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MATHEMATICS **0580/41**

Paper 4 Calculator (Extended) **October/November 2025**

2 hours

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 scientific 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 100.
- The number of marks for each question or part question is shown in brackets [ ].

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

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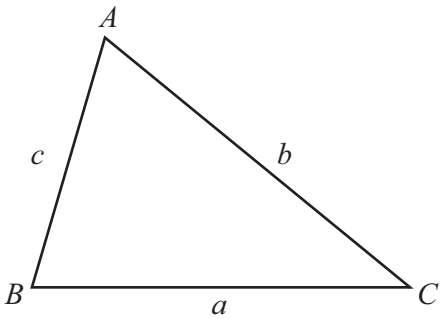
[Turn over

List of formulas

Area, A, of triangle, base b, height h.	$A = \frac{1}{2}bh$
Area, A, of circle of radius r.	$A = \pi r^2$
Circumference, C, of circle of radius r.	$C = 2\pi r$
Curved surface area, A, of cylinder of radius r, height h.	$A = 2\pi rh$
Curved surface area, A, of cone of radius r, sloping edge l.	$A = \pi rl$
Surface area, A, of sphere of radius r.	$A = 4\pi r^2$
Volume, V, of prism, cross-sectional area A, length l.	$V = Al$
Volume, V, of pyramid, base area A, height h.	$V = \frac{1}{3}Ah$
Volume, V, of cylinder of radius r, height h.	$V = \pi r^2 h$
Volume, V, of cone of radius r, height h.	$V = \frac{1}{3}\pi r^2 h$
Volume, V, of sphere of radius r.	$V = \frac{4}{3}\pi r^3$
For the equation $ax^2 + bx + c = 0$, where $a \neq 0$,	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

For the triangle shown,



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\text{Area} = \frac{1}{2}ab\sin C$$

1 A quadrilateral has

- rotational symmetry of order 2
- two diagonals that are the only lines of symmetry.

Write down the geometrical name of this quadrilateral.

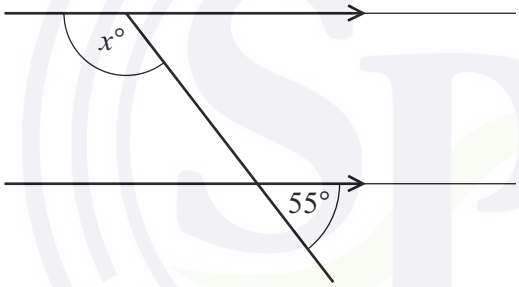
..... [1]

2 Solve.

$11 - 2x = 4$

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

3



NOT TO SCALE

The diagram shows two parallel lines and a straight line.

Find the value of x.

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

4 A train journey starts at 22 16.
The journey takes 5 hours 52 minutes.

Find the time the train journey finishes.

..... [1]

5

(a) In triangle ABC, $AB = 8$ cm, $AC = 7$ cm and $BC = 5$ cm.

Using a ruler and compasses only, construct triangle ABC.
The side AB has been drawn for you. [2]

(b) Measure angle ACB.

..... [1]

(c) Triangle ABC is a scale drawing of a field.

(i) The scale is 1 : 10 000.

Find the actual distance from A to B.
Give your answer in kilometres.

..... km [1]

(ii) B is due east of A.
Find the bearing of A from B.

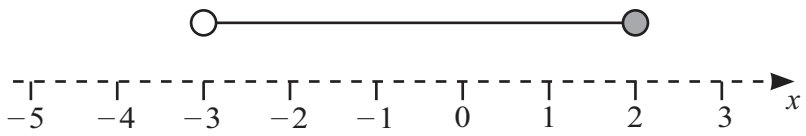
..... [1]

6 Expand.

$g(3-2g)$

..... [1]

7 **(a)**



Write down the inequality represented in the diagram.

..... [2]

(b) Write down the integer values of x that satisfy the inequality $-4 < 2x \leqslant 8$.

..... [2]

8 Calculate.

$$(3.5^2 - 2.2^3)^{\frac{1}{4}}$$

..... [1]

9 An athlete runs at a speed of 9.5 m/s.

Convert this speed into km/h.

..... km/h [2]

10 A is the point (2, 1).

$\overrightarrow{AB} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

Find the coordinates of B.

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

11 In a sale, the prices of coats are reduced by 15%.

(a) The original price of a coat is \$60.

Calculate the sale price of the coat.

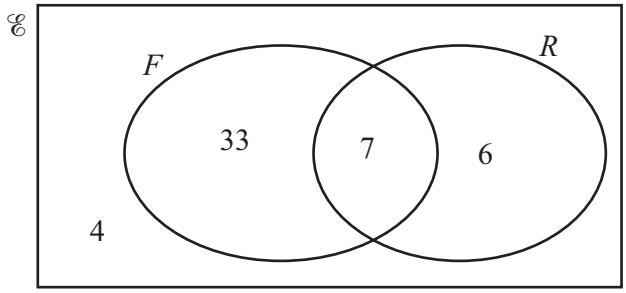
\$ ..... [2]

(b) The sale price of a different coat is \$58.14 .

Calculate the original price of this coat .

\$ ..... [2]

12 Some students are asked if they like football (F) or rugby (R).
The Venn diagram shows the results.



(a) Find the number of students who do not like rugby.

..... [1]

(b) Use set notation to describe the region containing students who like rugby but not football.

..... [1]

13

NOT TO SCALE

The diagram shows two vertical poles, AE and PT, standing on horizontal ground, AP.

Calculate the angle of elevation of the point T from the point E.

..... [3]

14 A cube contains a solid metal sphere.
The sphere touches all the faces of the cube.
The side length of the cube is 8 cm.

(a) Show that the volume of the sphere is $\frac{256}{3}\pi\,\text{cm}^3$.

[1]

(b) Calculate the percentage of the cube that is **not** occupied by the sphere.

..... % [3]

(c) The density of the metal of the sphere is $7.86\,\text{g/cm}^3$.

Calculate the mass of the sphere.
Give your answer in kilograms.
[Density = mass ÷ volume]

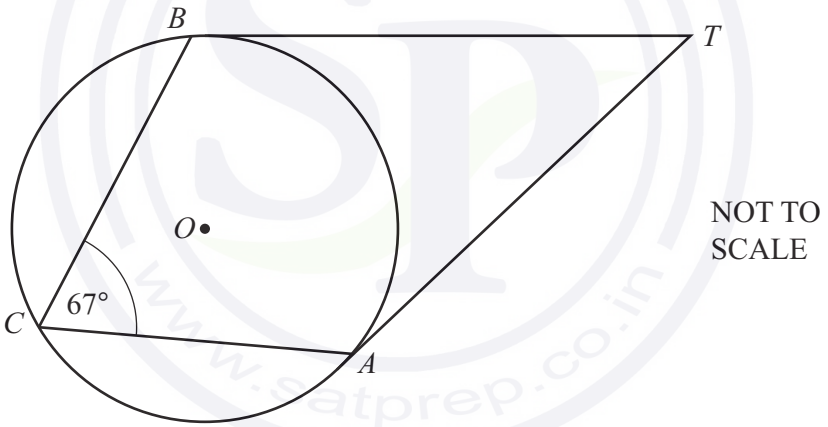
..... kg [2]

(d) The sphere is melted down and made into a solid cylinder with radius 3.1 cm.

Calculate the **total** surface area of the cylinder.

..... cm^2 [4]

15



A, *B* and *C* lie on a circle, centre *O*.
TA and *TB* are tangents to the circle at *A* and *B*.

Calculate angle *ATB*.

Angle *ATB* = ... [3]

16 The table shows some information about the heights of 50 plants.

Height (h cm)	$5 < h \leqslant 10$	$10 < h \leqslant 12$	$12 < h \leqslant 20$
Frequency	3	24	23

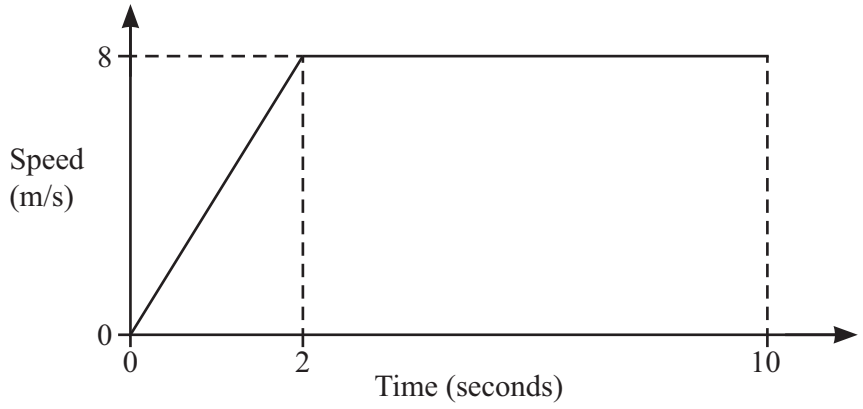
Calculate an estimate of the mean height.

..... cm [4]

17 Find the equation of the straight line that passes through the points (2, 0) and (0, 4).
Give your answer in the form $y = mx + c$.

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

18



NOT TO SCALE

The diagram shows part of the speed–time graph for an athlete in a race.

(a) Calculate the distance the athlete runs in the first 10 seconds.

..... m [2]

(b) The length of the race is 100 m.
After 10 seconds, the athlete continues to run at a speed of 8 m/s until the end of the race.

Calculate the **total** time the athlete takes to complete the 100 m race.

..... s [2]

19 The mass of a radioactive substance decays exponentially at a rate of 10% per day.
The initial mass of the substance is 20 g.

Find the number of whole days it takes for the mass of the substance to first be less than 1 g.

..... days [3]

20 These are the first five terms of a sequence.

48 24 12 6 3

(a) Find the next term.

..... [1]

(b) Find the nth term.

..... [2]

21 In triangle STU, $ST = 8$ cm, $SU = 9$ cm and angle $TSU = 50°$.

Calculate the area of triangle STU.

..... cm^2 [2]

22 Alex invests \$200 at a rate of r% per year compound interest.
At the end of 25 years the value of this investment is \$301.10 .

Find the value of r.

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

23 $y \propto \dfrac{1}{\sqrt{x+1}}$

When $x = 8$, $y = 3$.

Find y in terms of x.

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

24 Martha walks a distance of 10 km at a speed of x km/h.
She then runs a distance of 5 km at a speed of $(x+4)$ km/h.
The total time taken for the whole journey is 3.5 hours.

(a) Write down an expression in terms of x for the time Martha is walking.

..... h [1]

(b) Show that $7x^2 - 2x - 80 = 0$.

[4]

(c) Solve $7x^2 - 2x - 80 = 0$, giving your answers correct to 2 decimal places.
You must show all your working.

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

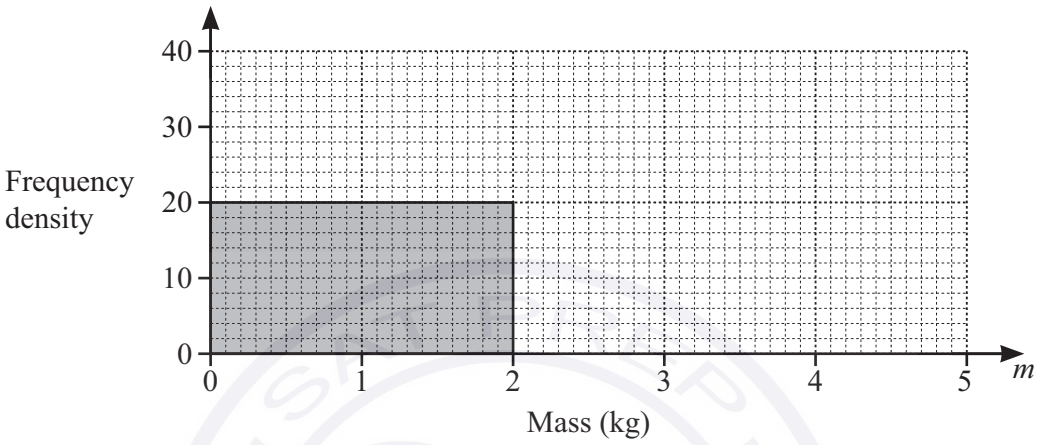
(d) Calculate the difference between the time Martha is walking and the time she is running.
Give your answer in hours and minutes correct to the nearest minute.

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

25 Kai sorts parcels into two types, light and heavy.

Type of parcel	Mass (m kg)
Light	$0 < m \leqslant 2$
Heavy	$2 < m \leqslant 5$

The histogram shows some information about the number of parcels Kai sorts in one day.



(a) Find the number of light parcels.

..... [1]

(b) There are 102 heavy parcels.

Complete the histogram. [2]

26 Solve the simultaneous equations.
You must show all your working.

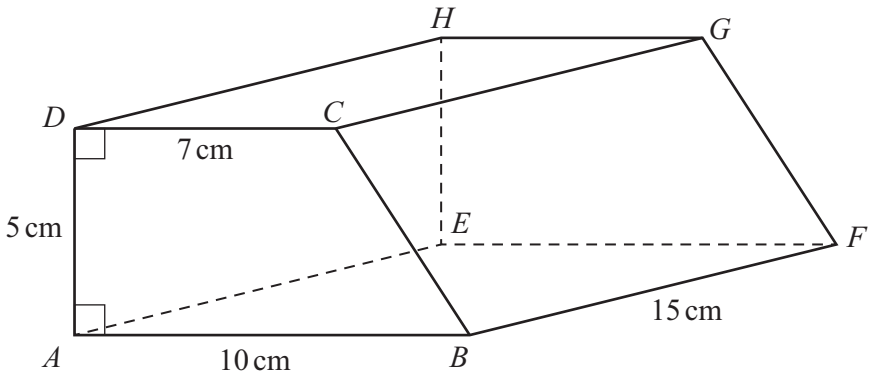
$y = 2x^2 - 3x - 7$
$y = 2x - 7$

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

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

[4]

27



NOT TO SCALE

The diagram shows a prism of length 15 cm.
The cross-section of the prism is a trapezium.

Angle $DAB = 90°$ and angle $ADC = 90°$.
$AB = 10$ cm, $AD = 5$ cm and $DC = 7$ cm.

Calculate the angle the diagonal AG makes with the base $ABFE$.

..... [4]

28 $f(x) = 7^{x-4}$

Find the value of x when

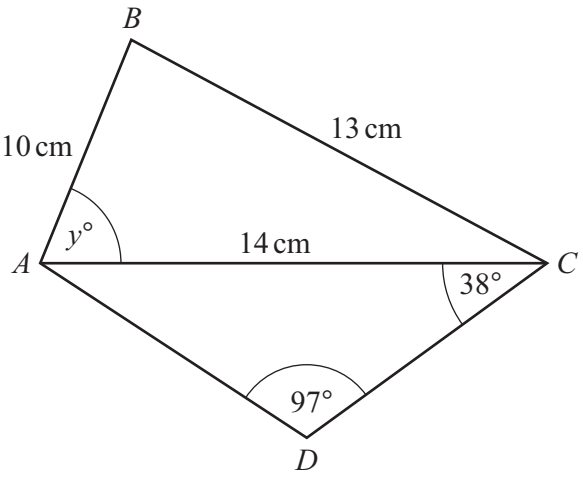
(a) $f(x) = 1$

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

(b) $f^{-1}(x) = 1$.

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

29



NOT TO SCALE

(a) Calculate the value of y.

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

(b) Calculate BD.

$BD =$ ..... cm [5]

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MATHEMATICS **0580/42**

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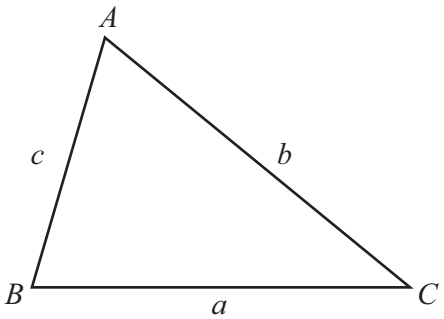

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$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\text{Area} = \frac{1}{2}ab\sin C$$

1 Write the ratio 60 grams : 3 kilograms in the form $1 : n$.

$1 :$ ..... [2]

2 Solve.

$8x - 17 = 27$

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

3 Write down the order of rotational symmetry of a regular decagon.

..... [1]

4 Pedro makes cards.

(a) He makes cards at a rate of 9 cards every 20 minutes.

Work out the number of cards he makes in 8 hours.

..... [2]

(b) Each card costs 12 cents to make.
Pedro sells each card for 50 cents.

Work out his percentage profit on each card.

.....% [2]

5 Nuwa is buying a phone.
One website sells the phone for 953 Yuan.
A different website sells the same phone for $141.
The exchange rate is 1 Yuan = $0.152 .

Calculate the difference between these phone prices.
Give your answer in dollars, correct to the nearest cent.

$ ..... [2]

6 One morning, a dentist has appointments for 10 patients.
The stem-and-leaf diagram shows the waiting time for 8 of these patients.

0	1 4
1	0 2 9
2	1 5 5

Key: 1 | 0 represents 10 minutes

The times for the two other patients, *P* and *Q*, are not shown in the stem-and-leaf diagram.

The mean waiting time of all 10 patients that morning is 16 minutes.
The range of waiting times is 26 minutes.
Patient *P* waits longer than patient *Q*.

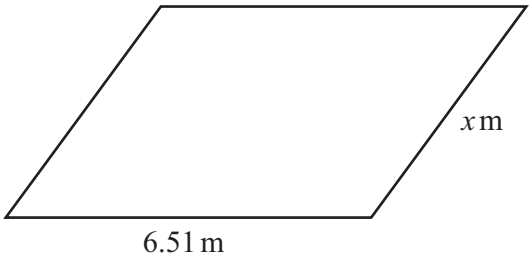
Find the waiting time for each of patient *P* and patient *Q*.

Patient *P* ..... min

Patient *Q* ..... min

[4]

7 The diagram shows a parallelogram.



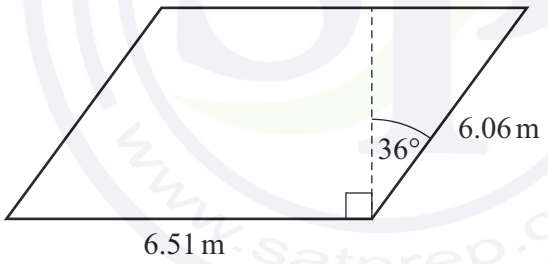
NOT TO SCALE

The parallelogram has the same perimeter as a circle with radius 4 m.

(a) Show that $x = 6.06$ m, correct to 2 decimal places.

[4]

(b)



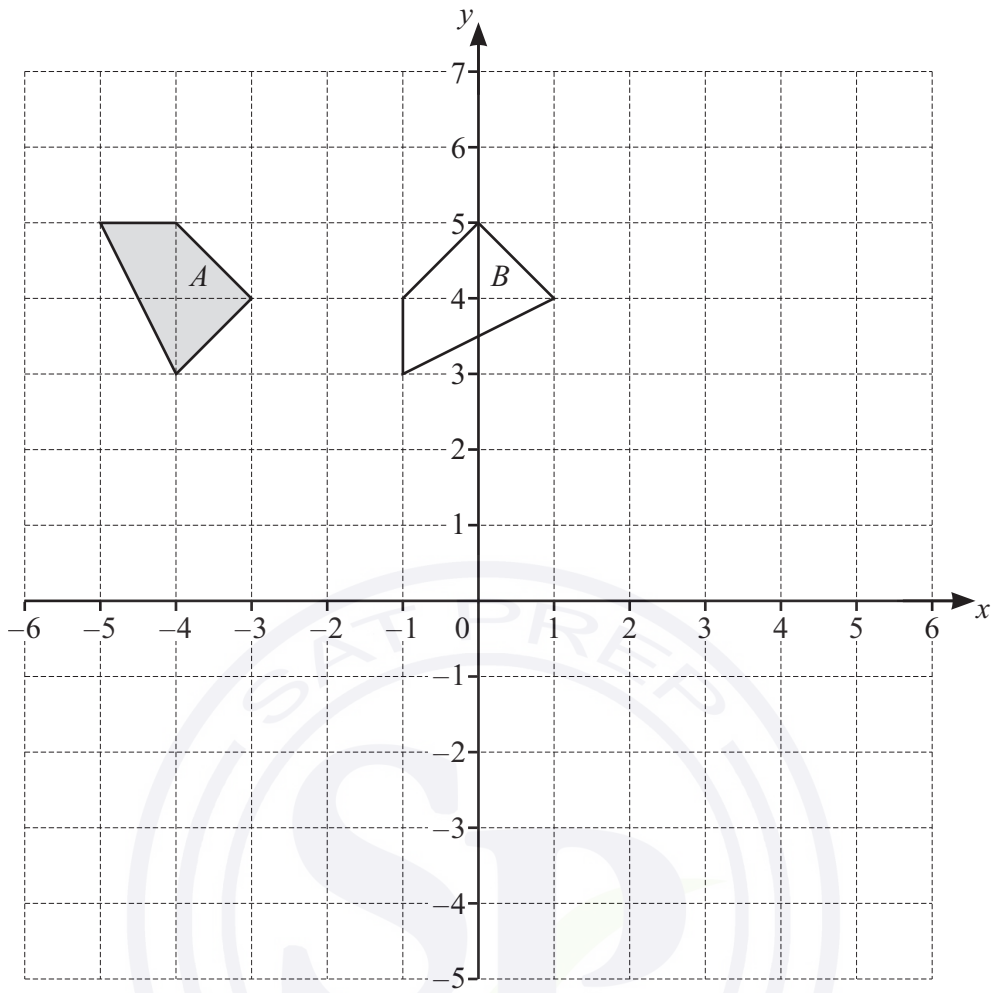
NOT TO SCALE

The floor of a room is in the shape of this parallelogram.
It costs \$18 per square metre to tile the floor.

Calculate the total cost of tiling the floor.

\$ ..... [4]

8



(a) On the diagram, draw the image of

(i) shape A after a translation by the vector $\begin{pmatrix} 1 \\ -7 \end{pmatrix}$ [2]

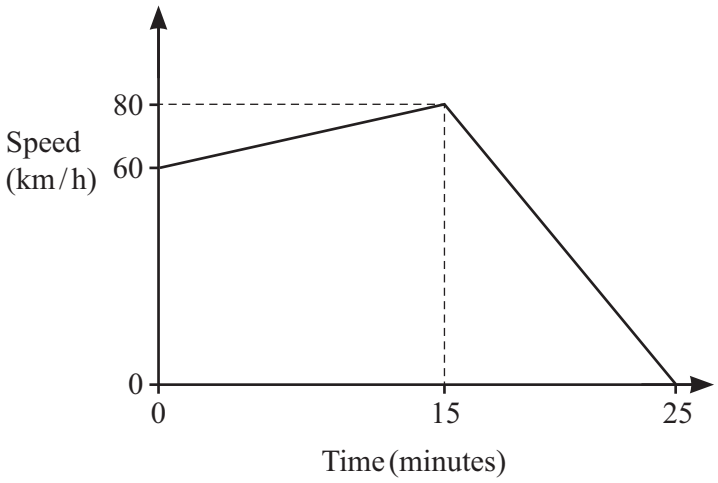
(ii) shape A after a reflection in the line $y = x + 1$. [3]

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

.....

..... [3]

9 The diagram shows the speed–time graph for part of a car journey.



NOT TO SCALE

Find the total distance travelled in the 25 minutes.

..... km [3]

10 Find the *n*th term of each sequence.

(a) 17, 9, 1, – 7, –15, …

..... [2]

(b) 3, 12, 27, 48, 75, …

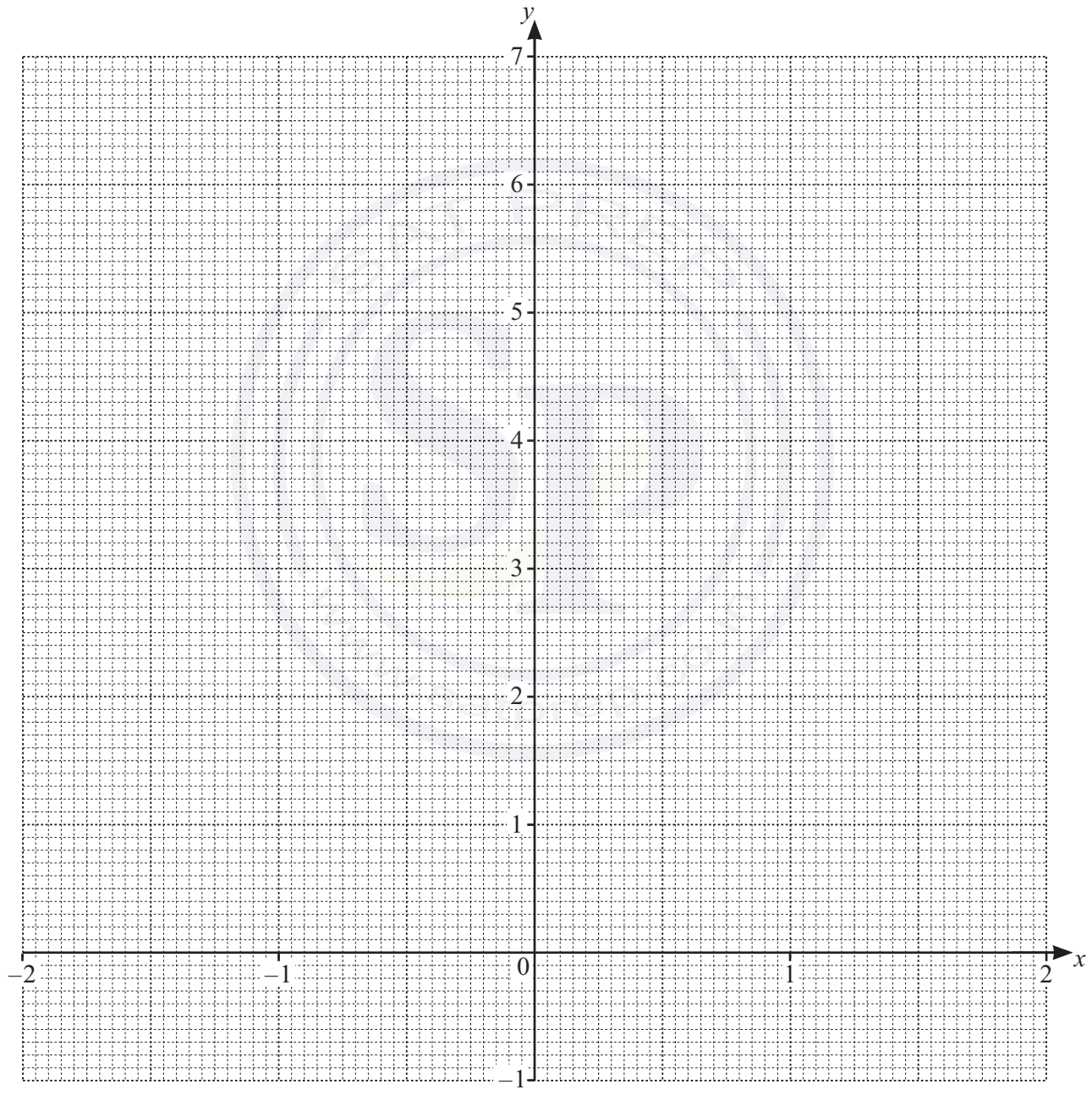
..... [2]

11 The table shows some values for $y = x^3 - 2x + 3$.
Where appropriate, values of y are given correct to 2 decimal places.

x	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2
y	-1		4	3.88	3	2.13	2		7

(a) Complete the table. [2]

(b) Draw the graph of $y = x^3 - 2x + 3$ for $-2 \leqslant x \leqslant 2$.

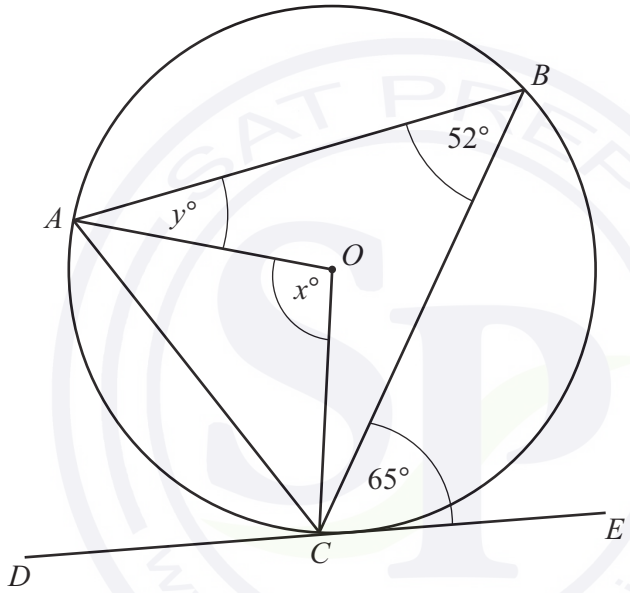


[4]

(c) By drawing a suitable straight line on the grid, solve the equation $x^3 - 2.5x + 1 = 0$.

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

12



NOT TO SCALE

A, B and C lie on a circle centre O.
DE is a tangent to the circle at C.
Angle $ABC = 52°$ and angle $BCE = 65°$.

(a) Find the value of x.
Give a geometrical reason for your answer.

$x =$ ..... because .....

..... [2]

(b) Find the value of y.

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

13 Simplify.

$$\frac{7}{2m} + \frac{3}{8m}$$

..... [2]

14 **(a)** Carlos invests \$24 000 at a rate of 3.2% per year compound interest.

Calculate the value of his investment at the end of 4 years.

\$ ..... [2]

(b) Carlos buys a painting for \$$x$.
He sells the painting for \$40 870.
He makes a profit of 34%.

Calculate the value of his profit.

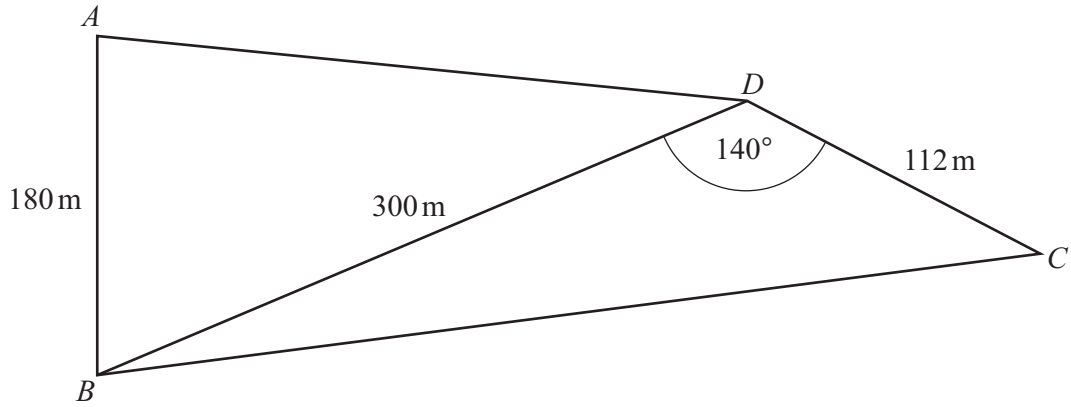
\$ ..... [3]

(c) Carlos also buys a car with a value of \$32 500.
The value of the car decreases exponentially by 23% each year.

Find a formula for the value, \$$V$, of the car at the end of n years.

..... [3]

15



NOT TO SCALE

The diagram shows a field, *ABCD*, in the shape of a quadrilateral.
BD is a straight path across the field.

(a) Calculate *BC*.

BC = ... m [3]

(b) Calculate angle *DBC*.

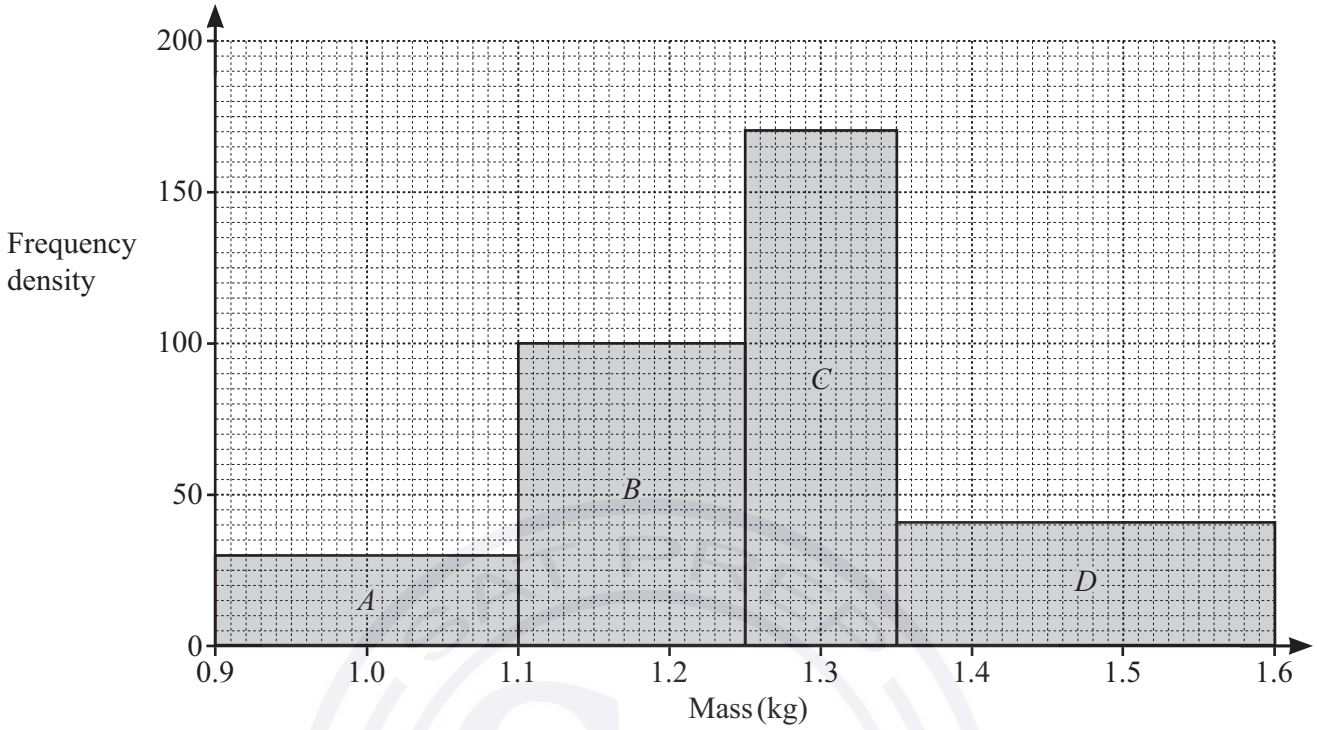
Angle *DBC* = ... [3]

(c) The total area of the field, *ABCD*, is 35 900 m^2.

Work out the length of the shortest distance from *D* to *AB*.

..... m [4]

16 The histogram shows information about the masses of some coconuts.
The masses are classified into four categories *A*, *B*, *C* and *D*.



(a) Show that there are 10 coconuts in category *D*.

[1]

(b) Two of the coconuts from those in category *C* and category *D* are chosen at random.

Find the probability that both are from category *D*.

..... [3]

(c) Calculate an estimate of the mean mass of the coconuts.

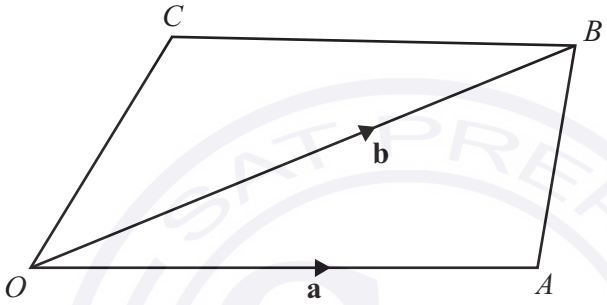
..... kg [4]

17 Expand and simplify.

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

..... [3]

18



NOT TO SCALE

In the diagram, OA is parallel to CB.
$OA : CB = 4 : 3$
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

(a) Find $\overrightarrow{AB}$ in terms of **a** and **b**.

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

(b) M is the midpoint of OC.

Find $\overrightarrow{AM}$ in terms of **a** and **b**.
Give your answer in its simplest form.

$\overrightarrow{AM} =$ ..... [3]

19 Solve the simultaneous equations.
You must show all your working and give your answers correct to 2 decimal places.

$y = 5 - 2x$

$y = 3x^2 - 7x - 6$

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

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

[6]

20 A solid metal prism has a mass of 4810 g, correct to the nearest 10 g.
The density of the metal is 7.7 g/cm^3, correct to 1 decimal place.

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

..... cm^3 [3]

21 y is inversely proportional to $(x+2)^2$.
w is proportional to x.

When $y = 8$, $x = 3.5$.
When $w = 15$, $x = 90$.

Find y in terms of w.

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

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MATHEMATICS **0580/43**

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- Do **not** write on any bar codes.
- You should use a scientific 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 100.
- The number of marks for each question or part question is shown in brackets [ ].

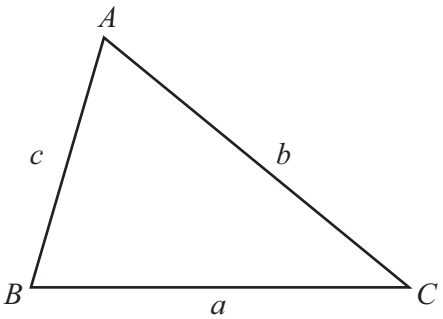
DC (DE/JG) 346755/2

[Turn over

List of formulas

Area, A, of triangle, base b, height h.	$A = \frac{1}{2}bh$
Area, A, of circle of radius r.	$A = \pi r^2$
Circumference, C, of circle of radius r.	$C = 2\pi r$
Curved surface area, A, of cylinder of radius r, height h.	$A = 2\pi rh$
Curved surface area, A, of cone of radius r, sloping edge l.	$A = \pi rl$
Surface area, A, of sphere of radius r.	$A = 4\pi r^2$
Volume, V, of prism, cross-sectional area A, length l.	$V = Al$
Volume, V, of pyramid, base area A, height h.	$V = \frac{1}{3}Ah$
Volume, V, of cylinder of radius r, height h.	$V = \pi r^2 h$
Volume, V, of cone of radius r, height h.	$V = \frac{1}{3}\pi r^2 h$
Volume, V, of sphere of radius r.	$V = \frac{4}{3}\pi r^3$
For the equation $ax^2 + bx + c = 0$, where $a \neq 0$,	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

For the triangle shown,



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\text{Area} = \frac{1}{2}ab\sin C$$

1 The nth term of a sequence is $5 - 2n$.

(a) Find the 6th term of this sequence.

..... [1]

(b) Find the greatest number in this sequence.

..... [1]

2 The stem-and-leaf diagram shows the age of each of 16 adults.

3	2 3 3 5 6 7
4	0 1 5 5 6 8 9
5	1 1 1

Key: 3 | 2 represents age 32 years

(a) Find the mode.

..... years [1]

(b) Find the median.

..... years [1]

(c) Find the percentage of the 16 adults with an age of less than 38 years.

.....% [2]

3 $G = \frac{4}{5}m^2n$

Find the value of G when $m = 6$ and $n = 15$.

$G =$ ..... [1]

4 **(a)** The scale diagram shows the position of town A on a map.
Town B is 12 km from town A on a bearing of 080°.

Using a scale of 1 cm represents 2 km, mark the position of town B on the diagram.

Scale: 1 cm to 2 km

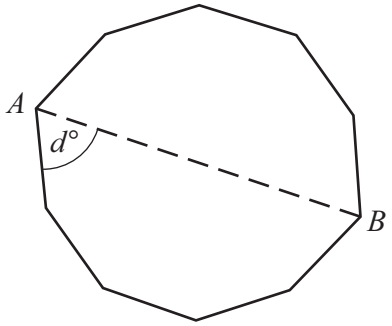
[2]

(b) The bearing of C from D is 130°.

Work out the bearing of D from C.

..... [2]

5 **(a)** The diagram shows a regular decagon.
AB is a line of symmetry of the decagon.



NOT TO SCALE

Work out the value of d.

$d =$ ..... [3]

(b) The exterior angle of a regular polygon with n sides is 45°.

Work out the value of n.

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

6 Simplify.

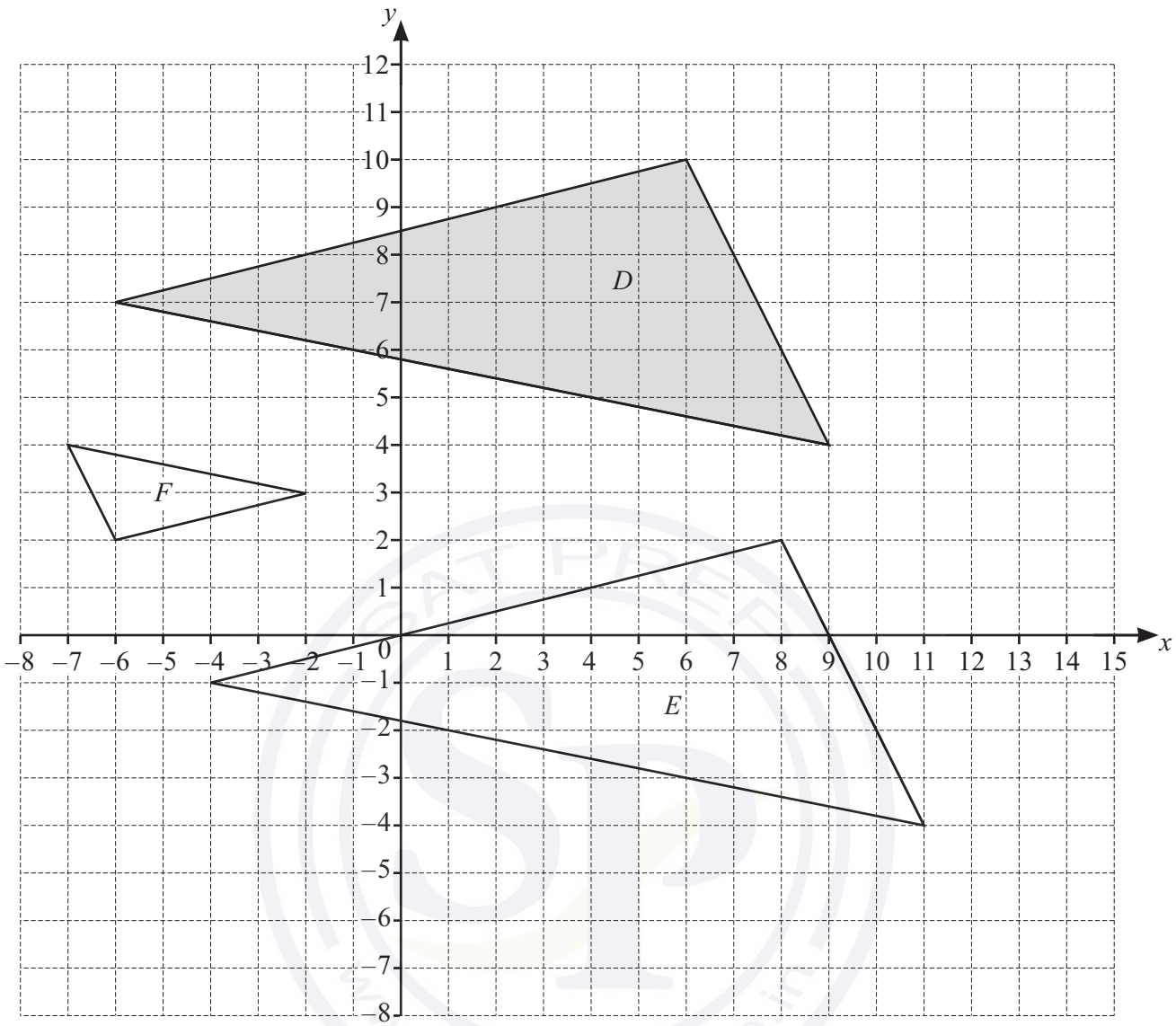
(a) $\dfrac{y^5}{y^2}$

..... [1]

(b) $3x^3 \times 5x^5$

..... [2]

7



(a) Describe fully the **single** transformation that maps triangle *D* onto triangle *E*.

.....

..... [2]

(b) Describe fully the **single** transformation that maps triangle *D* onto triangle *F*.

.....

..... [3]

8 m is a positive integer.

Write these values in order of size, starting with the smallest.

m 33% of m $\frac{1}{3}$ of m 320% of $\frac{m}{10}$

....., ..., ..., ... [2]

smallest

9 Draw a ring around the calculation that is equivalent to $n \div 2\frac{3}{5}$.

$n \times 2\frac{5}{3}$ $n \times \frac{5}{13}$ $n \times \frac{13}{5}$ $\frac{1}{n} \times \frac{13}{5}$ $\frac{1}{n} \times \frac{5}{13}$

[1]

10 Solve the simultaneous equations.

You must show all your working.

$3x + 5y = 5$
$2x - 5y = 45$

$x =$ .....

$y =$ .....

[2]

11

2.89×10^{-1}	1.3×10^{12}	8.3×10^{1}	9×10^{11}	2.03×10^{-5}	0.3×10^{-2}

Use a number from the box to complete each statement.

The number that is not written in standard form is ..... .

The largest number is ..... .

The smallest number is ..... .

[2]

12 A vase contains flowers that are red or pink or white.
Ruth picks a flower at random from the vase.
The probability that the flower is **not** red is 0.9 .
The probability that the flower is **not** pink is 0.65 .

Find the probability that the flower is white.

..... [2]

13 The point (5, 1024) lies on the curve $y = c^x$, where c is a whole number.

Find the y-coordinate of the point on the curve with x-coordinate -2.

..... [3]

14 These expressions are all equal in value.

$$\frac{5x-2}{3} \qquad 10-x \qquad y+11$$

Find the value of y.

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

15 The population of a town is 54 000.
The population is **decreasing** exponentially at a rate of 2% per year.

(a) Calculate the decrease in the population at the end of 4 years.

..... [3]

(b) Find the number of complete years it takes for the population of 54 000 to first fall below 44 000.

..... years [2]

16 Expand and simplify.

(a) $7(x+2)+4(3x-5)$

..... [2]

(b) $(3x-y)(5x+2y)$

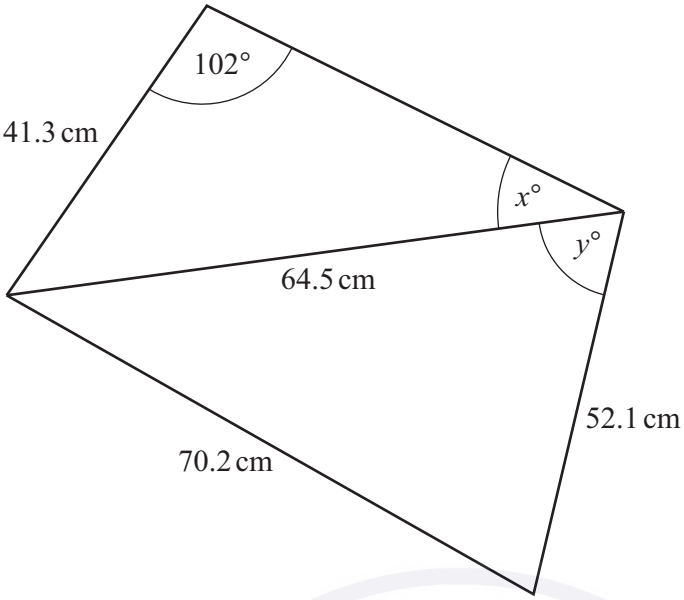
..... [2]

17 Make t the subject of the formula.

$$x = \frac{7t}{5-t}$$

$t =$ ..... [3]

18



NOT TO SCALE

(a) Calculate the value of x.

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

(b) Calculate the value of y.

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

19 $f(x) = 5^x$ $g(x) = 3x - 2$ $h(x) = x^2 + 1$

(a) Find $f(5)$.

..... [1]

(b) Find $g(8x)$.

..... [1]

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

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

(d) Find the positive solution of $gh(x) = 364$.

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

(e) Find $ff^{-1}(12)$.

..... [1]

20 $y = x^3 + 3x^2 - 13x$

(a) Find $\frac{dy}{dx}$.

..... [2]

(b) Find the gradient of the curve $y = x^3 + 3x^2 - 13x$ at the point where $x = 3$.

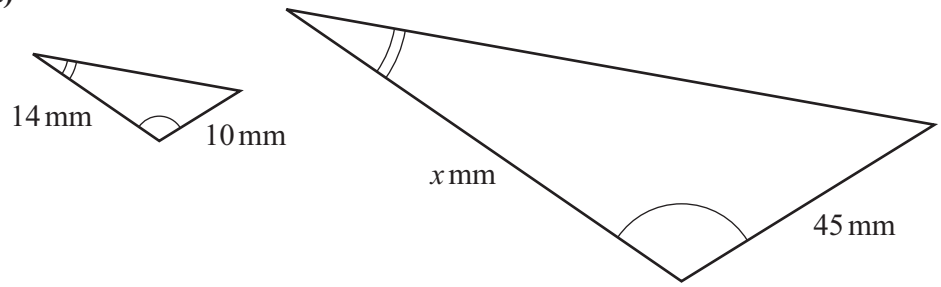
..... [2]

21 A dressmaker takes 75 hours to make 31 dresses.
In week 1, she takes a total of 12 hours 30 minutes to make the first 4 dresses.
In week 2, she makes the remaining 27 dresses at a constant hourly rate.

Work out the percentage increase in her hourly rate of making dresses from week 1 to week 2.

..... % [4]

22 (a)



NOT TO SCALE

The diagram shows two mathematically similar triangles.

Find the value of x.

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

(b) The surface areas of two mathematically similar containers are 124 cm^2 and 279 cm^2.
The capacity of the smaller container is 56 ml.

Find the capacity of the larger container.

..... ml [3]

23 The table shows some information about the mass of each of 200 oranges.

Mass (m grams)	$180 < m \leqslant 200$	$200 < m \leqslant 210$	$210 < m \leqslant 215$	$215 < m \leqslant 230$
Frequency	32	64	74	30

(a) Calculate an estimate of the mean mass of an orange.

..... g [4]

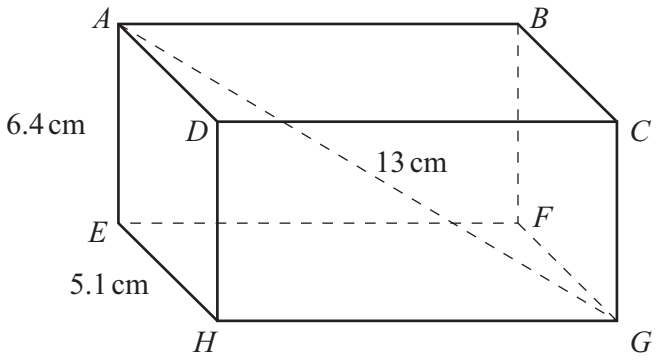
(b) Sarah draws a histogram to show this information.
The table shows the height of one of the bars for this histogram.

Complete the table.

Mass (m grams)	$180 < m \leqslant 200$	$200 < m \leqslant 210$	$210 < m \leqslant 215$	$215 < m \leqslant 230$
Height of bar (cm)			7.4	

[3]

24



NOT TO SCALE

The diagram shows a cuboid *ABCDEFGH*.
$AE = 6.4$ cm, $EH = 5.1$ cm and $AG = 13$ cm.

(a) Calculate *EF*.

EF = ... cm [3]

(b) Calculate the angle between the line *AG* and the base *EFGH* of the cuboid.

..... [3]

25 Jenna has a length of wire measuring 68 cm, correct to the nearest cm.

From this wire she cuts off two smaller pieces

- a piece of length 4.7 cm, correct to the nearest mm
- a piece of length 10.0 cm, correct to the nearest mm.

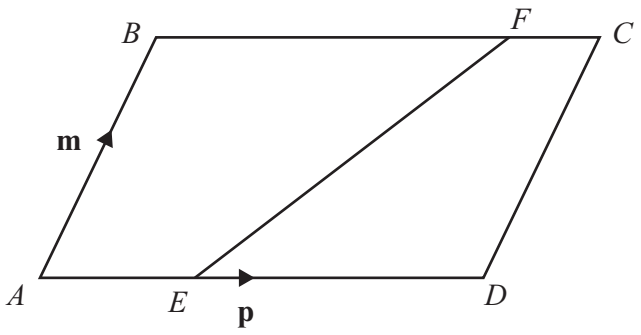
Work out the lower bound and the upper bound for the length of the wire remaining.

Lower bound = ... cm

Upper bound = ... cm

[3]

26



NOT TO SCALE

ABCD is a parallelogram.
$\overrightarrow{AB} = \mathbf{m}$ and $\overrightarrow{AD} = \mathbf{p}$.
F is a point on *BC* and $BF = 4FC$.
E is a point on *AD* and $AE : ED = 1 : 2$.

(a) Find $\overrightarrow{EF}$, in terms of **m** and **p**, in its simplest form.

..... [3]

(b) *EF* and *DC* are extended to meet at the point *G*.

Find $\overrightarrow{CG}$, in terms of **m** and/or **p**, in its simplest form.

..... [2]

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MATHEMATICS **0580/41**

Paper 4 Calculator (Extended) **May/June 2025**

2 hours

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.
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- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 100.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages.

DC (DE/SG) 341794/3

[Turn over

List of formulas

Area, A, of triangle, base b, height h.	$A = \frac{1}{2}bh$
Area, A, of circle of radius r.	$A = \pi r^2$
Circumference, C, of circle of radius r.	$C = 2\pi r$
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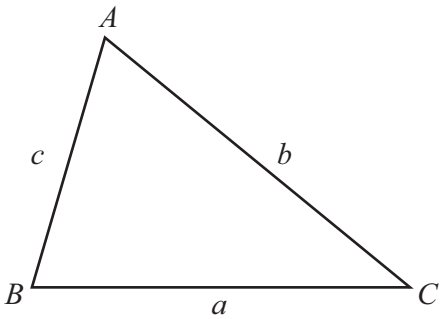
For the equation $ax^2 + bx + c = 0$, where $a \neq 0$,	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

For the triangle shown,



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\text{Area} = \frac{1}{2}ab\sin C$$

1 Solve.

$4c - 9 = 13$

$c =$ ..... [2]

2 Work out.

$$\frac{16.71 + 46.13}{\sqrt{8.6^2 - 3.5^2}}$$

Give your answer correct to 2 significant figures.

..... [2]

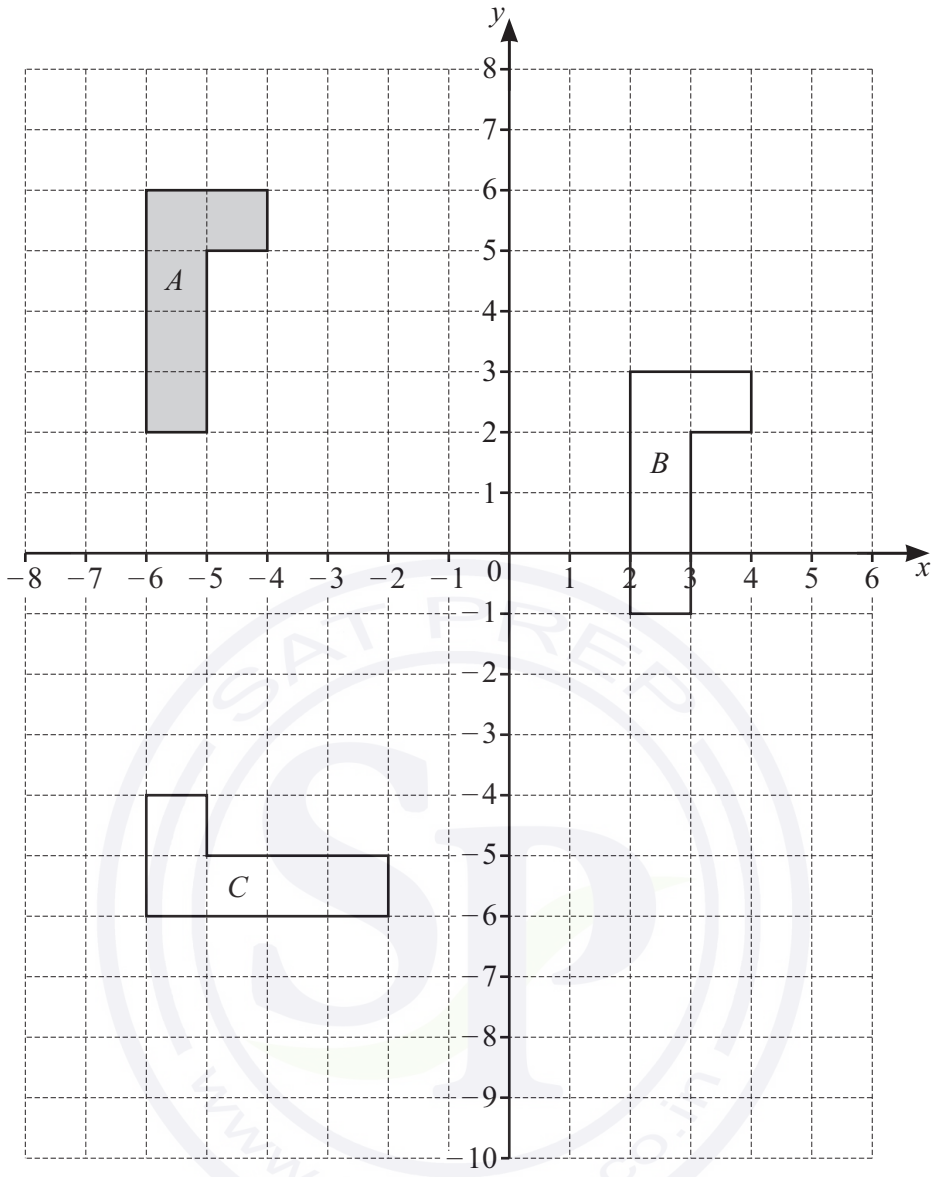
3 In the USA, one gallon of fuel costs \$4.83 .
In the UK, one litre of fuel costs £1.62 .

The exchange rate is £1 = \$1.215 .
1 gallon = 3.785 litres

In which country does 1 litre of fuel cost more and by how much?
Give your answer in dollars.

..... by \$ ..... [3]

4



(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 shape *A* after a reflection in the line $x = -2$. [2]

5 **(a)** These are the first 5 terms of a sequence.

1 8 27 64 125

Find the 10th term of this sequence.

..... [1]

(b) These are the first 5 terms of a different sequence.

5 8 13 20 29

Find the *n*th term of this sequence.

..... [2]

(c) The **sum of the first *n* terms** of another sequence is $\frac{n}{2}(5n-1)$.

(i) Use $n = 2$ to find the sum of the first two terms in this sequence.

..... [1]

(ii) Find the 3rd term of this sequence.

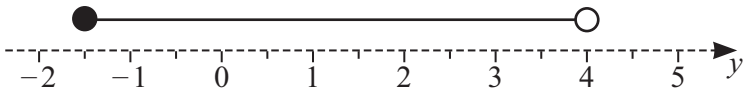
..... [2]

6 Expand.

$5x^2(3x-2)$

..... [2]

7



Write down the inequality in y shown by the number line.

..... [2]

8 Hadi buys a dishwasher.
He can either pay a single payment of \$980 or he can pay using a monthly plan.
The monthly plan is 20% of \$980 **plus** 12 payments of \$75.25 .

(a) Hadi uses the monthly plan.

Calculate the total amount Hadi pays.

\$ ..... [2]

(b) Find the percentage increase in the cost using the monthly plan compared to a single payment.

..... % [2]

9 In a sale, the original price of a sewing machine is reduced by \$38.
This is an 8% reduction in the original price.

Work out the original price of the sewing machine.

\$ ..... [2]

10 **(a)** Write down **all** the factors of 18.

..... [2]

(b) Factorise.

$3y - xy + 15 - 5x$

..... [2]

(c) $3y - xy + 15 - 5x = 18$

where x and y are positive integers.

Using your answers to **part (a)** and **part (b)**, find one possible value of x and the corresponding value of y.

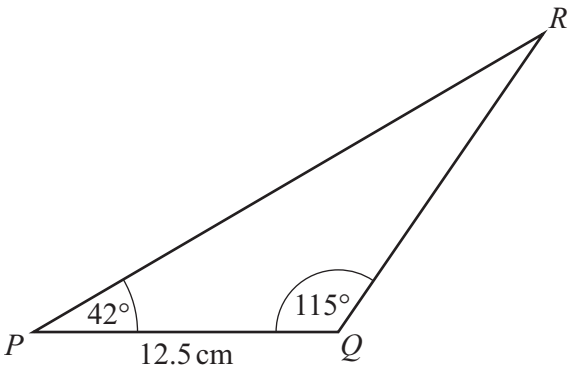
$x =$ ..... , $y =$ ..... [2]

11 A warehouse has a floor area of 800 m^2.
The plan of the warehouse is drawn to a scale of 1 : 50.

Calculate the floor area on the plan.
Give your answer in square centimetres.

..... cm^2 [3]

12



NOT TO SCALE

The diagram shows triangle PQR.

Calculate the shortest distance from Q to PR.

..... cm [3]

13 Make x the subject of this formula.

$$A = w^2 + 5x^2$$

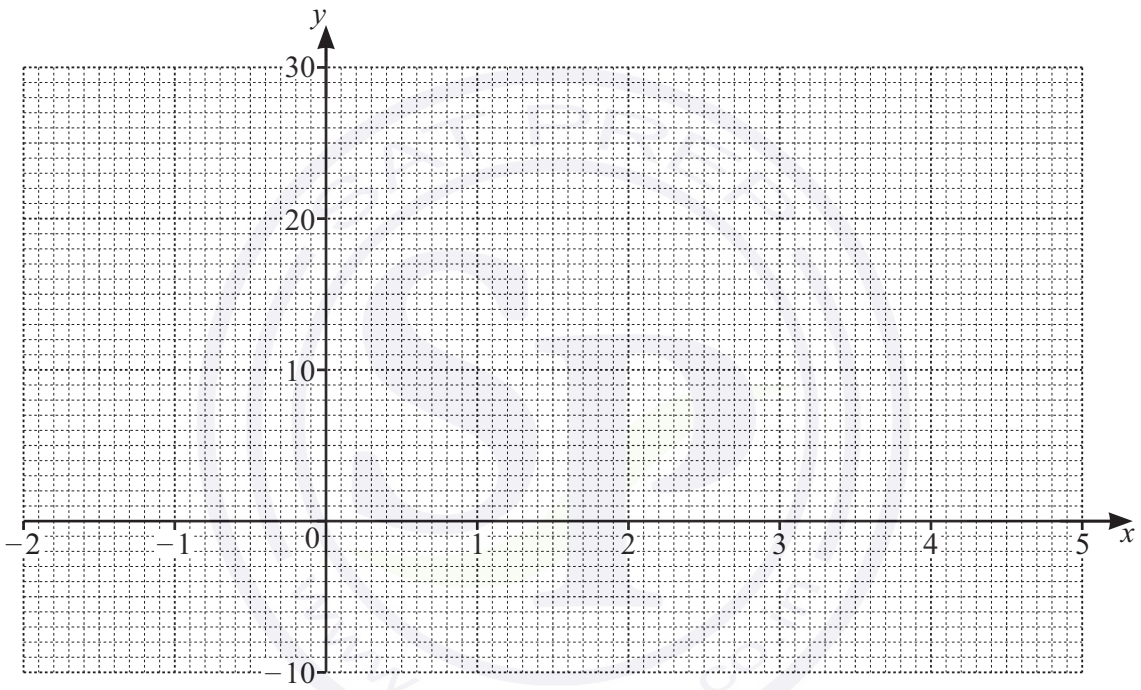
$x =$ ..... [3]

14 The table shows some values for $y = 5x^2 - x^3 - 4$.

x	-2	-1	0	1	2	3	4	5
y	24		-4		8	14		-4

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = 5x^2 - x^3 - 4$ for $-2 \leqslant x \leqslant 5$.



[4]

(c) By drawing a suitable straight line on the grid, solve the equation $x^3 - 5x^2 - x + 14 = 0$.

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

15 The height of each of 140 basketball players is recorded.
The table shows the results.

Height (h cm)	$160 < h \leqslant 180$	$180 < h \leqslant 185$	$185 < h \leqslant 190$	$190 < h \leqslant 200$	$200 < h \leqslant 210$
Frequency	7	12	31	70	20

(a) Calculate an estimate of the mean height.

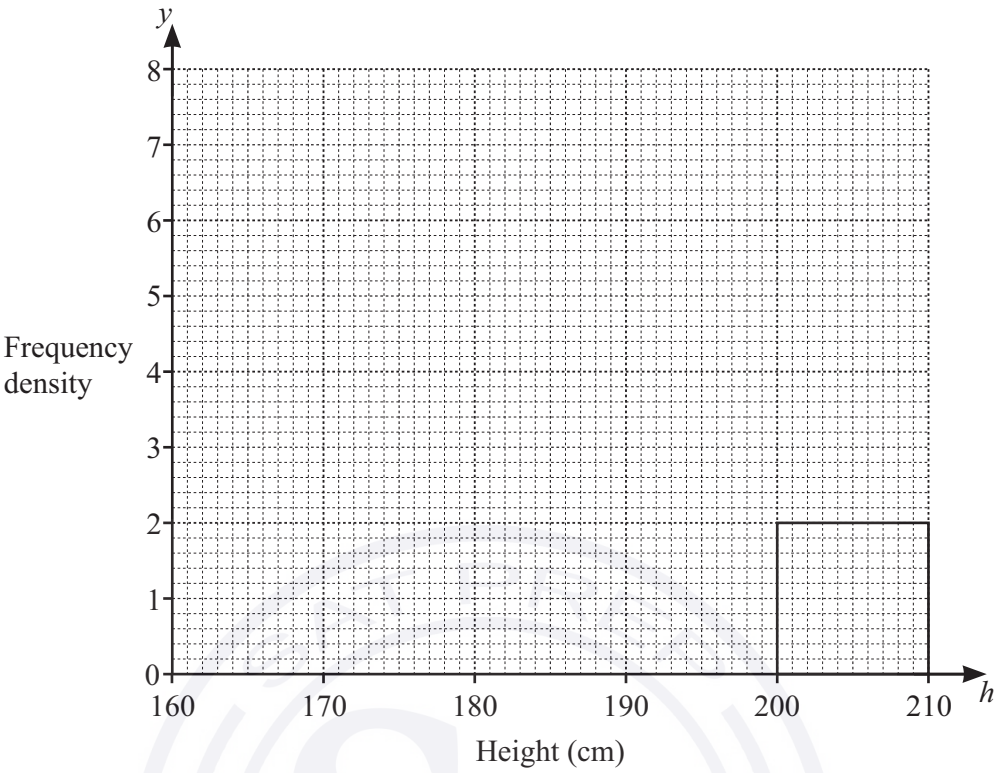
..... cm [4]

(b) Two of the players are chosen at random.

Find the probability that both players have a height greater than 190 cm and no more than 200 cm.

..... [2]

(c) Complete the histogram to show the information in the frequency table.



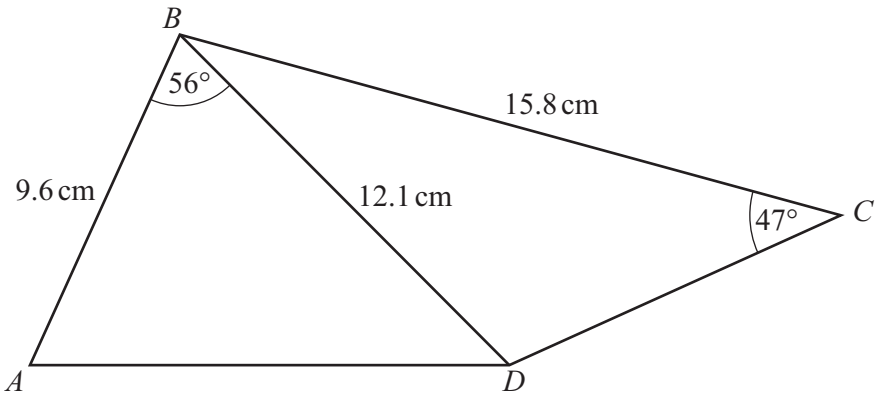
[3]

16 Mateo invests \$1250 at a rate of r% per year compound interest.
At the end of 6 years the total value of his investment is \$1484.

Calculate the value of r.

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

17



NOT TO SCALE

The diagram shows a quadrilateral *ABCD*.

(a) Calculate *AD*.

AD = ... cm [3]

(b) Calculate the obtuse angle *BDC*.

Angle *BDC* = ... [4]

(c) Calculate the area of the quadrilateral.

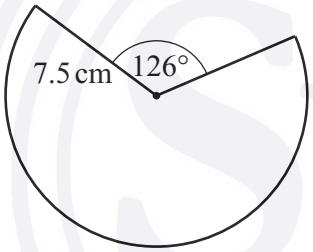
..... cm^2 [3]

18 $2x^2 + 12x - 2$ can be written in the form $a(x+b)^2 - c$.

Find the values of a, b and c.

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

19



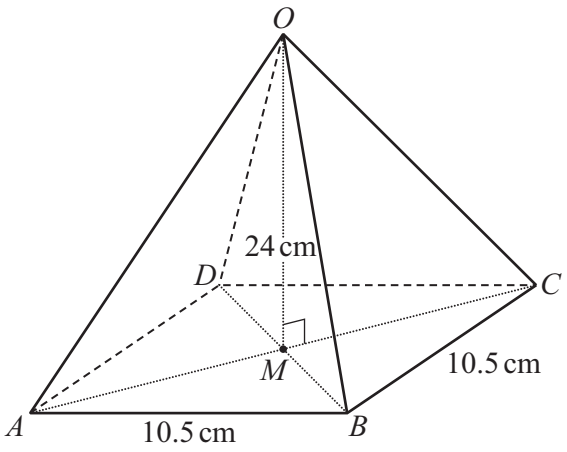
NOT TO SCALE

The diagram shows a major sector of a circle with radius 7.5 cm.

Calculate the perimeter of the major sector.

..... cm [4]

20



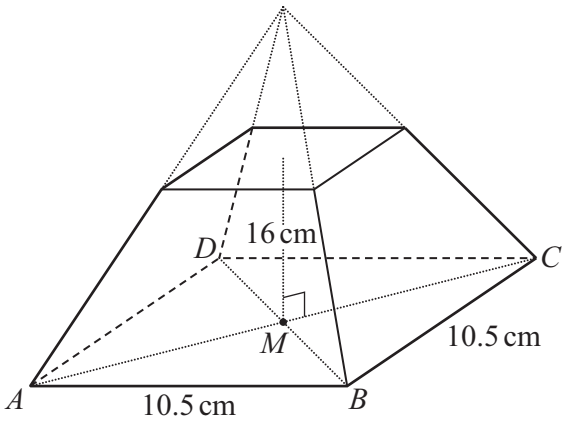
NOT TO SCALE

The diagram shows a pyramid $OABCD$.
The pyramid has a square base, $ABCD$, with sides 10.5 cm.
The vertex O is vertically above the centre of the base, M.
The height of the pyramid is 24 cm.

(a) Calculate the angle that OA makes with the base.

..... [4]

(b)



NOT TO SCALE

The diagram shows a frustum of the pyramid *OABCD*.
The height of the frustum is 16 cm.

Calculate the volume of the frustum.

..... cm^3 [5]

Question 21 is on page 16.

21 $\dfrac{16^{5m}}{4} = 64^{2n}$

Find m in terms of n.

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

22 $I = \dfrac{V}{R}$

V is 50, correct to the nearest 10.
R is 13, correct to the nearest integer.

Calculate the upper bound of I.

..... [3]

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MATHEMATICS **0580/42**

Paper 4 Calculator (Extended) **May/June 2025**

2 hours

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

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INFORMATION

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

[Turn over

List of formulas

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Circumference, C, of circle of radius r.	$C = 2\pi r$
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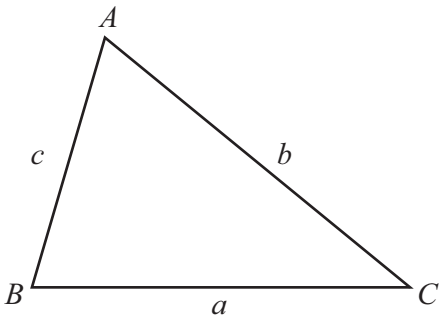
Volume, V, of cylinder of radius r, height h.	$V = \pi r^2 h$
Volume, V, of cone of radius r, height h.	$V = \frac{1}{3}\pi r^2 h$
Volume, V, of sphere of radius r.	$V = \frac{4}{3}\pi r^3$
For the equation $ax^2 + bx + c = 0$, where $a \neq 0$,	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

For the triangle shown,



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\text{Area} = \frac{1}{2}ab\sin C$$

1 A quadrilateral has these properties

- the diagonals are the only lines of symmetry
- it has rotational symmetry of order 2.

Write down the mathematical name of this quadrilateral.

..... [1]

2

The diagram shows the net of a solid.

Write down the mathematical name of this solid.

..... [1]

3 Mass of box A : Mass of box B = 4 : 7

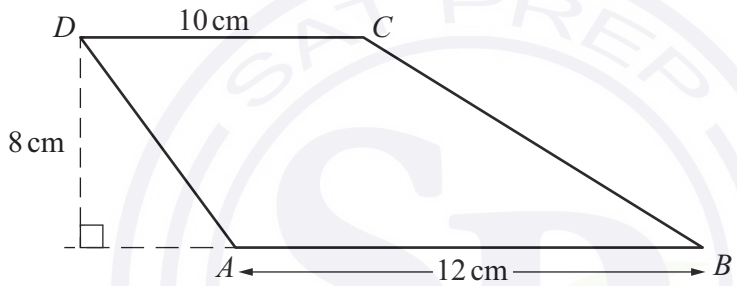
The mass of box B is 2.4 kg more than the mass of box A.

Calculate the mass of box A and the mass of box B.

box A ..... kg

box B ..... kg [3]

4



NOT TO SCALE

$ABCD$ is a trapezium.

Work out the area of the trapezium.

..... cm^2 [2]

5 Scott changes $300 into pounds (£).
The exchange rate is £1 = $1.20 .

Calculate the amount Scott receives.

..... pounds [1]

6 A solid wooden cone has base radius 4 cm and height 12 cm.
The density of the wood is 0.74 g/cm^3.

Calculate the mass of the cone.
[Density = Mass ÷ Volume]

..... g [3]

7 $y = mx + c$

Rearrange the formula to make m the subject.

$m =$ ..... [2]

8 Calculate.

$$\frac{2.1^2 - 1.9}{0.5}$$

..... [1]

9 Solve the simultaneous equations.
You must show all your working.

$$2w - 3y = 11$$
$$3w + y = 11$$

$w =$ .....

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

10 A group of 12 adults and 9 children travel on a bus.

The cost of an adult ticket is $\$n$.
The cost of a child ticket is $\$(n - 10)$.

The total cost of the tickets is \$277.50 .

Find the cost of one adult ticket.

\$ ..... [3]

11 In a sale, the original price of a shirt is reduced by 15%.
The sale price of the shirt is $23.63 .

Find the original price of the shirt.

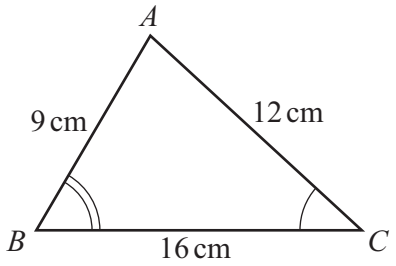
$ ..... [2]

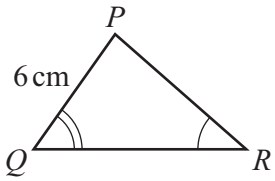
12 The length of a rectangle is 16 cm, correct to the nearest centimetre.
The width of the rectangle is 14 cm, correct to the nearest centimetre.

Calculate the lower bound of the perimeter of the rectangle.

..... cm [2]

13





NOT TO SCALE

Triangle ABC and triangle PQR are mathematically similar.

(a) Calculate the length of PR.

$PR =$ .....cm [2]

(b) Triangle ABC and triangle PQR are the cross-sections of two prisms.
These prisms are mathematically similar.
The volume of the smaller prism is $1120\,\text{cm}^3$.

Calculate the volume of the larger prism.

..... cm^3 [2]

14 Factorise.

$5x - 10 - ax + 2a$

..... [2]

15 The interior angle of a regular polygon is 172°.

Find the number of sides of this polygon.

..... [2]

16 On any day, the probability that the weather will be sunny is 0.7 .

(a) Find the probability that on any day the weather will not be sunny.

..... [1]

(b) When the weather is sunny, the probability that Rohit goes for a walk is 0.9 .
When the weather is not sunny, the probability that Rohit goes for a walk is 0.2 .

Find the probability that on any day Rohit goes for a walk.

..... [3]

17 **(a)** Alex invests \$400 at a rate of 2.3% per year simple interest.

Find the total amount Alex has at the end of 5 years.

\$ ..... [3]

(b) Virat has \$100 to spend.

In February he spends \$$x$.
In March he spends 10% more than he spends in February.
In April he spends 10% more than he spends in March.

At the end of April, Virat has \$33.80 remaining.

Find the value of x.

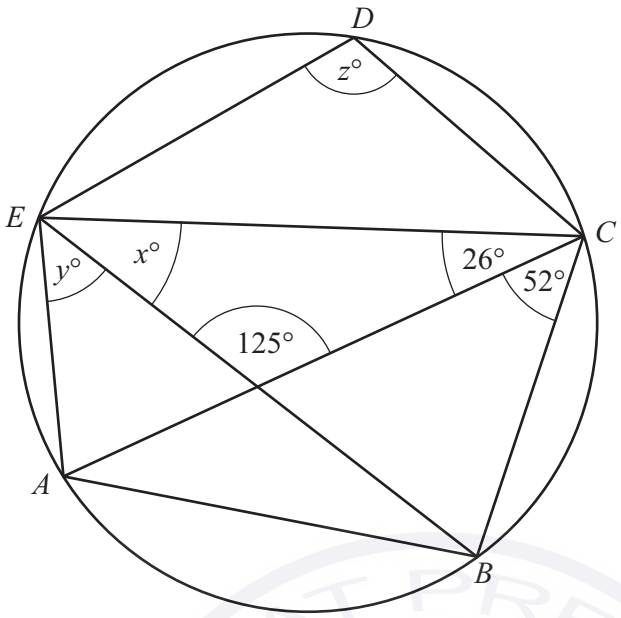
$x =$ ..... [3]

(c) Bobbie invests $500 in an account that pays compound interest each year.
At the end of 17 years, the value of Bobbie's investment is $700.13 .

Find the value of Bobbie's investment at the end of 20 years.

$ ..... [4]

18



NOT TO SCALE

A, *B*, *C*, *D* and *E* lie on a circle.

Find the values of *x*, *y* and *z*.

x = ...

y = ...

z = ...

[4]

19 $f(x) = x + 1$ $g(x) = 5 - 2x$ $h(x) = 2^x$

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

..... [1]

(b) The domain of $g(x)$ is $\{-3, 0, 2\}$.

Find the range of $g(x)$.

{ ..... } [2]

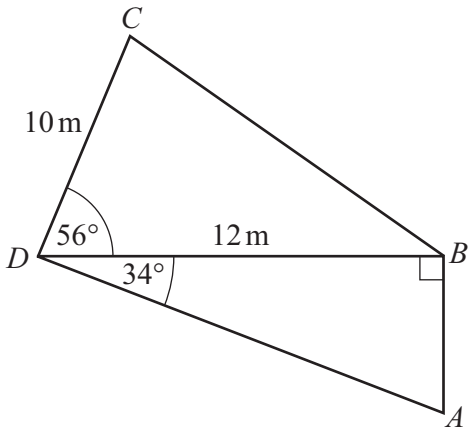
(c) Find x when $h(x) = \frac{1}{32}$.

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

(d) Find x when $h^{-1}(x) = 3$.

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

20



NOT TO SCALE

The diagram shows a quadrilateral *ABCD*.
CD = 10 m and *DB* = 12 m.
Angle *DBA* = 90°, angle *CDB* = 56° and angle *ADB* = 34°.

(a) Calculate the length of *AB*.

AB = ... m [2]

(b) Calculate the area of the quadrilateral *ABCD*.

..... m^2 [3]

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

..... m [5]

(d) Calculate the shortest distance from *B* to the line *AD*.

..... m [3]

21 Simplify.

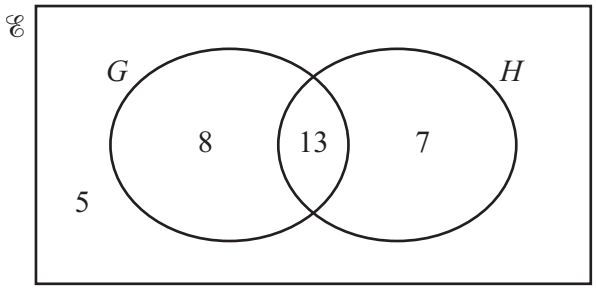
(a) $3t^5 \times 5t^3$

..... [2]

(b) $\left(64u^{36}\right)^{\frac{5}{6}}$

..... [2]

22



$\mathscr{E}$ = {number of students in a class}
G = {number of students who study geography}
H = {number of students who study history}

The Venn diagram shows information about the 33 students in a class.

(a) One of the students in the class is picked at random.

Find the probability that this student

(i) does not study geography and does not study history

..... [1]

(ii) studies geography and studies history.

..... [1]

(b) Two of the students who study history are picked at random.

Find the probability that one student also studies geography and one student does not study geography.

..... [3]

23 Simplify.

$$\frac{h^2+4h}{h^2-16}$$

..... [3]

24 Ahmed walks 2 km at a speed of x km/h.
He then walks a further 3 km at a speed of $(x+1)$ km/h.

The total time he takes to walk the 5 km is $1\frac{1}{4}$ hours.

(a) Show that $5x^2-15x-8=0$.

[5]

(b) Find the value of x.
Show all your working and give your answer correct to 2 decimal places.

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

25 P is the point $(8, 0)$ and Q is the point $(20, 6)$.

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

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

26 $y = ax^{11} + 3x^{b}$

$$\frac{dy}{dx} = 44x^{10} + 18x^{c}$$

Find the values of a, b and c.

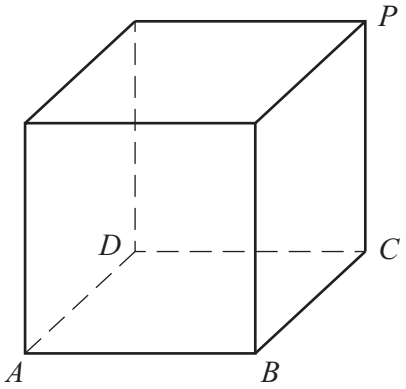
$a =$ .....

$b =$ .....

$c =$ .....

[2]

27



NOT TO SCALE

The diagram shows a cube.

Calculate the angle between the diagonal AP and the base $ABCD$.

..... [4]

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MATHEMATICS **0580/43**

Paper 4 Calculator (Extended) **May/June 2025**

2 hours

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 scientific 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 100.
- The number of marks for each question or part question is shown in brackets [ ].

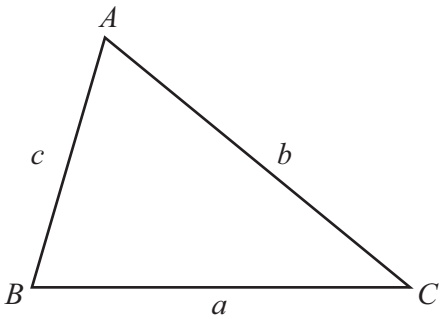
DC (DE/SG) 341843/3

[Turn over

List of formulas

Area, A, of triangle, base b, height h.	$A = \frac{1}{2}bh$
Area, A, of circle of radius r.	$A = \pi r^2$
Circumference, C, of circle of radius r.	$C = 2\pi r$
Curved surface area, A, of cylinder of radius r, height h.	$A = 2\pi rh$
Curved surface area, A, of cone of radius r, sloping edge l.	$A = \pi rl$
Surface area, A, of sphere of radius r.	$A = 4\pi r^2$
Volume, V, of prism, cross-sectional area A, length l.	$V = Al$
Volume, V, of pyramid, base area A, height h.	$V = \frac{1}{3}Ah$
Volume, V, of cylinder of radius r, height h.	$V = \pi r^2 h$
Volume, V, of cone of radius r, height h.	$V = \frac{1}{3}\pi r^2 h$
Volume, V, of sphere of radius r.	$V = \frac{4}{3}\pi r^3$
For the equation $ax^2 + bx + c = 0$, where $a \neq 0$,	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

For the triangle shown,



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\text{Area} = \frac{1}{2}ab\sin C$$

1 Find the median of these numbers.

5 11 11 13 17 21

..... [1]

2 In triangle ABC, $AC = 21$ m and $BC = 15.9$ m.

Using a ruler and compasses only, complete the scale drawing of the triangle.
Use a scale of 1 cm to represent 3 m.
The side AB is drawn for you.

Scale : 1 cm to 3 m

[3]

3

$\frac{2}{5}$	$\sqrt{15}$	23	$\sqrt{144}$	-2	0.8

From this list, write down

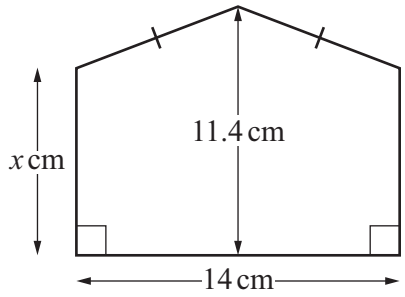
(a) a natural number

..... [1]

(b) an irrational number.

..... [1]

4 The diagram shows a pentagon made from two congruent trapeziums.



NOT TO SCALE

The area of the pentagon is $130.2\,\text{cm}^2$.

Calculate the value of x.

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

5 **(a)** Convert $780\,\text{cm}^2$ into m^2.

..... m^2 [1]

(b) Convert $0.037\,\text{m}^3$ into cm^3.

..... cm^3 [1]

6 One titanium atom has a mass of 7.95×10^{-23} grams.

Calculate the number of titanium atoms in 1 kg of titanium.
Give your answer in standard form.

..... [2]

7 $\mathscr{E} = \{x: x \text{ is an integer and } 1 \leqslant x \leqslant 12\}$
$E = \{\text{even numbers}\}$
$M = \{\text{multiples of 3}\}$

(a) Find n(M).

..... [1]

(b) Write down the set $E \cap M$.

{ ..... } [1]

(c) $y \in (E \cup M)'$

Write down a possible value of y.

..... [1]

8 Factorise.

(a) $28xy - 12x$

..... [2]

(b) $y - 6x + 2xy - 3$

..... [2]

9 **(a)** Simplify.

$$5x^5y \times 7x^3y^2$$

..... [2]

(b) $7^n = \sqrt[5]{7}$

Find the value of n.

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

10 Expand and simplify.

(a) $2x - x(5 - x^2)$

..... [2]

(b) $(x+4)(x-5)(x+3)$

..... [3]

11 The table shows three sequences.

	1st term	2nd term	3rd term	4th term	5th term	6th term	nth term
Sequence A	28	22	16	10	4		
Sequence B	$\frac{1}{6}$	$\frac{2}{7}$	$\frac{3}{8}$	$\frac{4}{9}$	$\frac{1}{2}$		
Sequence C	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4		

Complete the table.

[8]

12 $\sqrt{\dfrac{10^{400}}{10^{220} \times 10^{80}}} = 10^{k}$

Find the value of k.

$k =$ ..... [3]

13 Line L has the equation $y = 2(x-5)$.

(a) Find the coordinates of the point where line L intersects the y-axis.

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

(b) Find the x-coordinate of the point where line L intersects the line $y = 19$.

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

(c) Line P is perpendicular to line L.
Line P passes through the point $(2, 3)$.

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

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

14 Jess invests \$1400 in an account.
The account pays compound interest at a rate of r% per year.
At the end of 4 years the value of her investment is \$1523.15 .

Find the value of r.

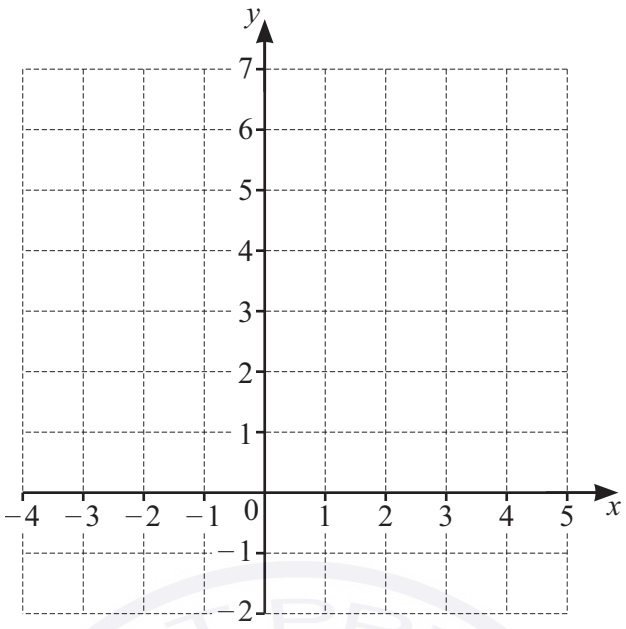
$r =$ ..... [3]

15 m is inversely proportional to the square root of $(t+2)$.
$m = 0.5$ when $t = 23$.

Find m when $t = 98$.

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

16

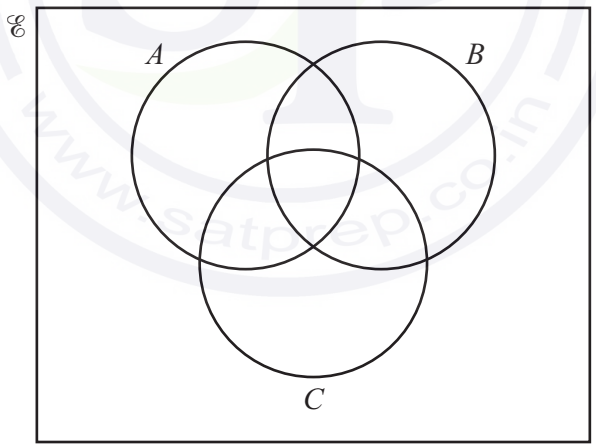


By shading the **unwanted** regions of the grid, draw and label the region R which satisfies these three inequalities.

$y < 3$ $x \leqslant 2$ $y < x + 3$

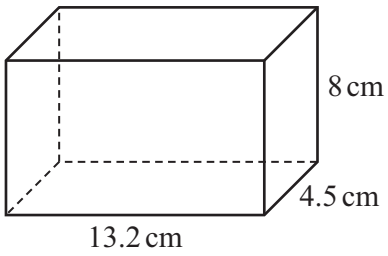
[5]

17 In the Venn diagram, shade the region $(A \cup B) \cap C'$.



[1]

18



NOT TO SCALE

The diagram shows a solid cuboid with sides of length 4.5 cm, 8 cm and 13.2 cm.

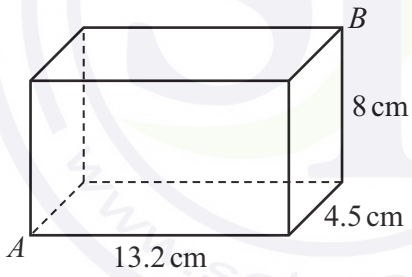
(a) Calculate the volume of the cuboid.

..... cm^3 [1]

(b) Calculate the total surface area of the cuboid.

..... cm^2 [3]

(c)



NOT TO SCALE

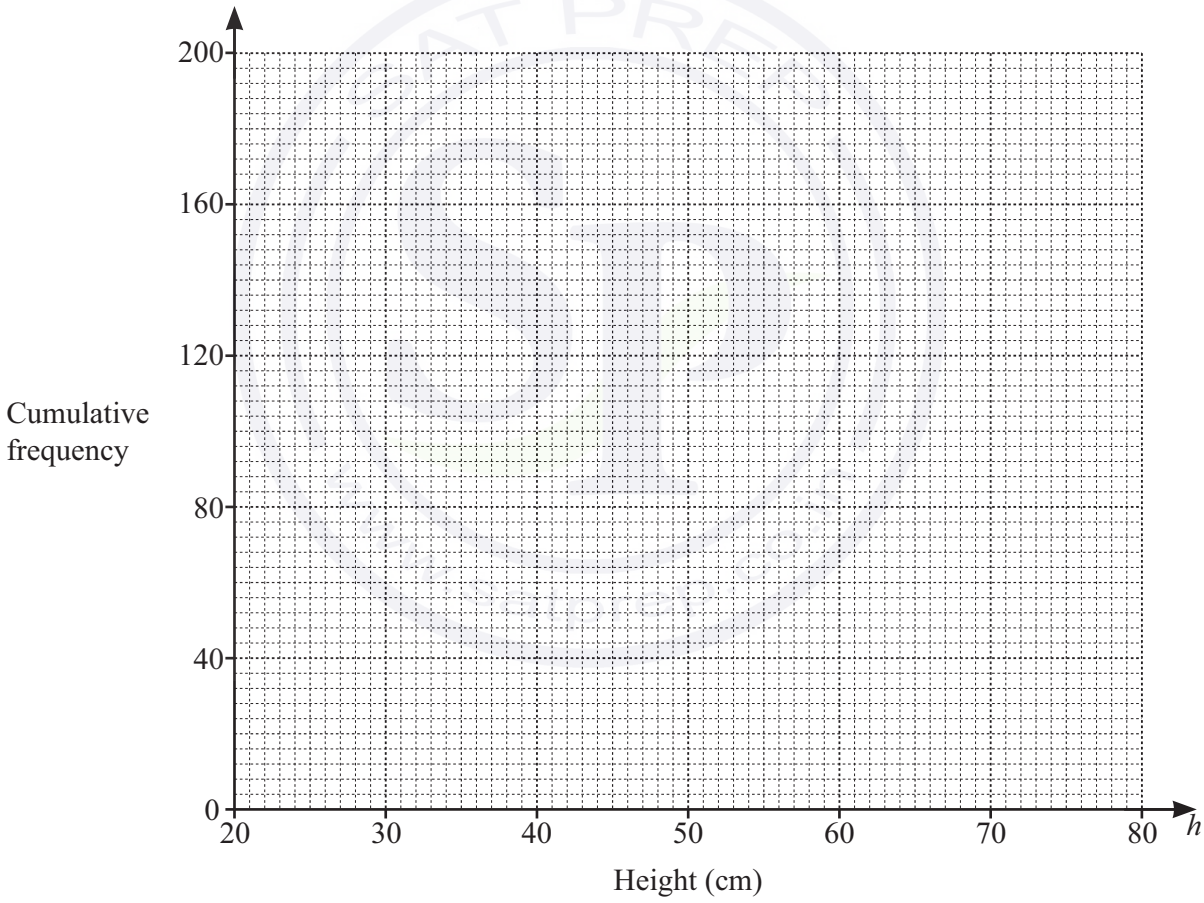
Calculate the angle between *AB* and the horizontal base of the cuboid.

..... [4]

19 The table shows some information about the heights of 200 plants.

Height (h cm)	Cumulative frequency
$h \leqslant 30$	6
$h \leqslant 40$	42
$h \leqslant 50$	76
$h \leqslant 60$	170
$h \leqslant 70$	190
$h \leqslant 80$	200

(a) Draw a cumulative frequency diagram to show this information.



[3]

(b) Find an estimate of the 75th percentile.

.....cm [1]

20 Stephan has two bags, A and B, each containing red sweets and yellow sweets only.
He picks two sweets at random, one from bag A and the other from bag B.

The probability that Stephan picks a red sweet from bag A is $\frac{3}{5}$.

The probability that Stephan picks a red sweet from bag A and a red sweet from bag B is $\frac{2}{15}$.

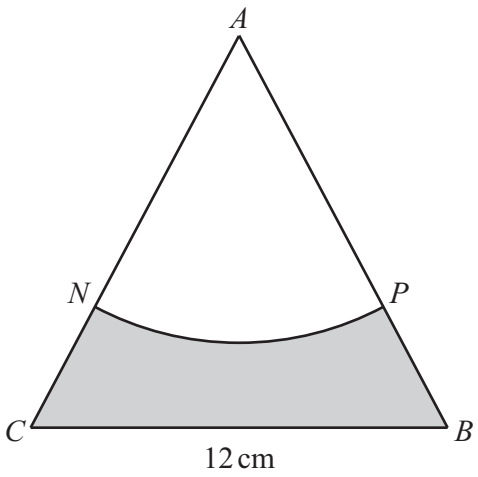
(a) Find the probability that Stephan picks a red sweet from bag B.

..... [2]

(b) Find the probability that Stephan picks a yellow sweet from bag A and a yellow sweet from bag B.

..... [3]

21



NOT TO SCALE

The diagram shows an equilateral triangle ABC with all sides of length 12 cm.
ANP is a sector of a circle, centre A.
N lies on AC such that $AN : NC = 2 : 1$.
P lies on AB such that $AP : PB = 2 : 1$.

Calculate the area of the shaded region.

..... cm^2 [4]

22 A metal cube has mass 14.2 g, correct to 1 decimal place.

(a) Find the lower bound of the mass of the cube.

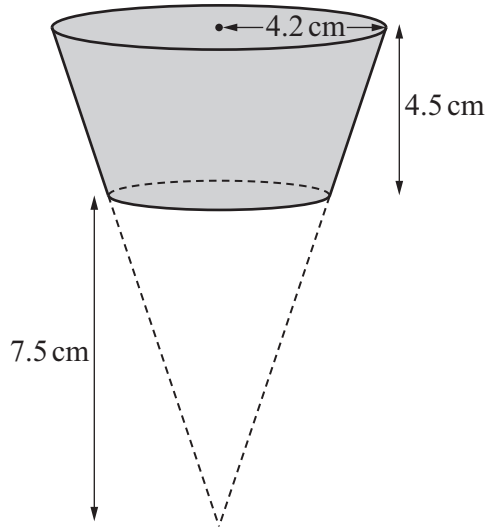
..... g [1]

(b) The side length of the cube is 1.3 cm, correct to 1 decimal place.

Calculate the upper bound of the density of the metal.
[Density = mass ÷ volume]

..... g/cm^3 [3]

23



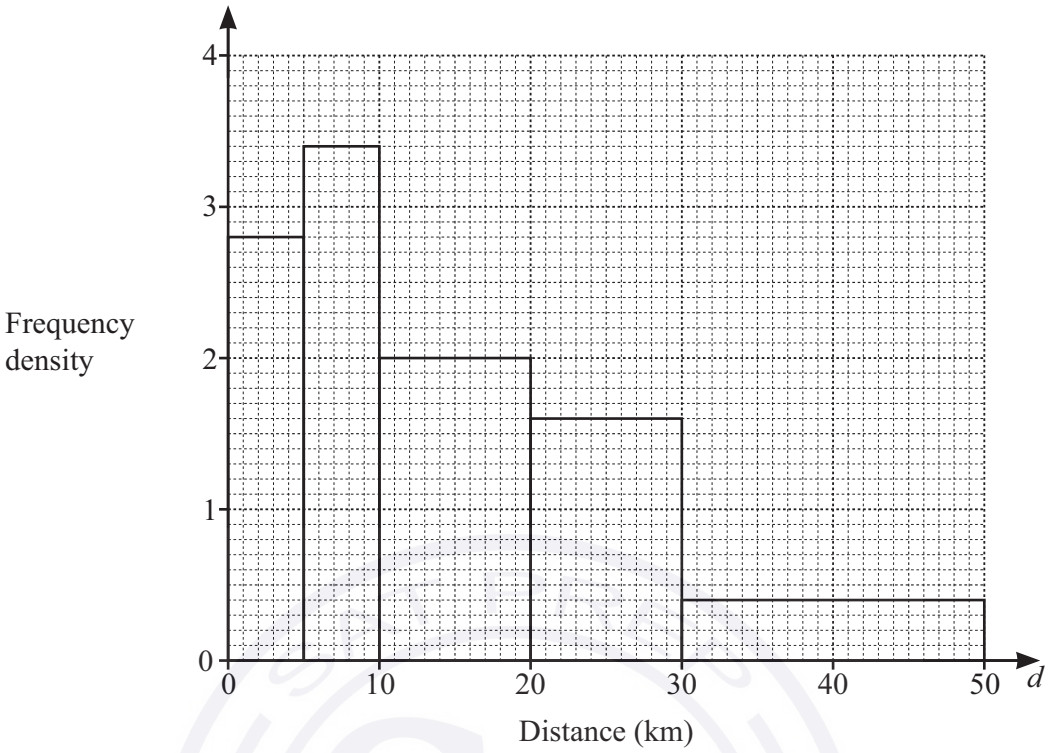
NOT TO SCALE

The diagram shows a frustum made by removing a small cone from a large cone.
The height of the small cone is 7.5 cm.
The height of the frustum is 4.5 cm.
The radius of the large cone is 4.2 cm.

Work out the volume of the frustum.

..... cm^3 [4]

24 The histogram shows information about the distance some people travel to work.



(a) Use the histogram to complete the table.

Distance ($d$km)	Number of people
$0 < d \leqslant 5$	
$5 < d \leqslant 20$	
$20 < d \leqslant 50$	

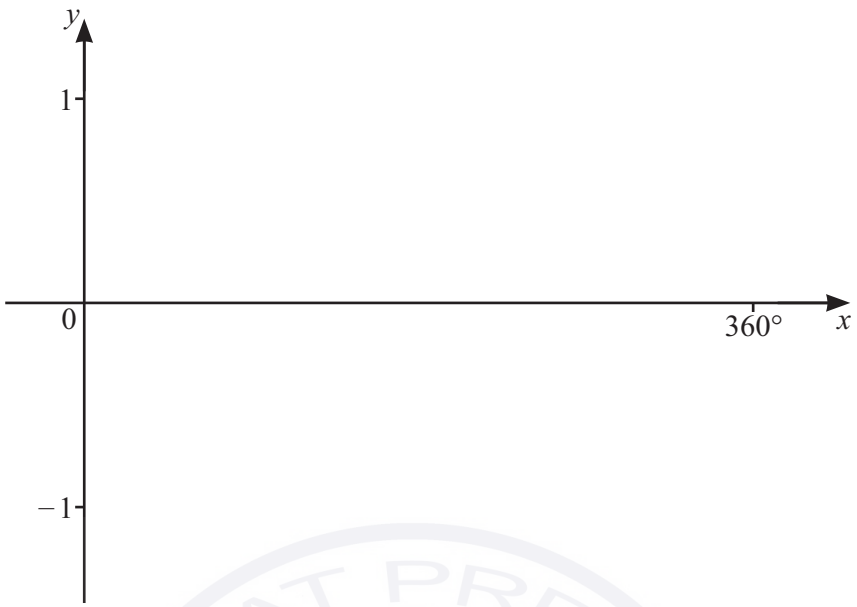
[3]

(b) The people who travel a distance greater than 35 km to work have a car allowance.

Calculate an estimate of the number of these people who have a car allowance.

..... [1]

25 **(a)** Sketch the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.

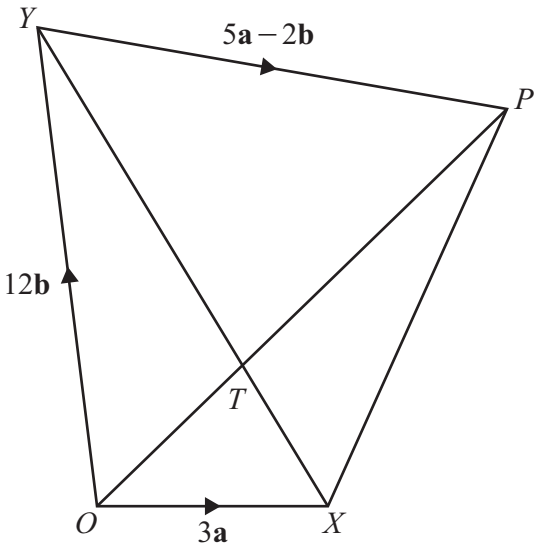


[2]

(b) Solve the equation $2 + 5\sin x = 1$ for $0° \leqslant x \leqslant 360°$.

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

26



NOT TO SCALE

The diagram shows a quadrilateral $OXPY$ with diagonals meeting at T.
$\overrightarrow{OX} = 3\mathbf{a}$ and $\overrightarrow{OY} = 12\mathbf{b}$.

(a) Find $\overrightarrow{XY}$ in terms of **a** and **b**.

..... [1]

(b) $XT : TY = 1 : 2$ and $\overrightarrow{YP} = 5\mathbf{a} - 2\mathbf{b}$.

Find the ratio $OT : TP$.

..... : ..... [4]

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MATHEMATICS **0580/42**

Paper 4 Calculator (Extended) **February/March 2025**

2 hours

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 scientific 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 100.
- The number of marks for each question or part question is shown in brackets [ ].

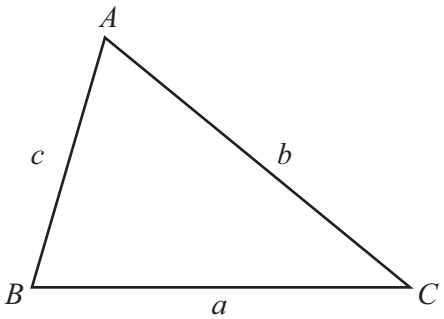
This document has **16** pages.

[Turn over

List of formulas

Area, A, of triangle, base b, height h.	$A = \frac{1}{2}bh$
Area, A, of circle of radius r.	$A = \pi r^2$
Circumference, C, of circle of radius r.	$C = 2\pi r$
Curved surface area, A, of cylinder of radius r, height h.	$A = 2\pi rh$
Curved surface area, A, of cone of radius r, sloping edge l.	$A = \pi rl$
Surface area, A, of sphere of radius r.	$A = 4\pi r^2$
Volume, V, of prism, cross-sectional area A, length l.	$V = Al$
Volume, V, of pyramid, base area A, height h.	$V = \frac{1}{3}Ah$
Volume, V, of cylinder of radius r, height h.	$V = \pi r^2 h$
Volume, V, of cone of radius r, height h.	$V = \frac{1}{3}\pi r^2 h$
Volume, V, of sphere of radius r.	$V = \frac{4}{3}\pi r^3$
For the equation $ax^2 + bx + c = 0$, where $a \neq 0$,	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

For the triangle shown,



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\text{Area} = \frac{1}{2}ab\sin C$$

1 Write down a factor of 28 that is a prime number.

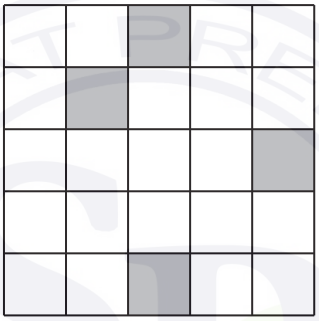
..... [1]

2 Simplify.

$$4y^2 + 3y - y^2 + 2y$$

..... [2]

3



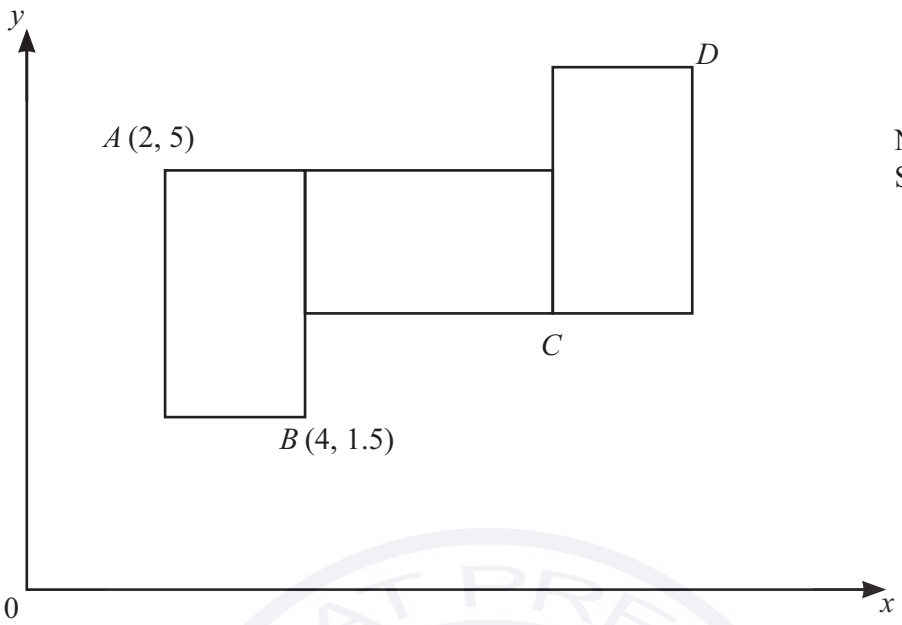
Shade **two** more small squares to make a pattern with two lines of symmetry. [1]

4 Calculate $\dfrac{20.24 - \sqrt[3]{30}}{6.5}$.

Give your answer correct to 1 decimal place.

..... [2]

5



NOT TO SCALE

A pattern is formed by 3 congruent rectangles.
Each rectangle is a rotation of 90° around one vertex of the rectangle next to it.
The point A has coordinates $(2, 5)$.
The point B has coordinates $(4, 1.5)$.

Work out the coordinates of point C and point D.

C (..... , ...)

D (..... , ...)

[3]

6 Each week Nisha is paid \$12 per hour for the first 40 hours that she works.
She is paid 30% more per hour for any extra hours that she works.
One week Nisha works for 45.5 hours.

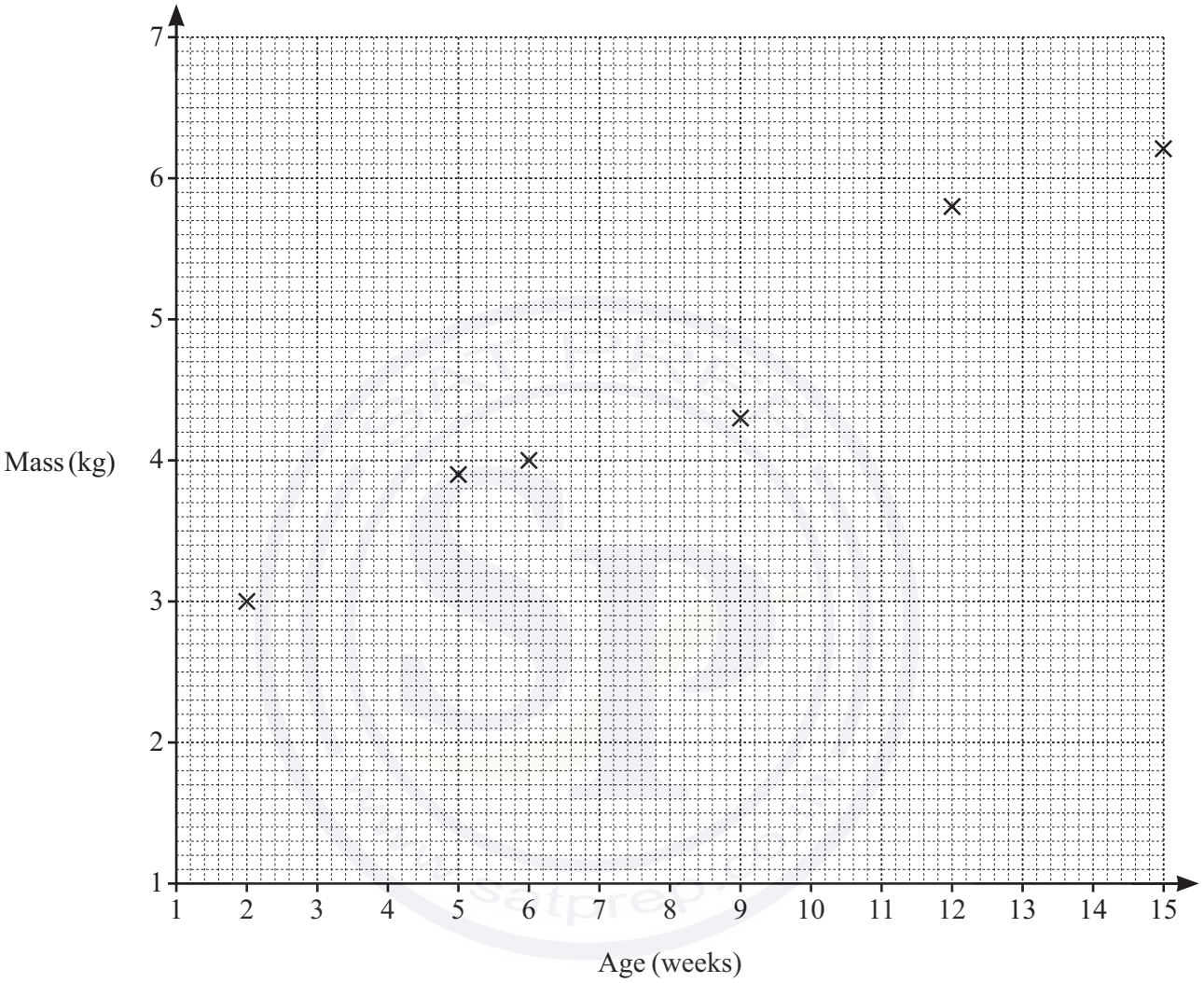
Calculate how much she is paid that week.

\$ ..... [3]

7 The table shows the age and mass of each of 10 babies.

Age (weeks)	9	12	15	2	5	6	9	7	1	11
Mass (kg)	4.3	5.8	6.2	3.0	3.9	4.0	4.6	4.5	2.5	5.3

(a)



Complete the scatter diagram.
The first six points have been plotted for you. [2]

(b) What type of correlation is shown in the scatter diagram?

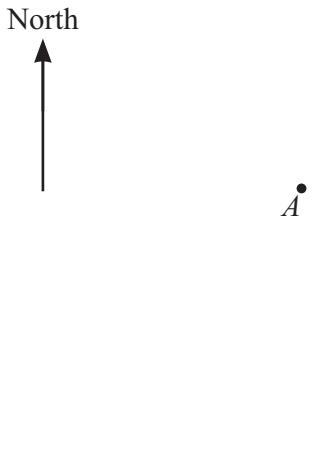
..... [1]

(c) On the scatter diagram, draw a line of best fit. [1]

(d) Use your line of best fit to find an estimate of the mass of a 14-week old baby.

..... kg [1]

8 The scale drawing shows the positions of boat A and boat B.
The scale is 1 cm represents 0.5 km.



Scale: 1 cm to 0.5 km

(a) Find the actual distance between boat A and boat B.

..... km [2]

(b) Lighthouse L lies to the east of boats A and B.
L is 4.4 km from boat A and 3.3 km from boat B.

Using a ruler and compasses only, construct and label the position of L. [3]

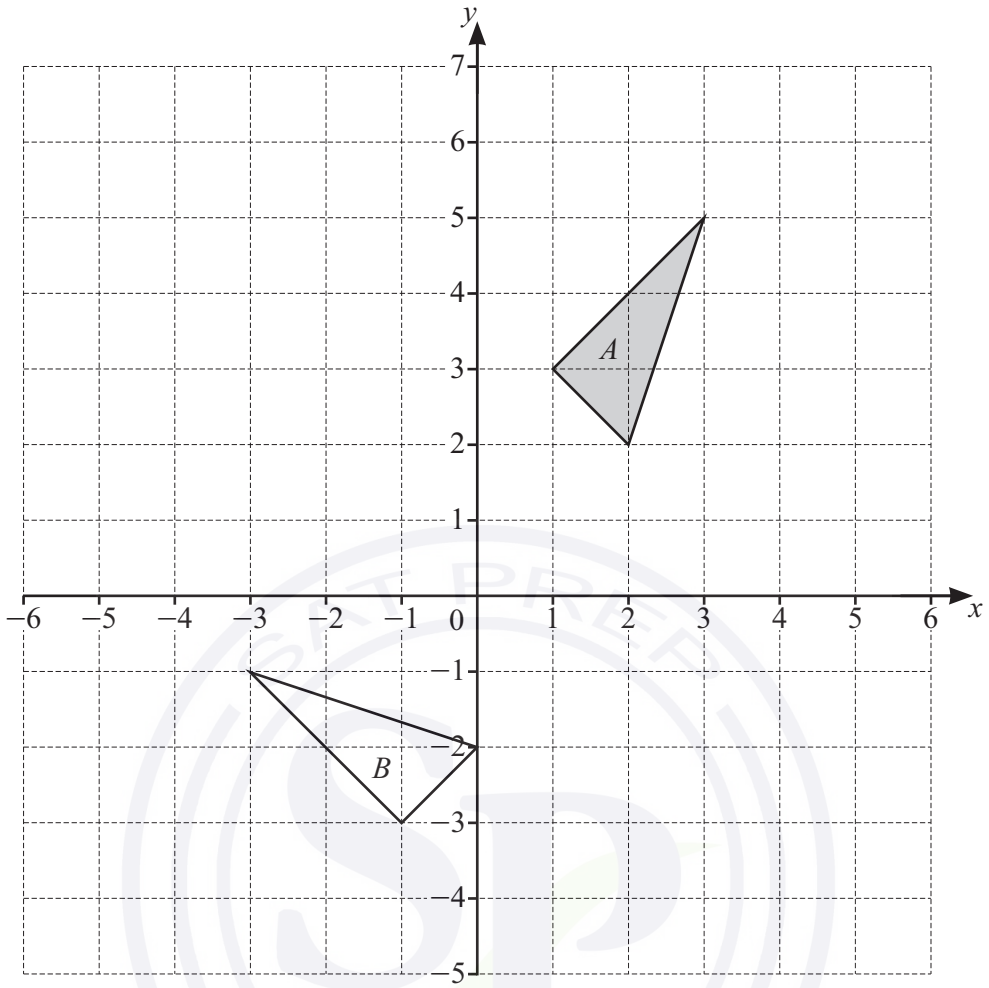
9 **(a)** Write 0.007 09 in standard form.

..... [1]

(b) Work out $\left(4 \times 10^4\right)^2$.
Give your answer in standard form.

..... [2]

10



(a) Draw the image of

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

(ii) triangle A after a translation by the vector $\begin{pmatrix} -6 \\ 1 \end{pmatrix}$. [2]

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

.....

..... [3]

11 **(a)** Midhil invests \$1500 at a rate of 4.2% per year compound interest.

Calculate the value of the investment at the end of 5 years.

\$ ..... [2]

(b) Hitanshi invests some money at a rate of x% per year compound interest.
At the end of 11 years the value of the investment has doubled.

Calculate the value of x.

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

12 A cone has sloping edge 12 cm and base radius 5 cm.

Calculate the **total** surface area of the cone.

..... cm^2 [2]

13 The table shows the first 5 terms of sequences A, B and C.

	1st term	2nd term	3rd term	4th term	5th term	nth term
Sequence A	5	12	31	68	129	
Sequence B	$\frac{10}{3}$	$\frac{9}{4}$	$\frac{8}{5}$	$\frac{7}{6}$	$\frac{6}{7}$	
Sequence C	4	8	16	32	64	

Complete the table to show the nth term of each sequence.

[6]

14 $f(x) = 5 - 4x$

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

..... [1]

(b) Find $f(3 - 2x)$.
Give your answer in its simplest form.

..... [2]

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

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

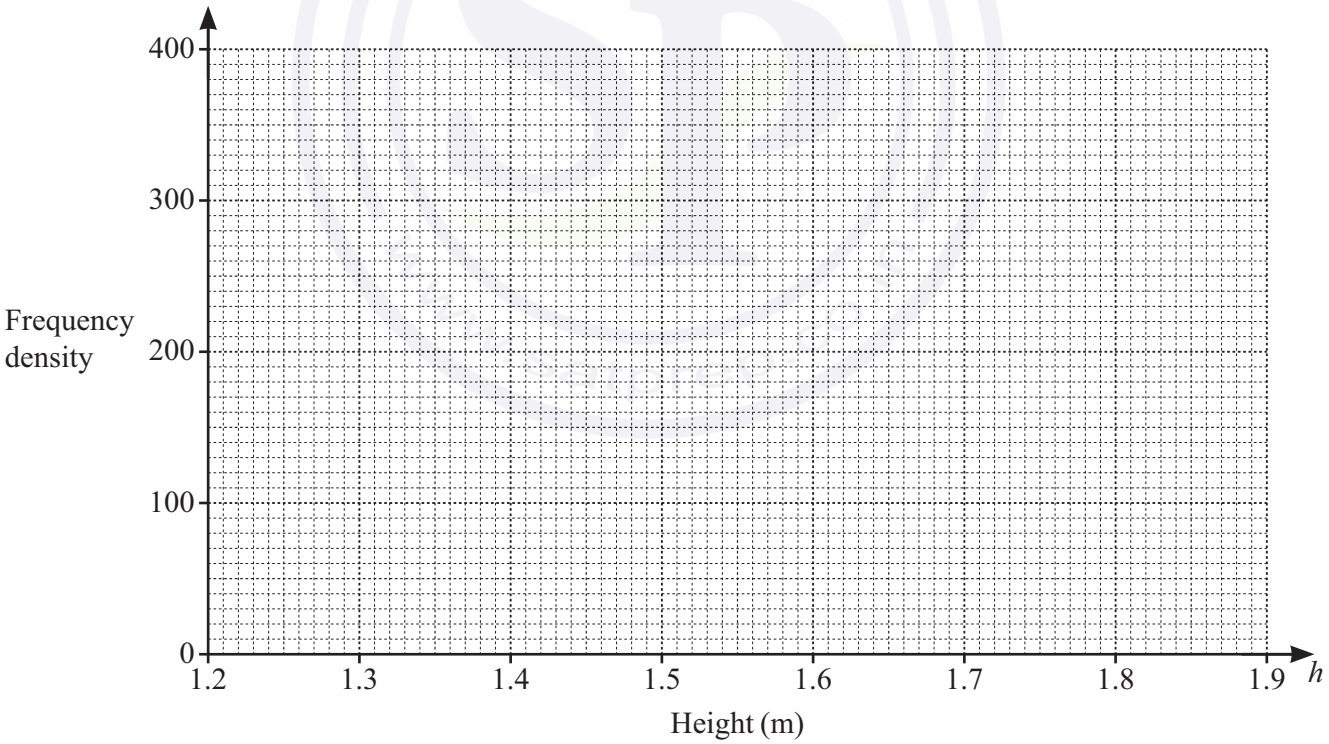
15 Virat records the height of each of 80 sunflowers.
The results are shown in the table.

Height (h m)	$1.2 < h \leq 1.5$	$1.5 < h \leq 1.6$	$1.6 < h \leq 1.7$	$1.7 < h \leq 1.9$
Frequency	12	20	34	14

(a) Calculate an estimate of the mean height.

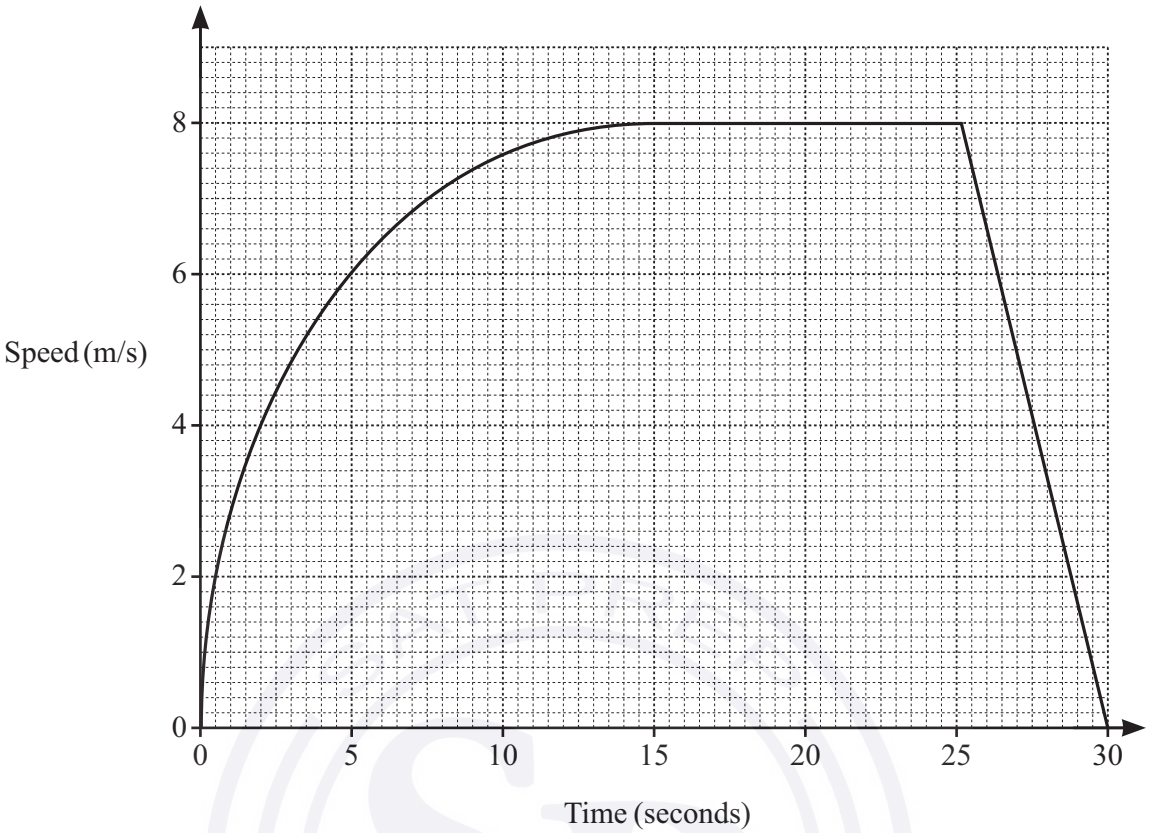
..... m [4]

(b) Draw a histogram to show the information in the table.



[3]

16 The graph shows the speed of a cyclist during a journey of 30 seconds.



(a) Write down the acceleration of the cyclist between 15 seconds and 25 seconds.

..... m/s^2 [1]

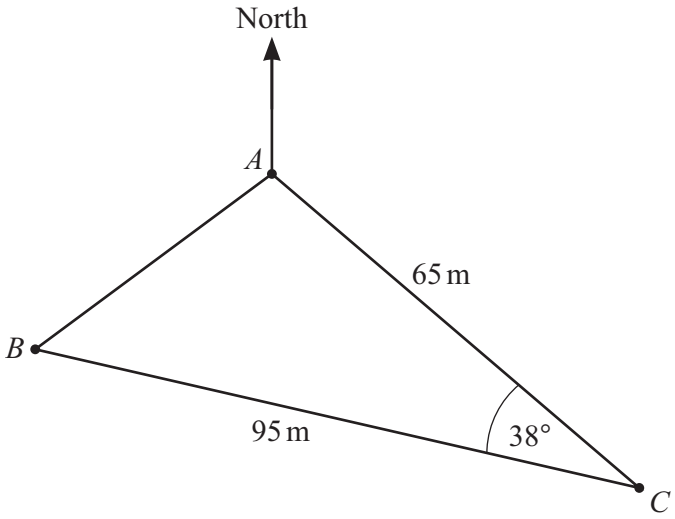
(b) By drawing a tangent, find an estimate for the acceleration of the cyclist at 7.5 seconds.

..... m/s^2 [2]

(c) Work out the average speed of the cyclist between 15 seconds and 30 seconds.

..... m/s [3]

17



NOT TO SCALE

The diagram shows three points A, B and C on horizontal ground.
The bearing of C from A is 145° and angle ACB = 38°.
AC = 65 m and BC = 95 m.

(a) Find the bearing of B from C.

..... [2]

(b) Show that AB = 59.3 m, correct to 1 decimal place.

[3]

(c) Angle BAC is obtuse.

Work out the bearing of B from A.

..... [4]

18 **(a)** Factorise.

$$18a^2 - 98$$

..... [2]

(b) Expand and simplify.

$$(x+4)(2x-1)(x-2)$$

..... [3]

19 Solve the equation $2 + 5\cos x = 0$ for $0° \leq x \leq 360°$.

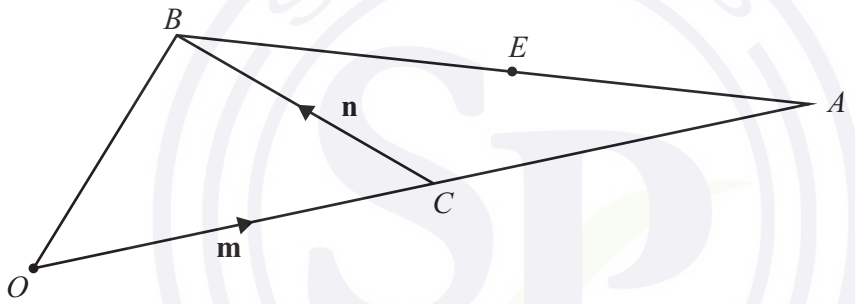
$x =$ .....or $x =$ ..... [3]

20 A piece of metal has volume 1240 cm^3, correct to the nearest 20 cm^3.
The mass of the piece of metal is 7800 g, correct to the nearest 100 g.

Calculate the lower bound of the density of the metal.
[Density = mass ÷ volume.]

..... g/cm^3 [3]

21



NOT TO SCALE

OAB is a triangle.
C is the midpoint of OA.
$\overrightarrow{OC} = \mathbf{m}$ and $\overrightarrow{CB} = \mathbf{n}$.
E lies on AB and $AE : EB = 4 : 5$.

Find, in terms of **m** and **n**, the position vector of E.
Give your answer in its simplest form.

..... [4]

22 The line $y = 4x + 12$ intersects the curve $y = 2x^2 - x - 3$ at point P and point Q.

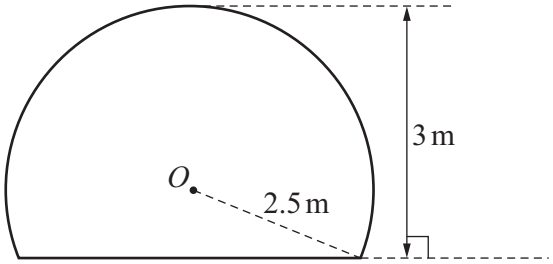
Find the coordinates of P and Q.
You must show all your working and give your answers correct to 2 decimal places.

(....., ...)

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

Question 23 is printed on the next page.

23



NOT TO SCALE

The diagram shows the major segment of a circle, centre O, radius 2.5 m.
The segment is the cross section of a tunnel with height 3 m.
The length of the tunnel is 800 m and it has the same cross section throughout its length.

Calculate the volume of the tunnel.

..... m^3 [7]