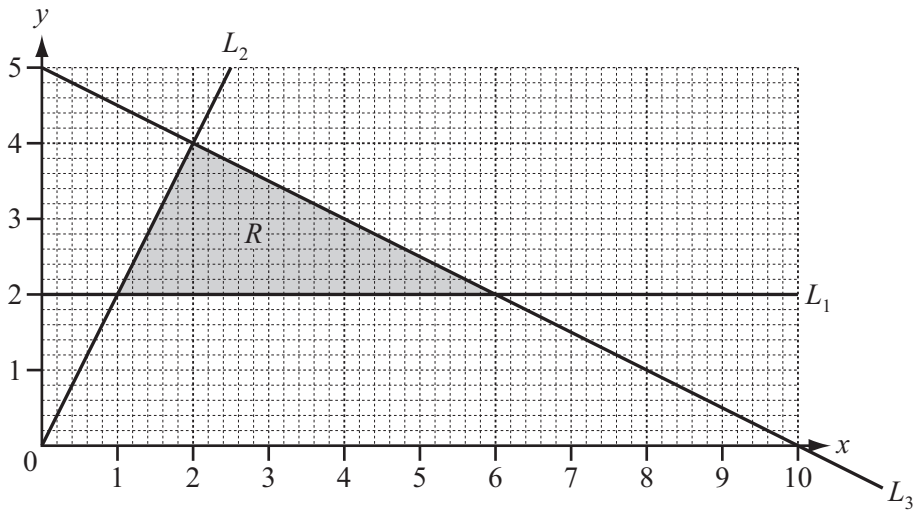
(c) Sara spends $\$x$ on pens which cost \$2.50 each.
She also spends $\$(x - 14.50)$ on pencils which cost \$0.50 each.
The **total** of the number of pens and the number of pencils is 19.

Write down and solve an equation in x.

Answer(c) $x =$ ..... [6]

For Examiner's Use

9



(a) Find the equations of the lines L_1, L_2 and L_3.

Answer(a) L_1 .....

L_2 .....

L_3 ..... [5]

(b) Write down the three inequalities that define the shaded region, R.

Answer(b) .....

.....

..... [3]

For Examiner's Use

(c) A gardener buys x bushes and y trees.
The cost of a bush is \$30 and the cost of a tree is \$200.
The shaded region R shows the only possible numbers of bushes and trees the gardener can buy.

(i) Find the number of bushes and the number of trees when the total cost is \$720.

Answer(c)(i) ..... bushes

..... trees [2]

(ii) Find the number of bushes and the number of trees which give the greatest possible total cost.
Write down this greatest possible total cost.

Answer(c)(ii) ..... bushes

..... trees

Greatest possible total cost = \$ ..... [3]

10 (a)

$1 = 1$

$1 + 2 = 3$

$1 + 2 + 3 = 6$

$1 + 2 + 3 + 4 = 10$

(i) Write down the next line of this pattern.

Answer(a)(i) ..... [1]

(ii) The sum of the first n integers is $\frac{n}{k}(n + 1)$.

Show that $k = 2$.

Answer(a)(ii)

[2]

(iii) Find the sum of the first 60 integers.

Answer(a)(iii) ..... [1]

(iv) Find n when the sum of the first n integers is 465.

Answer(a)(iv) $n =$ ..... [2]

(v) $1 + 2 + 3 + 4 + ... + x = \frac{(n-8)(n-7)}{2}$

Write x in terms of n.

Answer(a)(v) $x =$ ..... [1]

(b)

$1^3 = 1$

$1^3 + 2^3 = 9$

$1^3 + 2^3 + 3^3 = 36$

$1^3 + 2^3 + 3^3 + 4^3 = 100$

(i) Complete the statement.

$1^3 + 2^3 + 3^3 + 4^3 + 5^3 =$ ..... = (.....)^2 [2]

(ii) The sum of the first n integers is $\frac{n}{2}(n + 1)$.

Find an expression, in terms of n, for the sum of the first n cubes.

Answer(b)(ii) ..... [1]

(iii) Find the sum of the first 19 cubes.

Answer(b)(iii) ..... [2]

BLANK PAGE

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2635490223

MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2013**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **16** printed pages.

For Examiner's Use

1 Last year Mukthar earned $18 900 .
He did not pay tax on $5500 of his earnings.
He paid 24% tax on his remaining earnings.

(a) (i) Calculate how much tax Mukthar paid last year.

Answer(a)(i) $ ..... [2]

(ii) Calculate how much Mukthar earned each month after tax had been paid.

Answer(a)(ii) $ ..... [2]

(b) This year Mukthar now earns $19 750.50 .

Calculate the percentage increase from $18 900.

Answer(b) ..... % [2]

(c) Mukthar has $1500 to invest in one of the following ways.

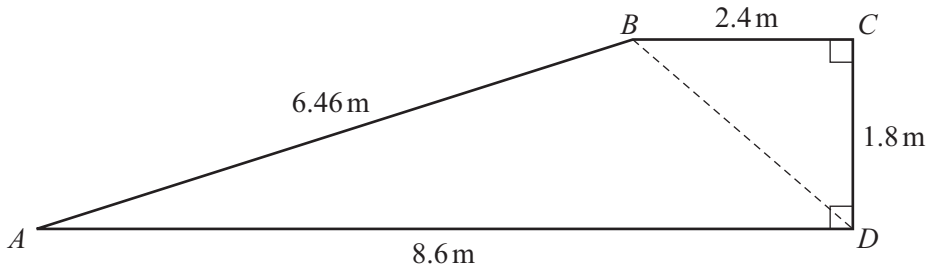
- **Account A** paying **simple** interest at a rate of 4.1% per year
- **Account B** paying **compound** interest at a rate of 3.3% per year

Which account will be worth more after **3 years** and by how much?

Answer(c) Account ..... by $ ..... [5]

For Examiner's Use

2



NOT TO SCALE

The diagram shows the cross section, *ABCD*, of a ramp.

(a) Calculate angle *DBC*.

Answer(a) Angle *DBC* = ... [2]

(b) **(i)** Show that *BD* is exactly 3 m.

Answer(b)(i)

[2]

(ii) Use the cosine rule to calculate angle *ABD*.

Answer(b)(ii) Angle *ABD* = ... [4]

(c) The ramp is a prism of width 4 m.

Calculate the volume of this prism.

Answer(c) ..... m^3 [3]

For Examiner's Use

3 **(a)** Write as a single fraction in its simplest form.

$$\frac{2x-1}{2} - \frac{3x+1}{5}$$

Answer(a) ..... [3]

(b) Expand and simplify.

$$(2x-3)^2 - 3x(x-4)$$

Answer(b) ..... [4]

(c) **(i)** Factorise.

$$2x^2 + 5x - 3$$

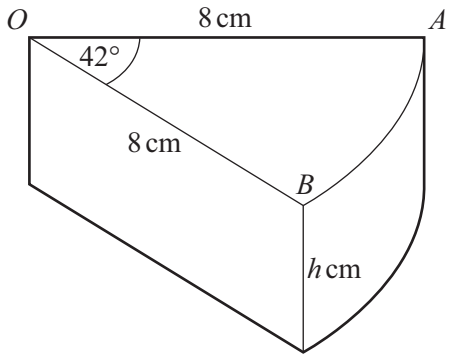
Answer(c)(i) ..... [2]

(ii) Simplify.

$$\frac{2x^2+5x-3}{2x^2-18}$$

Answer(c)(ii) ..... [3]

4



NOT TO SCALE

A wedge of cheese in the shape of a prism is cut from a cylinder of cheese of height h cm. The radius of the cylinder, OA, is 8 cm and the angle $AOB = 42°$.

(a) (i) The volume of the wedge of cheese is 90 cm^3.

Show that the value of h is 3.84 cm correct to 2 decimal places.

Answer(a)(i)

[4]

(ii) Calculate the **total** surface area of the wedge of cheese.

Answer(a)(ii) ..... cm^2 [5]

(b) A mathematically similar wedge of cheese has a volume of 22.5 cm^3.

Calculate the height of this wedge.

Answer(b) ..... cm [3]

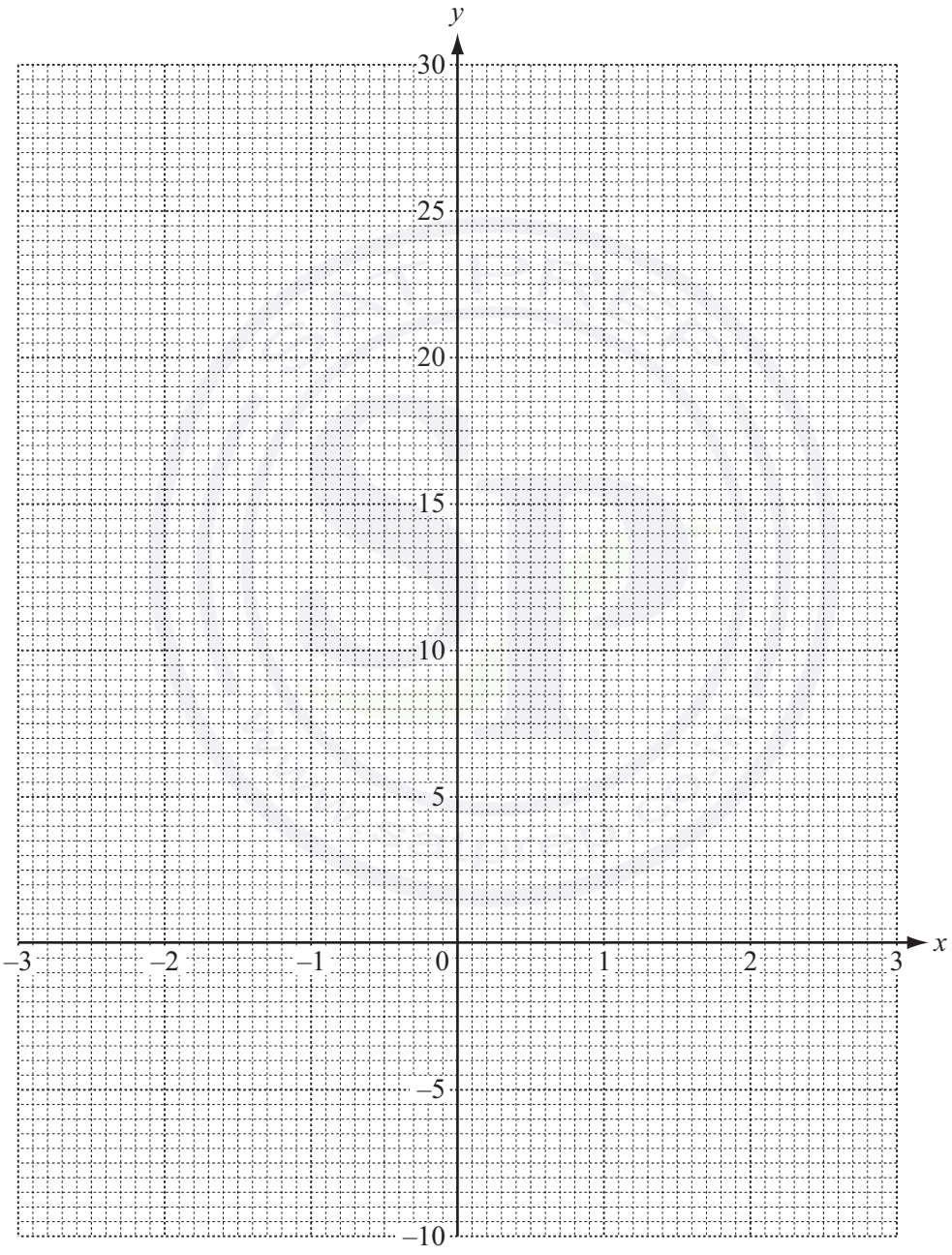
[Turn over

5 **(a)** Complete the table of values for $y = \frac{2}{x^2} - \frac{1}{x} - 3x$.

x	–3	–2	–1	–0.5	–0.3		0.3	0.5	1	2	3
y	9.6		6		26.5		18.0		–2	–6	–9.1

[3]

(b) Draw the graph of $y = \frac{2}{x^2} - \frac{1}{x} - 3x$ for $-3 \leqslant x \leqslant -0.3$ and $0.3 \leqslant x \leqslant 3$.



[5]

(c) Use your graph to solve these equations.

(i) $\frac{2}{x^2} - \frac{1}{x} - 3x = 0$

Answer(c)(i) x = ... [1]

(ii) $\frac{2}{x^2} - \frac{1}{x} - 3x - 7.5 = 0$

Answer(c)(ii) x = ... or x = ... or x = ... [3]

(d) (i) By drawing a suitable straight line on the graph, solve the equation $\frac{2}{x^2} - \frac{1}{x} - 3x = 10 - 3x$.

Answer(d)(i) x = ... or x = ... [4]

(ii) The equation $\frac{2}{x^2} - \frac{1}{x} - 3x = 10 - 3x$ can be written in the form $ax^2 + bx + c = 0$ where a, b and c are integers.

Find the values of a, b and c.

Answer(d)(ii) a = ... , b = ... , c = ... [3]

6

E	N	L	A	R	G	E	M	E	N	T

Prettie picks a card at random from the 11 cards above and does not replace it.
She then picks a second card at random and does not replace it.

(a) Find the probability that she picks

(i) the letter L and then the letter G,

Answer(a)(i) ..... [2]

(ii) the letter E twice,

Answer(a)(ii) ..... [2]

(iii) two letters that are the same.

Answer(a)(iii) ..... [2]

(b) Prettie now picks a third card at random.

Find the probability that the three letters

(i) are all the same,

Answer(b)(i) ..... [2]

(ii) **do not** include a letter E,

Answer(b)(ii) ..... [2]

(iii) include exactly two letters that are the same.

Answer(b)(iii) ..... [5]

For Examiner's Use

7 Noma flies from Johannesburg to Hong Kong.
Her plane leaves Johannesburg at 1845 and arrives in Hong Kong 13 hours and 25 minutes later.
The local time in Hong Kong is 6 hours ahead of the time in Johannesburg.

(a) At what time does Noma arrive in Hong Kong?

Answer(a) ..... [2]

(b) Noma sleeps for part of the journey.
The time that she spends sleeping is given by the ratio

sleeping : awake = 3 : 4 .

Calculate how long Noma sleeps during the journey.
Give your answer in hours and minutes.

Answer(b) ..... h ..... min [2]

For Examiner's Use

(c) (i) The distance from Hong Kong to Johannesburg is 10 712 km.
The time taken for the journey is 13 hours and 25 minutes.

Calculate the average speed of the plane for this journey.

Answer(c)(i) ..... km/h [2]

(ii) The plane uses fuel at the rate of 1 litre for every 59 metres travelled.

Calculate the number of litres of fuel used for the journey from Johannesburg to Hong Kong.
Give your answer in standard form.

Answer(c)(ii) ..... litres [4]

(d) The cost of Noma's journey is 10 148 South African Rand (R).
This is an increase of 18% on the cost of the journey one year ago.

Calculate the cost of the same journey one year ago.

Answer(d) R ..... [3]

[Turn over

For Examiner's Use

8 $f(x) = 4x + 3$ $\quad g(x) = \dfrac{7}{x+1}$ $(x \neq -1)$ $\quad h(x) = x^2 + 5x$

(a) Work out

(i) h(–3),

Answer(a)(i) ..... [1]

(ii) hg(13).

Answer(a)(ii) ..... [2]

(b) Find $f^{-1}(x)$.

Answer(b) $f^{-1}(x) =$ ..... [2]

(c) (i) Solve the equation $f(x) = 23$.

Answer(c)(i) $x =$ ..... [2]

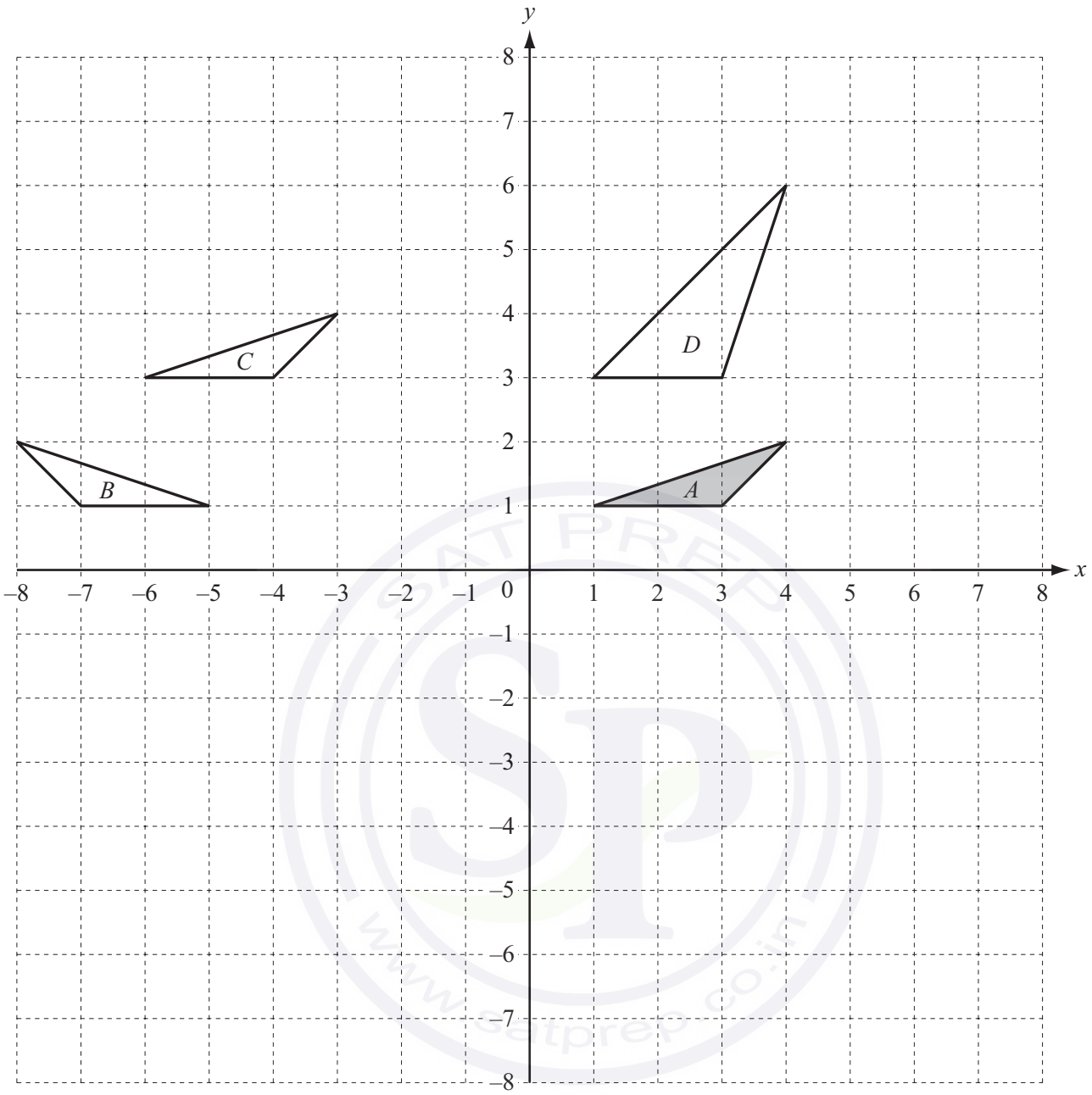
(ii) Solve the equation $h(x) = 7$.

Show all your working and give your answers correct to 2 decimal places.

Answer(c)(ii) $x =$ ..... or $x =$ ..... [5]

For Examiner's Use

9



(a) Describe fully the **single** transformation that maps triangle *A* onto

(i) triangle *B*,

Answer(a)(i) ..... [2]

(ii) triangle *C*,

Answer(a)(ii) ..... [2]

(iii) triangle *D*.

Answer(a)(iii) ..... [3]

For Examiner's Use

(b) On the grid, draw

(i) the rotation of triangle A about (6, 0) through 90° clockwise, [2]

(ii) the enlargement of triangle A by scale factor –2 with centre (0, –1), [2]

(iii) the shear of triangle A by shear factor –2 with the y-axis invariant. [2]

(c) Find the matrix that represents the transformation in **part (b)(iii)**.

Answer(c) $\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

Question 10 is printed on the next page.

For Examiner's Use

10 Complete the table for the following sequences.
The first row has been completed for you.

	Sequence				Next two terms		*n*th term	
	1	5	9	13	17	21	$4n - 3$	
(a)	12	21	30	39				[3]
(b)	80	74	68	62				[3]
(c)	1	8	27	64				[2]
(d)	2	10	30	68				[2]

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2039242007

MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2013**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **20** printed pages.

For Examiner's Use

1 **(a)** **(i)** In a camera magazine, 63 pages are used for adverts.
The ratio number of pages of adverts : number of pages of reviews = 7 : 5 .

Calculate the number of pages used for reviews.

Answer(a)(i) ..... [2]

(ii) In another copy of the magazine, 56 pages are used for reviews and for photographs.
The ratio number of pages of reviews : number of pages of photographs = 9 : 5 .

Calculate the number of pages used for photographs.

Answer(a)(ii) ..... [2]

(iii) One copy of the magazine costs \$4.90 .
An annual subscription costs \$48.80 for 13 copies.

Calculate the percentage discount by having an annual subscription.

Answer(a)(iii) ..... % [3]

For Examiner's Use

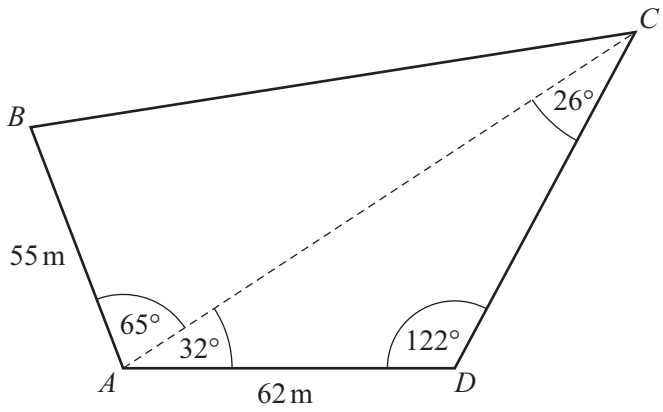
(b) In a car magazine, 25% of the pages are used for selling second-hand cars, $62\frac{1}{2}$% of the **remaining** pages are used for features, and the other 36 pages are used for reviews.

Work out the total number of pages in the magazine.

Answer(b) ..... [4]

For Examiner's Use

2 A field, *ABCD*, is in the shape of a quadrilateral.
A footpath crosses the field from *A* to *C*.



NOT TO SCALE

(a) Use the sine rule to calculate the distance *AC* and show that it rounds to 119.9 m, correct to 1 decimal place.

Answer(a)

[3]

(b) Calculate the length of *BC*.

Answer(b) BC = ... m [4]

(c) Calculate the area of triangle *ACD*.

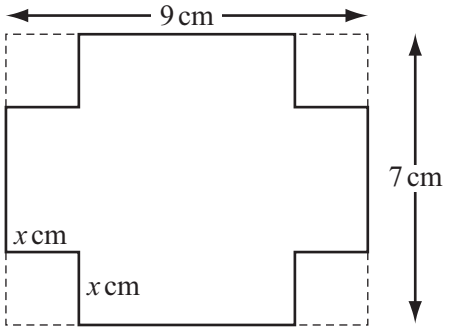
Answer(c) ..... m^2 [2]

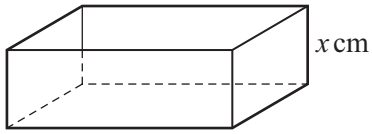
(d) The field is for sale at \$4.50 per square metre.

Calculate the cost of the field.

Answer(d) \$ ..... [3]

3 A rectangular metal sheet measures 9 cm by 7 cm.
A square, of side x cm, is cut from each corner.
The metal is then folded to make an open box of height x cm.





NOT TO SCALE

(a) Write down, in terms of x, the length and width of the box.

Answer(a) Length = ...

Width = ... [2]

(b) Show that the volume, V, of the box is $4x^3 - 32x^2 + 63x$.

Answer(b)

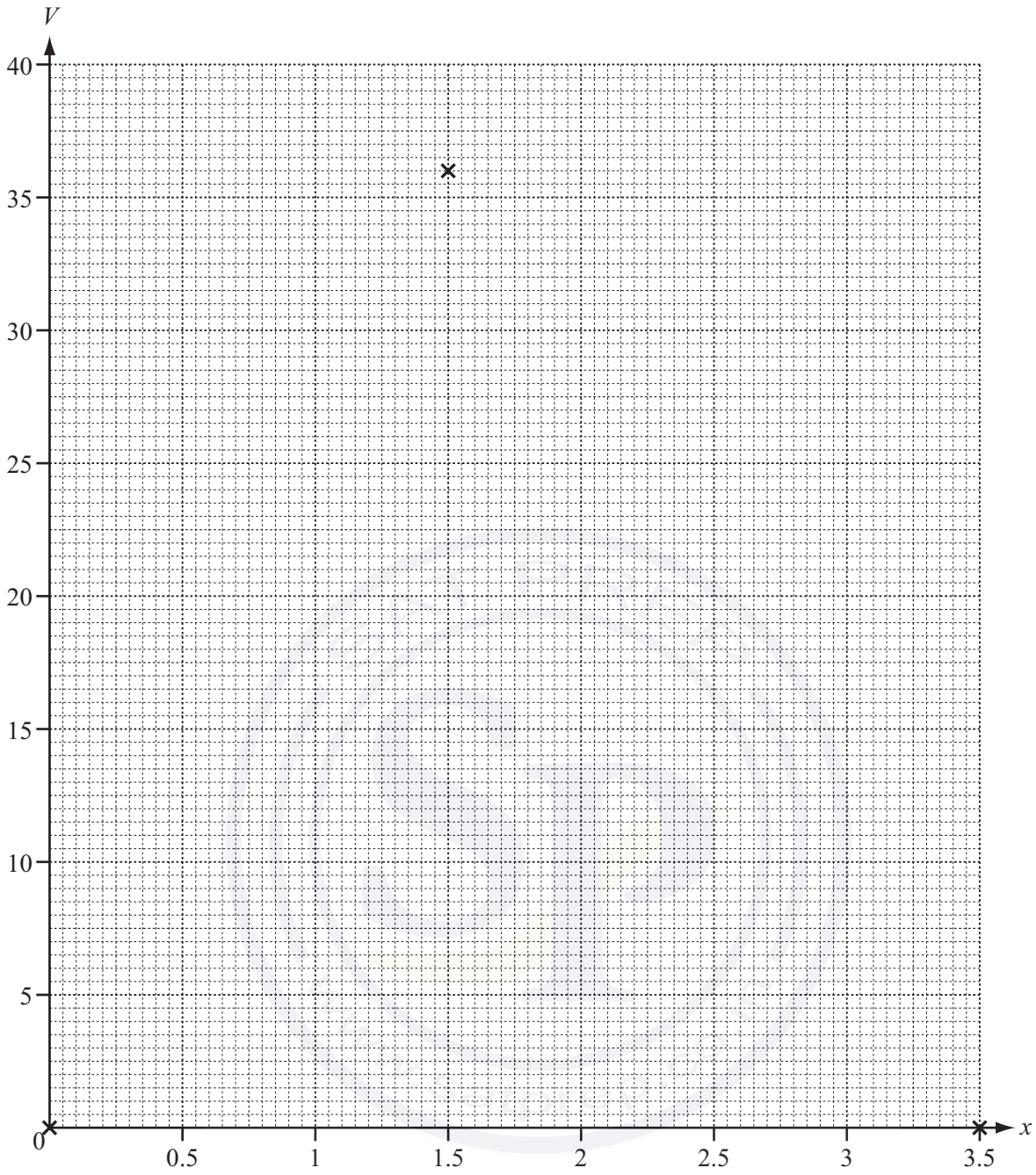
[2]

(c) Complete this table of values for $V = 4x^3 - 32x^2 + 63x$.

x	0	0.5	1	1.5	2	2.5	3	3.5
V	0		35	36	30		9	0

[2]

(d) On the grid opposite, draw the graph of $V = 4x^3 - 32x^2 + 63x$ for $0 \leq x \leq 3.5$.
Three of the points have been plotted for you.



[3]

(e) The volume of the box is at least $30\,cm^3$.
Write down, as an inequality, the possible values of x.

Answer(e) ..... [2]

(f) **(i)** Write down the maximum volume of the box.

Answer(f)(i) ..... cm^3 [1]

(ii) Write down the value of x which gives the maximum volume.

Answer(f)(ii) ..... [1]

4 **(a)** One angle of an isosceles triangle is 48°.

Write down the possible pairs of values for the remaining two angles.

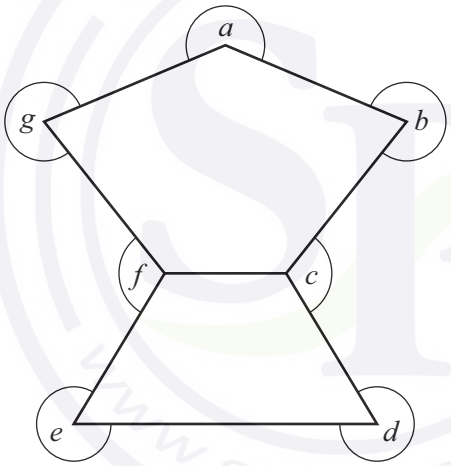
Answer(a) ..... and .....

..... and ..... [2]

(b) Calculate the sum of the interior angles of a pentagon.

Answer(b) ..... [2]

(c) Calculate the sum of the angles a, b, c, d, e, f and g shown in this diagram.

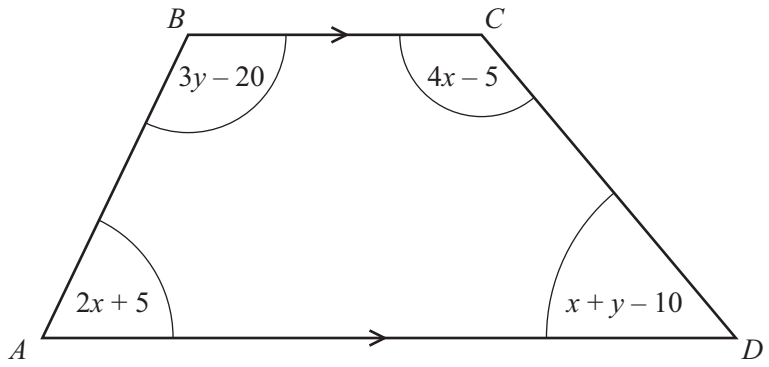


NOT TO SCALE

Answer(c) ..... [2]

For Examiner's Use

(d) The trapezium, *ABCD*, has four angles as shown.
All the angles are in degrees.



NOT TO SCALE

(i) Show that $7x + 4y = 390$.

Answer(d)(i)

[1]

(ii) Show that $2x + 3y = 195$.

Answer(d)(ii)

[1]

(iii) Solve these simultaneous equations.

Answer(d)(iii) $x =$ .....

$y =$ ..... [4]

(iv) Use your answer to **part (d)(iii)** to find the sizes of all four angles of the trapezium.

Answer(d)(iv) ..... , ... , ... , ... [1]

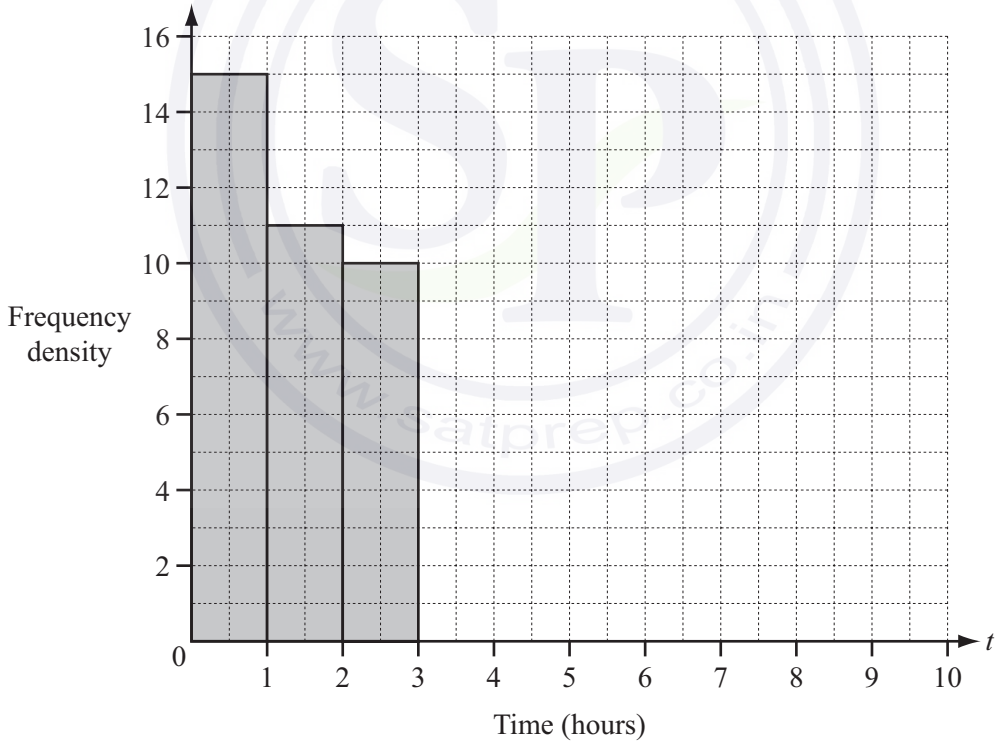
5 **(a)** 80 students were asked how much time they spent on the internet in one day. This table shows the results.

Time (t hours)	$0 < t \leqslant 1$	$1 < t \leqslant 2$	$2 < t \leqslant 3$	$3 < t \leqslant 5$	$5 < t \leqslant 7$	$7 < t \leqslant 10$
Number of students	15	11	10	19	13	12

(i) Calculate an estimate of the mean time spent on the internet by the 80 students.

Answer(a)(i) ..... hours [4]

(ii) On the grid, complete the histogram to show this information.



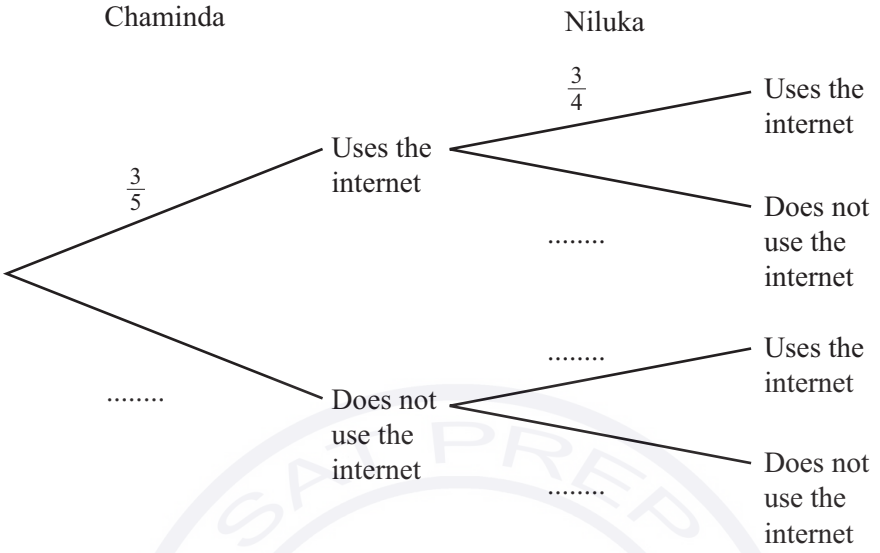
[4]

For Examiner's Use

(b) The probability that Chaminda uses the internet on any day is $\frac{3}{5}$.

The probability that Niluka uses the internet on any day is $\frac{3}{4}$.

(i) Complete the tree diagram.



[2]

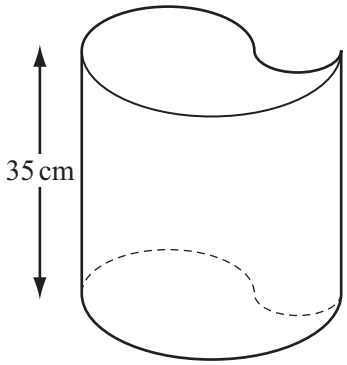
(ii) Calculate the probability, that on any day, at least one of the two students uses the internet.

Answer(b)(ii) ..... [3]

(iii) Calculate the probability that Chaminda uses the internet on three consecutive days.

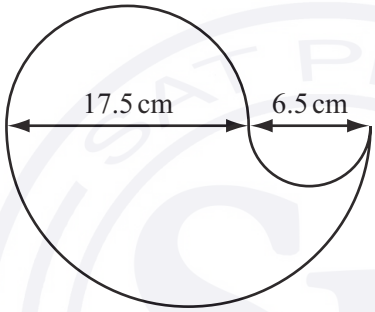
Answer(b)(iii) ..... [2]

6 Sandra has designed this open container.
The height of the container is 35 cm.



NOT TO SCALE

The cross section of the container is designed from three semi-circles with diameters 17.5 cm, 6.5 cm and 24 cm.



NOT TO SCALE

(a) Calculate the area of the cross section of the container.

Answer(a) ..... cm^2 [3]

(b) Calculate the external surface area of the container, including the base.

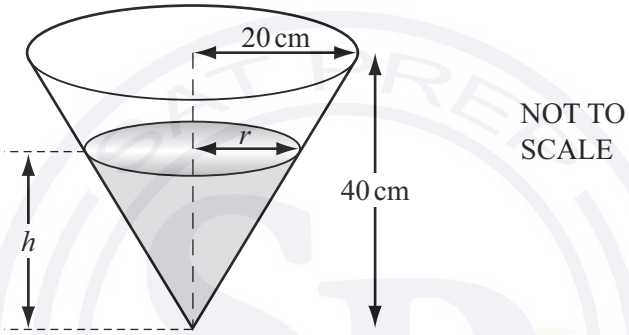
Answer(b) ..... cm^2 [4]

(c) The container has a height of 35 cm.

Calculate the capacity of the container.
Give your answer in litres.

Answer(c) ..... litres [3]

(d) Sandra's container is completely filled with water.
All the water is then poured into another container in the shape of a cone.
The cone has radius 20 cm and height 40 cm.



(i) The diagram shows the water in the cone.

Show that $r = \frac{h}{2}$.

Answer(d)(i)

[1]

(ii) Find the height, h, of the water in the cone.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

Answer(d)(ii) h = ... cm [3]

For Examiner's Use

7 **(a)** The co-ordinates of P are (–4, –4) and the co-ordinates of Q are (8, 14).

(i) Find the gradient of the line PQ.

Answer(a)(i) ..... [2]

(ii) Find the equation of the line PQ.

Answer(a)(ii) ..... [2]

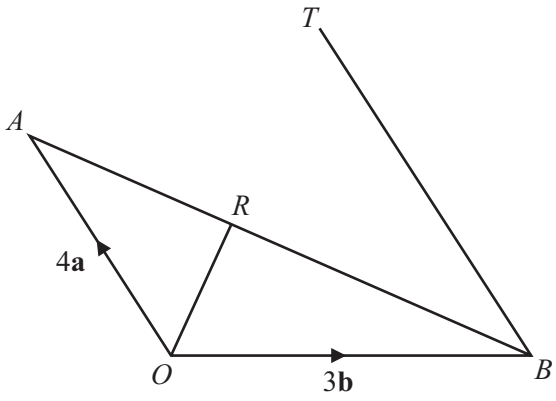
(iii) Write $\overrightarrow{PQ}$ as a column vector.

Answer(a)(iii) $\overrightarrow{PQ} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(iv) Find the magnitude of $\overrightarrow{PQ}$.

Answer(a)(iv) ..... [2]

(b)



NOT TO SCALE

In the diagram, $\overrightarrow{OA} = 4\mathbf{a}$ and $\overrightarrow{OB} = 3\mathbf{b}$.

R lies on AB such that $\overrightarrow{OR} = \frac{1}{5}(12\mathbf{a} + 6\mathbf{b})$.

T is the point such that $\overrightarrow{BT} = \frac{3}{2}\overrightarrow{OA}$.

(i) Find the following in terms of **a** and **b**, giving each answer in its simplest form.

(a) $\overrightarrow{AB}$

Answer(b)(i)(a) $\overrightarrow{AB}$ = ... [1]

(b) $\overrightarrow{AR}$

Answer(b)(i)(b) $\overrightarrow{AR}$ = ... [2]

(c) $\overrightarrow{OT}$

Answer(b)(i)(c) $\overrightarrow{OT}$ = ... [1]

(ii) Complete the following statement.

The points O, R and T are in a straight line because .....

..... [1]

(iii) Triangle OAR and triangle TBR are similar.

Find the value of $\dfrac{\text{area of triangle } TBR}{\text{area of triangle } OAR}$.

Answer(b)(iii) ..... [2]

For Examiner's Use

8 **(a)** Rearrange $s = ut + \frac{1}{2}at^2$ to make a the subject.

Answer(a) $a =$ ..... [3]

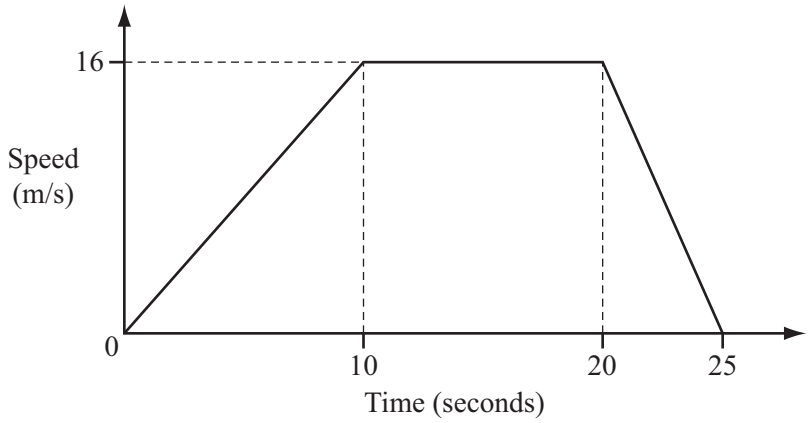
(b) The formula $v = u + at$ can be used to calculate the speed, v, of a car.

$u = 15$, $a = 2$ and $t = 8$, each correct to the nearest integer.

Calculate the upper bound of the speed v.

Answer(b) ..... [3]

(c) The diagram shows the speed-time graph for a car travelling between two sets of traffic lights.



(i) Calculate the deceleration of the car for the last 5 seconds of the journey.

Answer(c)(i) ..... m/s^2 [1]

(ii) Calculate the average speed of the car between the two sets of traffic lights.

Answer(c)(ii) ..... m/s [4]

For Examiner's Use

9 The first four diagrams in a sequence are shown below.

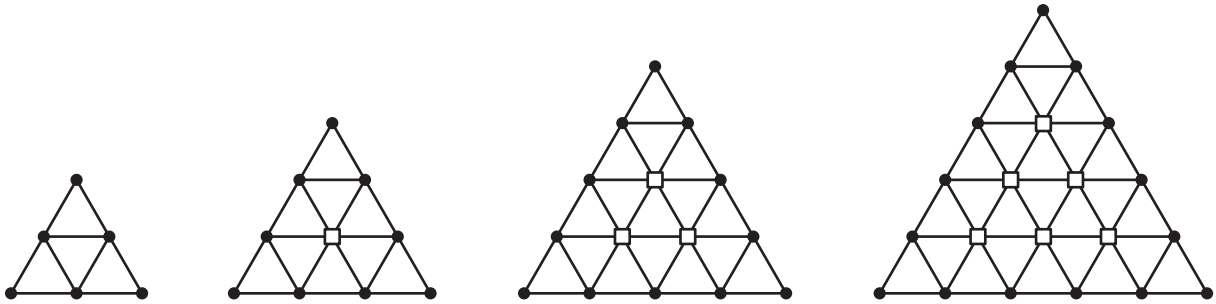


Diagram 1 Diagram 2 Diagram 3 Diagram 4

The diagrams are made from dots (●) and squares (□) joined by lines.

(a) Complete the table.

Diagram	1	2	3	4	5		n
Number of dots	6	9	12				
Number of squares	0	1	3				$\frac{1}{2}n(n-1)$
Number of triangles	4	9	16				
Number of lines	9	18	30	45	63		$\frac{3}{2}(n+1)(n+2)$

[9]

(b) Which diagram has 360 lines?

Answer(b) ..... [2]

(c) The **total** number of lines in the first n diagrams is

$$\frac{1}{2}n^3 + pn^2 + qn.$$

(i) When $n = 1$, show that $p + q = 8\frac{1}{2}$.

Answer(c)(i)

[1]

(ii) By choosing another value of n and using the equation in **part (c)(i)**, find the values of p and q.

Answer(c)(ii) $p =$ .....

$q =$ ..... [5]

Question 10 is printed on the next page.

For Examiner's Use

10 **(a)** Simplify.

$$\frac{x^2 - 3x}{x^2 - 9}$$

Answer(a) ..... [3]

(b) Solve.

$$\frac{15}{x} - \frac{20}{x+1} = 2$$

Answer(b) x = ... or x = ... [7]

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2013**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **19** printed pages and **1** blank page.

For Examiner's Use

1 **(a)** One day, Maria took 27 minutes to walk 1.8 km to school.
She left home at 07 48.

(i) Write down the time Maria arrived at school.

Answer(a)(i) ..... [1]

(ii) Show that Maria's average walking speed was 4 km/h.

Answer(a)(ii)

[2]

(b) Another day, Maria cycled the 1.8 km to school at an average speed of 15 km/h.

(i) Calculate the percentage **increase** that 15 km/h is on Maria's walking speed of 4 km/h.

Answer(b)(i) ..... % [3]

(ii) Calculate the percentage **decrease** that Maria's cycling time is on her walking time of 27 minutes.

Answer(b)(ii) ..... % [3]

For Examiner's Use

(iii) After school, Maria cycled to her friend's home.
This took 9 minutes, which was 36% of the time Maria takes to walk to her friend's home.

Calculate the time Maria takes to walk to her friend's home.

Answer(b)(iii) ..... min [2]

2

$$f(x) = 3 - x - x^2 \qquad g(x) = 3^x$$

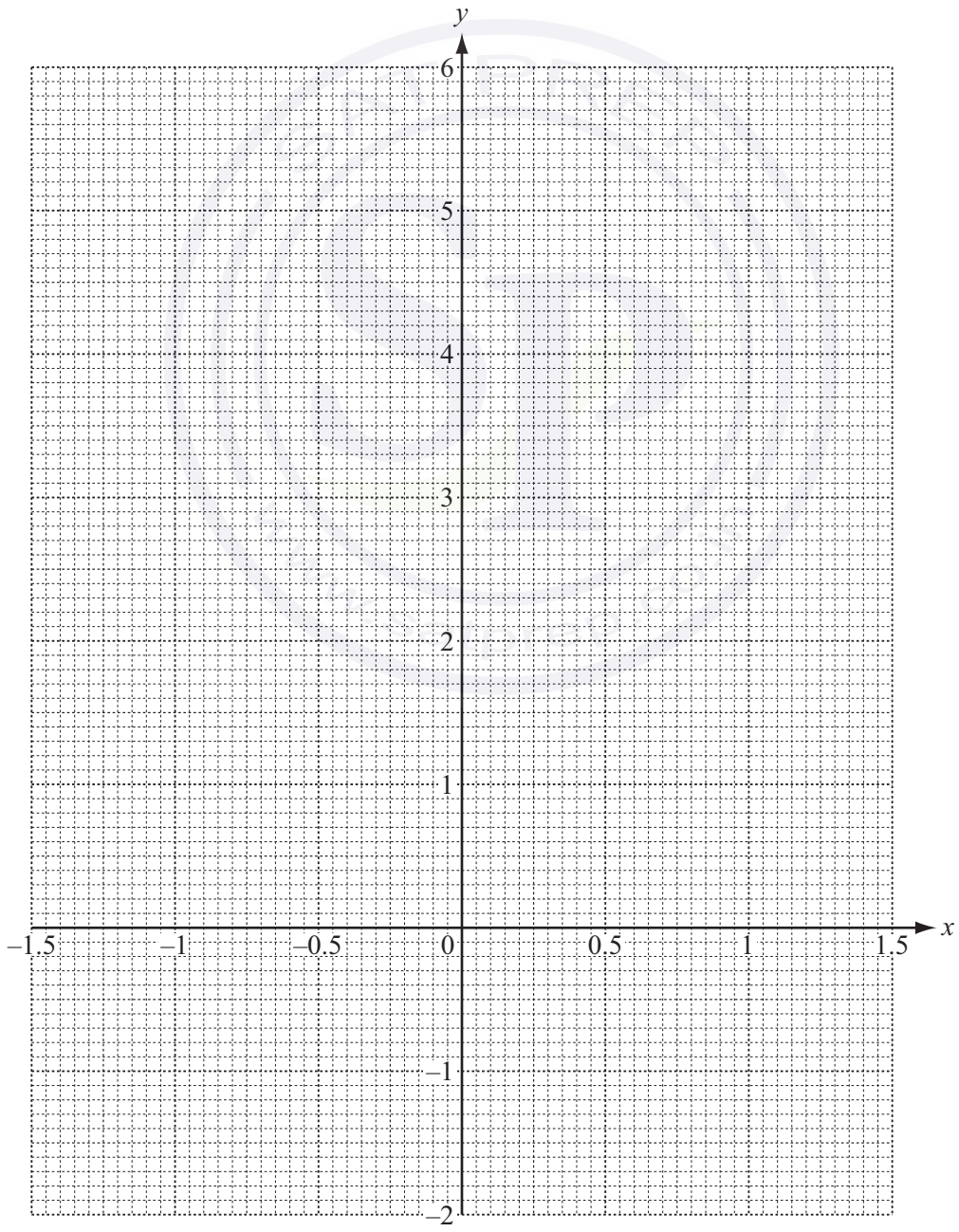
(a) Complete the tables of values for $f(x)$ and $g(x)$.

x	–1.5	–1	–0.5	0	0.5	1	1.5
$f(x)$	2.25	3	3.25		2.25	1	–0.75

x	–1.5	–1	–0.5	0	0.5	1	1.5
$g(x)$	0.19		0.58		1.73	3	5.20

[3]

(b) On the grid, draw the graphs of $y = f(x)$ and $y = g(x)$ for $-1.5 \leqslant x \leqslant 1.5$.



[6]

(c) For $-1.5 \leqslant x \leqslant 1.5$, use your graphs to solve

(i) $f(x) = 0$,

Answer(c)(i) $x =$ ..... [1]

(ii) $g(x) = 4$,

Answer(c)(ii) $x =$ ..... [1]

(iii) $f(x) = g(x)$.

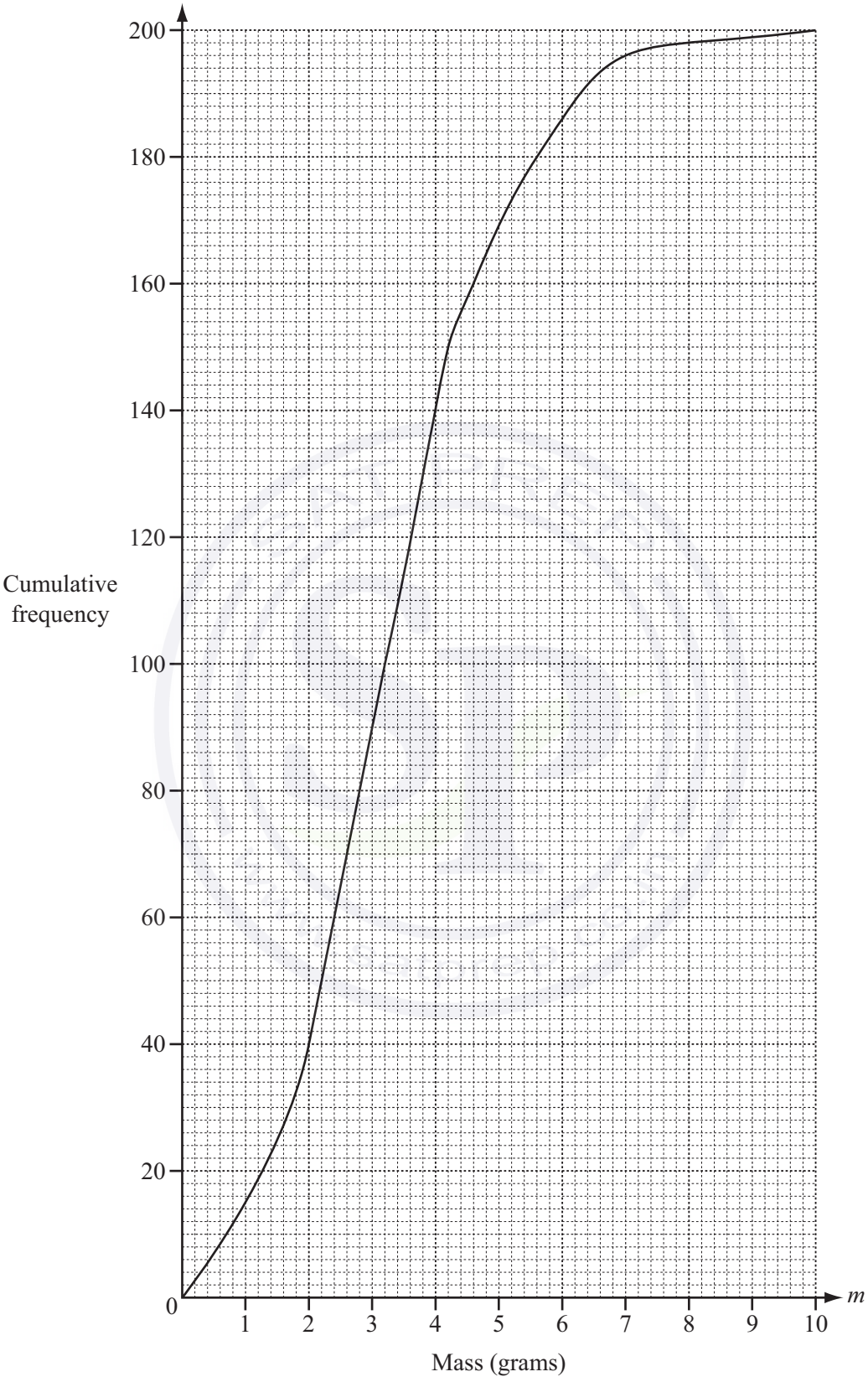
Answer(c)(iii) $x =$ ..... [1]

(d) By drawing a suitable tangent, find an estimate of the gradient of the graph of $y = f(x)$ when $x = 0.5$.

Answer(d) ..... [3]

For Examiner's Use

3 200 students estimate the mass (m grams) of a coin.
The cumulative frequency diagram shows the results.



For Examiner's Use

(a) Find

(i) the median,

Answer(a)(i) ..... g [1]

(ii) the upper quartile,

Answer(a)(ii) ..... g [1]

(iii) the 80th percentile,

Answer(a)(iii) ..... g [1]

(iv) the number of students whose estimate is 7 g or less.

Answer(a)(iv) ..... [1]

(b) **(i)** Use the cumulative frequency diagram to complete the frequency table.

Mass (m grams)	$0 < m \leqslant 2$	$2 < m \leqslant 4$	$4 < m \leqslant 6$	$6 < m \leqslant 8$	$8 < m \leqslant 10$
Frequency	40				2

[2]

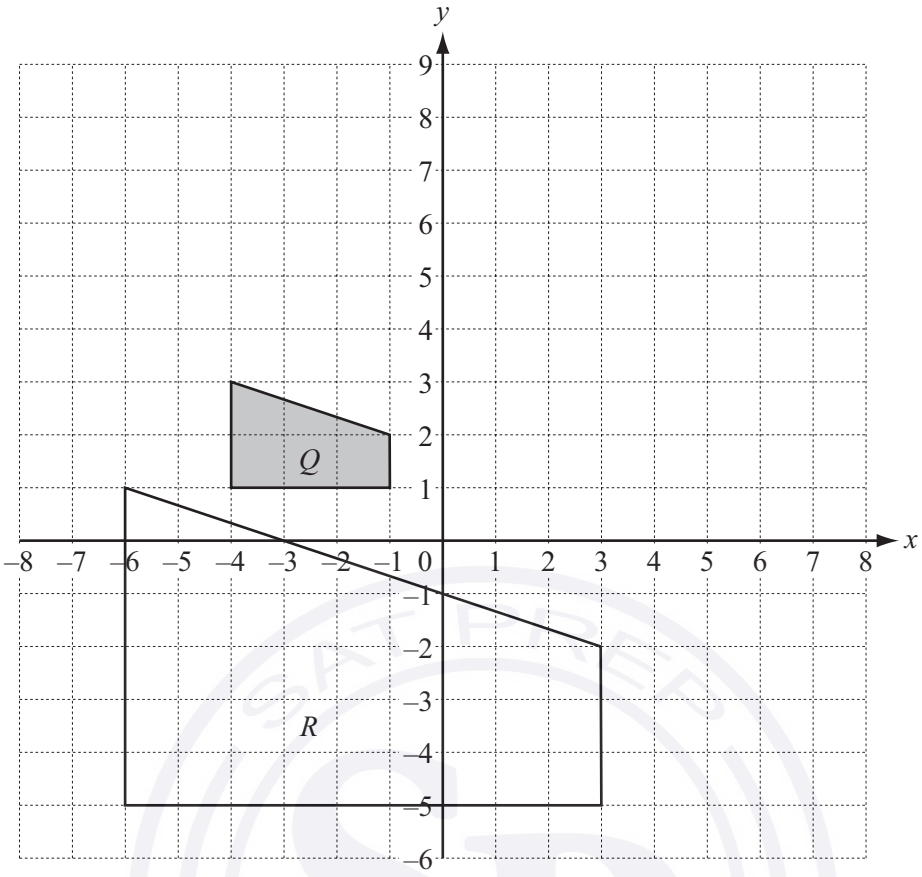
(ii) A student is chosen at random.
The probability that the student estimates that the mass is greater than M grams is 0.3.

Find the value of M.

Answer(b)(ii) M = ... [2]

[Turn over

4



(a) Describe fully the **single** transformation that maps shape Q onto shape R.

Answer(a) ..... [3]

(b) **(i)** Draw the image when shape Q is translated by the vector $\begin{pmatrix} 5 \\ 4 \end{pmatrix}$. [2]

(ii) Draw the image when shape Q is reflected in the line $x = 2$. [2]

(iii) Draw the image when shape Q is stretched, factor 3, x-axis invariant. [2]

(iv) Find the 2×2 matrix that represents a stretch of factor 3, x-axis invariant.

Answer(b)(iv) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(c) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$.

Answer(c) ..... [2]

5

Height (h cm)	$150 < h \leqslant 160$	$160 < h \leqslant 165$	$165 < h \leqslant 180$	$180 < h \leqslant 190$
Frequency	5	9	18	10

The table shows information about the heights of a group of 42 students.

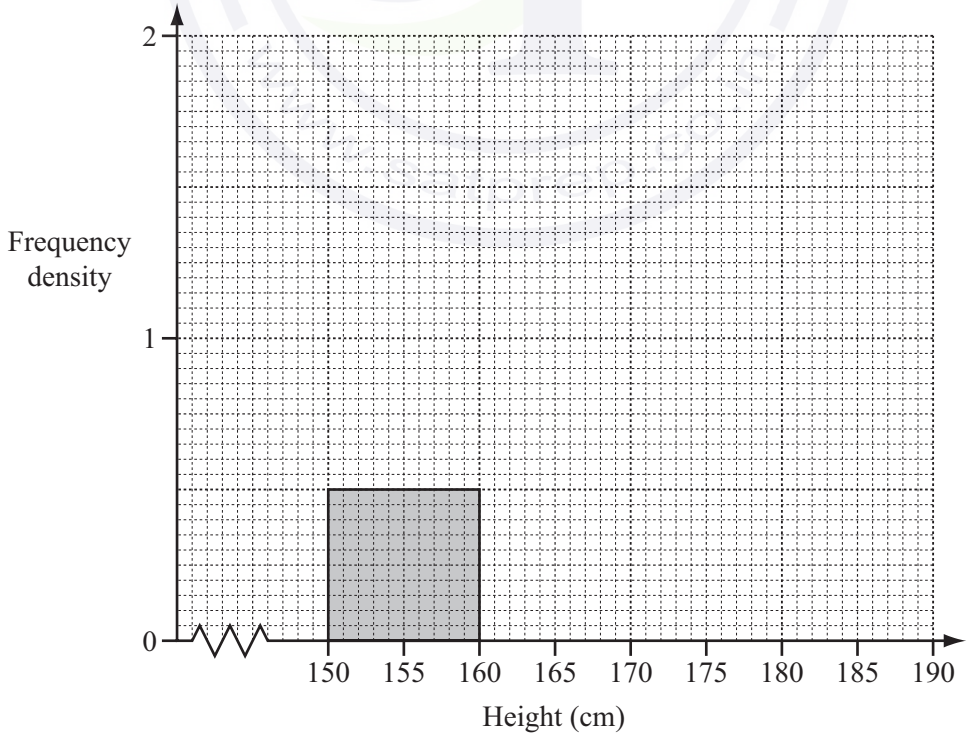
(a) Using mid-interval values, calculate an estimate of the mean height of the students.
Show your working.

Answer(a) ..... cm [3]

(b) Write down the interval which contains the lower quartile.

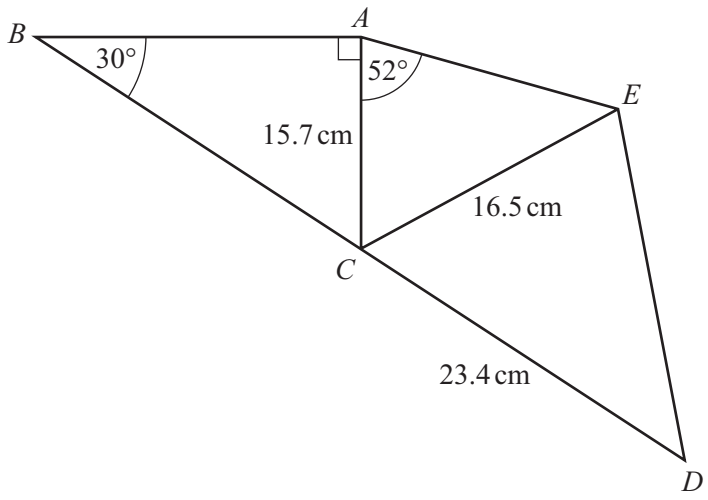
Answer(b) ..... [1]

(c) Complete the histogram to show the information in the table.
One column has already been drawn for you.



[4]

6



NOT TO SCALE

In the diagram, *BCD* is a straight line and *ABDE* is a quadrilateral.
Angle *BAC* = 90°, angle *ABC* = 30° and angle *CAE* = 52°.
AC = 15.7 cm, *CE* = 16.5 cm and *CD* = 23.4 cm.

(a) Calculate *BC*.

Answer(a) BC = ... cm [3]

(b) Use the sine rule to calculate angle *AEC*.
Show that it rounds to 48.57°, correct to 2 decimal places.

Answer(b)

[3]

(c) **(i)** Show that angle $ECD = 40.6°$, correct to 1 decimal place.

Answer(c)(i)

[2]

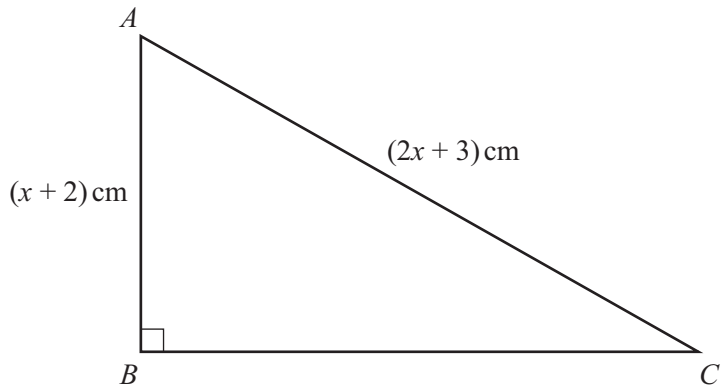
(ii) Calculate DE.

Answer(c)(ii) DE = ... cm [4]

(d) Calculate the area of the quadrilateral $ABDE$.

Answer(d) ..... cm^2 [4]

7 (a)



NOT TO SCALE

In triangle ABC, $AB = (x + 2)$ cm and $AC = (2x + 3)$ cm.

$\sin ACB = \frac{9}{16}$

Find the length of BC.

Answer(a) $BC =$ ..... cm [6]

(b) A bag contains 7 white beads and 5 red beads.

(i) The mass of a red bead is 2.5 grams more than the mass of a white bead.
The total mass of all the 12 beads is 114.5 grams.

Find the mass of a white bead and the mass of a red bead.

Answer(b)(i) White ..... g

Red ..... g [5]

For Examiner's Use

(ii) Two beads are taken out of the bag at random, without replacement.

Find the probability that

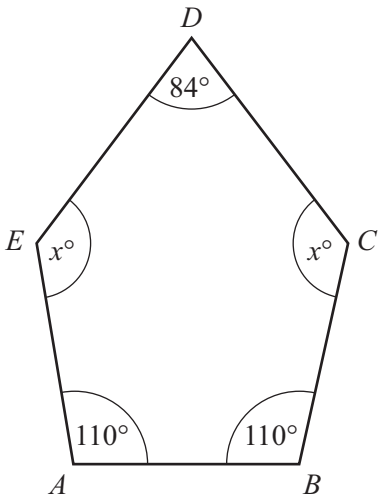
(a) they are both white,

Answer(b)(ii)(a) ..... [2]

(b) one is white and one is red.

Answer(b)(ii)(b) ..... [3]

8 (a)



NOT TO SCALE

In the pentagon $ABCDE$, angle EAB = angle ABC = 110° and angle CDE = 84°.
Angle BCD = angle DEA = x°.

(i) Calculate the value of x.

Answer(a)(i) x = ... [2]

(ii) $BC = CD$.
Calculate angle CBD.

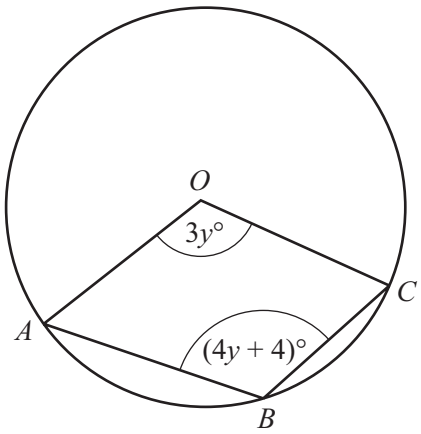
Answer(a)(ii) Angle CBD = ... [1]

(iii) This pentagon also has one line of symmetry.
Calculate angle ADB.

Answer(a)(iii) Angle ADB = ... [1]

(b) A, B and C lie on a circle centre O.
Angle AOC = $3y$° and angle ABC = $(4y + 4)$°.

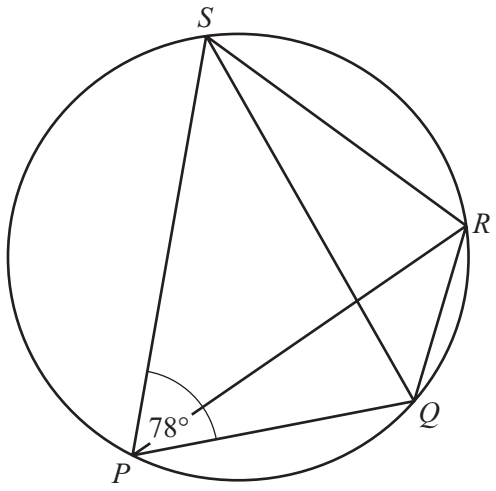
Find the value of y.



NOT TO SCALE

Answer(b) y = ... [4]

(c)



NOT TO SCALE

In the cyclic quadrilateral $PQRS$, angle $SPQ = 78°$.

(i) Write down the geometrical reason why angle $QRS = 102°$.

Answer(c)(i) ..... [1]

(ii) Angle PRQ : Angle $PRS = 1 : 2$.

Calculate angle PQS.

Answer(c)(ii) Angle PQS = ... [3]

(d)

NOT TO SCALE

The diagram shows two similar figures.
The areas of the figures are $5\,cm^2$ and $7.2\,cm^2$.
The lengths of the bases are l cm and 6.9 cm.

Calculate the value of l.

Answer(d) l = ... [3]

For Examiner's Use

9 $f(x) = x^2 + x - 3$ $g(x) = 2x + 7$ $h(x) = 2^x$

(a) Solve the equation $f(x) = 0$.
Show all your working and give your answers correct to 2 decimal places.

Answer(a) $x =$ ..... or $x =$ ..... [4]

(b) $fg(x) = px^2 + qx + r$

Find the values of p, q and r.

Answer(b) $p =$ .....

$q =$ .....

$r =$ ..... [3]

(c) Find $g^{-1}(x)$.

Answer(c) $g^{-1}(x) =$ ..... [2]

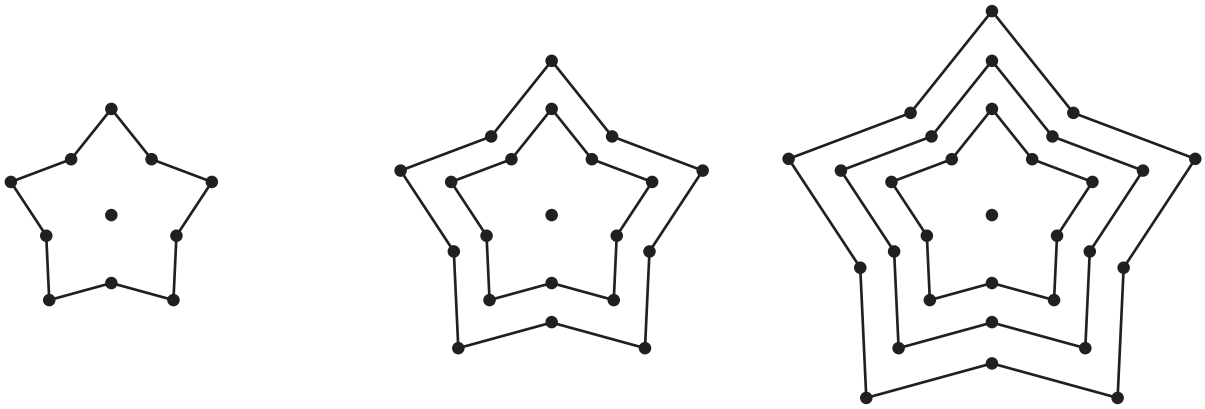
(d) Find x when $h(x) = 0.25$.

Answer(d) $x =$ ..... [1]

(e) Find hhh(3).
Give your answer in standard form, correct to 4 significant figures.

Answer(e) ..... [4]

10



Star 1 Star 2 Star 3

The diagrams show a sequence of stars made of lines and dots.

(a) Complete the table for Star 5, Star 7 and Star *n*.

	Star 1	Star 2	Star 3	Star 4	Star 5		Star 7		Star *n*
Number of lines	10	20	30	40					
Number of dots	11	21	31	41					

[4]

(b) The sums of the number of dots in two consecutive stars are shown in the table.

Star 1 and Star 2	Star 2 and Star 3	Star 3 and Star 4
32	52	72

Find the sum of the number of dots in

(i) Star 10 and Star 11,

Answer(b)(i) ..... [1]

(ii) Star *n* and Star (n + 1),

Answer(b)(ii) ..... [1]

(iii) Star (n + 7) and Star (n + 8).

Answer(b)(iii) ..... [1]

(c) The **total number of dots** in the first n stars is given by the expression $5n^2 + 6n$.

(i) Show that this expression is correct when $n = 3$.

Answer(c)(i)

[2]

(ii) Find the total number of dots in the first 10 stars.

Answer(c)(ii) ..... [1]

(d) The total number of dots in the first n stars is $5n^2 + 6n$.
The number of dots in the $(n + 1)$th star is $10(n + 1) + 1$.

Add these two expressions to show that the total number of dots in the first $(n + 1)$ stars is

$$5(n + 1)^2 + 6(n + 1) .$$

You must show each step of your working.

Answer(d)

[4]

BLANK PAGE

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 1 2 7 7 8 6 5 7 2 9 *

MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2013**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **19** printed pages and **1** blank page.

For Examiner's Use

1 A tennis club has 560 members.

(a) The ratio men : women : children = 5 : 6 : 3.

(i) Show that the club has 240 women members.

Answer(a)(i)

[2]

(ii) How many members are children?

Answer(a)(ii) ..... [1]

(b) $\frac{5}{8}$ of the 240 women members play in a tournament.

How many women members do **not** play in the tournament?

Answer(b) ..... [2]

(c) The annual membership fee in 2013 is \$198 for each adult and \$75 for each child.

(i) Calculate the total amount the 560 members pay in 2013.

Answer(c)(i) \$ ..... [2]

(ii) The adult fee of \$198 in 2013 is 5.6% more than the fee in 2012.

Calculate the adult fee in 2012.

Answer(c)(ii) \$ ..... [3]

For Examiner's Use

(d) The club buys 36 tennis balls for $9.50 and sells them to members for $0.75 each.

Calculate the percentage profit the club makes.

Answer(d) ..... % [3]

(e) A tennis court is a rectangle with length 23.7 m and width 10.9 m, each correct to 1 decimal place.

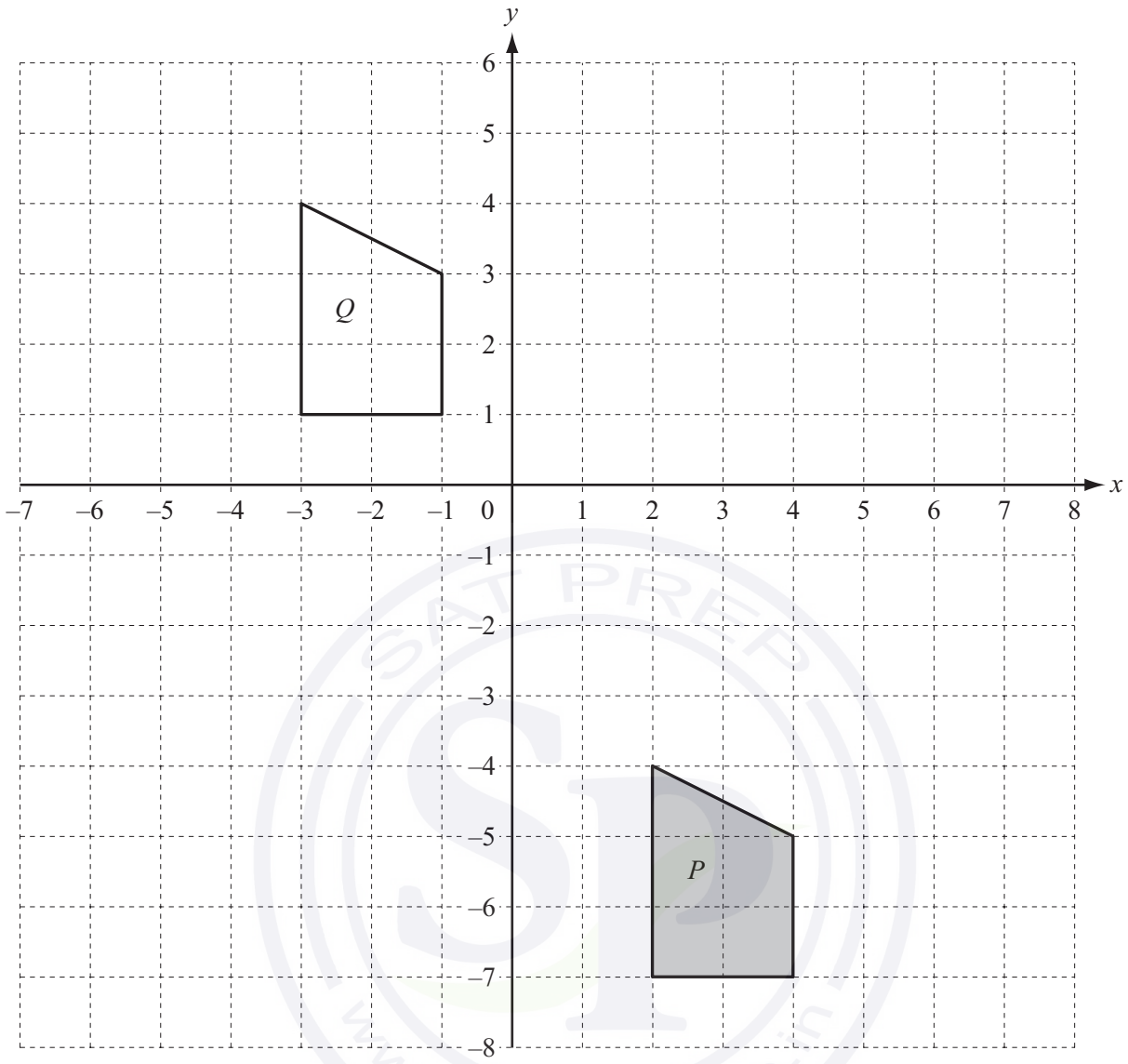
Calculate the upper and lower bounds of the perimeter of the court.

Answer(e) Upper bound ..... m

Lower bound ..... m [3]

For Examiner's Use

2 (a)



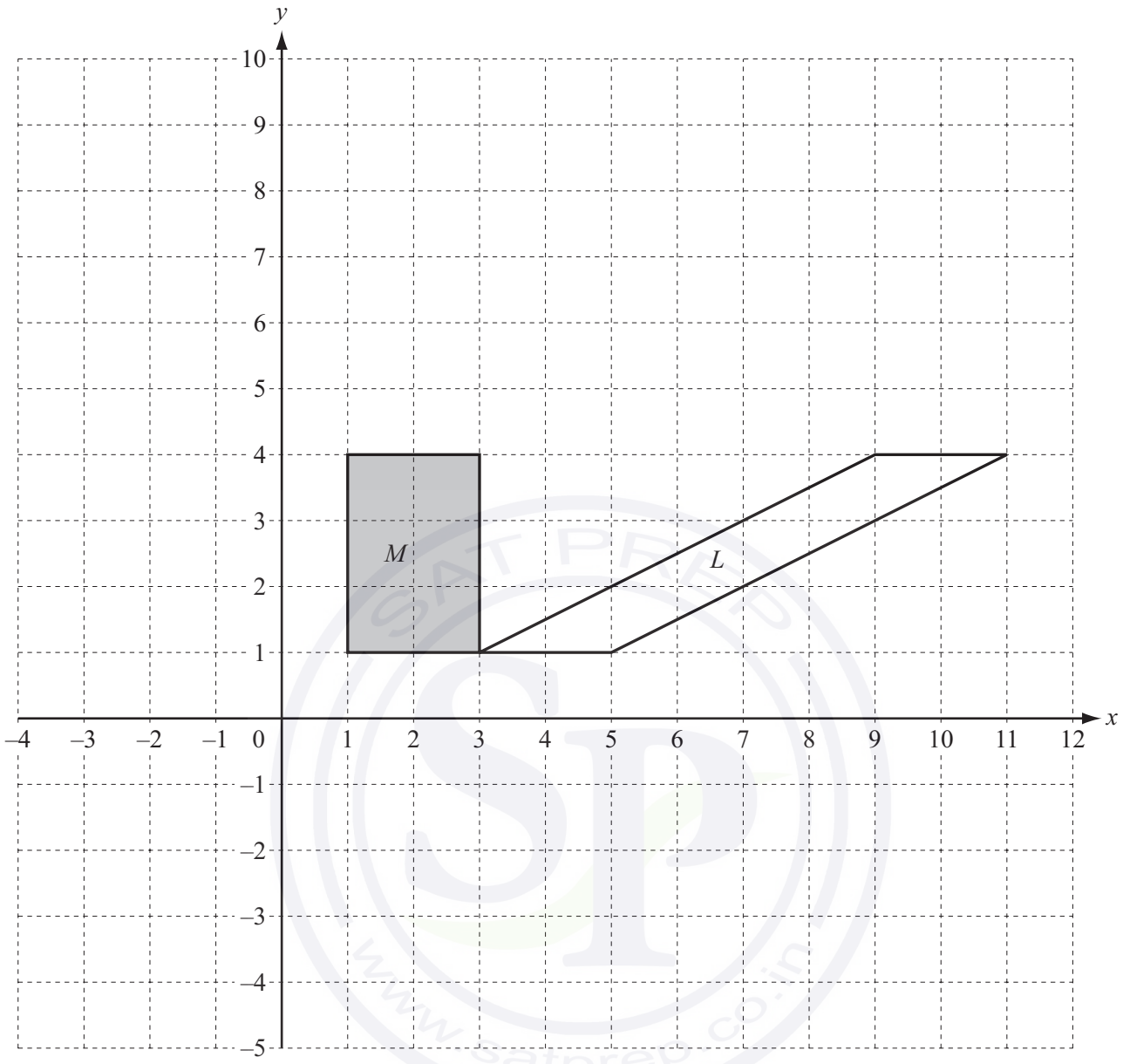
(i) Describe fully the **single** transformation which maps shape *P* onto shape *Q*.

Answer(a)(i) ..... [2]

(ii) On the grid above, draw the image of shape *P* after reflection in the line $y = -1$. [2]

(iii) On the grid above, draw the image of shape *P* under the transformation represented by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$. [3]

(b)



(i) Describe fully the **single** transformation which maps shape *M* onto shape *L*.

Answer(b)(i) ..... [3]

(ii) On the grid above, draw the image of shape *M* after enlargement by scale factor 2, centre (5, 0). [2]

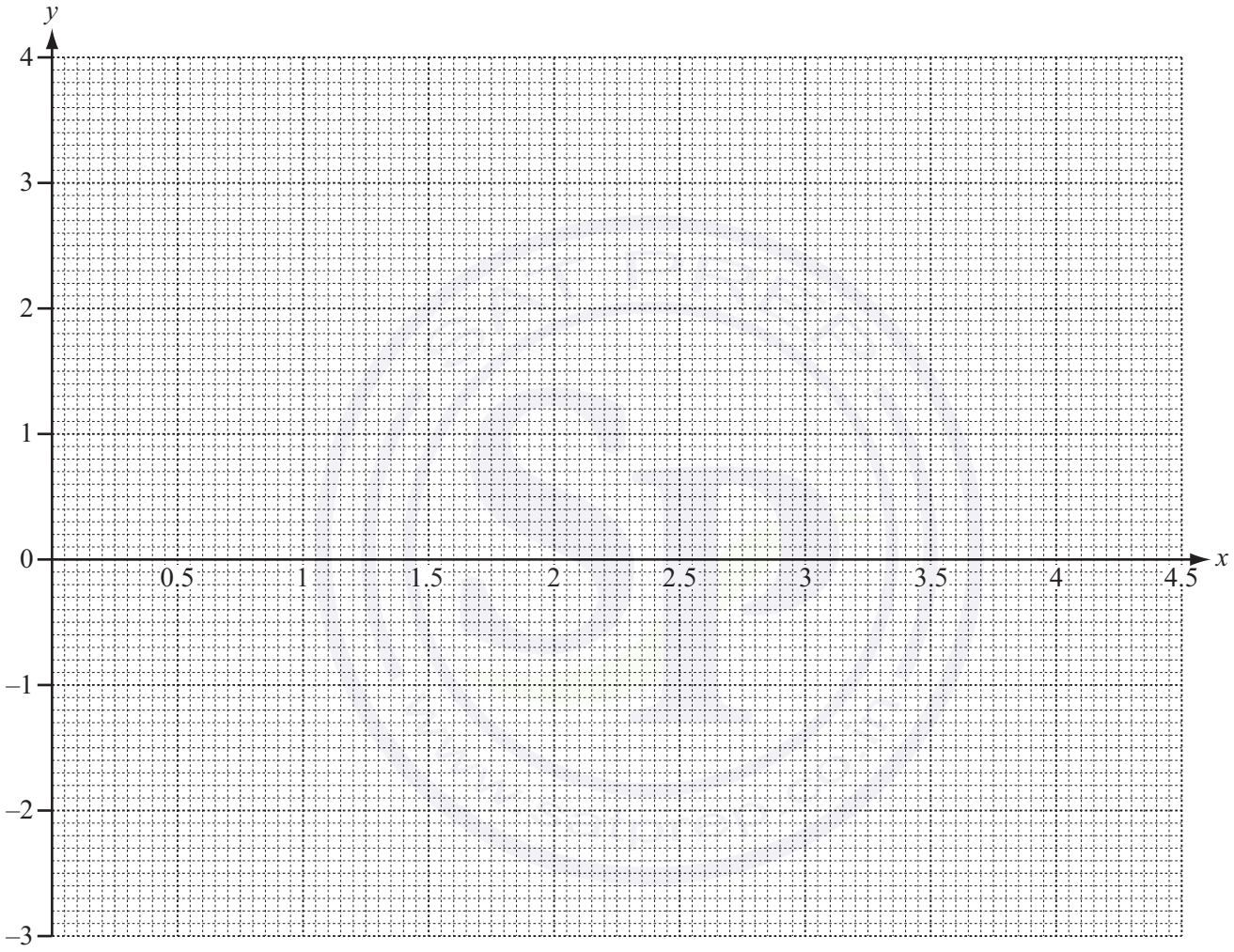
For Examiner's Use

3 The table shows some values for the function $y = 11x - 2x^2 - 12$ for $1 \leqslant x \leqslant 4.5$.

x	1	1.5	2	2.5	3	3.5	4	4.5
y	–3		2	3	3			

(a) Complete the table of values. [3]

(b) On the grid below, draw the graph of $y = 11x - 2x^2 - 12$ for $1 \leqslant x \leqslant 4.5$.



[4]

(c) By drawing a suitable line, use your graph to solve the equation $11x - 2x^2 = 11$.

Answer(c) $x =$ ..... or $x =$ ..... [2]

(d) The line $y = mx + 2$ is a tangent to the curve $y = 11x - 2x^2 - 12$ at the point P.

By drawing this tangent,

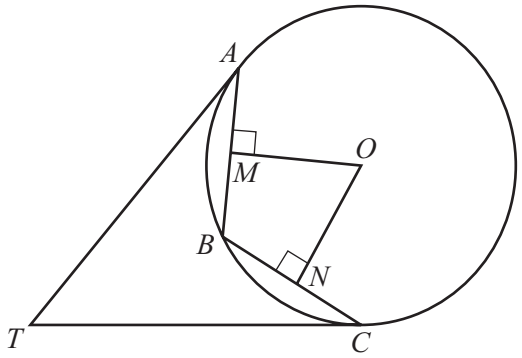
(i) find the co-ordinates of the point P,

Answer(d)(i) (..... , ...) [2]

(ii) work out the value of m.

Answer(d)(ii) $m =$ ..... [2]

4



NOT TO SCALE

A, B and C lie on the circle centre O, radius 8.5 cm.
$AB = BC = 10.7$ cm.
OM is perpendicular to AB and ON is perpendicular to BC.

(a) Calculate the area of the circle.

Answer(a) ..... cm^2 [2]

(b) Write down the length of MB.

Answer(b) ..... cm [1]

(c) Calculate angle MOB and show that it rounds to 39° correct to the nearest degree.

Answer(c)

[2]

(d) Using angle $MOB = 39°$, calculate the length of the **major** arc AC.

Answer(d) ..... cm [3]

(e) The tangents to the circle at A and at C meet at T.

Explain clearly why triangle ATB is congruent to triangle CTB.

Answer(e)

[3]

5 Paul buys a number of large sacks of fertiliser costing \$$x$ each.

He spends \$27.

(a) Write down, in terms of x, an expression for the number of large sacks which Paul buys.

Answer(a) ..... [1]

(b) Rula buys a number of small sacks of fertiliser.
Each small sack costs \$2 less than a large sack.
Rula spends \$25.

Write down, in terms of x, an expression for the number of small sacks which Rula buys.

Answer(b) ..... [1]

(c) Rula buys 4 more sacks than Paul.
Write down an equation in x and show that it simplifies to $2x^2 - 3x - 27 = 0$.

Answer(c)

[4]

(d) Solve $2x^2 - 3x - 27 = 0$.

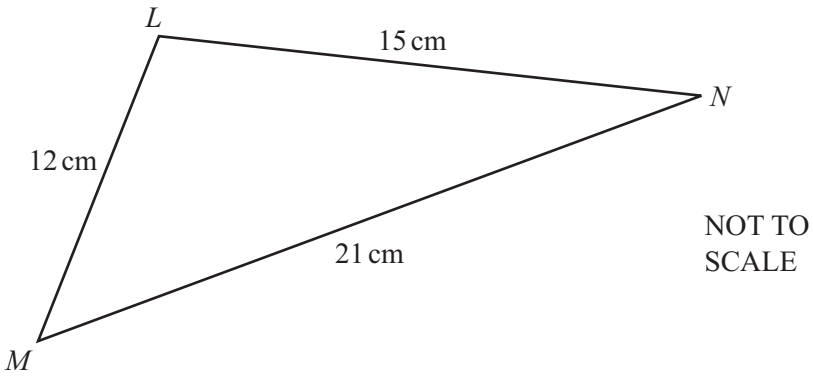
Answer(d) $x =$ ..... or $x =$ ..... [3]

(e) Calculate the number of sacks which Paul buys.

Answer(e) ..... [1]

[Turn over

6 (a)



The diagram shows triangle LMN with $LM = 12$ cm, $LN = 15$ cm and $MN = 21$ cm.

(i) Calculate angle LMN.
Show that this rounds to 44.4°, correct to 1 decimal place.

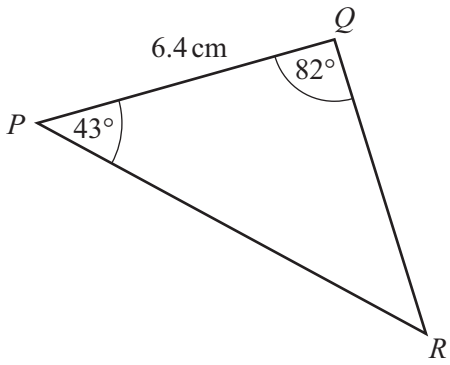
Answer(a)(i)

[4]

(ii) Calculate the area of triangle LMN.

Answer(a)(ii) ..... cm^2 [2]

(b)



NOT TO SCALE

The diagram shows triangle PQR with $PQ = 6.4$ cm, angle $PQR = 82°$ and angle $QPR = 43°$.

Calculate the length of PR.

Answer(b) PR = ... cm [4]

7 $\mathbf{A} = \begin{pmatrix} 5 \\ 7 \end{pmatrix}$ $\mathbf{B} = (6 \quad -4)$ $\mathbf{C} = \begin{pmatrix} 2 & 4 \\ 1 & 3 \end{pmatrix}$ $\mathbf{D} = \begin{pmatrix} 2 & 9 \\ -1 & -3 \end{pmatrix}$

(a) Calculate the result of each of the following, if possible.

If a calculation is not possible, write "not possible" in the answer space.

(i) $3\mathbf{A}$

Answer(a)(i) [1]

(ii) $\mathbf{AC}$

Answer(a)(ii) [1]

(iii) $\mathbf{BA}$

Answer(a)(iii) [2]

(iv) $\mathbf{C} + \mathbf{D}$

Answer(a)(iv) [1]

(v) $\mathbf{D}^2$

Answer(a)(v) [2]

(b) Calculate $\mathbf{C}^{-1}$, the inverse of $\mathbf{C}$.

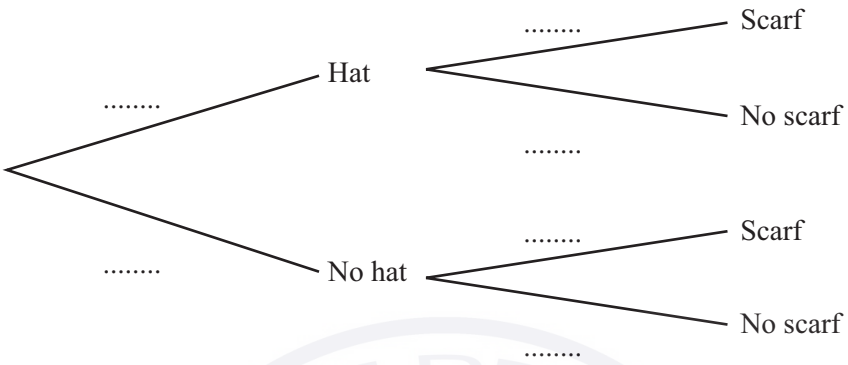
Answer(b) [2]

For Examiner's Use

8 In this question, give all your answers as fractions.

When Ivan goes to school in winter, the probability that he wears a hat is $\frac{5}{8}$.
If he wears a hat, the probability that he wears a scarf is $\frac{2}{3}$.
If he does not wear a hat, the probability that he wears a scarf is $\frac{1}{6}$.

(a) Complete the tree diagram.



[3]

(b) Find the probability that Ivan

(i) does not wear a hat and does not wear a scarf,

Answer(b)(i) ..... [2]

(ii) wears a hat but does not wear a scarf,

Answer(b)(ii) ..... [2]

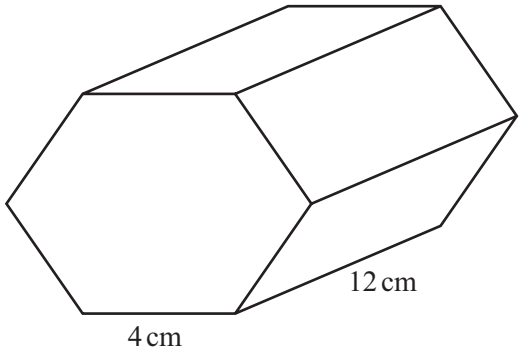
(iii) wears a hat or a scarf but not both.

Answer(b)(iii) ..... [2]

(c) If Ivan wears a hat and a scarf, the probability that he wears gloves is $\frac{7}{10}$.
Calculate the probability that Ivan does **not** wear all three of hat, scarf and gloves.

Answer(c) ..... [3]

9 **(a)**



NOT TO SCALE

The diagram shows a prism of length 12 cm.
The cross section is a regular hexagon of side 4 cm.

Calculate the total surface area of the prism.

Answer(a) ..... cm^2 [4]

(b) Water flows through a cylindrical pipe of radius 0.74 cm.
It fills a 12 litre bucket in 4 minutes.

(i) Calculate the speed of the water through the pipe in centimetres per minute.

Answer(b)(i) ..... cm/min [4]

For Examiner's Use

(ii) When the 12 litre bucket is emptied into a circular pool, the water level rises by 5 **millimetres**.

Calculate the radius of the pool correct to the nearest centimetre.

Answer(b)(ii) ..... cm [5]

For Examiner's Use

10 **(a)** Write as a single fraction

(i) $\frac{5}{4} - \frac{2x}{5}$,

Answer(a)(i) ..... [2]

(ii) $\frac{4}{x+3} + \frac{2x-1}{3}$.

Answer(a)(ii) ..... [3]

(b) Solve the simultaneous equations.

$9x - 2y = 12$
$3x + 4y = -10$

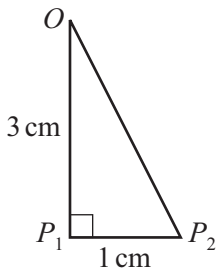
Answer(b) $x =$ .....

$y =$ ..... [3]

(c) Simplify $\dfrac{7x + 21}{2x^2 + 9x + 9}$.

Answer(c) ..... [4]

11 Sidney draws the triangle OP_1P_2.
$OP_1 = 3$ cm and $P_1P_2 = 1$ cm.
Angle $OP_1P_2 = 90°$.



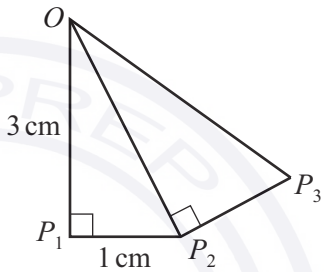
NOT TO SCALE

(a) Show that $OP_2 = \sqrt{10}$ cm.

Answer(a)

[1]

(b) Sidney now draws the lines P_2P_3 and OP_3.
Triangle OP_2P_3 is mathematically similar to triangle OP_1P_2.



NOT TO SCALE

(i) Write down the length of P_2P_3 in the form $\frac{\sqrt{a}}{b}$ where a and b are integers.

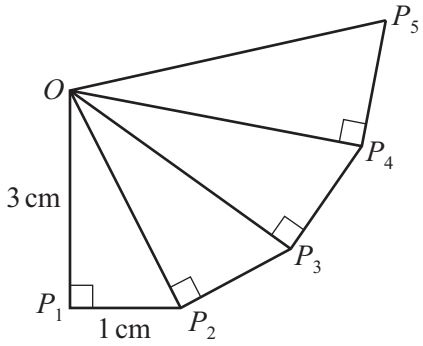
Answer(b)(i) P_2P_3 = ... cm [1]

(ii) Calculate the length of OP_3 giving your answer in the form $\frac{c}{d}$ where c and d are integers.

Answer(b)(ii) OP_3 = ... cm [2]

(c) Sidney continues to add mathematically similar triangles to his drawing.

Find the length of OP_5.



NOT TO SCALE

Answer(c) OP_5 = ... cm [2]

(d) (i) Show that angle $P_1OP_2 = 18.4°$, correct to 1 decimal place.

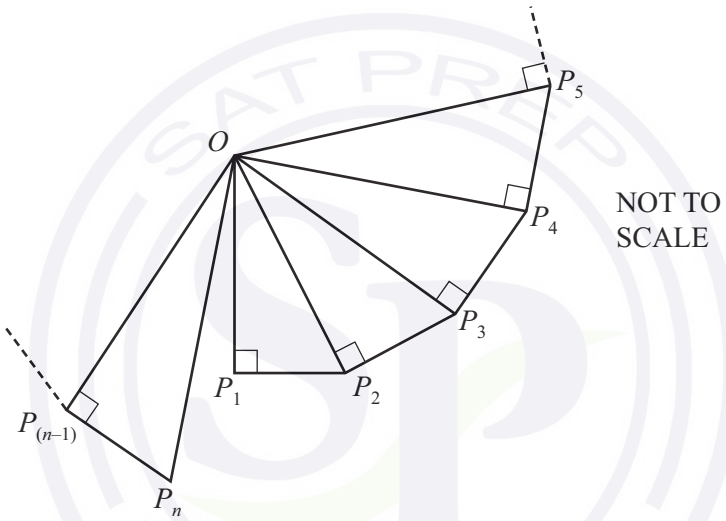
Answer(d)(i)

[2]

(ii) Write down the size of angle P_2OP_3.

Answer(d)(ii) Angle P_2OP_3 = ... [1]

(iii) The last triangle Sidney can draw without covering his first triangle is triangle $OP_{(n-1)}P_n$.



Calculate the value of n.

Answer(d)(iii) n = ... [3]

BLANK PAGE

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

9687546924

MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2013**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **19** printed pages and **1** blank page.

For Examiner's Use

1 **(a)** Ali and Ben receive a sum of money.
They share it in the ratio 5 : 1.
Ali receives $2345.

Calculate the total amount.

Answer(a) $ ..... [2]

(b) Ali uses 11% of his $2345 to buy a television.

Calculate the cost of the television.

Answer(b) $ ..... [2]

(c) A different television costs $330.

(i) Ben buys one in a sale when this cost is reduced by 15%.

How much does Ben pay?

Answer(c)(i) $ ..... [2]

(ii) $330 is 12% less than the cost last year.

Calculate the cost last year.

Answer(c)(ii) $ ..... [3]

For Examiner's Use

(d) Ali invests $1500 of his share in a bank account.
The account pays compound interest at a rate of 2.3% per year.

Calculate the total amount in the account at the end of 3 years.

Answer(d) $ ..... [3]

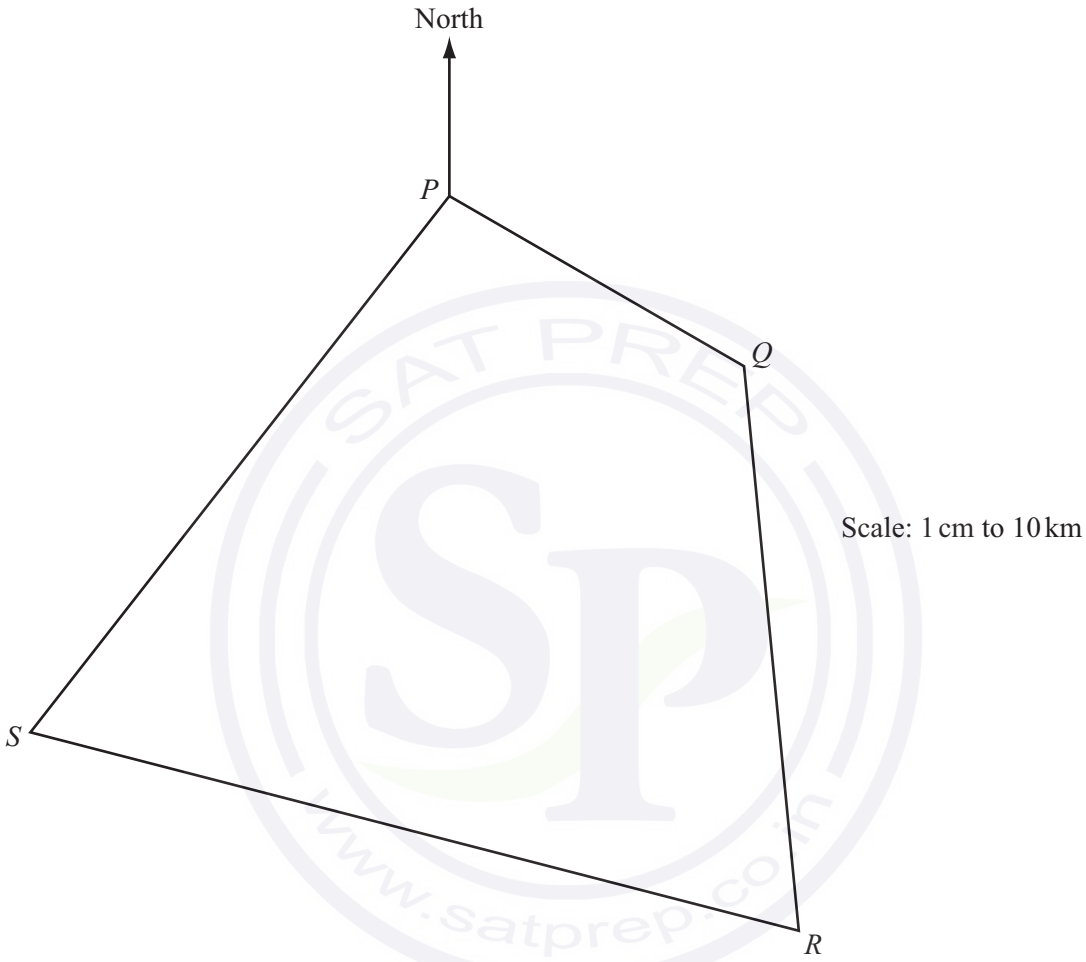
(e) Ali also buys a computer for $325.
He later sells this computer for $250.

Calculate Ali's percentage loss.

Answer(e) ..... % [3]

2 (a) In this question show all your construction arcs and use only a ruler and compasses to draw the boundaries of your region.

This scale drawing shows the positions of four towns, P, Q, R and S, on a map where 1 cm represents 10 km.



A nature reserve lies in the quadrilateral $PQRS$.
The boundaries of the nature reserve are:

- equidistant from Q and from R
- equidistant from PS and from PQ
- 60 km from R
- along QR.

(i) Shade the region which represents the nature reserve. [7]

(ii) Measure the bearing of S from P.

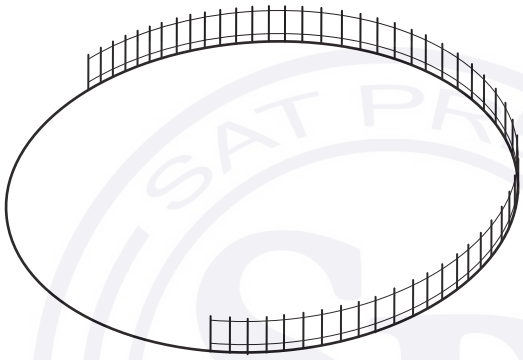
Answer(a)(ii) ..... [1]

(b) A circular lake in the nature reserve has a radius of 45 m.

(i) Calculate the area of the lake.

Answer(b)(i) ..... m^2 [2]

(ii)



NOT TO SCALE

A fence is placed along part of the circumference of the lake.
This arc subtends an angle of 210° at the centre of the circle.

Calculate the length of the fence.

Answer(b)(ii) ..... m [2]

3 **(a)** Luk wants to buy x goats and y sheep.

(i) He wants to buy at least 5 goats.

Write down an inequality in x to represent this condition.

Answer(a)(i) ..... [1]

(ii) He wants to buy at least 11 sheep.

Write down an inequality in y to represent this condition.

Answer(a)(ii) ..... [1]

(iii) He wants to buy at least 20 animals.

Write down an inequality in x and y to represent this condition.

Answer(a)(iii) ..... [1]

(b) Goats cost \$4 and sheep cost \$8.
The maximum Luk can spend is \$160.

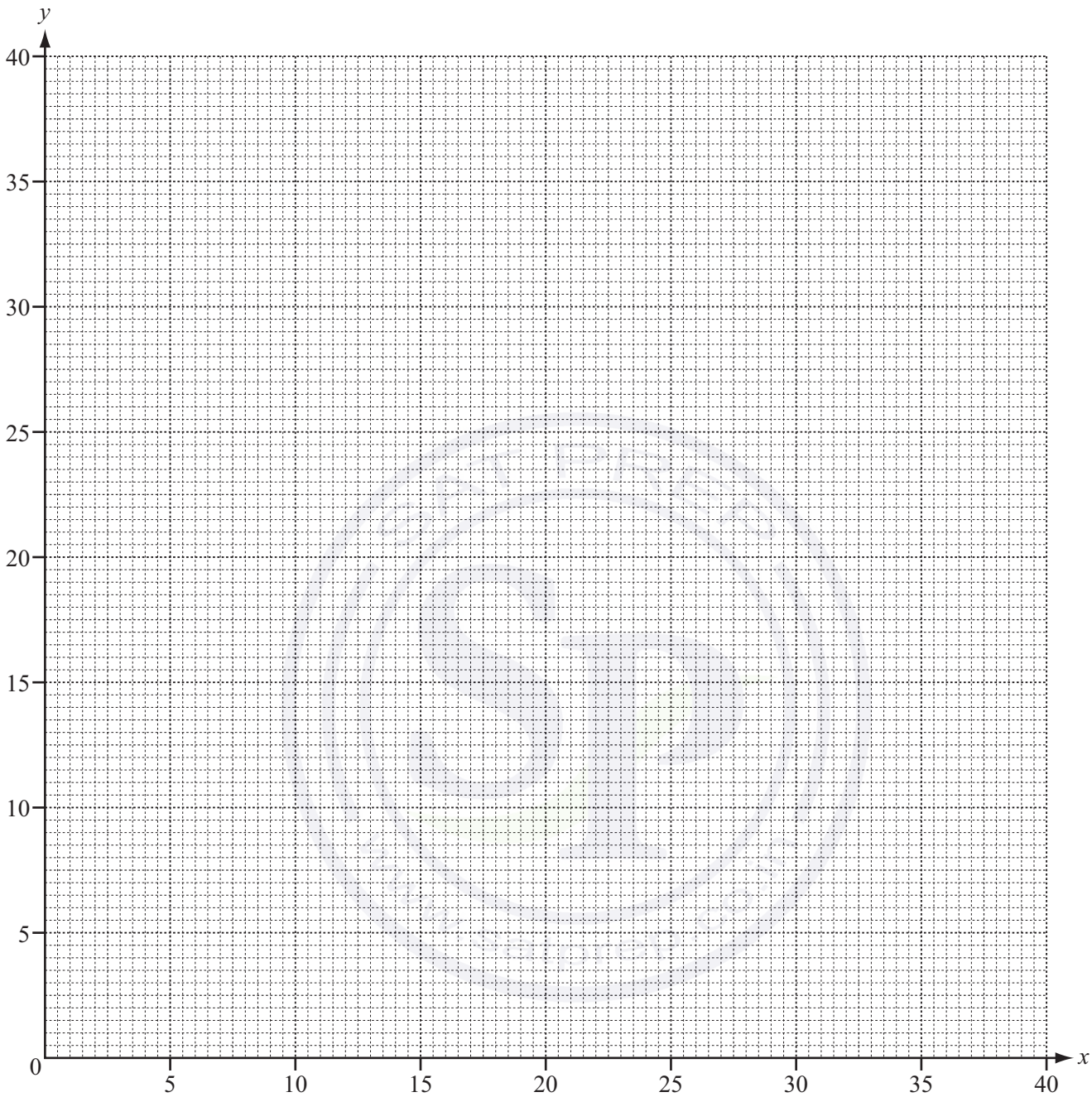
Write down an inequality in x and y and show that it simplifies to $x + 2y \leqslant 40$.

Answer(b)

[1]

For Examiner's Use

(c) (i) On the grid below, draw four lines to show the four inequalities and shade the **unwanted** regions.

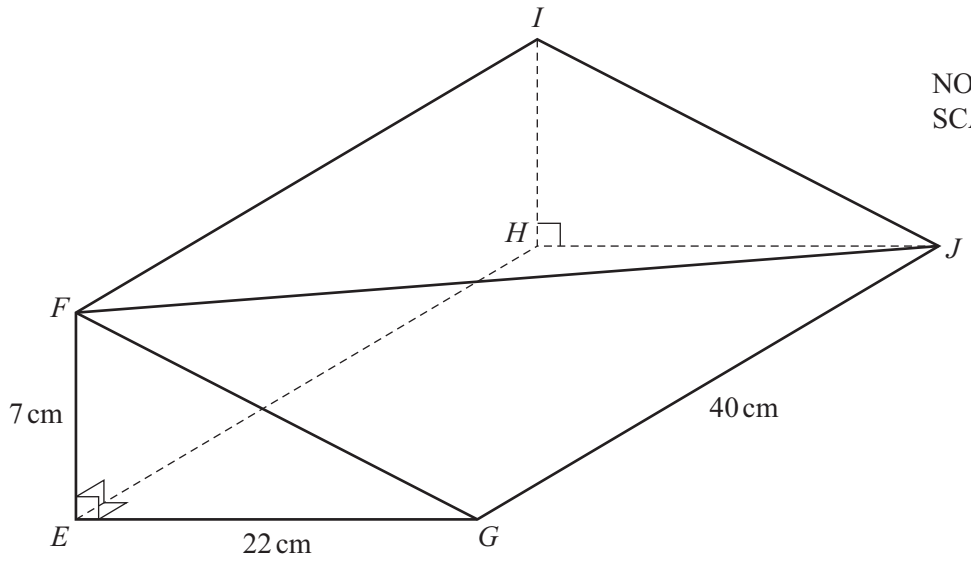


[7]

(ii) Work out the maximum number of animals that Luk can buy.

Answer(c)(ii) ..... [2]

4



NOT TO SCALE

EFGHIJ is a solid metal prism of length 40 cm.
The cross section *EFG* is a right-angled triangle.
EF = 7 cm and *EG* = 22 cm.

(a) Calculate the volume of the prism.

Answer(a) ..... cm^3 [2]

(b) Calculate the length *FJ*.

Answer(b) FJ = ... cm [4]

(c) Calculate the angle between FJ and the base $EGJH$ of the prism.

Answer(c) ..... [3]

(d) The prism is melted and made into spheres.
Each sphere has a radius 1.5 cm.

Work out the greatest number of spheres that can be made.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

Answer(d) ..... [3]

(e) (i) A right-angled triangle is the cross section of another prism.
This triangle has height 4.5 cm and base 11.0 cm.
Both measurements are correct to 1 decimal place.

Calculate the upper bound for the area of this triangle.

Answer(e)(i) ..... cm^2 [2]

(ii) Write your answer to **part (e)(i)** correct to 4 significant figures.

Answer(e)(ii) ..... cm^2 [1]

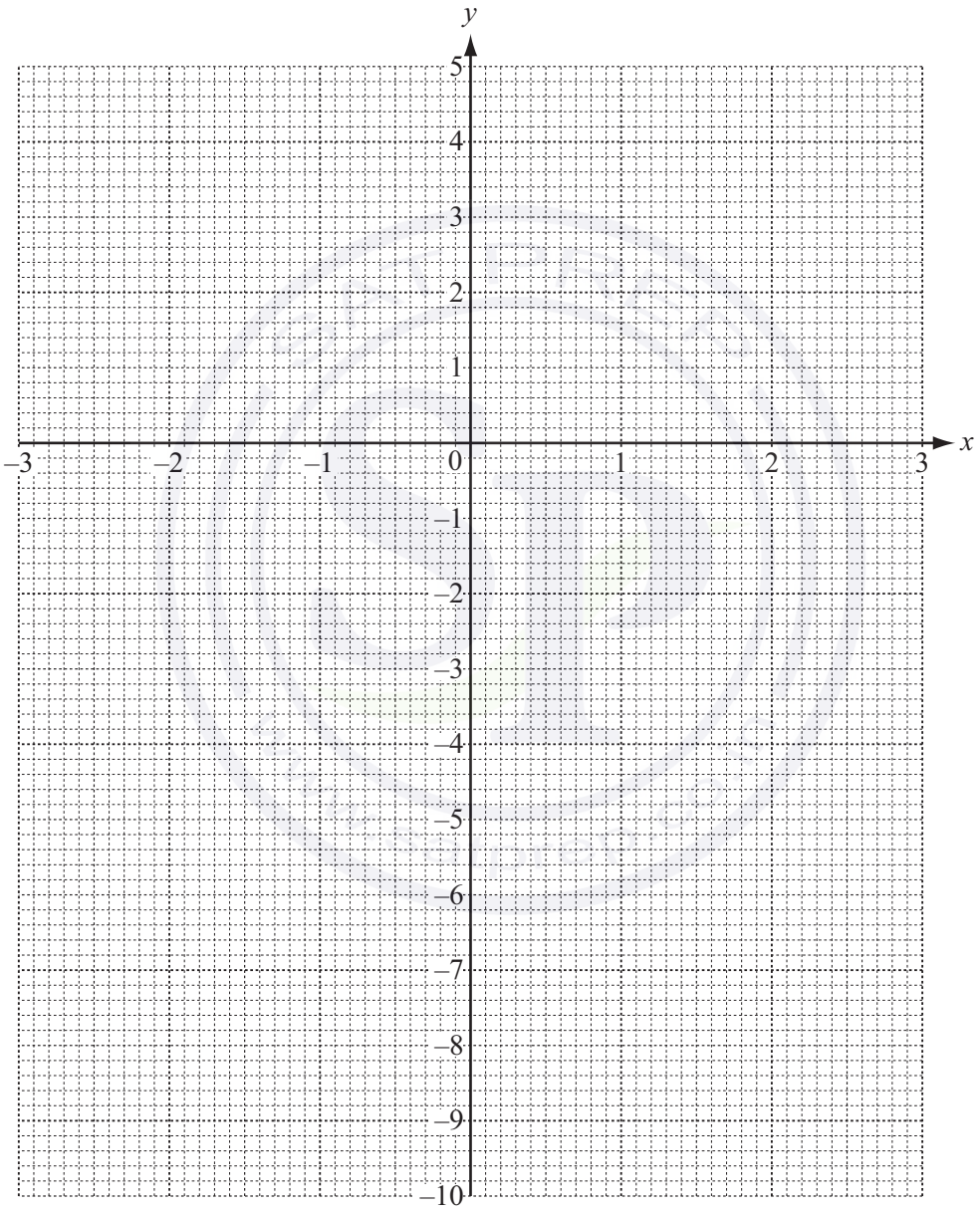
[Turn over

5 **(a)** Complete this table of values for the function $f(x) = \frac{1}{x} - x^2$, $x \neq 0$.

x	–3	–2	–1	–0.5	–0.2		0.2	0.5	1	2	3
f(x)	–9.33	–4.5	–2	–2.25			4.96			–3.5	–8.67

[3]

(b) Draw the graph of $f(x) = \frac{1}{x} - x^2$ for $-3 \leq x \leq -0.2$ and $0.2 \leq x \leq 3$.



[5]

(c) Use your graph to solve $f(x) = -3$.

Answer(c) $x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(d) By drawing a suitable line on your graph, solve the equation $f(x) = 2x - 2$.

Answer(d) $x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(e) By drawing a suitable tangent, work out an estimate of the gradient of the curve at the point where $x = -2$.

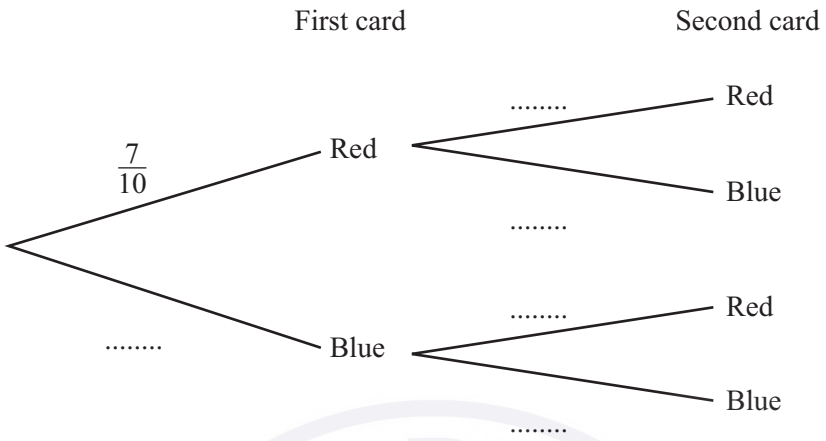
You must show your working.

Answer(e) ..... [3]

For Examiner's Use

6 In a box there are 7 red cards and 3 blue cards.
A card is drawn at random from the box and is not replaced.
A second card is then drawn at random from the box.

(a) Complete this tree diagram.

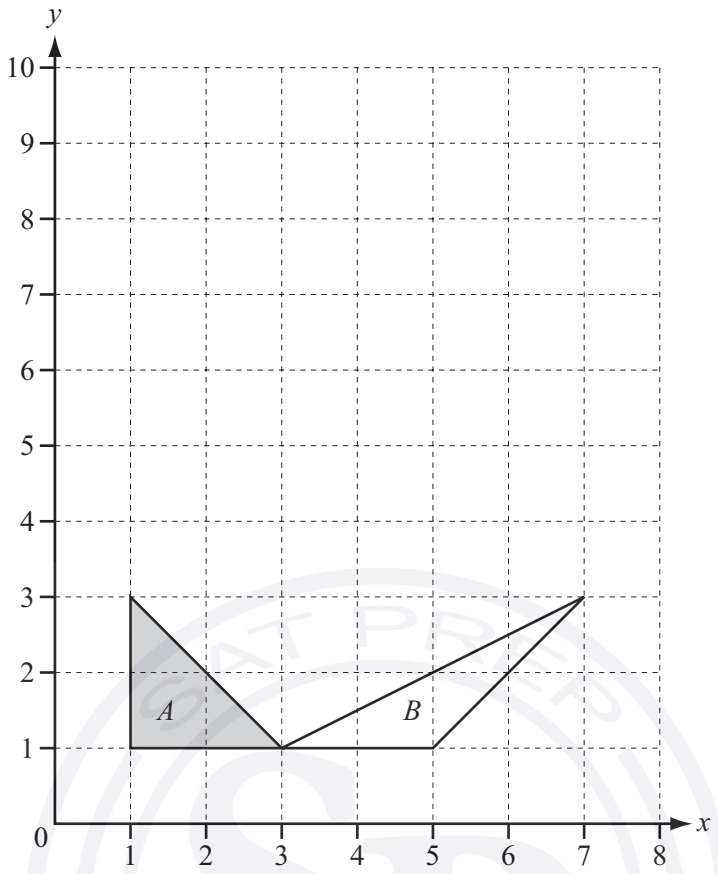


[3]

(b) Work out the probability that the two cards are of different colours.
Give your answer as a fraction.

Answer(b) ..... [3]

7



(a) (i) Draw the image of shape *A* after a stretch, factor 3, *x*-axis invariant. [2]

(ii) Write down the matrix representing a stretch, factor 3, *x*-axis invariant.

Answer(a)(ii) ( ) [2]

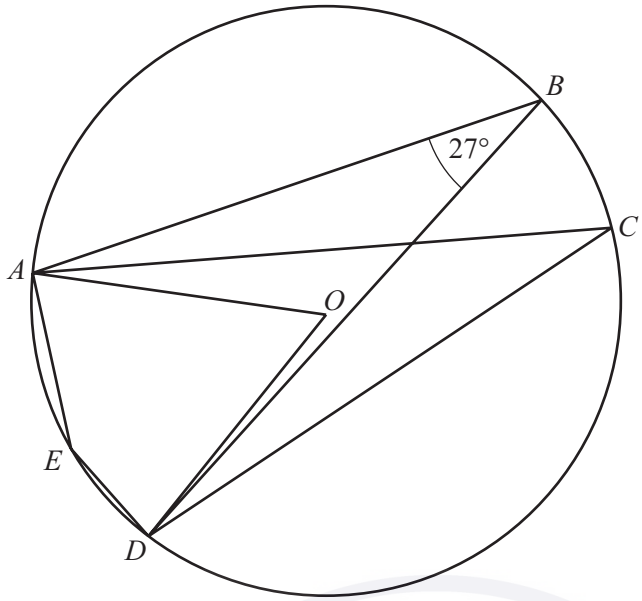
(b) (i) Describe fully the **single** transformation which maps shape *A* onto shape *B*.

Answer(b)(i) ..... [3]

(ii) Write down the matrix representing the transformation which maps shape *A* onto shape *B*.

Answer(b)(ii) ( ) [2]

8 (a)



NOT TO SCALE

A, *B*, *C*, *D* and *E* are points on the circle centre *O*.
Angle *ABD* = 27°.

Find

(i) angle *ACD*,

Answer(a)(i) Angle *ACD* = ... [1]

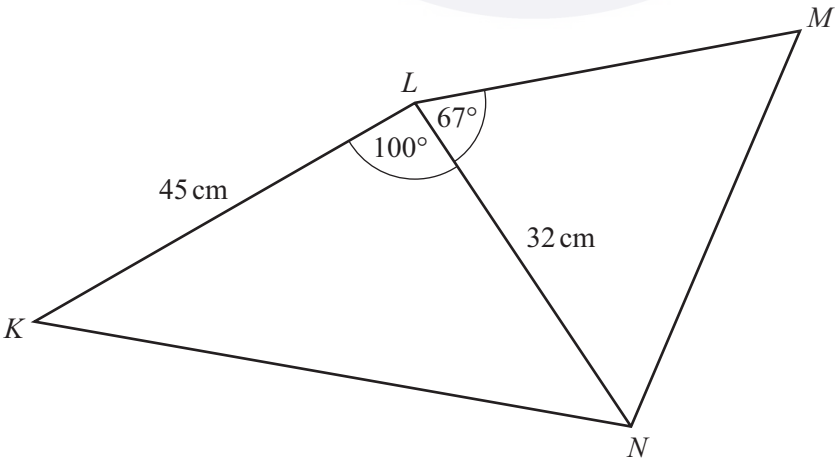
(ii) angle *AOD*,

Answer(a)(ii) Angle *AOD* = ... [1]

(iii) angle *AED*.

Answer(a)(iii) Angle *AED* = ... [1]

(b)



NOT TO SCALE

The diagram shows quadrilateral *KLMN*.
KL = 45 cm, *LN* = 32 cm, angle *KLN* = 100° and angle *NLM* = 67°.

(i) Calculate the length *KN*.

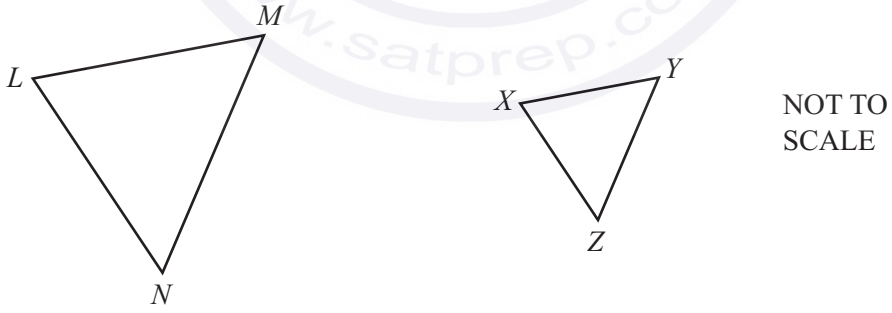
Answer(b)(i) *KN* = ... cm [4]

(ii) The area of triangle *LMN* is 324 cm^2.

Calculate the length *LM*.

Answer(b)(ii) *LM* = ... cm [3]

(iii) Another triangle *XYZ* is mathematically similar to triangle *LMN*.



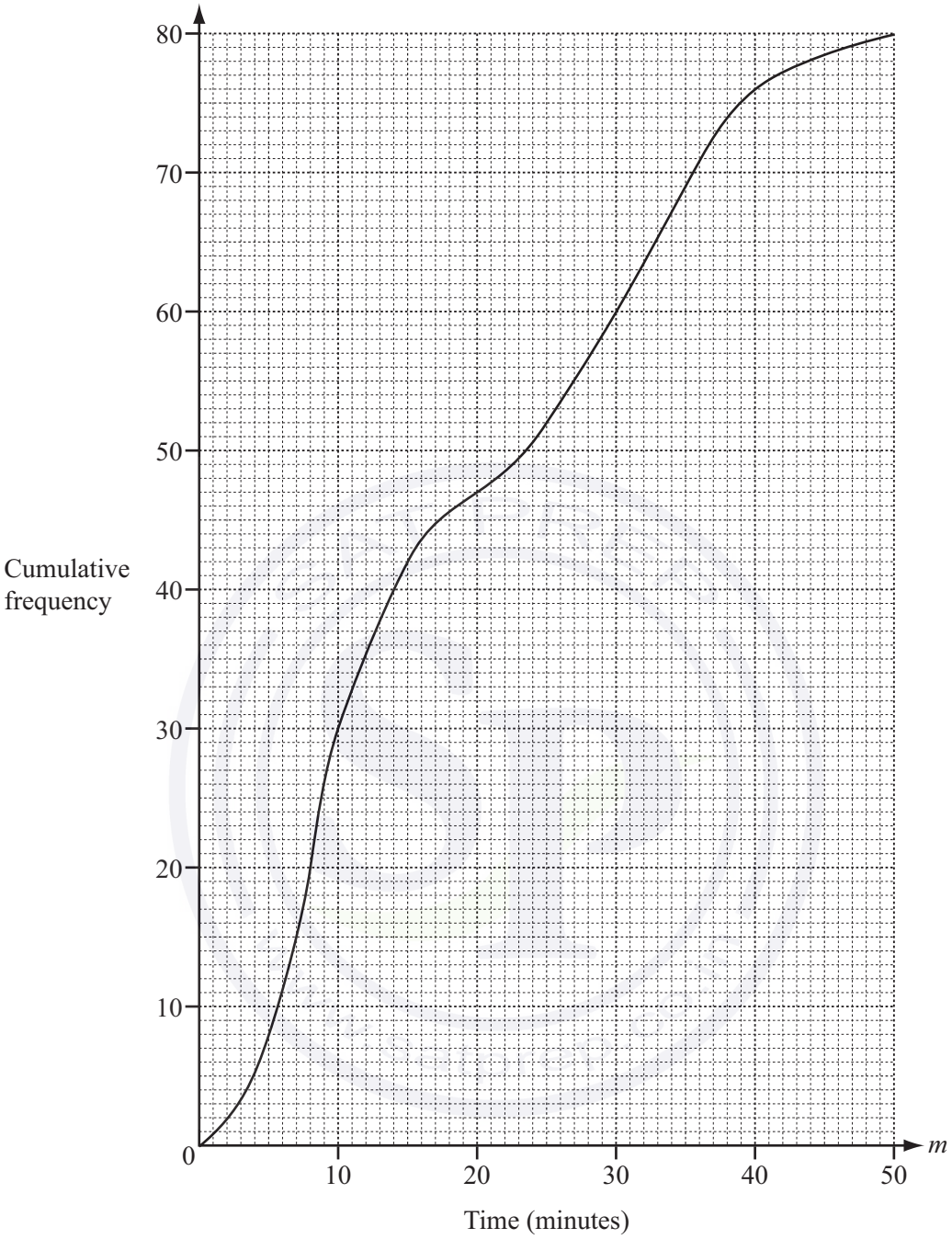
XZ = 16 cm and the area of triangle *LMN* is 324 cm^2.

Calculate the area of triangle *XYZ*.

Answer(b)(iii) ..... cm^2 [2]

For Examiner's Use

9 Sam asked 80 people how many minutes their journey to work took on one day.
The cumulative frequency diagram shows the times taken (m minutes).



(a) Find

(i) the median,

Answer(a)(i) ..... min [1]

(ii) the lower quartile,

Answer(a)(ii) ..... min [1]

(iii) the inter-quartile range.

Answer(a)(iii) ..... min [1]

For Examiner's Use

(b) One of the 80 people is chosen at random.

Find the probability that their journey to work took more than 35 minutes.
Give your answer as a fraction.

Answer(b) ..... [2]

(c) Use the cumulative frequency diagram to complete this frequency table.

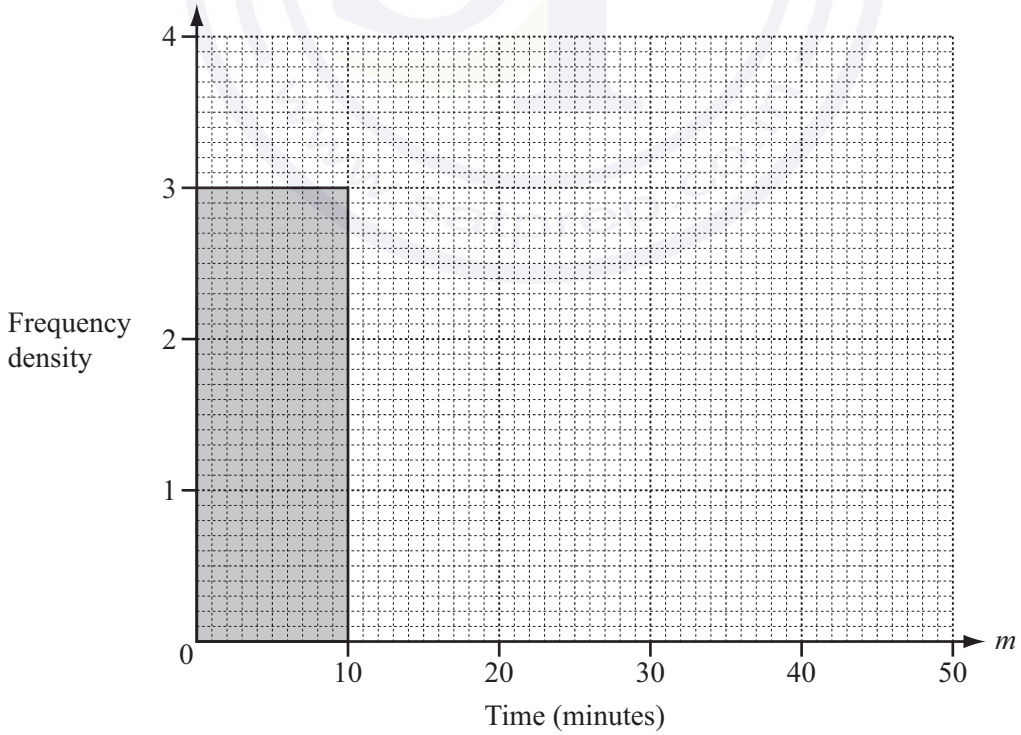
Time (m minutes)	$0 < m \leq 10$	$10 < m \leq 15$	$15 < m \leq 30$	$30 < m \leq 40$	$40 < m \leq 50$
Frequency	30	12	18		

[2]

(d) Using mid-interval values, calculate an estimate of the mean journey time for the 80 people.

Answer(d) ..... min [3]

(e) Use the table in **part (c)** to complete the histogram to show the times taken by the 80 people.
One column has already been completed for you.



[5]

For Examiner's Use

10 (a) (i) Solve $2(3x - 7) = 13$.

Answer(a)(i) $x =$ ..... [3]

(ii) Solve by factorising $x^2 - 7x + 6 = 0$.

Answer(a)(ii) $x =$ ..... or $x =$ ..... [3]

(iii) Solve $\frac{3x - 2}{5} + \frac{x + 2}{10} = 4$.

Answer(a)(iii) $x =$ ..... [4]

For Examiner's Use

(b) $1^2 = 1$

$1^2 + 2^2 = 5$

$1^2 + 2^2 + 3^2 = 14$

$1^2 + 2^2 + 3^2 + 4^2 = 30$

$1^2 + 2^2 + 3^2 + 4^2 + \ldots\ldots\ldots\ldots + n^2 = an^3 + bn^2 + \frac{n}{6}$

Work out the values of a and b.

Answer(b) $a =$ .....

$b =$ ..... [6]

BLANK PAGE