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MATHEMATICS **0580/21**

Paper 2 (Extended) **October/November 2024**

1 hour 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.
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- Do **not** write on any bar codes.
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- 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages.

[Turn over

1 A concert starts at 19 50 and finishes 2 hours 42 minutes later.

Work out the time the concert finishes.

..... [1]

2 Find the reciprocal of $1\frac{1}{4}$.

..... [1]

3 Use one of the symbols $<$, $>$ or $=$ to make each statement true.

$\frac{2}{7}$ 0.2861

$\frac{99}{900}$ 11%

1^3 ..... 4^0

[2]

4 Safia has a piece of fabric of length 5.6 m.
She cuts the fabric into two parts, with lengths in the ratio 3 : 4.

Calculate the length of the longer part.

..... m [2]

5 Work out.

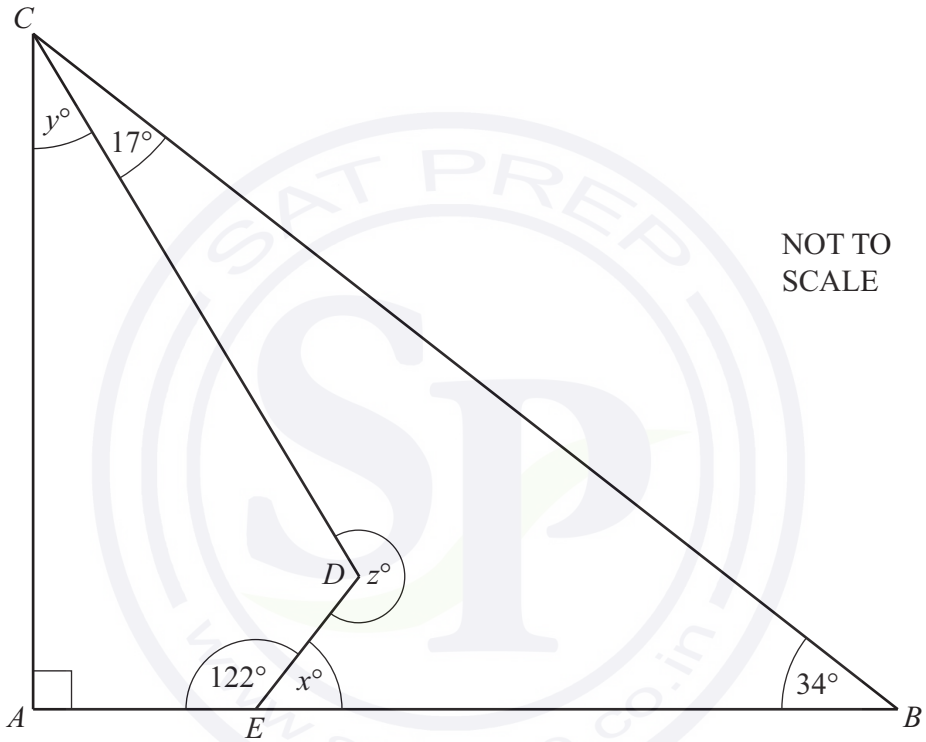
(a) $3\begin{pmatrix} 6 \\ -4 \end{pmatrix}$

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

(b) $\begin{pmatrix} 4 \\ -1 \end{pmatrix} + \begin{pmatrix} -7 \\ 5 \end{pmatrix}$

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

6 The diagram shows a right-angled triangle *ABC* and a quadrilateral *AEDC*.



Find the value of

(a) x

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

(b) y

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

(c) z.

$z =$ ..... [1]

7 Factorise.

$28x - 35$

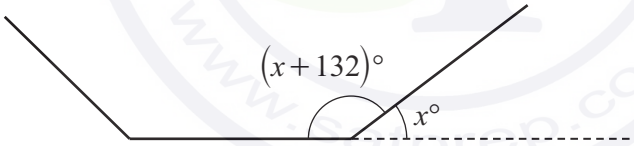
..... [1]

8 Edith invests $3000 in a savings account.
The account pays simple interest at a rate of 2.6% per year.

Calculate the total interest earned at the end of 3 years.

$ ..... [2]

9



NOT TO SCALE

The diagram shows part of a regular polygon.
The interior angle of the polygon is 132° larger than the exterior angle.

Calculate the number of sides of this polygon.

..... [3]

10 Jacinda plays a game with her friend.
She can win, lose or draw the game.
The probability that she wins the game is 0.28 .

(a) Jacinda is twice as likely to draw the game as to lose the game.

Work out the probability that she loses the game.

..... [2]

(b) Jacinda plays the game 150 times.

Find the expected number of times that **she wins**.

..... [1]

11 **Without using a calculator**, work out $5\frac{1}{3} - 3\frac{4}{7}$.
You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

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

$$5x + 6y = 9$$
$$3x - 2y = -17$$

$x =$ .....

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

13 **(a)** A sequence has nth term $3n^2 - 1$.

Find the second term in this sequence.

..... [1]

(b) The table shows the first five terms of sequences A and B.

	1st term	2nd term	3rd term	4th term	5th term	nth term
Sequence A	–6	–2	2	6	10	
Sequence B	3	17	55	129	251	

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

[4]

14 Two solid steel statues are mathematically similar.
The smaller statue has height 12 cm and the larger statue has height 15 cm.
The larger statue has a mass 2.5 kg.
The density of steel is 8 g/cm^3.

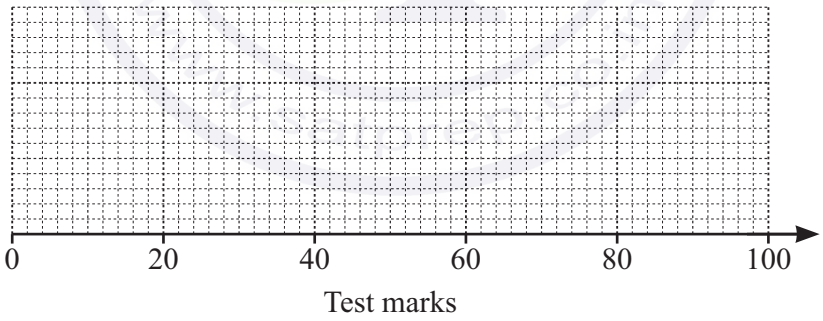
Calculate the volume of the smaller statue.
[Density = mass ÷ volume.]

..... cm^3 [4]

15 Students in class *P* take a test.
These statistics show information about their marks.

- lower quartile = 38
- median = 53
- interquartile range = 28
- range = 81
- highest mark = 96

(a) Draw a box-and-whisker plot to represent this information.



[3]

(b) Students in class *Q* take the same test.
For class *Q*, the median is 49 and the interquartile range is 35.

Make two comments comparing the distribution of marks for class *P* with that of class *Q*.

1. .....

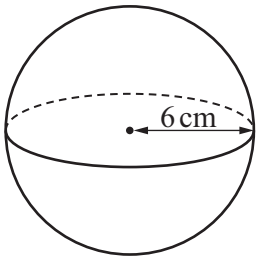
.....

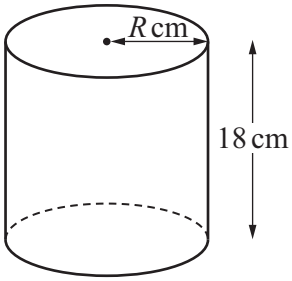
2. .....

.....

[2]

16





NOT TO SCALE

The diagram shows a sphere of radius 6 cm and a cylinder of height 18 cm and radius R cm.
The volume of the sphere is equal to the volume of the cylinder.

Calculate the curved surface area of the cylinder.
Give your answer in terms of π.
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$]

..... cm^2 [4]

17 Solve.

$$3x^2 - 7x - 16 = 0$$

You must show all your working and give your answers correct to 2 decimal places.

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

18 $g(x) = 4^{x+3}$

(a) Find x when $g(x) = 1$.

..... [1]

(b) Find $g^{-1}\left(\frac{1}{16}\right)$.

..... [2]

19 $\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
$P = \{\text{odd numbers}\}$
$Q = \{\text{multiples of 3}\}$
$R = \{\text{square numbers}\}$

(a) Find $P \cap Q \cap R$.

{ ..... } [1]

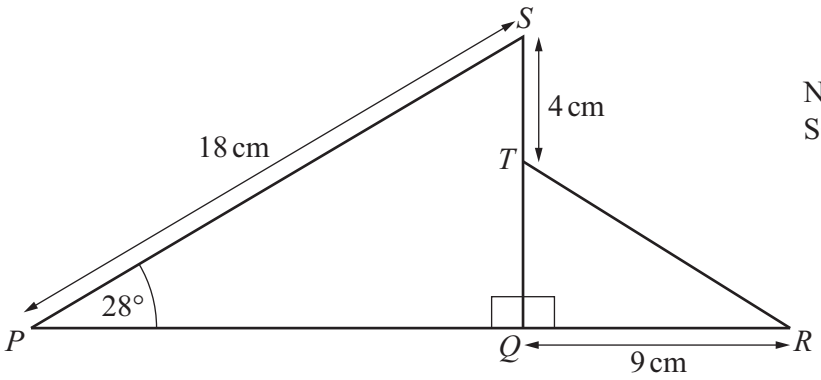
(b) **(i)** Find $Q \cup R$.

{ ..... } [1]

(ii) Find $n\left(P \cap (Q \cup R)'\right)$.

..... [1]

20



NOT TO SCALE

The diagram shows two right-angled triangles *PQS* and *RQT*.
PQR and *QTS* are straight lines.

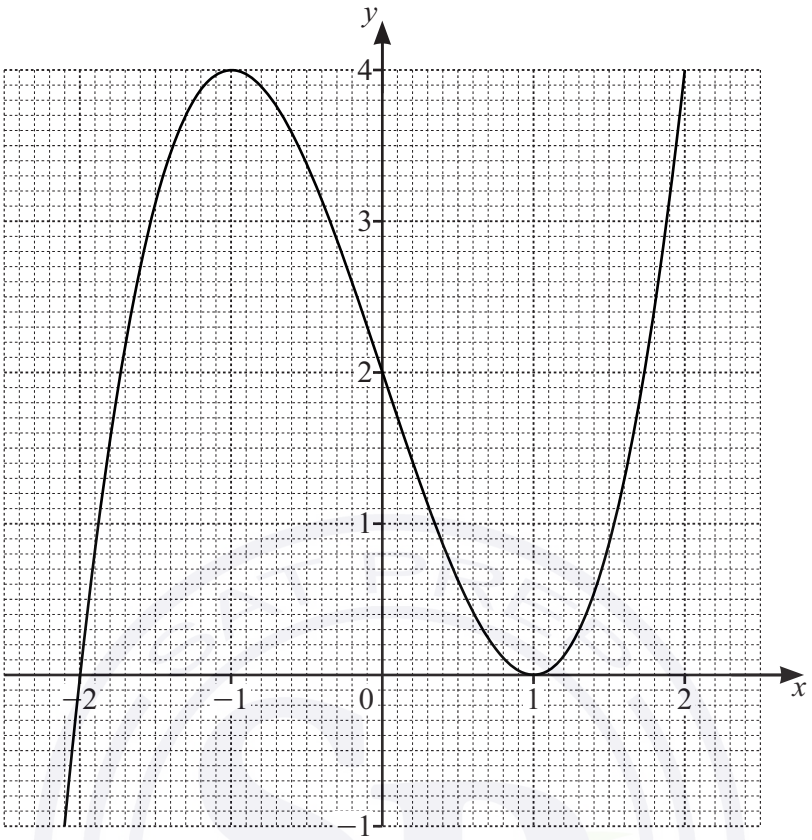
Calculate angle *QTR*.

Angle *QTR* = ... [5]

21 Solve the equation $3\tan x + 5 = 1$ for $0° \leqslant x \leqslant 360°$.

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

22 The graph of $y = (x+2)(x-1)^2$ is shown on the grid.



(a) Show that $y = (x+2)(x-1)^2$ can be written as $y = x^3 - 3x + 2$.

[2]

(b) By drawing a suitable straight line, solve the equation $2x^3 - 5x = 0$.

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

Question 23 is printed on the next page.

23 $(x-5)^2+k=x^2-px-21$

Find the value of p and the value of k.

$p =$ .....

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

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MATHEMATICS **0580/22**

Paper 2 (Extended) **October/November 2024**

1 hour 30 minutes

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INFORMATION

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This document has **16** pages.

[Turn over

1 These are the first eight terms of a sequence.

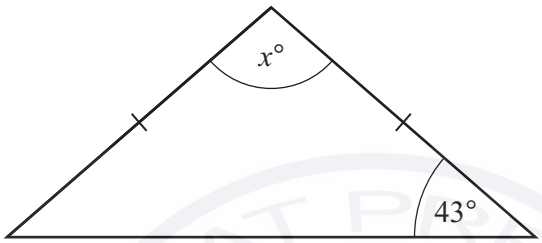
$c \quad -3 \quad -9 \quad -15 \quad -21 \quad -27 \quad -33 \quad k$

Find the value of c and the value of k.

$c =$ .....

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

2 The diagram shows an isosceles triangle.



NOT TO SCALE

Find the value of x.

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

3

0.25	3.142	$\sqrt{3}$	-3	24	-0.4	1.2	$-\frac{1}{4}$

Complete each statement with a number from the list.

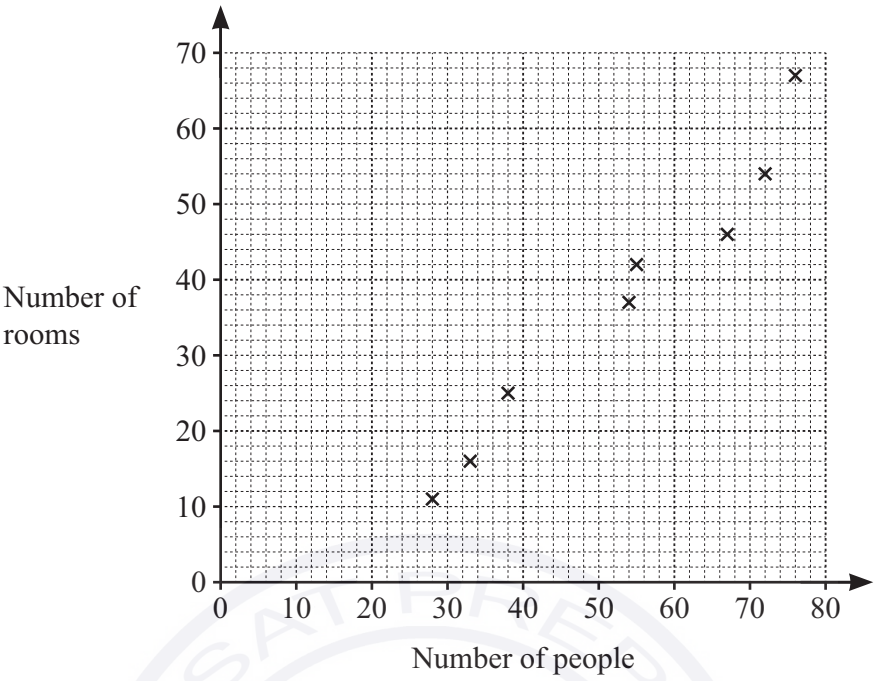
..... is a natural number.

..... is an irrational number.

..... is the reciprocal of 4.

[3]

4 The scatter diagram shows the number of rooms and the number of people in each of eight buildings.



(a) One of the buildings has 67 rooms.

Write down the number of people in this building.

..... [1]

(b) In another building there are 42 people and 33 rooms.

On the scatter diagram, plot this point. [1]

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

(ii) There are 45 people in a different building.

Find an estimate for the number of rooms in this building.

..... [1]

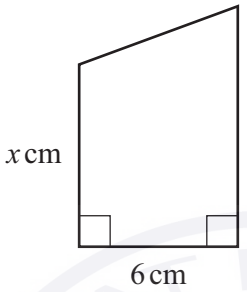
(d) What type of correlation is shown in the scatter diagram?

..... [1]

5 Convert $7.51\,m^2$ into cm^2.

..... cm^2 [1]

6 The diagram shows a trapezium.



NOT TO SCALE

The area of the trapezium is $42\,cm^2$.

Calculate the value of x.

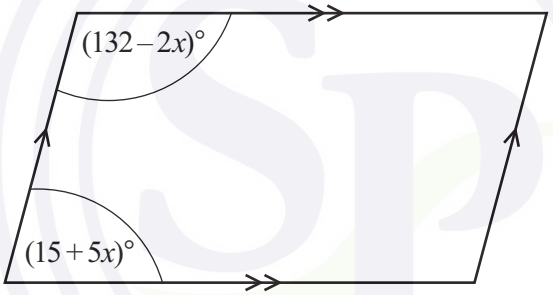
$x =$ ..... [2]

7 **Without using a calculator**, work out $\frac{2}{7} \div \frac{6}{11}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [2]

8 The diagram shows a parallelogram.

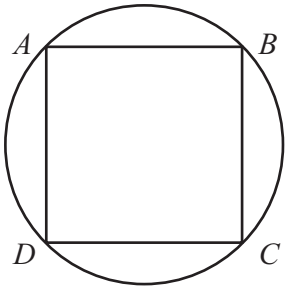


NOT TO SCALE

Work out the size of the smallest interior angle of the parallelogram.

..... [4]

9



NOT TO SCALE

Points A, B, C and D lie on a circle.
$ABCD$ is a square with area $72\,\text{cm}^2$.

Calculate the area of the circle.
Give your answer as a multiple of π.

..... cm^2 [3]

10 Calculate $\sqrt[3]{1+10.9\times0.4^2}$.

..... [1]

11 Factorise fully.

(a) $24x^2 - 9xy$

..... [2]

(b) $63x^2 - 28y^2$

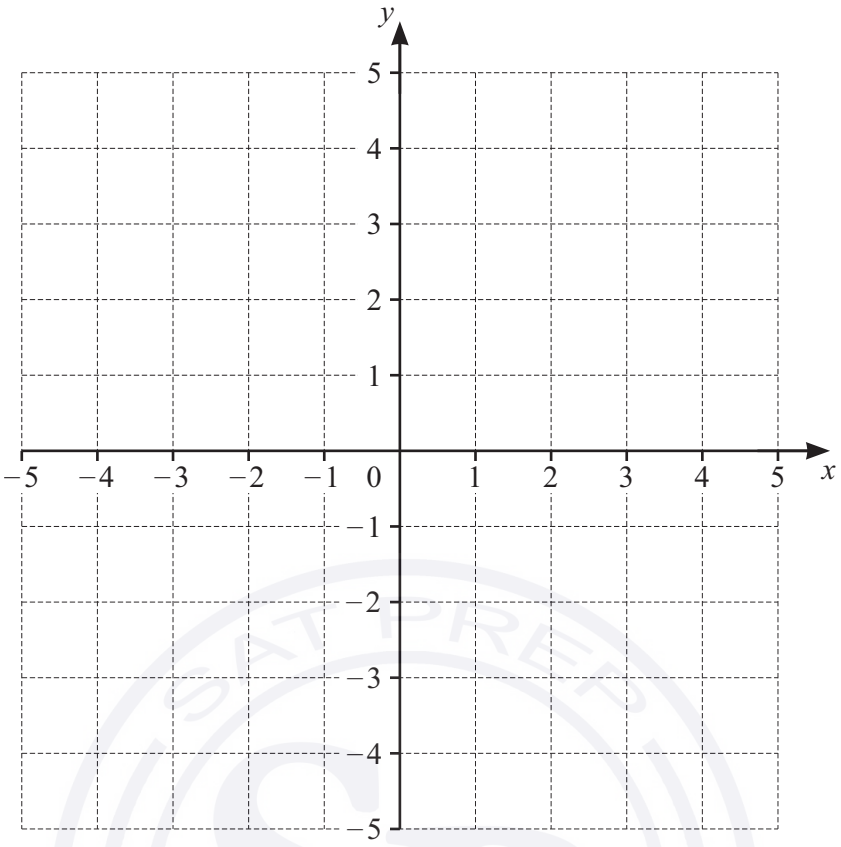
..... [3]

12 y is directly proportional to the square root of $x + 1$.
$y = 10.5$ when $x = 8$.

Find y when $x = 1.56$.

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

13



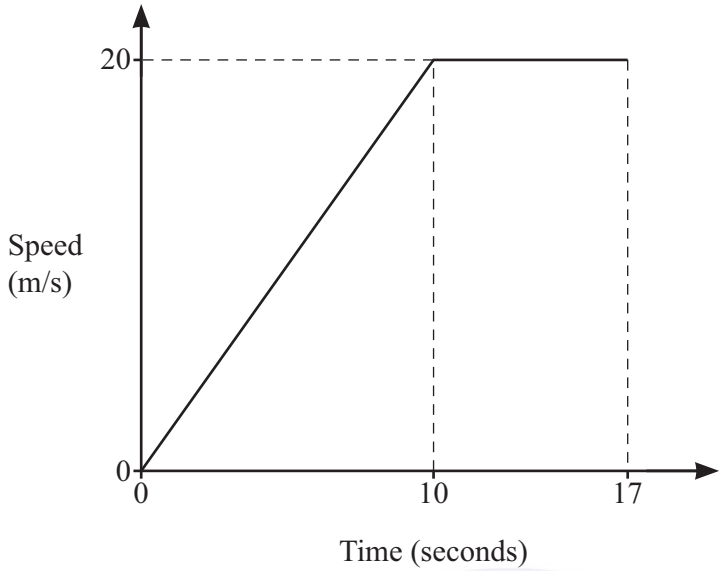
The region R satisfies these inequalities.

$$-3 < y \leqslant 2 \qquad y \leqslant x - 1$$

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

[4]

14



NOT TO
SCALE

The diagram shows the speed–time graph for 17 seconds of a car journey.

(a) Find the acceleration of the car during the first 10 seconds.

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

(b) Calculate the total distance travelled by the car during the 17 seconds.

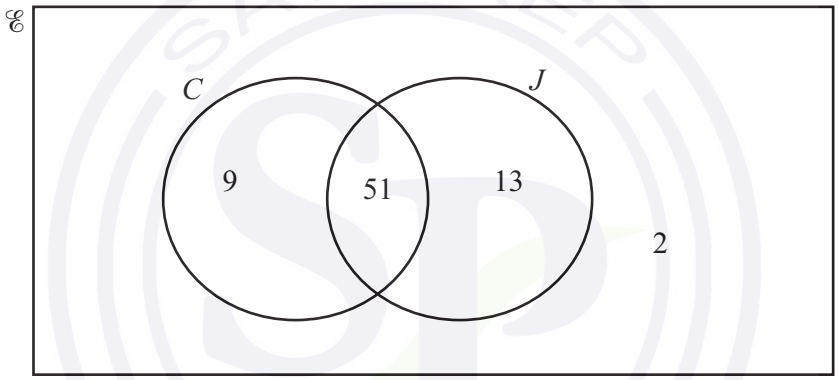
..... m [3]

15 At the start of an experiment there are 40 000 bacteria.
The number of bacteria increases at a rate of 15% per hour.

Calculate the number of bacteria after 3 hours.

..... [2]

16 75 people are asked if they have a car, C, and if they have a job, J.
The Venn diagram shows the results.

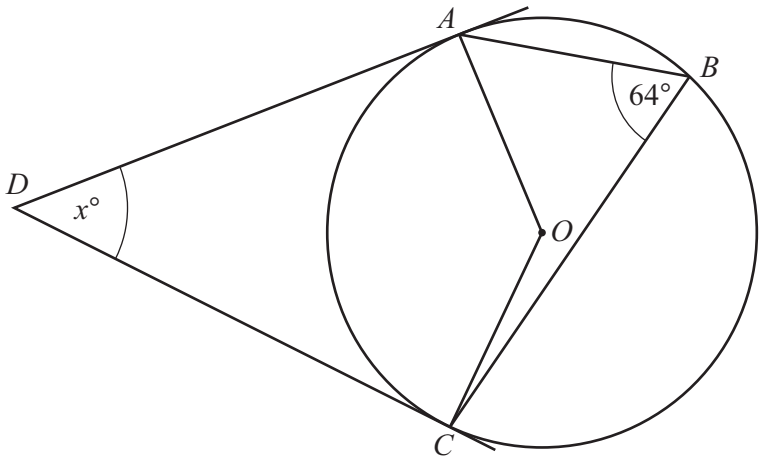


A person is chosen at random from those who have a car.

Find the probability that this person also has a job.

..... [1]

17



NOT TO SCALE

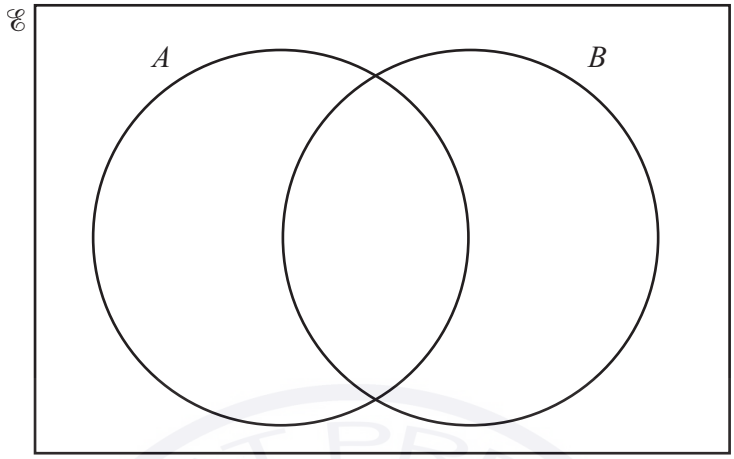
A, B and C are points on the circumference of a circle with centre O.
DA and DC are tangents to the circle.
Angle $ABC = 64°$.

Work out the value of x.

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

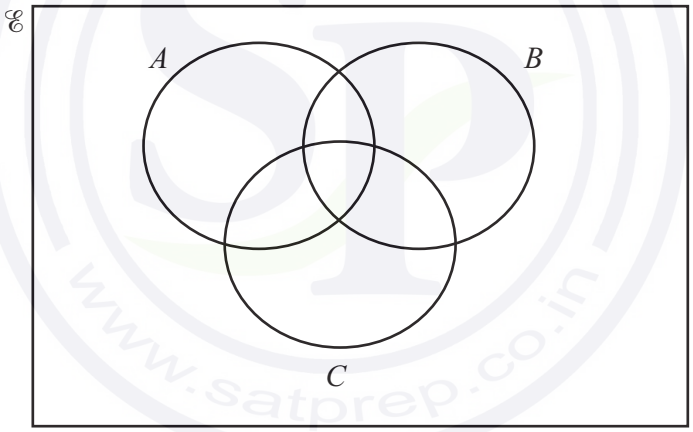
18 **(a)** $\mathscr{E} = \{8 \times 10^{-1}, \quad 0.\dot{8}, \quad 8\%, \quad \sqrt{0.08}\}$

$A = \{ a: 0.08 < a \leqslant 0.8\}$
$B = \{ b: b \geqslant 0.8\}$



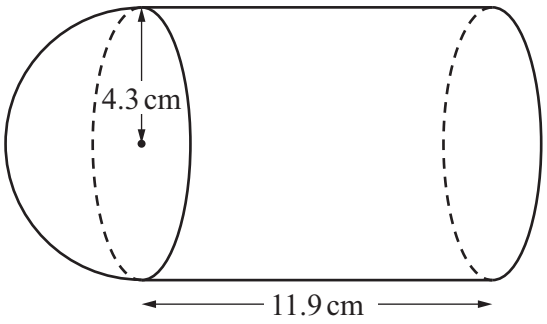
Complete the Venn diagram. [3]

(b) Shade the region $(A \cup C) \cap B'$ in the Venn diagram.



[1]

19



NOT TO SCALE

A solid is made from a cylinder and a hemisphere, both of radius 4.3 cm.
The cylinder has length 11.9 cm.

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

..... cm^3 [3]

(b) Calculate the total surface area of the solid.
[The surface area, A, of a sphere with radius r is $A = 4\pi r^2$.]

..... cm^2 [4]

20 Find an expression for the nth term of this sequence.

$$\frac{1}{7}, \quad 1, \quad 7, \quad 49, \quad 343, \quad 2401, \quad \ldots$$

..... [2]

21 Expand and simplify.

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

..... [3]

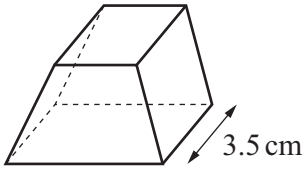
22 A is the point $(17, 9)$ and B is the point $(23, 39)$.

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

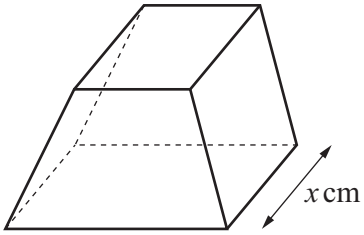
$y =$ ..... [5]

Question 23 is printed on the next page.

23



Small box



Large box

NOT TO SCALE

The small box is mathematically similar to the large box.
The volume of the large box is 72.8% greater than the volume of the small box.
The small box has length 3.5 cm and the large box has length x cm.

Calculate the value of x.

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

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DC (CJ/FC) 337622/2

[Turn over

1

61	62	63	64	65	66	67	68	69

From the list of numbers, write down

(a) a cube number

..... [1]

(b) a prime number.

..... [1]

2 A train journey starts at 23 30 and finishes at 07 15 the next day.

Find the time taken for this journey.

..... h ..... min [1]

3 Simplify.

$3p - t - p - 4t$

..... [2]

4 The scale drawing shows the positions of town K and town L.
The scale is 1 cm represents 10 km.

Scale : 1 cm to 10 km

(a) Find the actual distance between town K and town L.

..... km [2]

(b) Measure the bearing of town L from town K.

..... [1]

5 Each student in a class of 20 students records the number of coins in their pockets.
The table shows the results.

Number of coins	0	1	2	3	4	5	6
Frequency	3	1	7	8	0	0	1

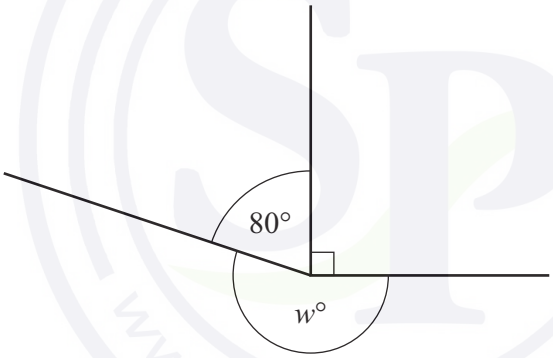
(a) Find the median.

..... [1]

(b) Calculate the mean.

..... [3]

6



NOT TO SCALE

The diagram shows three lines meeting at a point.

Find the value of w.

$w =$ ..... [1]

7 Solve the equation.

$$7 - h = 3 - 5h$$

$h =$ ..... [2]

8 Sacha buys b books and m magazines.
The cost of each book is \$12 and the cost of each magazine is \$5.

Write an expression, in terms of b and m, for the total cost of the books and the magazines.

\$ ..... [2]

9 Find the size of an interior angle of a regular 15-sided polygon.

..... [2]

10 **Without using a calculator**, work out $2\frac{1}{4} - 1\frac{11}{12}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [3]

11 Solve the simultaneous equations.

$$3p - 2q = 7$$
$$p + 2q = 1$$

$p =$ .....

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

12 $V = \sqrt[3]{\frac{x}{y}}$

Rearrange the formula to write x in terms of V and y.

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

13 Find the nth term of each sequence.

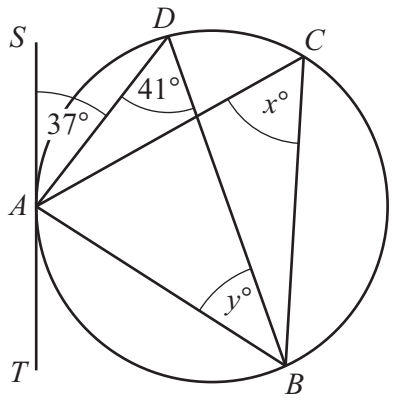
(a) 21, 13, 5, −3, −11, …

..... [2]

(b) 2.5, 5, 10, 20, 40, …

..... [2]

14 (a)



NOT TO SCALE

A, *B*, *C* and *D* lie on the circle.
TAS is a tangent to the circle at *A*.

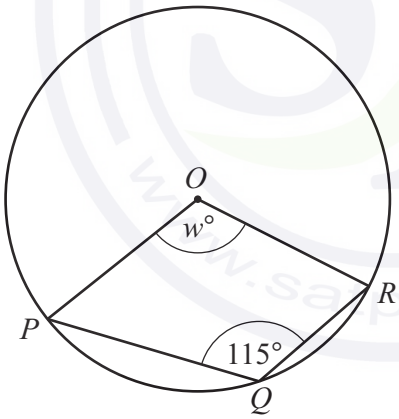
(i) Find the value of *x*.

x = ... [1]

(ii) Find the value of *y*.

y = ... [1]

(b)



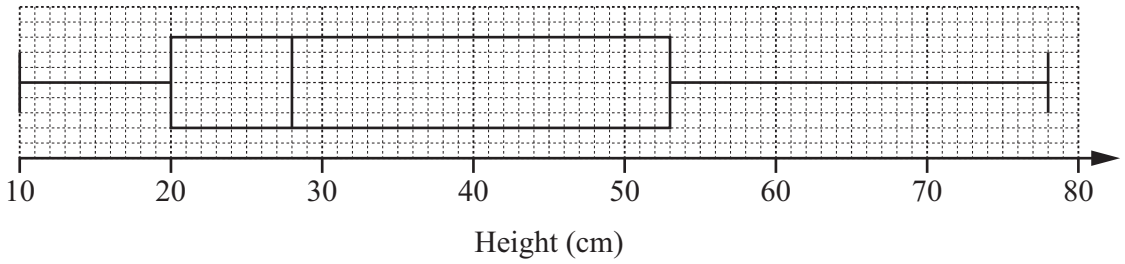
NOT TO SCALE

P, *Q* and *R* lie on the circle, centre *O*.

Find the value of *w*.

w = ... [2]

15



The box-and-whisker diagram shows information about the heights of some plants.

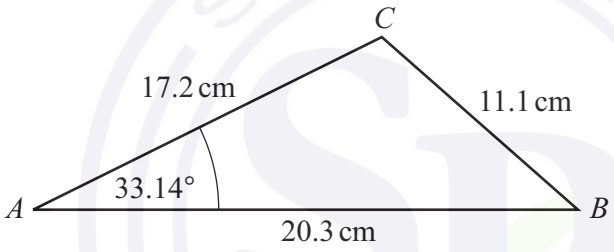
(a) Find the median height.

..... cm [1]

(b) Find the interquartile range of the heights.

..... cm [1]

16



NOT TO SCALE

Calculate the shortest distance from C to AB.

..... cm [3]

17 Simplify.

(a) $18x^{18} \div 3x^{3}$

..... [2]

(b) $\left(125y^{75}\right)^{\frac{2}{3}}$

..... [2]

18 Two mathematically similar solids have volumes $81\,\text{cm}^3$ and $24\,\text{cm}^3$.
The height of the smaller solid is 4.8 cm.

Calculate the height of the larger solid.

..... cm [3]

19 y is inversely proportional to $\sqrt{x+2}$.
When $x = 2$, $y = 3$.

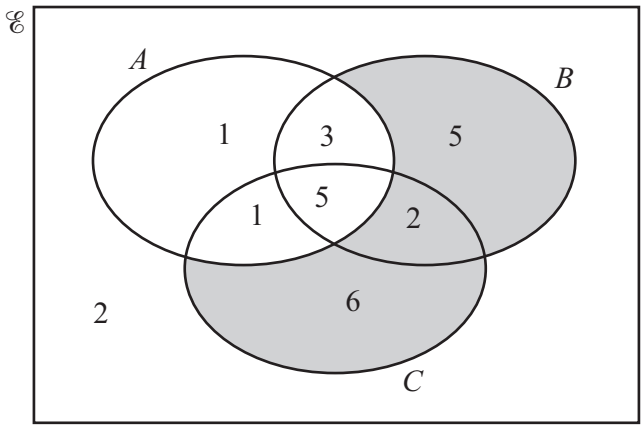
Find y in terms of x.

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

20 Solve the equation $\tan x + 2 = 0$ for $0° \leqslant x \leqslant 360°$.

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

21



The Venn diagram shows the number of elements in each region.

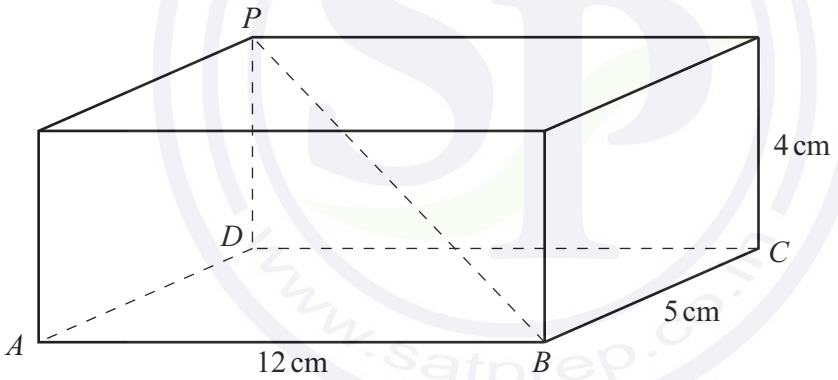
(a) Use set notation to describe the shaded region.

..... [1]

(b) Find $n(A \cap B \cap C)$.

..... [1]

22



NOT TO SCALE

The diagram shows a cuboid with a diagonal PB.

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

..... [4]

23 Write $x^2 + 8x - 7$ in the form $(x + a)^2 + b$.

..... [2]

24 A rectangle has an area of $150\,m^2$, correct to the nearest square metre.
The length of the rectangle is 22 m, correct to the nearest metre.

Calculate the upper bound of the width of the rectangle.

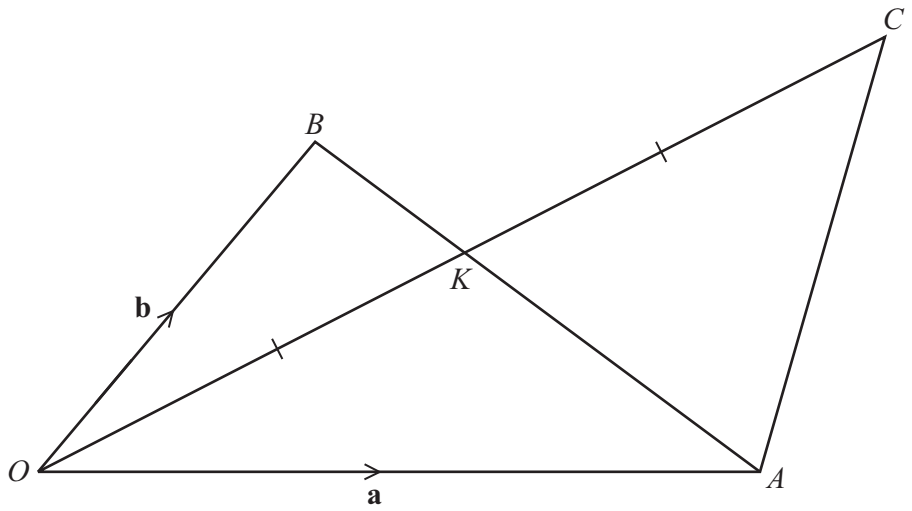
..... m [3]

25 Simplify.

$$\frac{3x - 2 - 3xy + 2y}{1 - y^2}$$

..... [4]

26



NOT TO SCALE

In the diagram, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
$AK : KB = 2 : 1$.
$OK = KC$.

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

$\overrightarrow{AC} =$ ..... [4]

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MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2024**

1 hour 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

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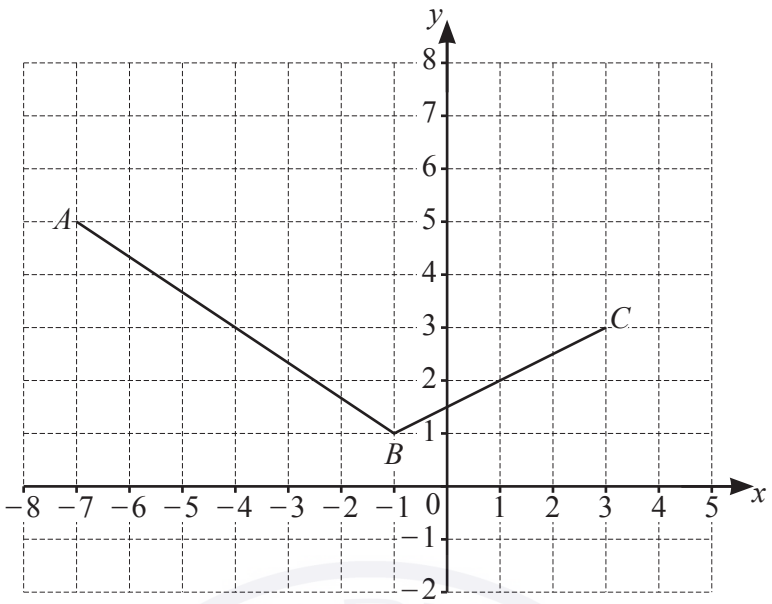
[Turn over

1



The diagram shows two sides of a parallelogram $ABCD$.

Find the coordinates of point D.

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

2 Geetha has a box of toys.
She picks a toy at random from the box.
The probability that she picks a wooden toy is 0.6 .

(a) Work out the probability that she does not pick a wooden toy.

..... [1]

(b) The box contains three types of toys, wooden, plastic or metal.

Type of toy	Wooden	Plastic	Metal
Number of toys		14	14
Probability	0.6		

Complete the table.

[2]

3 The table shows some information about two sequences.

	nth term	5th term
Sequence A	$60 - 4n$	
Sequence B	$n^2 - 300$	

(a) Complete the table.

[2]

(b) Find the smallest **positive** number in sequence B.

..... [2]

4 Find the greatest **odd** number that is a factor of 140 and a factor of 210.

..... [2]

5 Calculate.

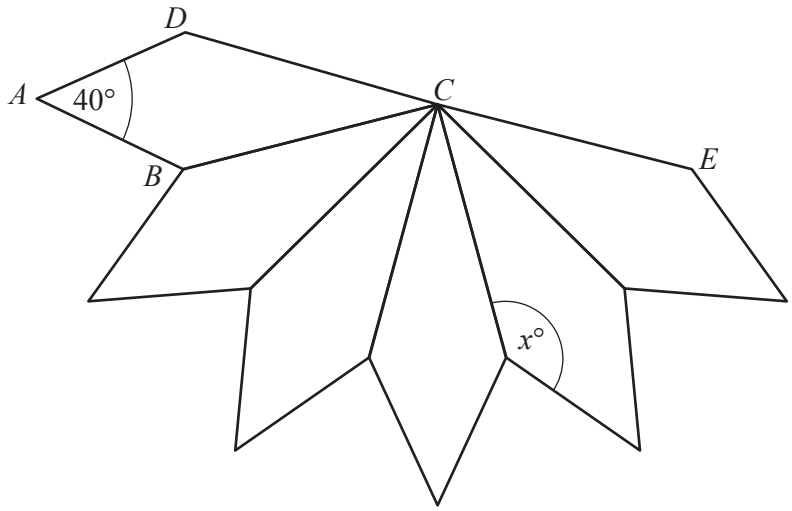
(a) $\sqrt[3]{343} - \sqrt{40.96}$

..... [1]

(b) $(192 + 4 \times 16)^{1.25}$

..... [1]

6



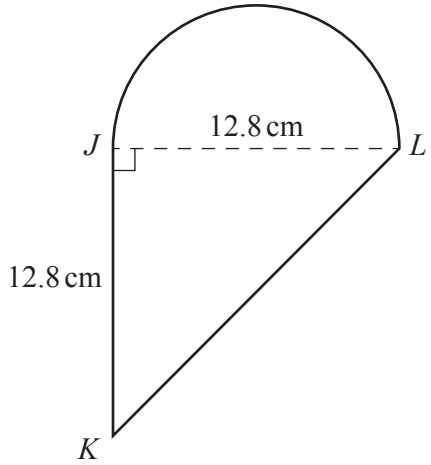
NOT TO SCALE

The diagram shows 5 kites that are congruent to kite *ABCD*.
Each kite is joined to the next kite along one edge.
Angle *DAB* = 40° and *DCE* is a straight line.

Find the value of *x*.

x = ... [3]

7



NOT TO SCALE

The diagram shows a shape made from a triangle JKL and a semicircle with diameter JL.
JKL is an isosceles right-angled triangle with $JK = JL = 12.8$ cm.

(a) Calculate the area of this shape.

..... cm^2 [3]

(b) Calculate the perimeter of this shape.

..... cm [4]

8 These are the first five terms of a sequence.

11 18 25 32 39

Find an expression for the nth term of the sequence.

..... [2]

9 The value of a car is \$8000.
Each year the value of the car decreases exponentially by 25%.

Calculate the value of this car after 3 years.

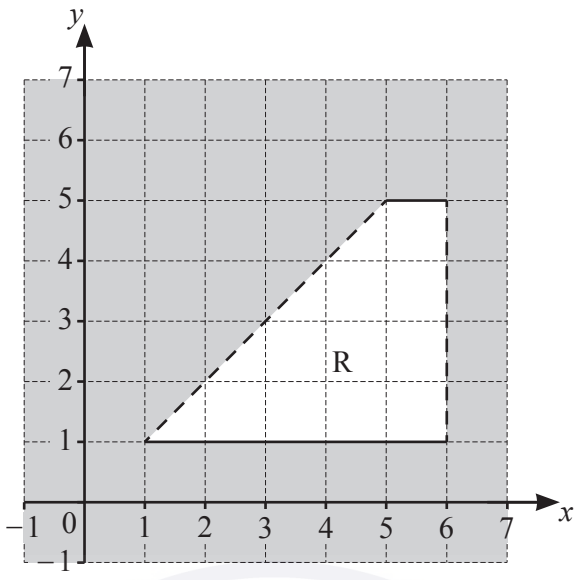
\$ ..... [2]

10 Amir invests \$1500 in an account.
The account pays compound interest at a rate of r % per year.
At the end of 8 years the value of his investment is \$1656.73 .

Find the value of r.

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

11



Find the inequalities that define the unshaded region, R.

..... [4]

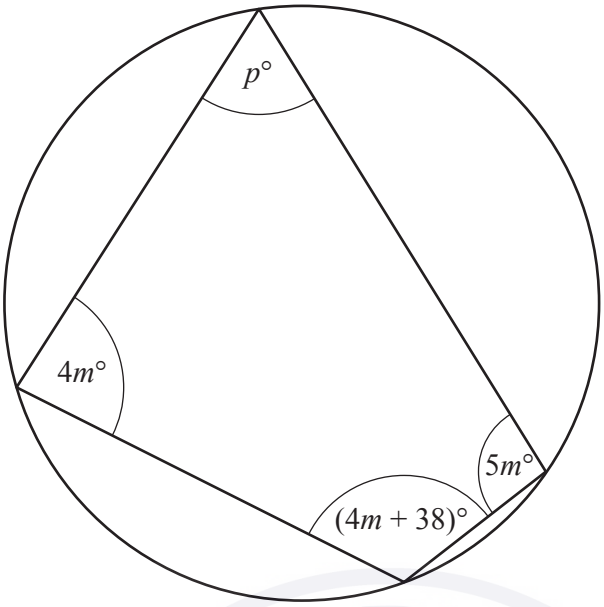
12 Solve the simultaneous equations.
You must show all your working.

$$\frac{3x}{2} + 5y = 5$$
$$4x - 3y = 46$$

$x =$ .....

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

13



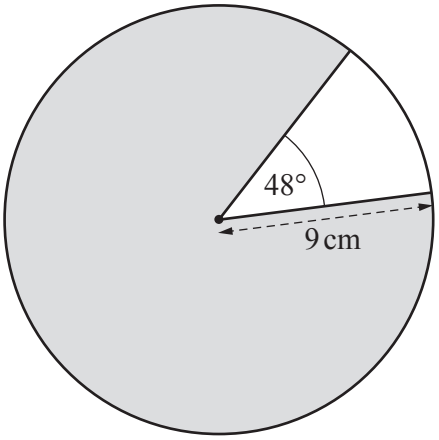
NOT TO SCALE

The diagram shows a cyclic quadrilateral.

Find the value of p.

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

14



NOT TO SCALE

The diagram shows a circle with radius 9 cm.

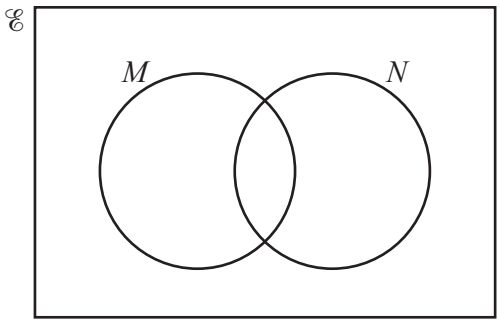
Calculate the area of the shaded major sector.

..... cm^2 [3]

15 Write $0.1\dot{4}\dot{6}$ as a fraction in its simplest form.
You must show all your working.

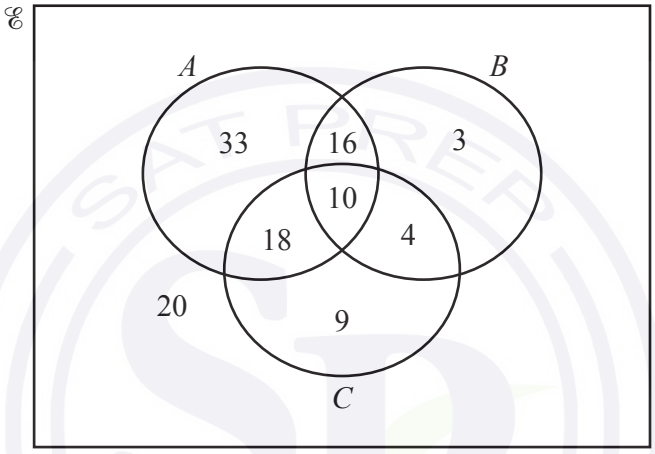
..... [3]

16 **(a)** In the Venn diagram, shade the region $M' \cap N'$.



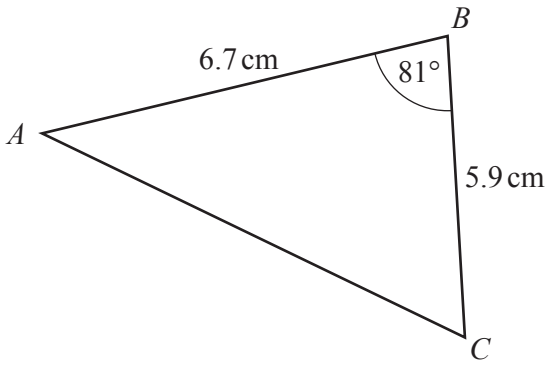
[1]

(b) Find $n(B \cap (A' \cup C))$.



..... [1]

17

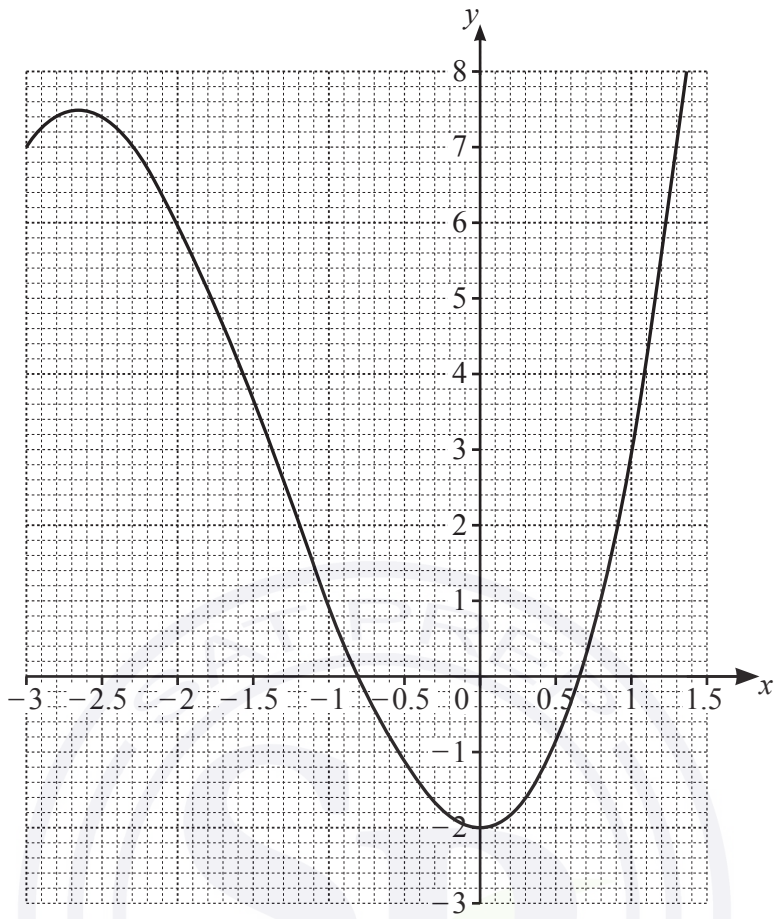


NOT TO SCALE

Calculate the area of triangle ABC.

..... cm^2 [2]

18



The diagram shows the graph of $y = x^3 + 4x^2 - 2$ for $-3 \leqslant x \leqslant 1.5$.

By drawing a suitable straight line, solve the equation $x^3 + 4x^2 - 2 = 2x$ for $-3 \leqslant x \leqslant 1.5$.

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

19 Factorise completely.

(a) $12m^2 - 75t^2$

..... [3]

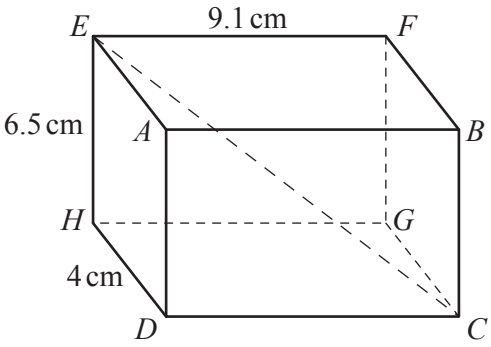
(b) $xy + 15 + 3y + 5x$

..... [2]

20 Solve the equation $8\sin x + 6 = 1$ for $0° \leqslant x \leqslant 360°$.

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

21



NOT TO SCALE

The diagram shows a cuboid.
$HD = 4$ cm, $EH = 6.5$ cm and $EF = 9.1$ cm.

Calculate the angle between CE and the base $CDHG$.

..... [4]

22 Bag *A* and bag *B* each contain red counters and blue counters only.
Stephan picks a counter at random from bag *A* and Jen picks a counter at random from bag *B*.

The probability that Stephan picks a red counter is 0.4 .
The probability that Stephan and Jen both pick a red counter is 0.25 .

Find the probability that Stephan and Jen both pick a blue counter.

..... [4]

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MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2024**

1 hour 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

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- 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages.

1 The temperature at midnight is −4 °C.
The temperature at noon is 25 °C.

Work out the difference between these two temperatures.

..... °C [1]

2 A gardener charges $6.55 for each hour he works plus a fixed charge of $15.50 .

Calculate the total amount he charges when he works for 4 hours.

$ ..... [2]

3 A delivery driver records the number of pizzas she delivers each month for one year.

48	44	39	28	57	22
36	41	54	57	49	52

(a) Complete the stem-and-leaf diagram.

2	
3	
4	
5	

Key: 4 | 8 represents 48 pizzas

[2]

(b) Find the median.

..... [1]

4 Jonah has \$750.
He spends $\frac{1}{4}$ of this money on travel and some of this money on food.
He now has \$437.50 .

Work out the fraction of the \$750 he spends on food.

..... [3]

5 The table shows part of a tram timetable.

Newpoint	Westhill
10 30	11 17
12 18	
13 30	14 17

All the trams take the same number of minutes to complete the journey from Newpoint to Westhill.

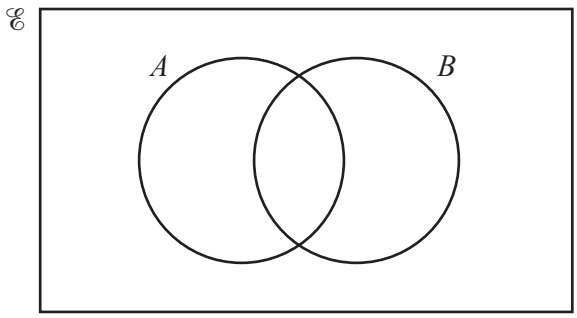
Complete the table.

[2]

6 Write 0.04628 correct to 2 significant figures.

..... [1]

7



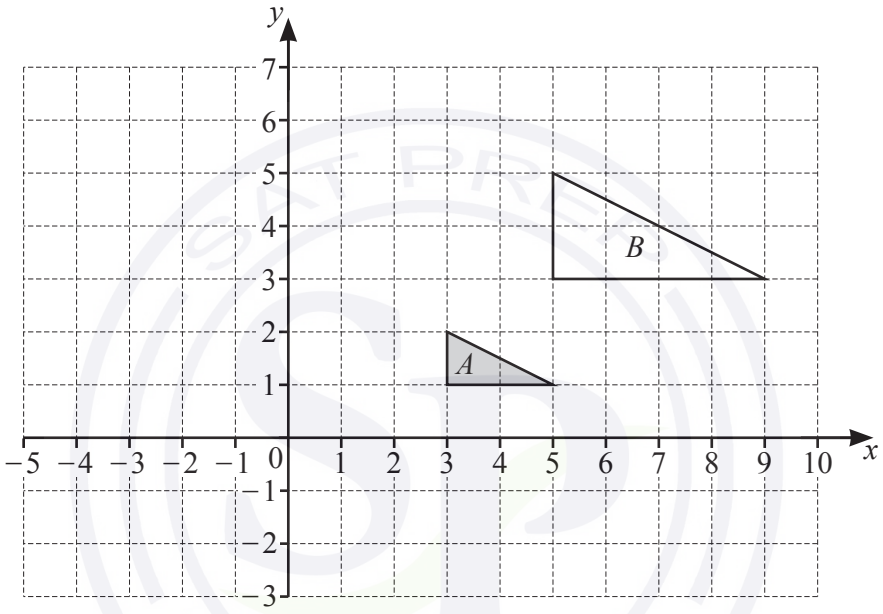
On the Venn diagram, shade the region $A \cup B$. [1]

8 Kai invests \$5000 in an account paying simple interest at a rate of r% per year.
At the end of 8 years, the value of his investment is \$5700.

Find the value of r.

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

9



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

.....

..... [3]

(b) On the grid, draw the image of triangle A after a translation by the vector $\begin{pmatrix} -4 \\ 3 \end{pmatrix}$. [2]

10 Write 174 000 in standard form.

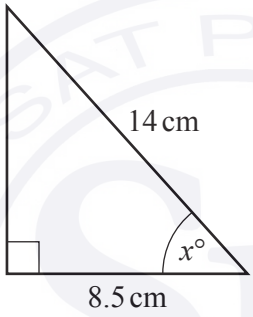
..... [1]

11 A company surveys 40 of its employees.
In the survey, 3 employees say they walk to work.
The company has a total of 1240 employees.

Find the expected number of employees in the company who walk to work.

..... [2]

12



NOT TO SCALE

The diagram shows a right-angled triangle.

Calculate the value of x.

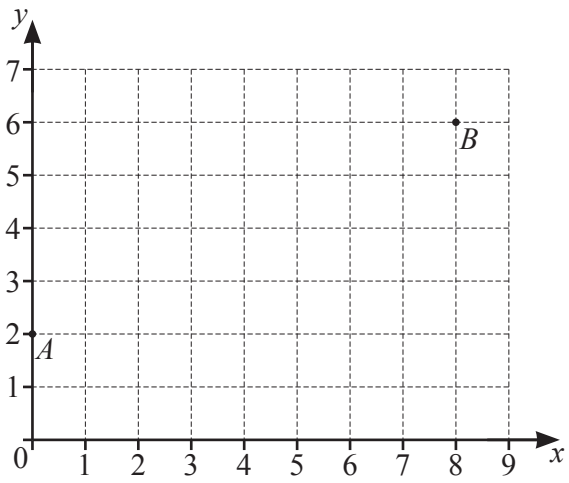
$x =$ ..... [2]

13 **Without using a calculator**, work out $2\frac{1}{4} \div 1\frac{7}{8}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

14



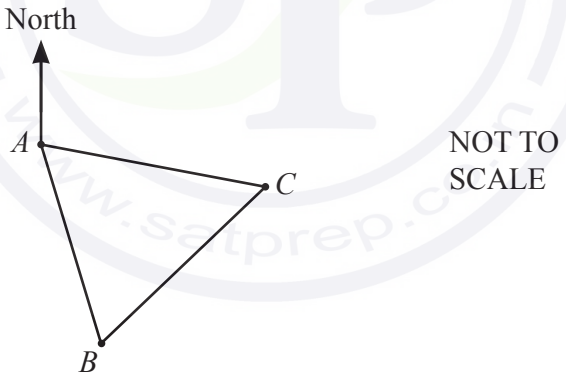
A is the point (0, 2) and B is the point (8, 6).

Find the equation of line AB.

Give your answer in the form $y = mx + c$.

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

15

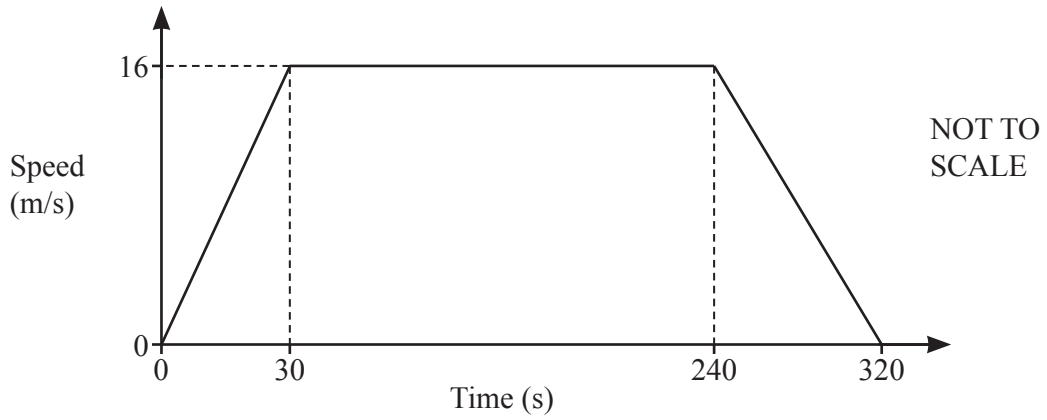


Three towns, A, B and C, are equidistant from each other.
The bearing of C from A is 104°.

Calculate the bearing of B from C.

..... [3]

16 The speed–time graph shows information about a car journey.



(a) Find the deceleration of the car between 240 and 320 seconds.

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

(b) Calculate the total distance the car travels during the 320 seconds.

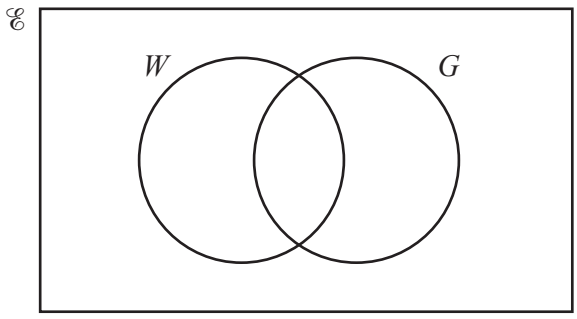
..... m [3]

17 W = {students who walk to school}
G = {students who wear glasses}

There are 20 students in a class.

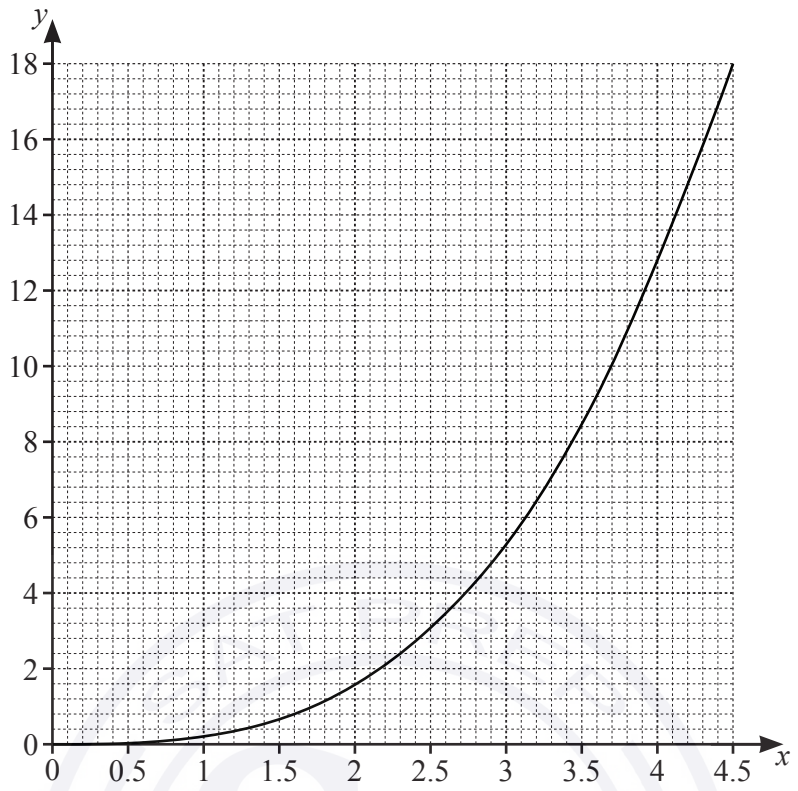
- 8 walk to school
- 3 wear glasses and walk to school
- 2 do not wear glasses and do not walk to school.

Complete the Venn diagram.



[2]

18



The graph of $y = f(x)$ is drawn on the grid.

(a) Draw the tangent to the graph at the point $x = 3$. [1]

(b) Use your tangent to find an estimate for the gradient of the curve at the point $x = 3$.

..... [2]

19 **(a)** y is directly proportional to $(x-1)^2$.
When $x = 4$, $y = 3$.

Find y when $x = 7$.

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

(b) m is inversely proportional to the square root of p.

Explain what happens to the value of m when the value of p is multiplied by 9.

..... [1]

20 Two parcels are mathematically similar.
The larger parcel has volume $80\,\text{cm}^3$ and height $5.2\,\text{cm}$.
The smaller parcel has volume $33.75\,\text{cm}^3$.

Calculate the height of the smaller parcel.

..... cm [3]

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

$$4y + 3x = 13$$
$$y = x^2 - 18$$

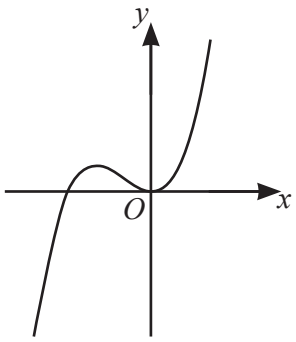
$x =$ ..... $y =$ .....

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

[Turn over

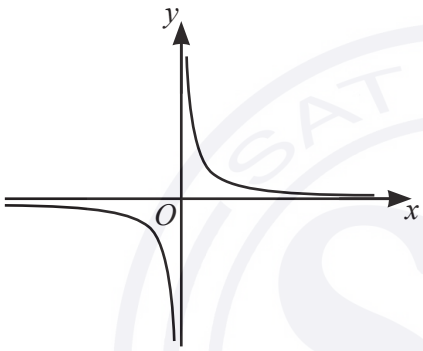
22 **(a)** For each sketch, put a ring around the correct type of function shown.

(i)



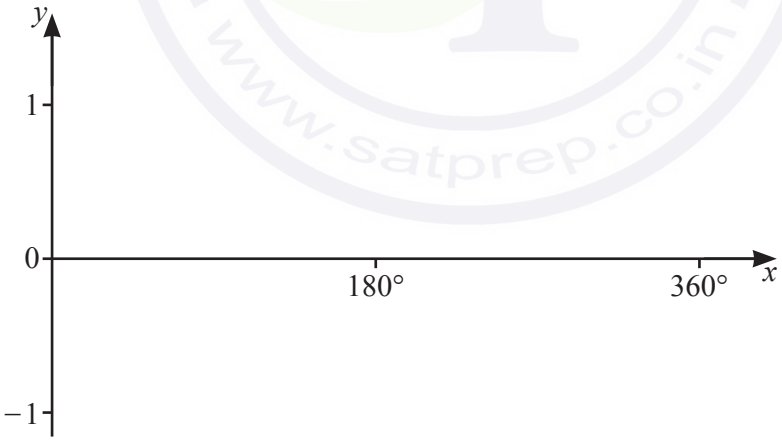
linear cubic quadratic reciprocal exponential [1]

(ii)



linear cubic quadratic reciprocal exponential [1]

(b) **(i)** On the grid, sketch the curve $y = \sin x$ for $0° \leqslant x \leqslant 360°$.

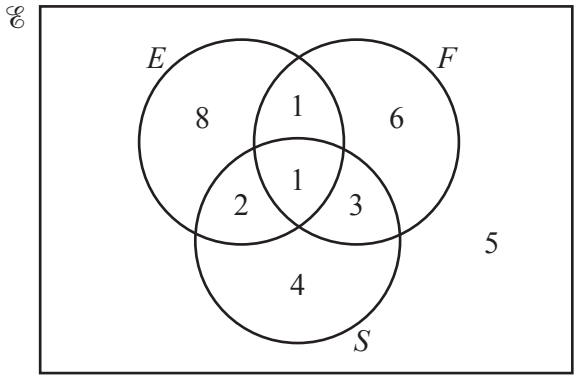


[2]

(ii) Solve the equation $\sin x + 0.4 = 0$ for $0° \leqslant x \leqslant 360°$.

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

23



The Venn diagram shows information about the number of students in a class.
Some study English (E), some study French (F), some study Spanish (S) and some do not study any of these languages.

(a) Find $\mathrm{n}\left((E \cup F)' \cup S\right)$.

..... [1]

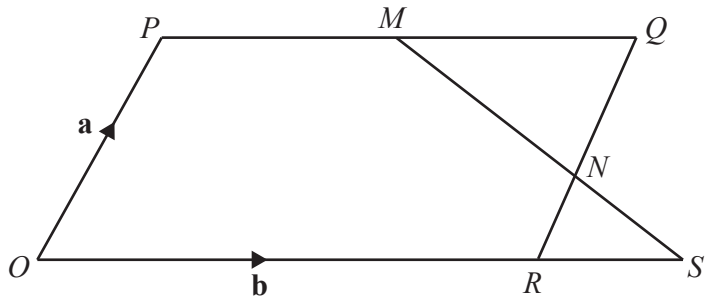
(b) One student is picked at random from those who study Spanish.

Find the probability that this student studies exactly two languages.

..... [2]

Question 24 is printed on the next page.

24



NOT TO SCALE

O is the origin and $OPQR$ is a parallelogram.
M is the midpoint of PQ and N divides QR in the ratio 2 : 1.
$\overrightarrow{OP} = \mathbf{a}$ and $\overrightarrow{OR} = \mathbf{b}$.

(a) Find $\overrightarrow{MN}$.
Give your answer in terms of **a** and/or **b** and in its simplest form.

$\overrightarrow{MN} =$ ..... [2]

(b) The lines MN and OR are extended to meet at S.

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

..... [3]

* 0019655329601 *

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MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2024**

1 hour 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Any blank pages are indicated.

DC (PQ/SG) 329287/2

[Turn over

1 Write the number two million two thousand and two in figures.

..... [1]

2 Put one pair of brackets into this calculation to make it correct.

$$5 - 4 \times 3 - 9 - 2 = 0$$

[1]

3 Simplify.

$7x - 8y - x - y$

..... [2]

4 The base of a cuboid measures 10 cm by 7 cm.
The volume of the cuboid is 280 cm^3.

Calculate the height of the cuboid.

..... cm [2]

5 In a city, the probability that it will rain today is 0.15 .

Find the probability that it will not rain today in this city.

..... [1]

6 Factorise completely.

$4x^2y - 5xy^2$

..... [2]

7 The scale of a map is 1 : 40 000.
On the map the distance between two villages is 37 cm.

Calculate the actual distance between the two villages.
Give your answer in kilometres.

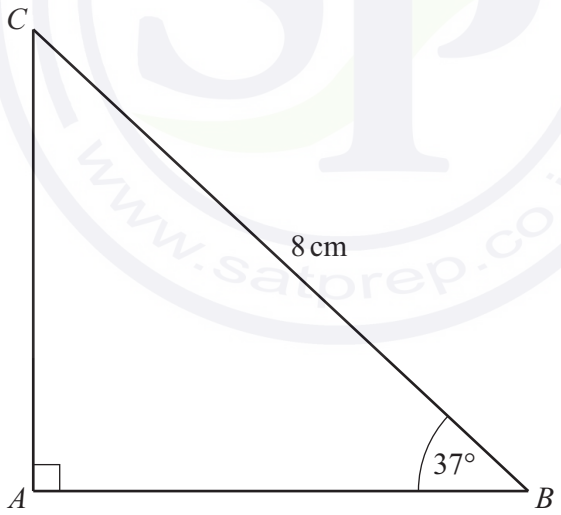
..... km [2]

8 **Without using a calculator**, work out $\frac{3}{7} - \frac{1}{14}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [2]

9



The diagram shows a right-angled triangle.

Calculate AB.

$AB =$ ..... cm [2]

10 Find the gradient of the line joining the points $(-2, 7)$ and $(3, 1)$.

..... [2]

11 Solve the simultaneous equations.

$$5t - 2w = 19$$
$$3t + 2w = 5$$

$t =$ .....

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

12 Simplify.

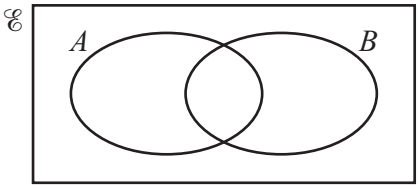
(a) $\dfrac{32g^{16}}{16g^{8}}$

..... [2]

(b) $\left(625k^{8}\right)^{\frac{3}{4}}$

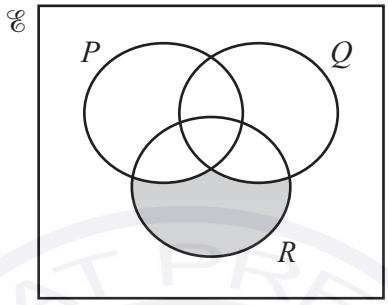
..... [2]

13 (a)



Shade the region $A \cup B'$. [1]

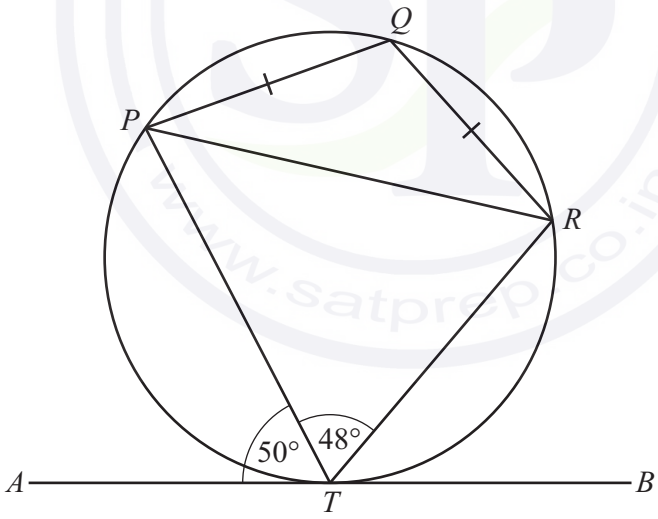
(b)



Use set notation to describe the shaded region.

..... [1]

14



NOT TO SCALE

P, Q, R and T are points on the circle.
AB is a tangent to the circle at T.
Angle $ATP = 50°$, angle $PTR = 48°$ and $PQ = QR$.

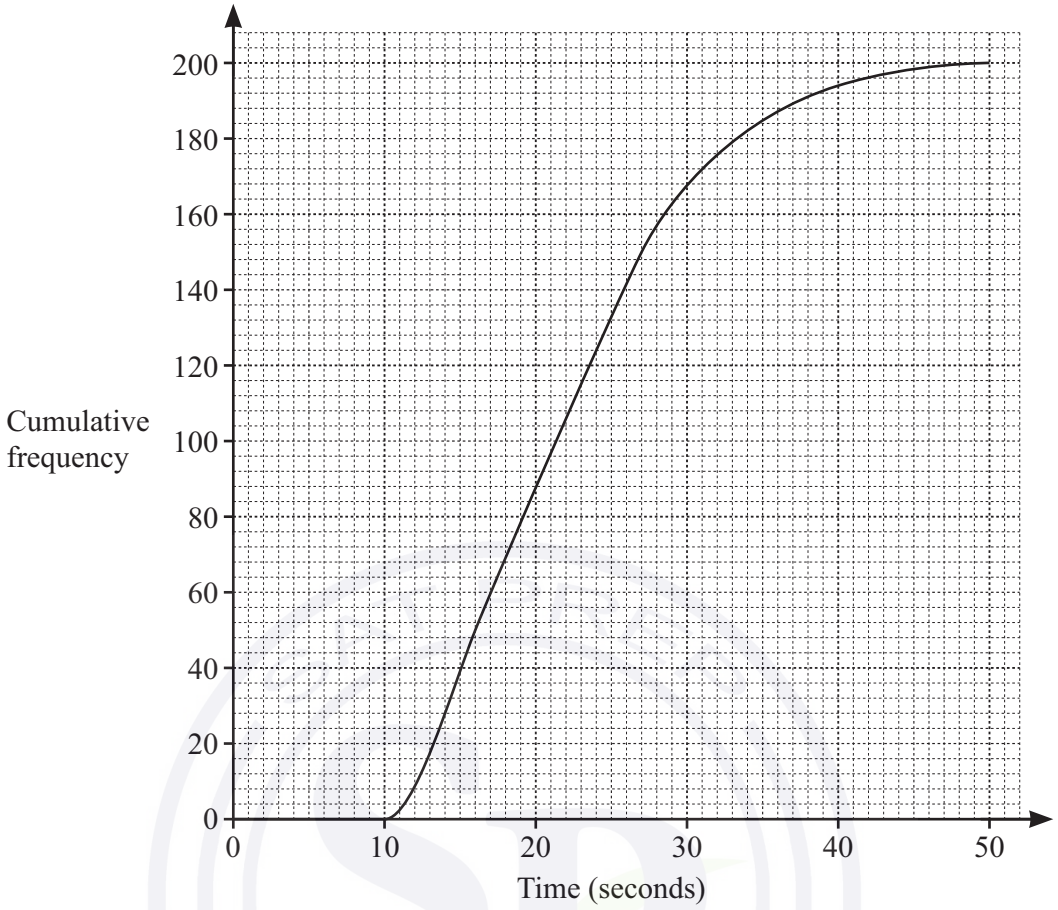
(a) Find angle PRT.

Angle $PRT =$ ..... [1]

(b) Find angle QPR.

Angle $QPR =$ ..... [2]

15



The time taken for each of 200 students to complete a calculation is measured.
The cumulative frequency diagram shows the results.

Use the diagram to find an estimate for

(a) the interquartile range

..... s [2]

(b) the number of students taking more than 40 seconds to complete the calculation.

..... [2]

16 $A = \pi r^2 + \pi dh$

Rearrange the formula to make h the subject.

$h =$ ..... [2]

17 Work out, giving each answer in standard form.

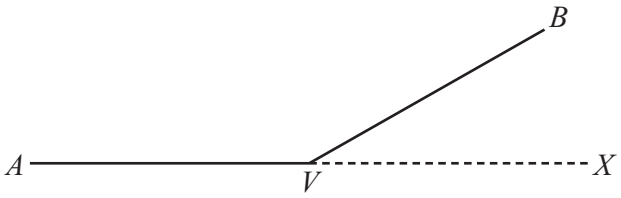
(a) $\left(2.1 \times 10^{101}\right) \times \left(8 \times 10^{101}\right)$

..... [2]

(b) $\left(2.1 \times 10^{101}\right) + \left(2.1 \times 10^{100}\right)$

..... [2]

18



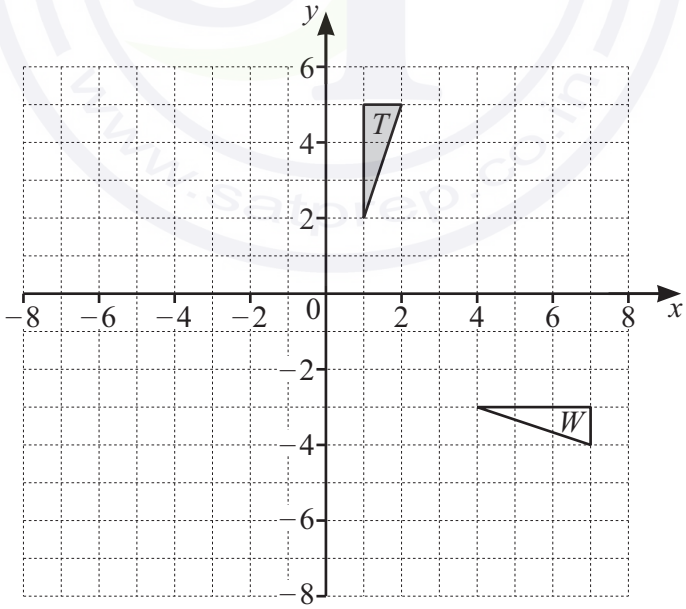
NOT TO SCALE

The diagram shows two sides, VA and VB, of a regular polygon.
AVX is a straight line.
Angle $BVX = y°$ and angle $AVB = 11.5y°$.

Find the number of sides of this polygon.

..... [3]

19



(a) Describe fully the **single** transformation that maps triangle T onto triangle W.

.....

..... [3]

(b) Draw the enlargement of triangle T with scale factor -2 and centre of enlargement $(-1, 1)$. [2]

20 $f(x) = 3^x + 2$

(a) Find x when $f(x) = 245$.

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

(b) Find x when $f^{-1}(x) = 7$.

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

21 Write the recurring decimal $0.4\dot{1}$ as a fraction in its simplest form.
You must show all your working.

..... [2]

22 Solve the equation $\tan x + \sqrt{3} = 0$ for $0° \leqslant x \leqslant 360°$.

..... [3]

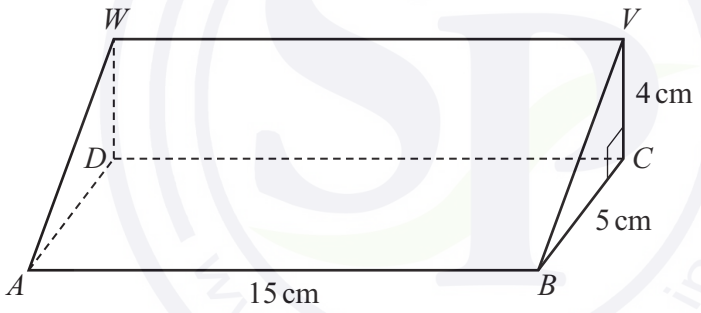
23 Simplify.

$$\frac{2}{y+1} - \frac{3}{y}$$

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

..... [3]

24



NOT TO SCALE

The diagram shows a triangular prism with cross-section triangle BCV.
Angle $BCV = 90°$, $BC = 5\,\text{cm}$, $CV = 4\,\text{cm}$ and $AB = 15\,\text{cm}$.

Calculate the angle between AV and the base $ABCD$.

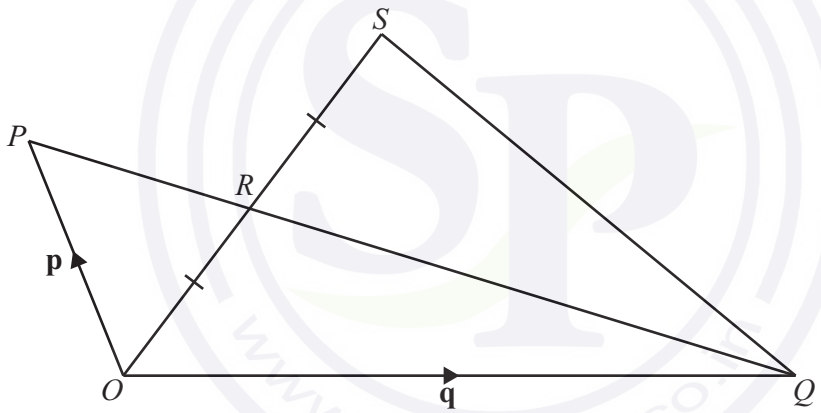
..... [4]

25 Simplify.

$$\frac{pt-p-t+1}{1-t^2}$$

..... [4]

26



NOT TO SCALE

In the diagram, O is the origin.
$\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OQ} = \mathbf{q}$.
R is the point of intersection of PQ and OS, with $PR : RQ = 1 : 2$ and $OR = RS$.

Find the position vector of S in terms of $\mathbf{p}$ and $\mathbf{q}$.
Give your answer in its simplest form.

..... [4]

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MATHEMATICS **0580/22**

Paper 2 (Extended) **February/March 2024**

1 hour 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.
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- 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages.

1 A night bus runs from 21 50 to 05 18 the next day.

Work out the number of hours and minutes that the night bus runs.

..... h ..... min [1]

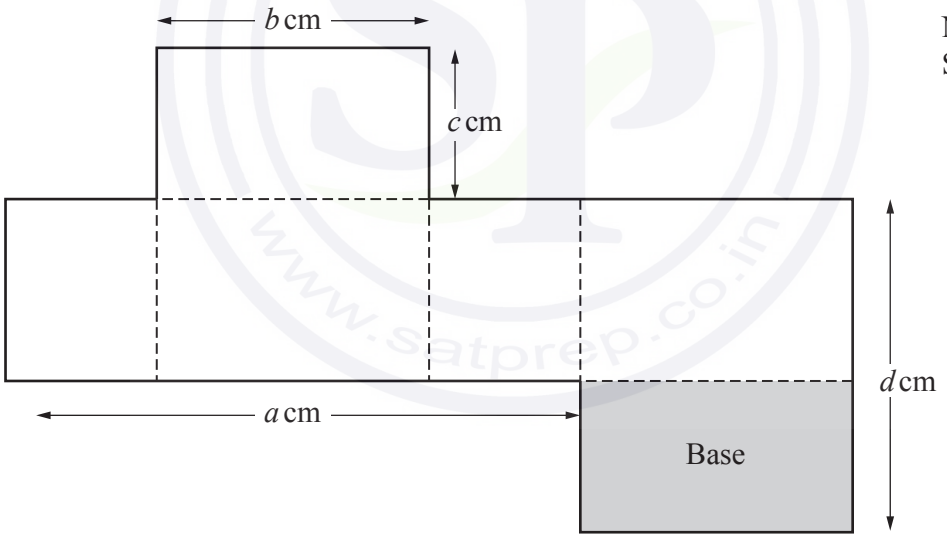
2 Calculate $\sqrt{5.76} + 2.8^3$.

..... [1]

3 Simplify $4m + 7k - m + 3k$.

..... [2]

4



NOT TO SCALE

The diagram shows the net of a cuboid with its base shaded.
The length of the cuboid is 10 cm, its width is 4 cm and its height is 5 cm.

Write down the values of each of a, b, c and d.

$a =$ ....., $b =$ ....., $c =$ ....., $d =$ ..... [4]

5 There are 20 cars in a car park and 3 of the cars are blue.

(a) James wants to draw a pie chart to show this information.

Find the angle of the sector for the blue cars in this pie chart.

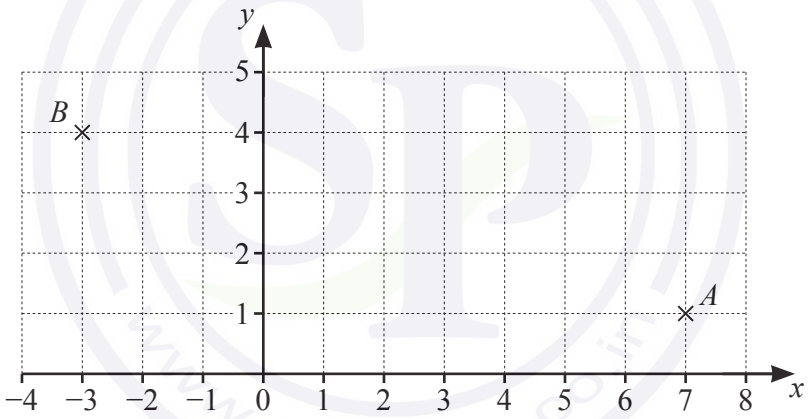
..... [2]

(b) One of the 20 cars is picked at random.

Find the probability that this car is **not** blue.

..... [1]

6



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

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

7 As the temperature increases, the number of people who go swimming increases.

Write down the type of correlation that this statement describes.

..... [1]

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

Find the first three terms of this sequence.

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

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

1 3 9 27 81

Find the nth term of this sequence.

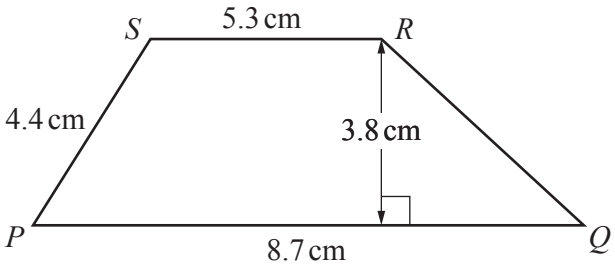
..... [2]

9 The line $y = 2x - 5$ intersects the line $y = 3$ at the point P.

Find the coordinates of the point P.

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

10



NOT TO SCALE

The diagram shows a trapezium *PQRS*.

Calculate the area of the trapezium.

..... cm^2 [2]

11 **Without using a calculator**, work out $1\frac{1}{4} - \frac{5}{6}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [3]

12 Farid spins a three-sided spinner with sides labelled *A*, *B* and *C*.
The probability that the spinner lands on *C* is 0.35 .
Farid spins the spinner 40 times.

Calculate the number of times he expects the spinner to land on *C*.

..... [1]

13 The bearing of *B* from *A* is 107°.

Calculate the bearing of *A* from *B*.

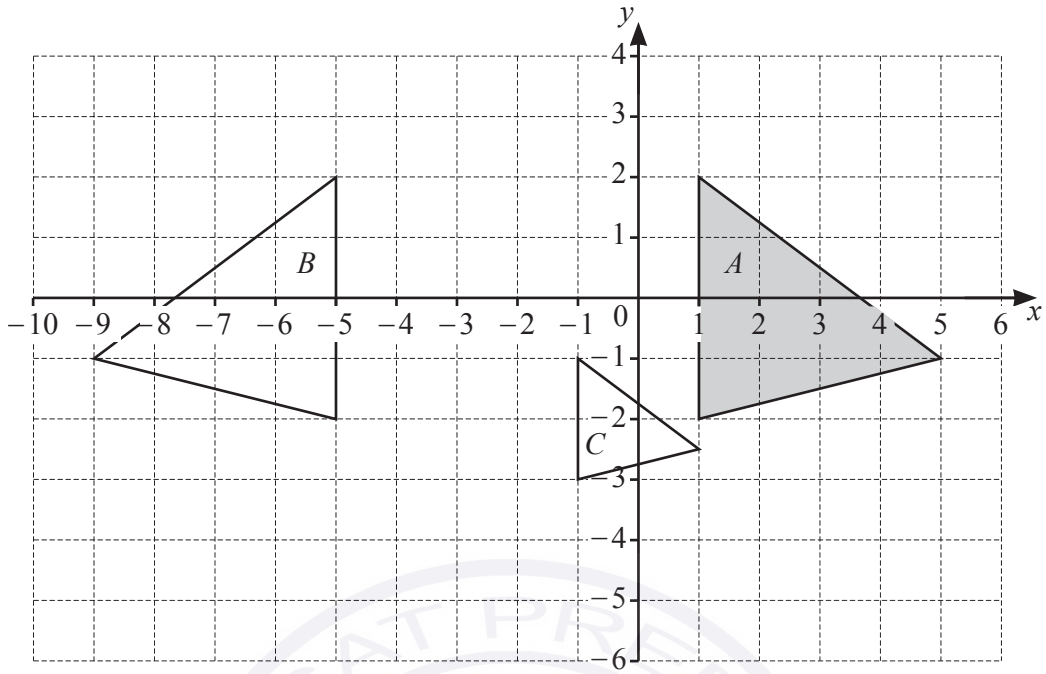
..... [2]

14 A train, 1750 metres long, is travelling at 55 km/h.

Calculate how long it will take for the whole train to completely cross a bridge that is 480 metres long.
Give your answer in seconds, correct to the nearest second.

..... s [3]

15



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

(i) triangle *A* onto triangle *B*

.....

..... [2]

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

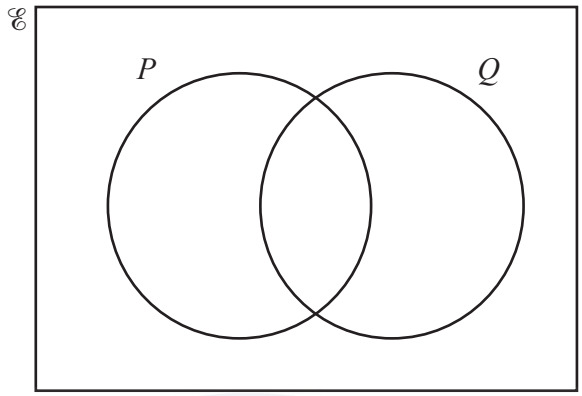
.....

..... [3]

(b) Draw the image of triangle *A* after a rotation, 90° clockwise, about (1, 3). [2]

16 x is an integer.

$\mathscr{E} = \{x : 1 \leqslant x \leqslant 10\}$
$P = \{x : x \text{ is an even number}\}$
$Q = \{x : x \text{ is a multiple of } 5\}$



Complete the Venn diagram. [2]

17 The height of each of 200 people is measured.
The table shows the results.

Height (h cm)	$100 < h \leqslant 120$	$120 < h \leqslant 130$	$130 < h \leqslant 150$	$150 < h \leqslant 190$
Frequency	32	55	64	49

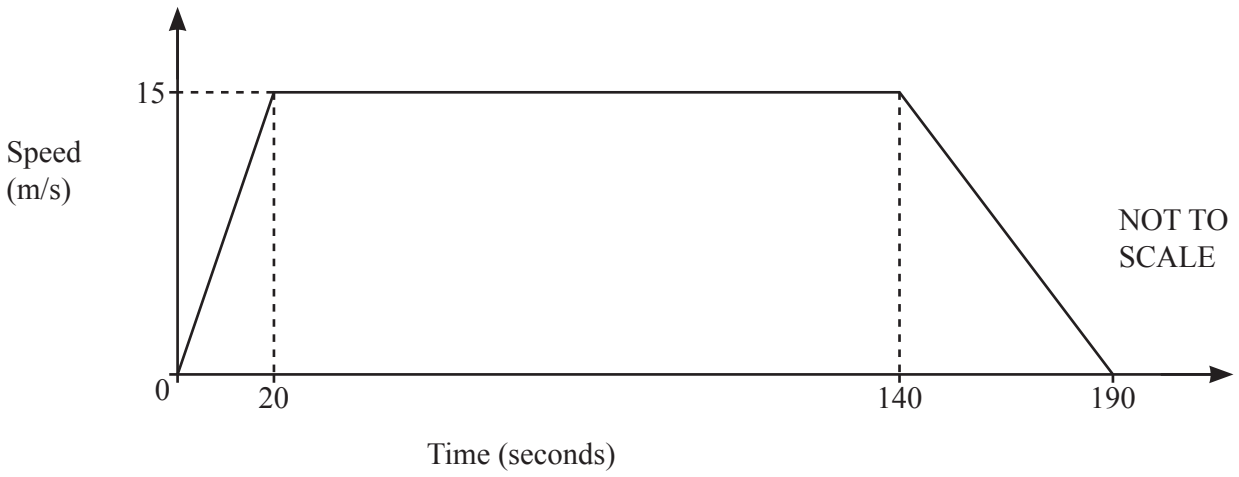
Calculate an estimate of the mean height.

..... cm [4]

18 Find the highest common factor (HCF) of $28x^5$ and $98x^3$.

..... [2]

19

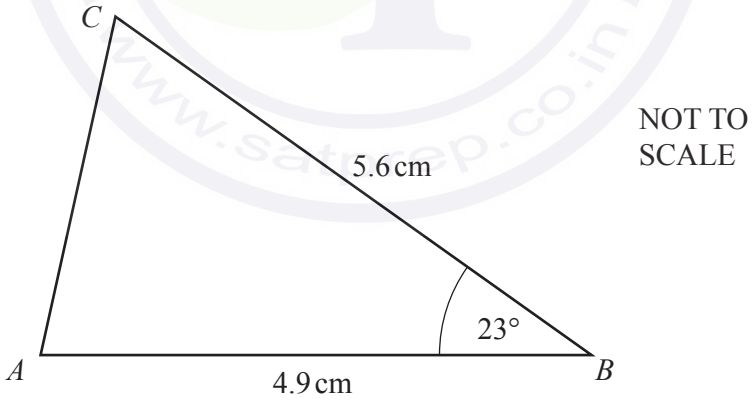


The speed–time graph shows information about a bus journey.

Calculate the total distance travelled by the bus.

..... m [3]

20



Calculate the area of triangle *ABC*.

..... cm^2 [2]

21 **(a)** $\sqrt[5]{3} = 3^h$

Write down the value of h.

$h =$ ..... [1]

(b) Simplify $\left(4x^3\right)^3$.

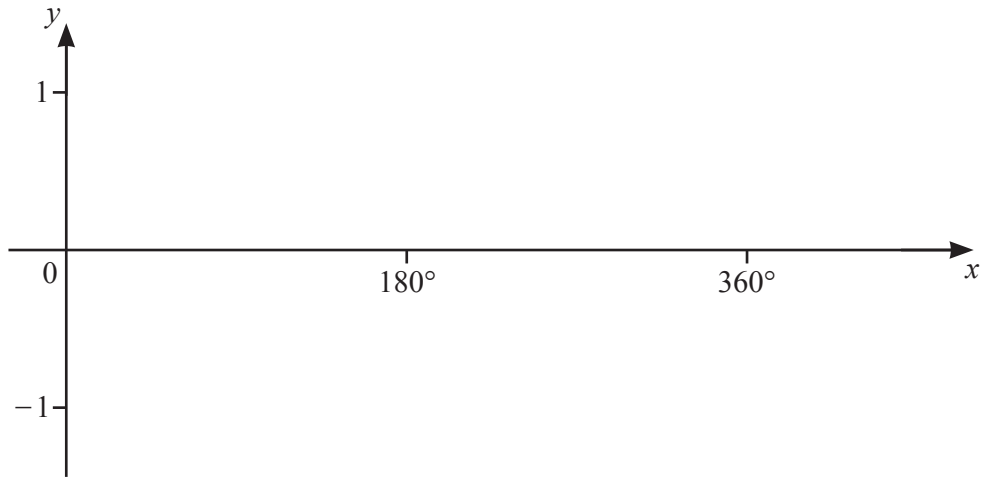
..... [2]

22 y is inversely proportional to the square of $(x+3)$.
When $x = 5$, $y = 0.375$.

Find y in terms of x.

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

23 **(a)** On the axes, sketch the graph of $y = \cos x$, for $0° \leqslant x \leqslant 360°$.



[2]

(b) Solve the equation $\cos x = 0.294$ for $0° \leqslant x \leqslant 360°$.

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

24 $x^2 - 16x + a$ can be written in the form $(x + b)^2$.

Find the value of a and the value of b.

$a =$ .....

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

Questions 25 and 26 are printed on the next page.

25 A bag contains 2 green buttons, 5 red buttons and 6 blue buttons.
Two buttons are taken at random from the bag without replacement.

Calculate the probability that the two buttons are different colours.

..... [4]

26 A is the point (6, 1) and B is the point (2, 7).

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

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

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MATHEMATICS **0580/21**

Paper 2 (Extended) **October/November 2023**

1 hour 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.
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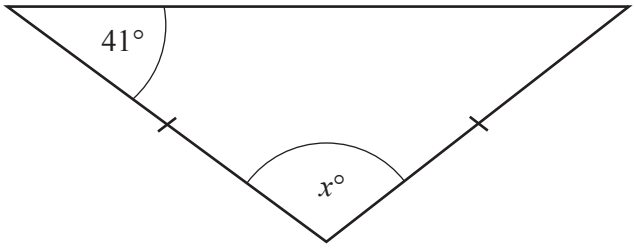
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages.

1 The diagram shows an isosceles triangle.



NOT TO SCALE

Find the value of x.

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

2 The stem-and-leaf diagram shows the time, in minutes, it takes each of 15 people to complete a race.

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

Key: 1 | 6 represents 16 minutes

Find

(a) the mode

..... min [1]

(b) the range

..... min [1]

(c) the median.

..... min [1]

3 Complete these statements.

(a) When $x =$ ..... , $x+3=8$.

[1]

(b) When $7y=63$, $10y =$ .....

[1]

4 The table shows some information about Amir's shopping.

Fruit	Cost per kilogram	Number of kilograms Amir buys	Cost
Oranges	\$2.35	3.2	\$.....
Bananas	\$.....	2.8	\$.....
		Total	\$13.54

Complete the table.

[3]

5 Factorise completely.

(a) $42mk-35m$

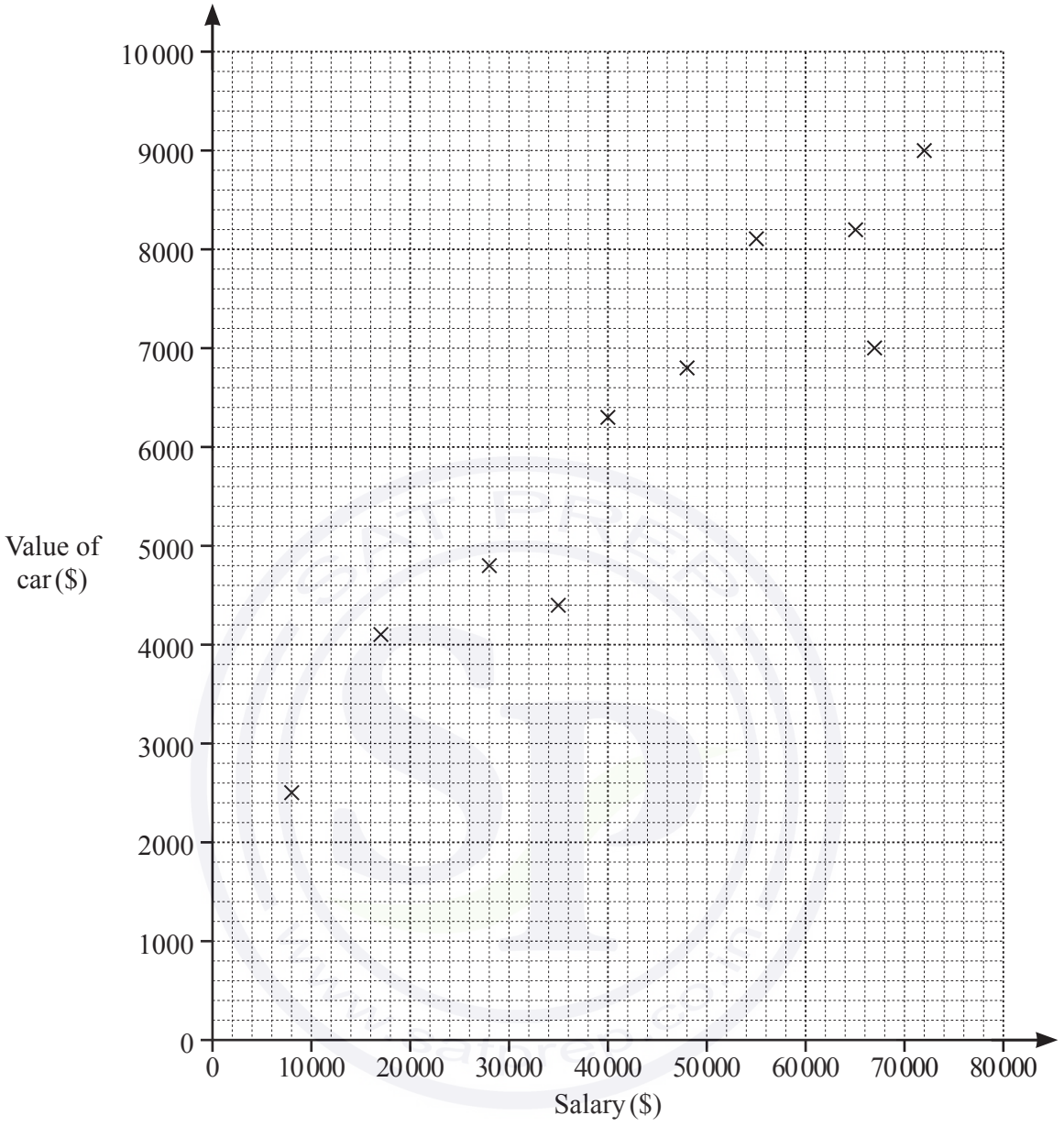
..... [2]

(b) h^2-144

..... [1]

[Turn over

6 For each of 10 people working in an office, the scatter diagram shows their salary and the value of their car.



(a) One of these people has a salary of $28 000.

Find the value of their car.

$ ..... [1]

(b) Another person starts to work in the office.
Their salary is $54 000 and the value of their car is $6100.

Plot this information on the scatter diagram. [1]

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

..... [1]

7 The exchange rate between Singapore dollars and euros is 1 Singapore dollar = 0.62 euros.

Find the value of 161.20 euros in Singapore dollars.

..... Singapore dollars [1]

8 Calculate.

$$7\frac{3}{11} \times 3\frac{3}{10}$$

..... [1]

9 Find the highest common factor (HCF) of 140 and 126.

..... [2]

10 Simplify.

(a) $n^5 \times n$

..... [1]

(b) $8x^6 \div 2x^2$

..... [2]

(c) $(243y^{20})^{\frac{2}{5}}$

..... [2]

11 Solve.

$$4(2x-3) \geqslant 43+3x$$

..... [3]

12 Write $0.4\dot{2}$ as a fraction in its simplest form.
You must show all your working.

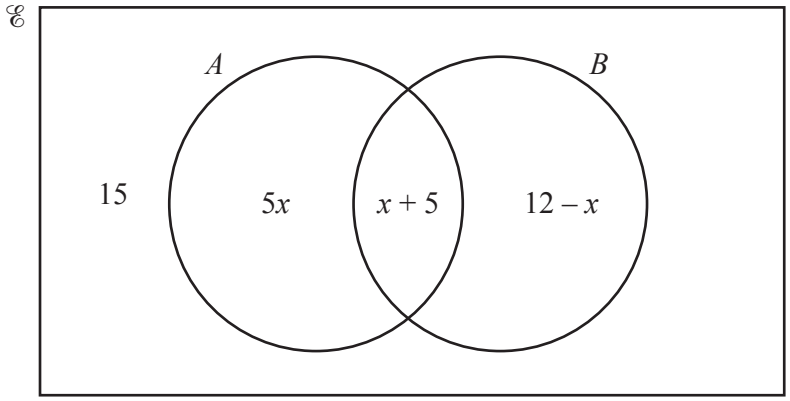
..... [3]

13 At the end of 2021 there were 27 000 rhinos living in the wild.
The number of rhinos is expected to decrease exponentially by 3% each year.

Work out the number of rhinos expected to be living in the wild 4 years later, at the end of 2025.
Give your answer correct to the nearest whole number.

..... [3]

14 (a)

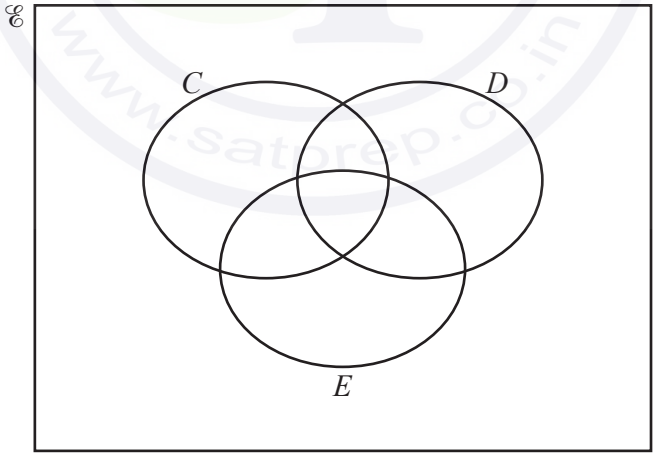


The Venn diagram shows information about the number of elements in sets A, B and $\mathscr{E}$.
$n(\mathscr{E}) = 52$.

Find $n(A \cap B)$.

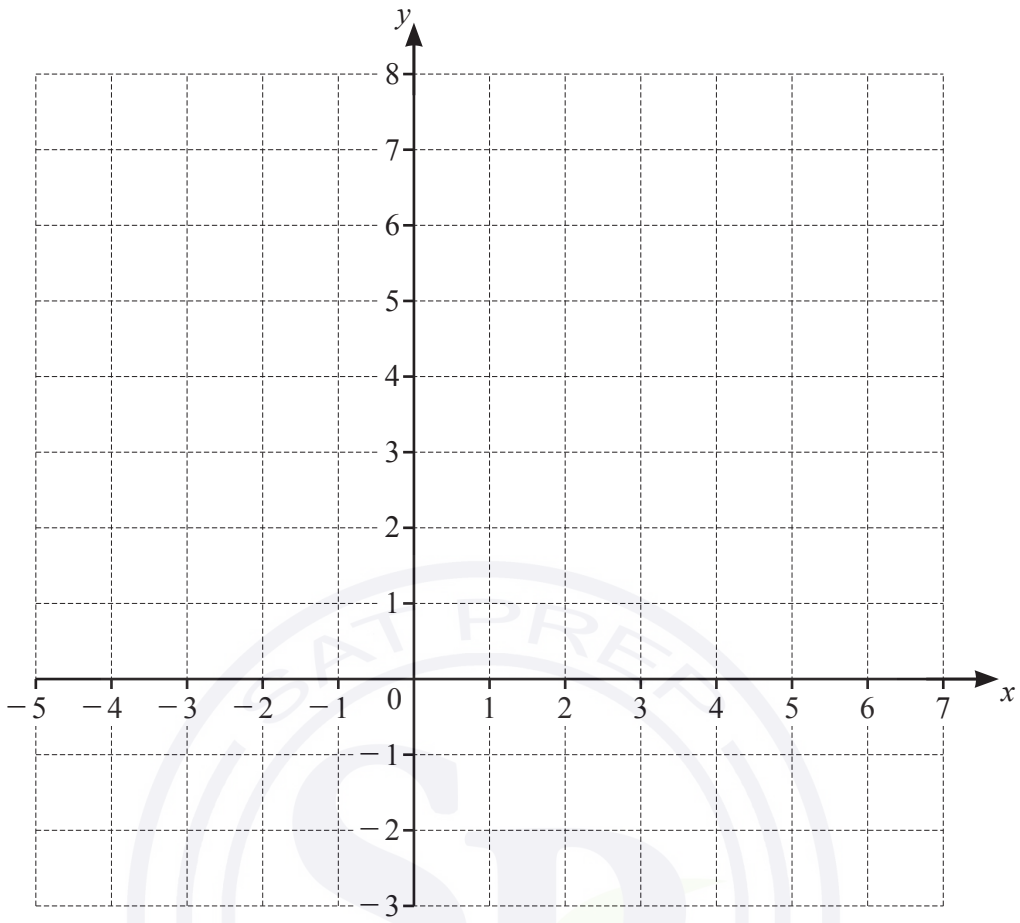
..... [3]

(b) In this Venn diagram, shade the region $C \cap D \cap E$.



[1]

15



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

$y > 1$ $x \leqslant 2$ $y \geqslant x + 2$

[5]

16 $P = 2w + 2h$

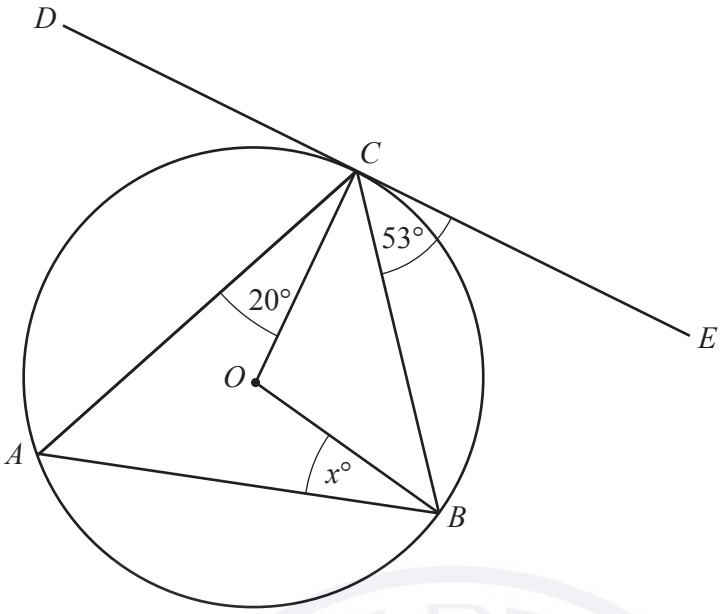
$w = 11$ and $h = 9.5$, both correct to 2 significant figures.

Find the lower bound and the upper bound for P.

Lower bound = ...

Upper bound = ... [3]

17



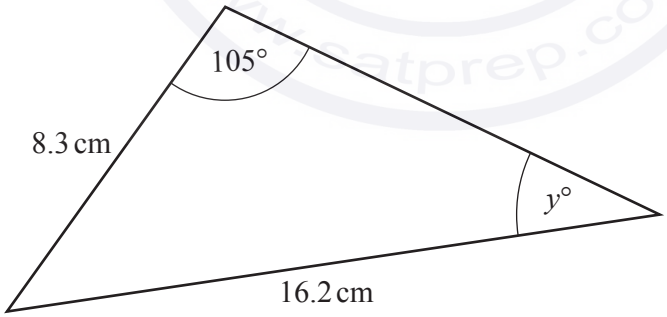
NOT TO SCALE

A, B and C are points on the circumference of a circle, centre O.
Tangent DE touches the circle at C.
Angle $BCE = 53°$ and angle $ACO = 20°$.

Find the value of x.

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

18



NOT TO SCALE

Calculate the value of y.

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

19 (a)

Sketch the graph of $y = \cos x$ for $0° \leqslant x \leqslant 360°$.

[2]

(b) When $\cos x = 0.21$, find the **reflex** angle x.

..... [2]

20 Write as a single fraction in its simplest form.

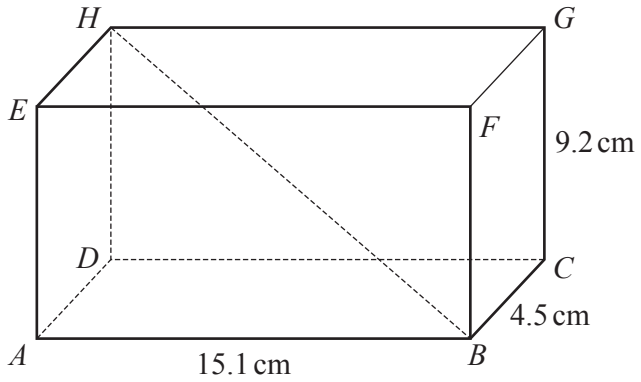
(a) $\dfrac{10x^2 - 60x}{x^2 - x - 30}$

..... [3]

(b) $\dfrac{7}{x+3} + \dfrac{5}{8x-1}$

..... [3]

21



NOT TO SCALE

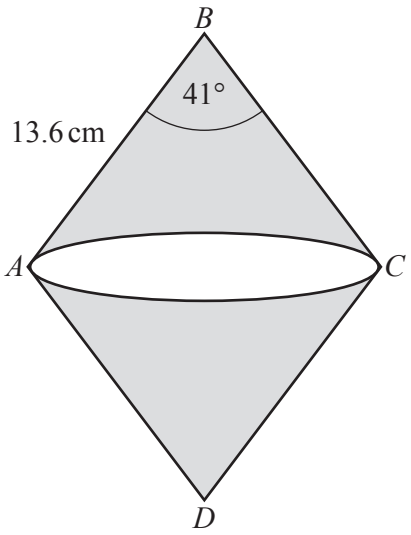
The diagram shows a cuboid $ABCDEFGH$.
$AB = 15.1$ cm, $BC = 4.5$ cm and $CG = 9.2$ cm.

Calculate the angle that the diagonal BH makes with the face $ADHE$.

..... [4]

Question 22 is printed on the next page.

22



NOT TO SCALE

ABCD is a rhombus with side length 13.6 cm.
Angle $ABC = 41°$.
BAC is a sector of a circle with centre *B*.
DAC is a sector of a circle with centre *D*.

Calculate the shaded area.

..... cm^2 [4]

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MATHEMATICS **0580/22**

Paper 2 (Extended) **October/November 2023**

1 hour 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages.

1 Write 24.07839

(a) correct to 2 decimal places

..... [1]

(b) correct to the nearest 10.

..... [1]

2 Write down the number that is 9 greater than -23.

..... [1]

3 $v = u + at$

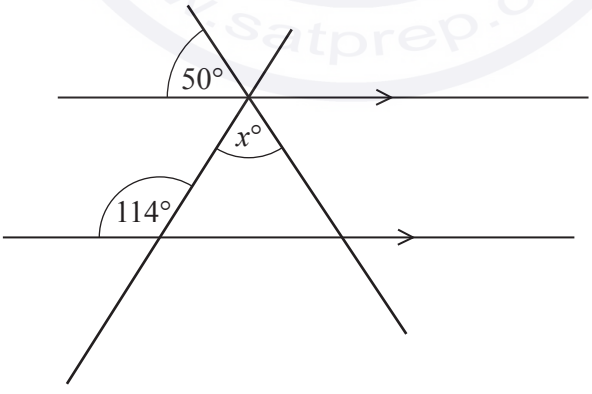
Find the value of v when $u = 30$, $a = -2$ and $t = 7$.

$v =$ ..... [2]

4 Change 62 000 millimetres into kilometres.

..... km [1]

5



NOT TO SCALE

The diagram shows two intersecting straight lines crossing two parallel lines.

Find the value of x.

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

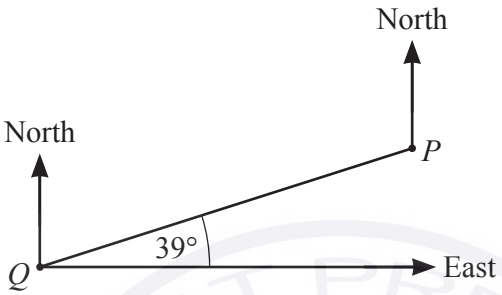
6 **(a)** Explain why 111 is not a prime number.

..... [1]

(b) Find a prime number between 110 and 120.

..... [1]

7



NOT TO SCALE

Find the bearing of Q from P.

..... [2]

8 **Without using a calculator**, work out $3\frac{1}{8} - 1\frac{3}{4}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

9 Write 90 as a product of its prime factors.

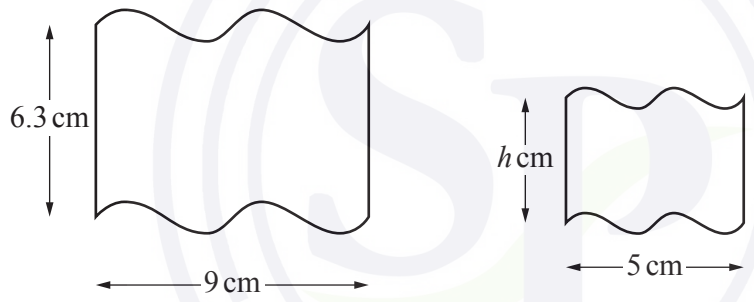
..... [2]

10 Expand and simplify.

$$2(t+w)+3(w-t)$$

..... [2]

11



NOT TO SCALE

The two shapes are mathematically similar.

(a) Find the value of h.

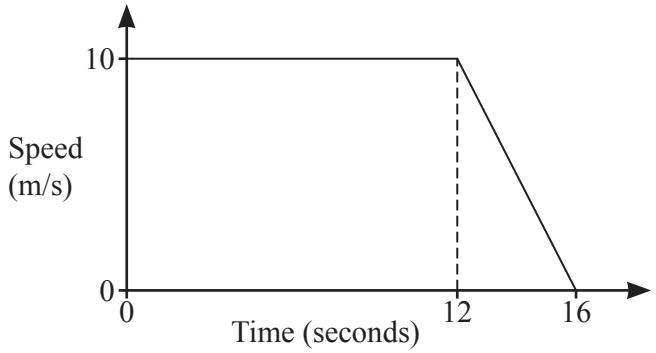
$h =$ ..... [2]

(b) The area of the smaller shape is $16\,\text{cm}^2$.

Calculate the area of the larger shape.

..... cm^2 [2]

12



NOT TO SCALE

The diagram shows a speed–time graph for 16 seconds of a car journey.

(a) Find the deceleration of the car in the final 4 seconds.

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

(b) Find the total distance travelled during the 16 seconds.

..... m [2]

13 **(a)** $3^{3p} \times 3^{2p} = 729$

Find the value of p.

$p =$ ..... [2]

(b) Simplify.

$(32x^{10})^{\frac{1}{5}}$

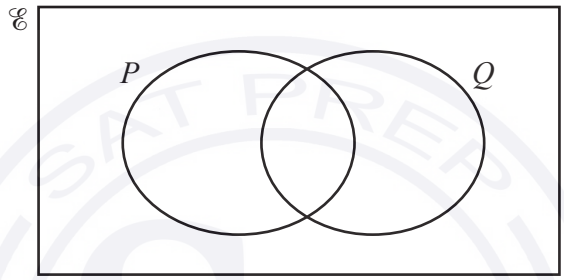
..... [2]

14 $y = 2w^2 - x$

Rearrange the formula to make w the subject.

$w =$ ..... [3]

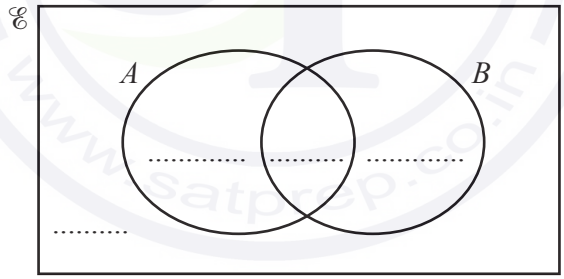
15 **(a)** On the Venn diagram, shade the region $P \cup Q'$.



[1]

(b) $n(\mathscr{E}) = 20$ $n(A \cup B)' = 1$ $n(A) = 12$ $n(B) = 10$

Complete the Venn diagram.

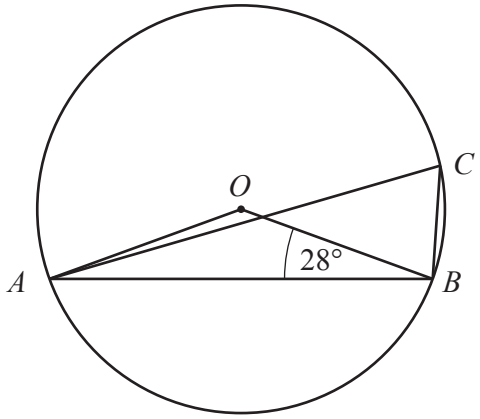


[2]

16 Find the lowest common multiple (LCM) of $12x^8$ and $8x^{12}$.

..... [2]

17 (a)



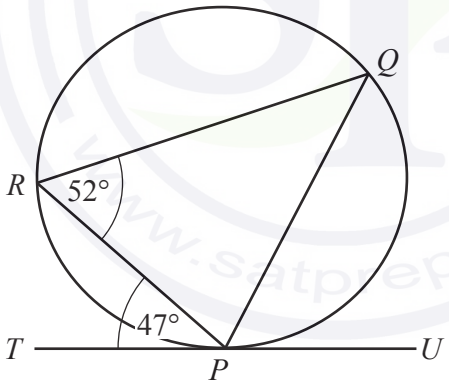
NOT TO SCALE

A, B and C are points on a circle, centre O.
Angle $OBA = 28°$.

Find angle ACB.

Angle ACB = ... [2]

(b)



NOT TO SCALE

P, Q and R are points on a circle.
TU is a tangent to the circle at P.
Angle $TPR = 47°$ and angle $PRQ = 52°$.

Find angle RPQ.

Angle RPQ = ... [2]

18 A solid cylinder has radius 5 cm and height 8 cm.

Calculate the total surface area of the cylinder.

..... cm^2 [4]

19 Find the nth term of each sequence.

(a) 11, 8, 5, 2, −1, …

..... [2]

(b) 1, 5, 25, 125, 625, …

..... [2]

20 The area of a rectangle is $55.2\,\text{cm}^2$, correct to 1 decimal place.
The length of the rectangle is 9 cm, correct to the nearest cm.

Calculate the upper bound of the width of the rectangle.

..... cm [3]

21 The line $y = x + 1$ intersects the curve $y = x^2 + x - 3$ at two points.

Find the coordinates of the two points.

(..... , ...)

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

22 x is inversely proportional to the square root of w.
When $w = 16$, $x = 3$.

Find x in terms of w.

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

23 Some students record their reaction times.
The table shows the results.

Reaction time (t seconds)	$0 < t \leqslant 6$	$6 < t \leqslant 10$
Frequency	18	16

On a histogram, the height of the block for the $0 < t \leqslant 6$ interval is 7.5 cm.

Calculate the height of the block for the $6 < t \leqslant 10$ interval.

..... cm [2]

24 Simplify.

$$\frac{ax-2a-x+2}{a^2-1}$$

..... [4]

25 The derivative of $2ax^7+3x^k$ is $42x^6+15x^{k-1}$.

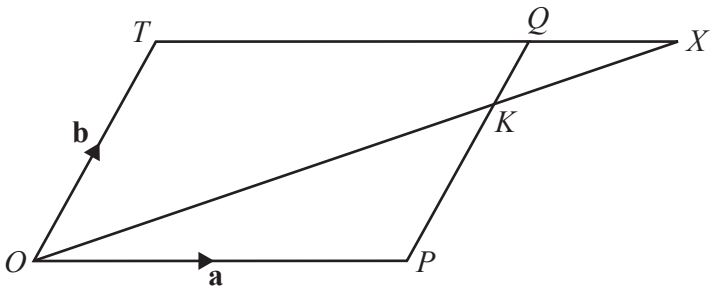
Find the value of a and the value of k.

$a =$ .....

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

Question 26 is printed on the next page.

26



NOT TO SCALE

The diagram shows a parallelogram $OPQT$.
The position vector of P is **a** and the position vector of T is **b**.

K is on PQ so that $PK : KQ = 3 : 1$.
The lines OK and TQ are extended to meet at X.

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

..... [3]

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MATHEMATICS **0580/23**

Paper 2 (Extended) **October/November 2023**

1 hour 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.
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- 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages.

1 Tara goes on a journey by train.
The train leaves at 06 48.
The journey takes 12 hours and 35 minutes.

Find the time when Tara arrives.

..... [1]

2

61	63	64	66	68	69

From this list, write down

(a) a cube number

..... [1]

(b) a prime number.

..... [1]

3 The stem-and-leaf diagram shows the heights, in centimetres, of some plants.

10	4 8
11	1 3 4 6
12	2 3 6 9
13	2 6 9

Key: 10 | 4 represents 10.4 cm

(a) Find the median height.

..... cm [1]

(b) Work out the mean height.

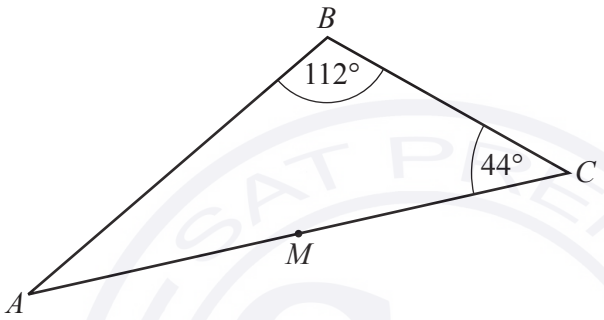
..... cm [2]

4 Shubhu invests $750 in a savings account for 5 years.
The account pays simple interest at a rate of 1.8% per year.

Calculate the total interest she earns during the 5 years.

$ ..... [2]

5



NOT TO SCALE

The diagram shows triangle *ABC*.
M is the midpoint of *AC*.

Triangle *ABC* is rotated 180° about centre *M*.
The image and the original triangle together form a quadrilateral *ABCD*.

(a) Write down the mathematical name of the quadrilateral *ABCD*.

..... [1]

(b) Find angle *BAD*.

Angle *BAD* = ... [2]

6 Rama asks a group of students how they travel to school.
The table shows the probability of how a student, chosen at random, travels to school.

	Bus	Walk	Car	Other
Probability	0.4	0.32	0.17	

(a) Complete the table.

[2]

(b) There are 1800 students at the school.

Find the expected number of students that walk to school.

..... [1]

7 **Without using a calculator**, work out $1\frac{5}{6} \div \frac{11}{15}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

8 Find the highest common factor (HCF) of 48 and 80.

..... [2]

9 $P = \dfrac{2wy^2}{3}$

Find the positive value of y when $P = 108$ and $w = 8$.

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

10 $\overrightarrow{AB} = \begin{pmatrix} 7 \\ -3 \end{pmatrix}$

(a) Find $3\overrightarrow{AB}$.

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

(b) Find $\left|\overrightarrow{AB}\right|$.

$\left|\overrightarrow{AB}\right| =$ ..... [2]

11 A bronze sphere has radius 3.6 cm.
The density of bronze is 8.05 g/cm^3.

Find the mass of the sphere.
Give your answer **in kilograms**, correct to the nearest gram.

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

[Density = mass ÷ volume.]

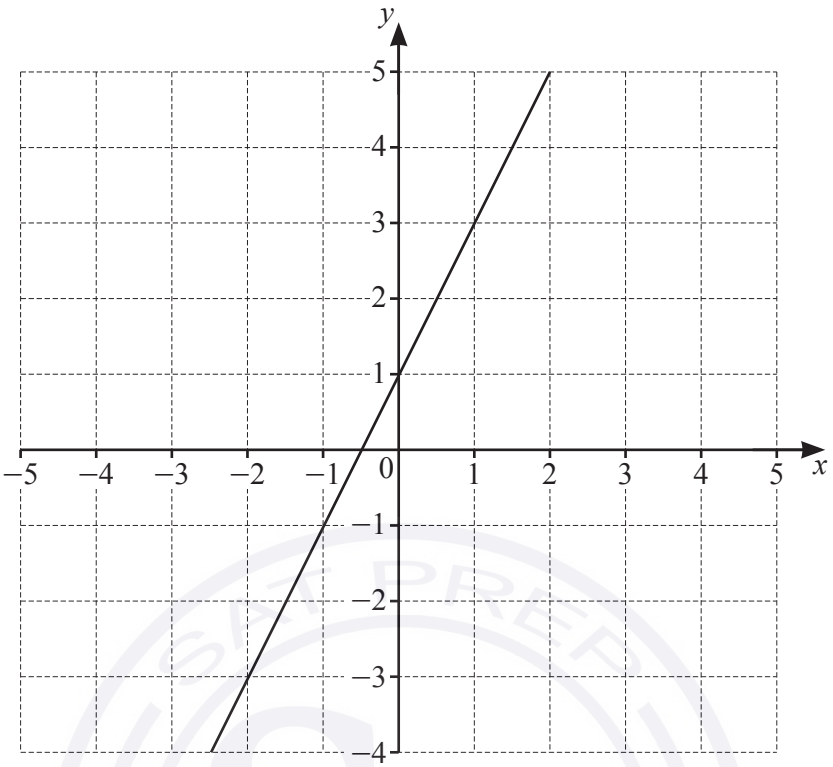
..... kg [4]

12 Oliver sent 22% more messages in June than in May.
He sent 305 messages in June.

Find how many more messages he sent in June than in May.

..... [3]

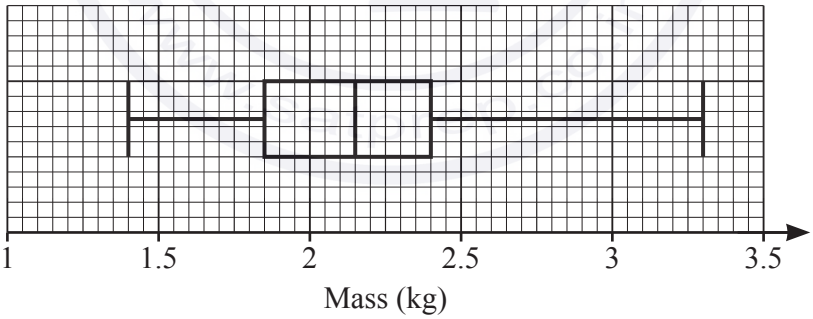
13 The graph of $y = 2x + 1$ is drawn on the grid.



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

$y \geqslant 2x + 1$ $y \geqslant 1$ $4x + 3y < 12$ [4]

14 The box-and-whisker plot shows information about the mass, in kg, of some parcels.



(a) Find the mass of the heaviest parcel.

..... kg [1]

(b) Find the interquartile range.

..... kg [1]

15 $T = \sqrt{3d - e}$

Rearrange the formula to make d the subject.

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

16 A cylinder with height 12.5 cm has a curved surface area of 105π cm^2.

Calculate the volume of the cylinder.

..... cm^3 [4]

17 **(a)** Simplify.

$$\left(64y^{27}\right)^{\frac{2}{3}}$$

..... [2]

(b) Simplify.

$$\frac{x-5}{x^2-25}$$

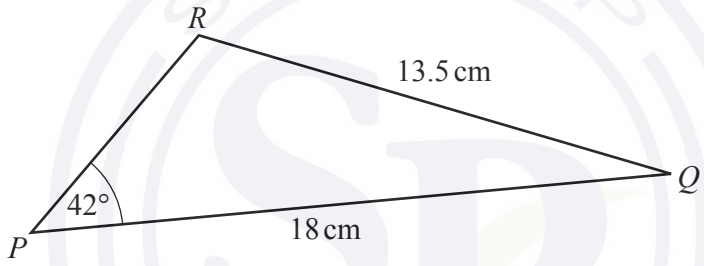
..... [2]

18 F is proportional to the product of m and a.

Calculate the percentage change in F when m is increased by 40% and a is decreased by 15%.

..... % [3]

19



Calculate the obtuse angle PRQ.

Angle PRQ = ... [4]

20 $(x+a)(x+2)(2x+3)$ is equivalent to $2x^3+bx^2+cx-18$.

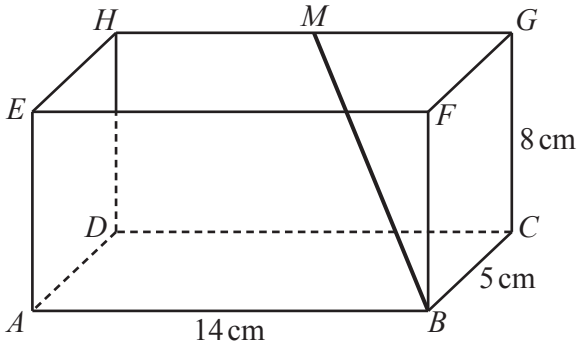
Find the value of each of a, b and c.

$a =$ .....

$b =$ .....

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

21



NOT TO SCALE

The diagram shows a cuboid $ABCDEFGH$.
$AB = 14$ cm, $BC = 5$ cm and $CG = 8$ cm.
M is the midpoint of HG.

(a) Calculate BM.

..... cm [3]

(b) Calculate the angle that BM makes with the base $ABCD$.

..... [3]

Question 22 is printed on the next page.

22 Find the coordinates of the point where the line $4x+y=9$ intersects the curve $y+x^2=5$.
You must show all your working.

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

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9971247929

MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2023**

1 hour 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.
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- 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

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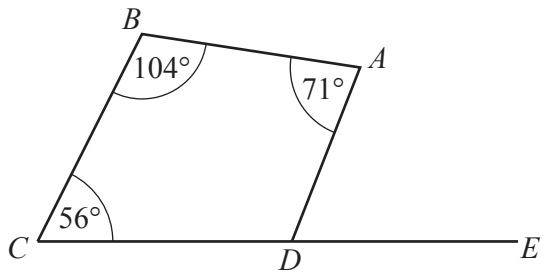
[Turn over

1



NOT TO SCALE

CDE is a straight line.

Find angle *ADE*.

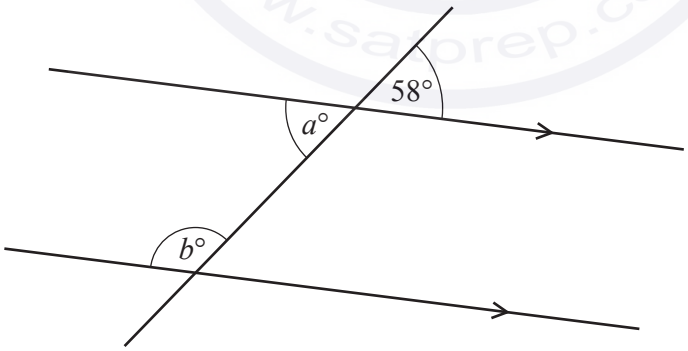
..... [2]

2 A train journey starts at 21 43.
It takes 8 hours and 32 minutes.

Find the time the journey finishes.

..... [1]

3



NOT TO SCALE

The diagram shows a straight line intersecting two parallel lines.

Find the value of *a* and the value of *b*, giving a geometrical reason for each answer.

a = ... because .....

b = ... because ..... [4]

4 By writing each number in the calculation correct to 1 significant figure, work out an estimate for the value of

$$\frac{6.7 \times 2.1}{18 - 5.9}.$$

You must show all your working.

..... [2]

5 Eric has four colours of paint.
The table shows the probability that he uses each colour.

Colour	Red	Blue	Green	Yellow
Probability	0.3	0.35	0.13	x

Find the value of x.

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

6 Calculate the volume of a sphere with diameter 4.8 cm.

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

..... cm^3 [2]

7 The scale of a map is 1 : 125 000.
On a map, the length of an island is 9.4 cm.

Calculate the actual length of the island, giving your answer in kilometres.

..... km [2]

[Turn over

8 **(a)** The nth term of a sequence is $10 - n^2$.

Write down the first three terms of this sequence.

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

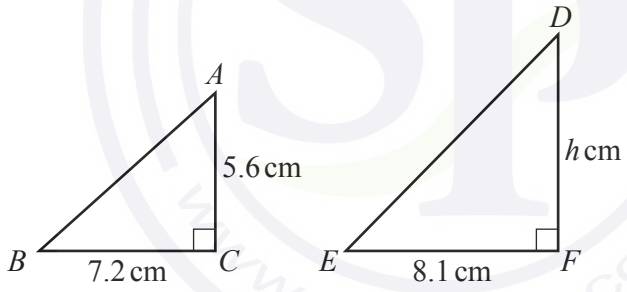
(b) These are the first four terms of another sequence.

7 10 13 16

Find an expression for the nth term of this sequence.

..... [2]

9



NOT TO SCALE

Triangle ABC is similar to triangle DEF.

Calculate the value of h.

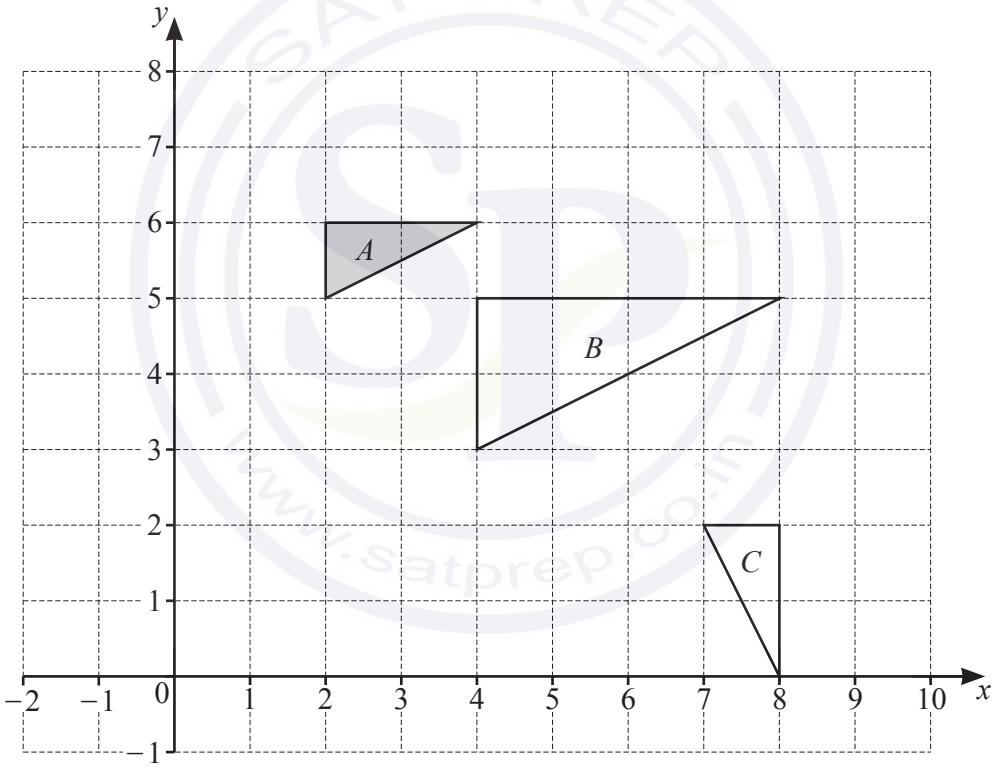
$h =$ ..... [2]

10 **Without using a calculator**, work out $2\frac{1}{7} \div \frac{5}{9}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

11



Describe the **single** transformation that maps

(a) triangle A onto triangle B

.....

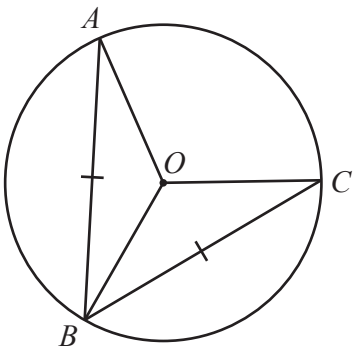
..... [3]

(b) triangle A onto triangle C.

.....

..... [3]

12 (a)



NOT TO SCALE

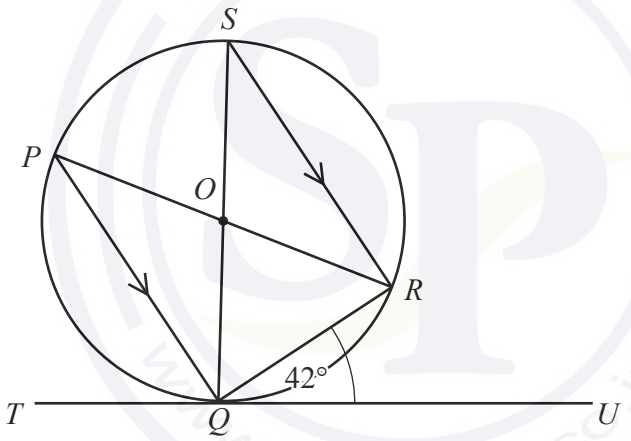
AO, *OB* and *OC* are all radii of the circle.
AB = *BC*.
Therefore triangle *AOB* is congruent to triangle *COB*.

Draw a ring around the correct criterion for this statement.

SAS *RHS* *SSS* *ASA*

[1]

(b)



NOT TO SCALE

P, *Q*, *R* and *S* are points on the circle and *TQU* is a tangent to the circle at *Q*.
PR and *SQ* intersect at the centre of the circle, *O*, and *PQ* is parallel to *SR*.
Angle *RQU* = 42°.

Calculate

(i) angle *QSR*

Angle *QSR* = ... [1]

(ii) angle *PQS*

Angle *PQS* = ... [1]

(iii) angle *POS*.

Angle *POS* = ... [1]

13 Anya invests \$6000 in an account that pays compound interest at a rate of r% per year.
At the end of 8 years, the account has earned \$621.70 in interest.

Calculate the value of r.

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

14 y is directly proportional to the square of $(x + 3)$.
When $x = 2$, $y = 5$.

Find y when $x = 1$.

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

15 A bag contains 5 green buttons, 2 blue buttons and 6 white buttons.
Maya takes two buttons at random from the bag, without replacement.

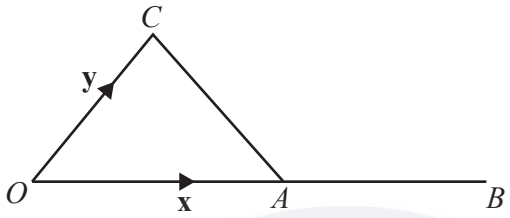
Calculate the probability that one button is green and the other button is not green.

..... [3]

16 **(a)** Find the magnitude of the vector $\begin{pmatrix} -4 \\ 5 \end{pmatrix}$.

..... [2]

(b)



NOT TO SCALE

The diagram shows a triangle OAC.
A is the midpoint of the straight line OB.
$\overrightarrow{OA} = \mathbf{x}$ and $\overrightarrow{OC} = \mathbf{y}$.

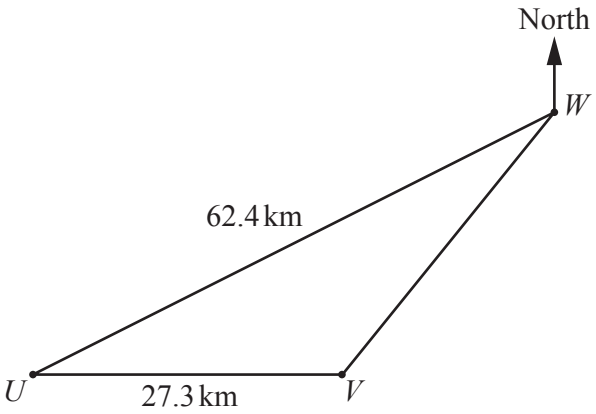
Find $\overrightarrow{CB}$ in terms of $\mathbf{x}$ and $\mathbf{y}$.

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

17 Simplify $\left(81x^{12}\right)^{\frac{3}{4}}$.

..... [2]

18



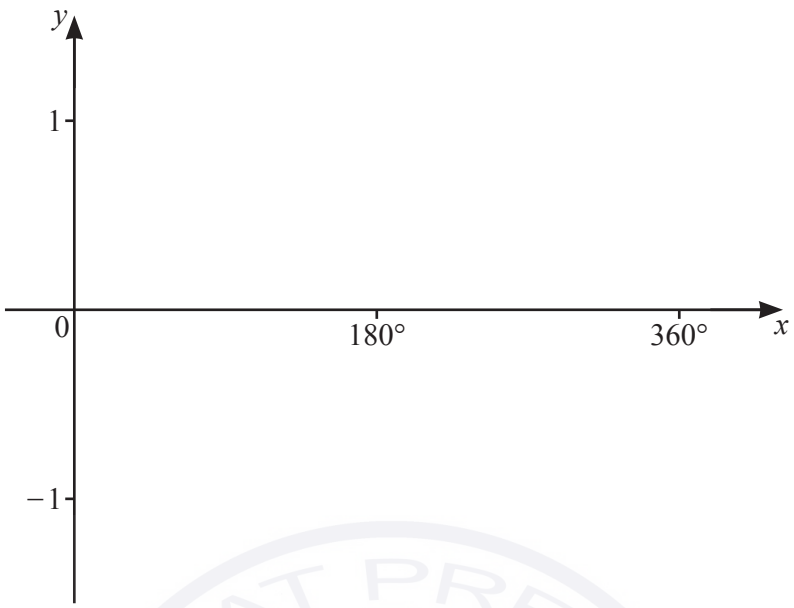
NOT TO SCALE

The diagram shows the position of three towns, U, V and W.
U is due west of V and angle $UVW = 125°$.

Calculate the bearing of U from W.

..... [4]

19 **(a)** On the diagram, sketch the graph of $y = \cos x$ for $0° \leqslant x \leqslant 360°$.



[2]

(b) Solve the equation $5\cos x + 3 = 0$ for $0° \leqslant x \leqslant 360°$.

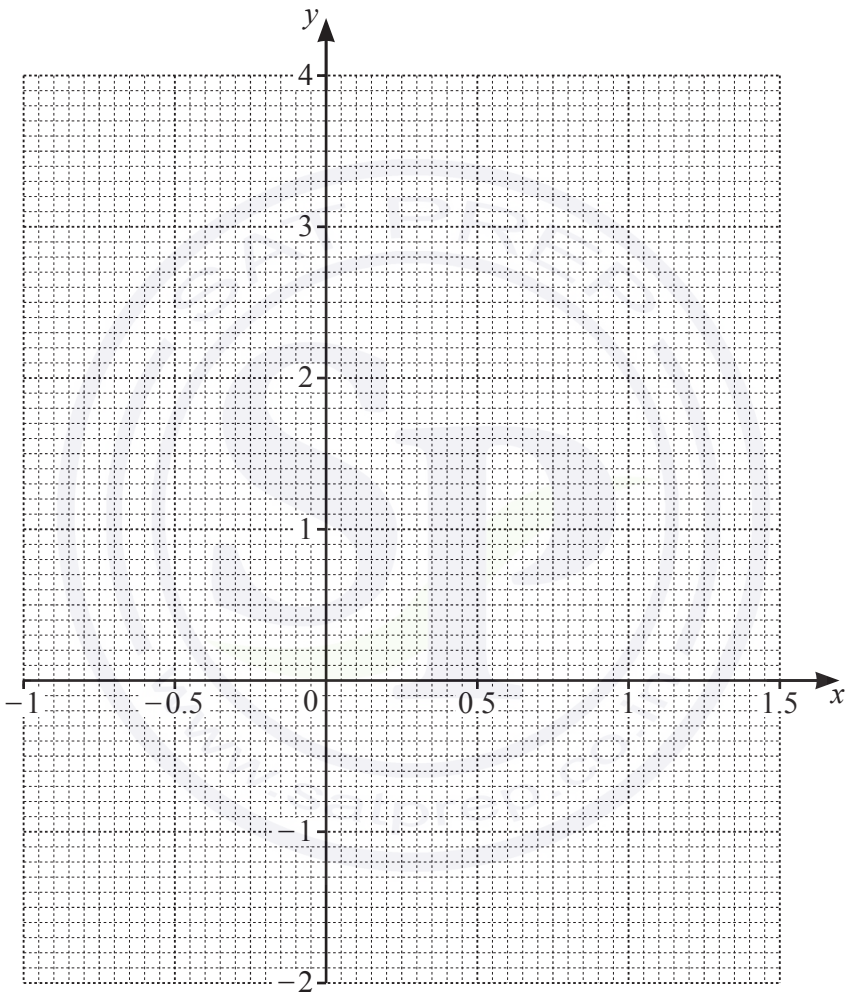
$x =$ ..... or $x =$ ..... [3]

20 The table shows some values for $y = 3x^2 - 2x - 1$.

x	-1	-0.5	0	0.5	1	1.5
y	4		-1		0	2.75

(a) Complete the table. [1]

(b) On the grid, draw the graph of $y = 3x^2 - 2x - 1$ for $-1 \leqslant x \leqslant 1.5$.



[3]

(c) By drawing a suitable straight line, solve the equation $3x^2 - 4x - 2 = 0$ for $-1 \leqslant x \leqslant 1.5$.

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

Question 21 is printed on the next page.

21 A curve has equation $y = x^3 - 12x$.

(a) Find the gradient of the curve at the point (1,−11).

..... [3]

(b) Find the coordinates of the turning points of the curve.

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

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MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2023**

1 hour 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages.

1 Find the temperature that is 8 °C colder than −5 °C.

..... °C [1]

2 There are two prime numbers in this list.

27 47 57 61 75 93

Work out the sum of these two prime numbers.

..... [2]

3 On ten days, Stefan records the number of minutes he has to wait for a train.

1 3 12 5 4 23 5 24 11 8

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

0	1 3
1	
2	

Key: 0 | 1 represents 1 minute

[2]

(b) Find the median.

..... min [1]

4 The distance from town *A* to town *B* on a map is 3.5 cm.
The scale on the map is 1 : 250 000.

Find the actual distance, in kilometres, from town *A* to town *B*.

..... km [2]

5 A spinner is spun.
The possible outcomes are A, B, C or D.
The probability of spinning A, C or D is shown in the table.

Letter on spinner	A	B	C	D
Probability	0.2		0.05	0.35

Complete the table.

[2]

6 $\mathscr{E} = \{x: 1 \leqslant x \leqslant 20\}$
$E = \{\text{even numbers}\}$
$M = \{\text{multiples of 5}\}$

(a) Find $\text{n}(M)$.

..... [1]

(b) Find the elements in the set $E \cap M$.

..... [1]

(c) $y \notin E$.

Write down a possible value of y.

..... [1]

7 **Without using a calculator**, work out $\frac{4}{7} \div 1\frac{5}{21}$.
You must show all your working and give your answer as a fraction in its simplest form.

..... [3]

8 Solve.

(a) $\frac{30}{x} = 6$

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

(b) $11x - 3 \geqslant 2(2x + 9)$

..... [3]

9 F is the point $(1, -4)$, $\overrightarrow{FG} = \begin{pmatrix} 8 \\ -3 \end{pmatrix}$ and $\overrightarrow{GH} = \begin{pmatrix} -12 \\ 35 \end{pmatrix}$.

Find

(a) $3\overrightarrow{FG}$

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

(b) $\overrightarrow{FG} + \overrightarrow{GH}$

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

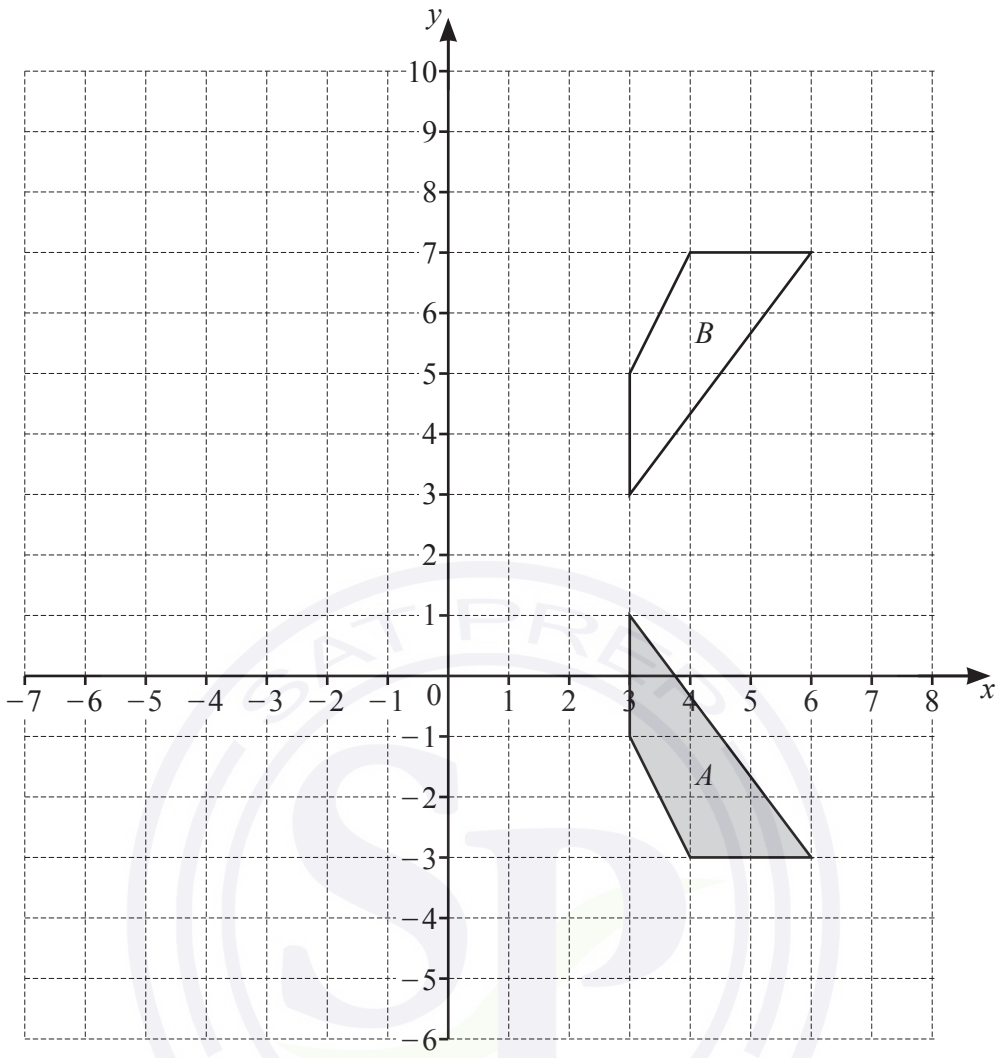
(c) the coordinates of the point G

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

(d) the magnitude of vector $\overrightarrow{GH}$.

..... [2]

10



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

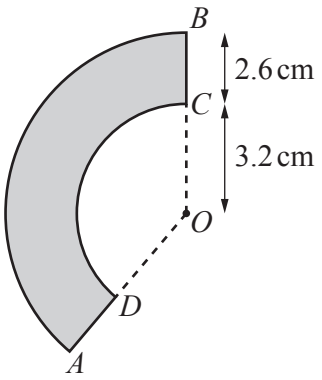
.....

..... [2]

(b) Rotate shape *A* 90° clockwise about the point (−1, 2). [2]

(c) Enlarge shape *A* by scale factor −2, centre (2, 0). [2]

11



NOT TO SCALE

The diagram shows a shape, $ABCD$, formed by the sectors of two circles with the same centre O.
Both sector angles are 140°, $OC = 3.2$ cm and $CB = 2.6$ cm.
The area of the shape is $k\pi$ cm^2.

Find the value of k.

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

12 One solution of the equation $ax^2 + b = 181$ is $x = 8$.
a and b are both positive integers **greater than 1**.

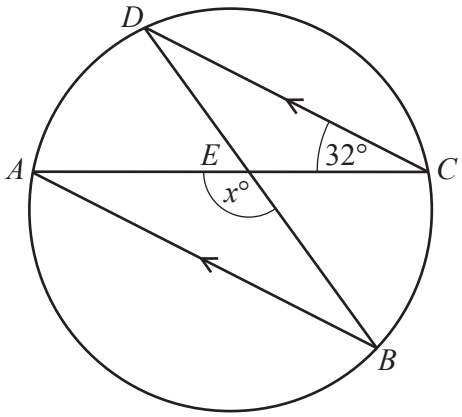
(a) Find the value of b.

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

(b) Write down the other solution of the equation $ax^2 + b = 181$.

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

13



NOT TO SCALE

A, B, C and D are points on a circle.
AB is parallel to DC and angle $ACD = 32°$.
Chords AC and DB intersect at E.

Find the value of x.

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

14 $f(x) = 5x + 2$

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

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

15 C is the point $(5, -1)$ and D is the point $(13, 15)$.

(a) Find the midpoint of CD.

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

(b) Find the gradient of CD.

..... [2]

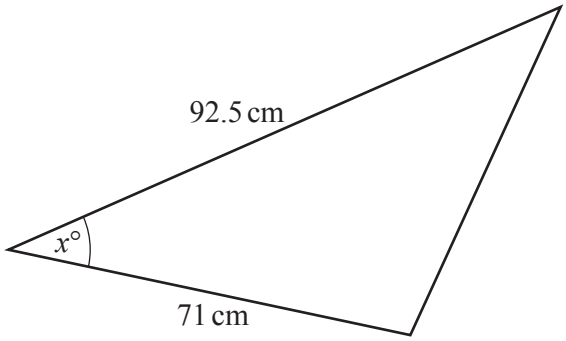
(c) Find the equation of the perpendicular bisector of CD.
Give your answer in the form $y = mx + c$.

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

16 Write $0.62\dot{1}$ as a fraction in its simplest form.
You must show all your working.

..... [3]

17



NOT TO SCALE

The diagram shows a triangle with an acute angle marked $x°$.
The area of the triangle is $2143\,\text{cm}^2$.

Work out the value of x.

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

18 Make x the subject of the formula.

$$c = \frac{3x}{2x-5}$$

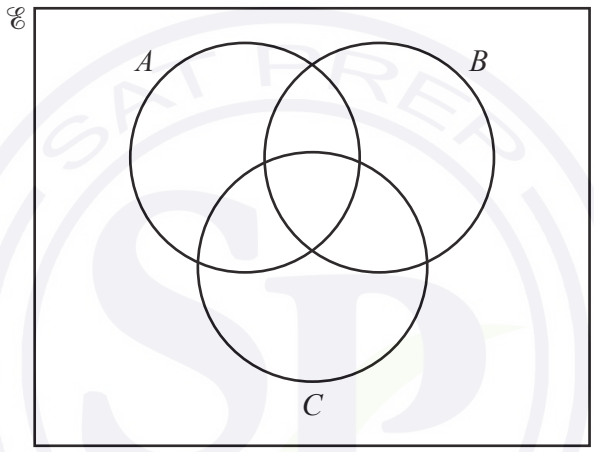
$x =$ ..... [4]

19 m is inversely proportional to the square of $(t+2)$.
$m = 0.64$ when $t = 3$.

Find m when $t = 8$.

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

20 In the Venn diagram, shade the region $A \cap B' \cap C$.



[1]

21 Solve the equation $5\sin x = -3$ for $0° \leqslant x \leqslant 360°$.

..... [3]

Questions 22 and 23 are printed on the next page.

22 Write as a single fraction in its simplest form.

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

..... [3]

23 Bag A and bag B each contain red sweets and yellow sweets.
Anna picks a sweet at random from bag A.
Ben picks a sweet at random from bag B.
The probability that Anna picks a red sweet is $\frac{2}{5}$.
The probability Anna and Ben both pick a yellow sweet is $\frac{1}{10}$.

Find the probability that Anna and Ben both pick a red sweet.

..... [3]

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MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2023**

1 hour 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.
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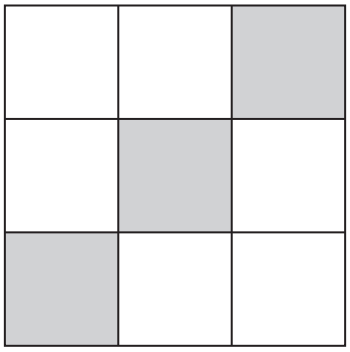
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Any blank pages are indicated.

1



(a) Complete the statement.

The diagram has rotational symmetry of order ..... . [1]

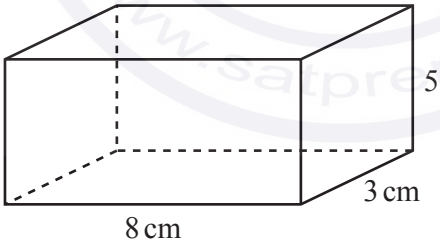
(b) On the diagram, draw all the lines of symmetry. [2]

2 A film lasts for 2 hours 50 minutes.
The film ends at 23 05.

Find the time the film starts.

..... [1]

3



NOT TO SCALE

Find the total surface area of the cuboid.

..... cm^2 [3]

4 $v = u - 9.8t$

Find the value of v when $u = 4$ and $t = -7$.

$v =$ ..... [2]

5 Simplify $d^8 \div d^2$.

..... [1]

6 At the end of the day, a shopkeeper has 12 tins of cat food left.
This is $\frac{3}{13}$ of the number he had at the beginning of the day.

Calculate the number of tins he had at the beginning of the day.

..... [2]

7 A spinner has five sides.
Each side is painted red, blue, green, yellow or orange.
The table shows some of the probabilities of the spinner landing on each colour.

Colour	Red	Blue	Green	Yellow	Orange
Probability	0.3	0.16	0.18	0.25	

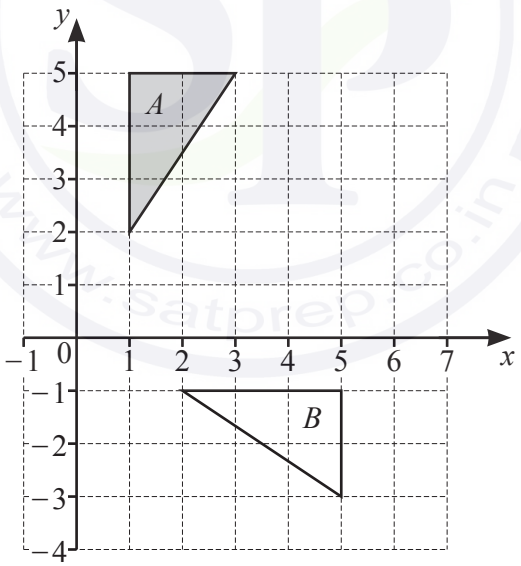
(a) Complete the table. [2]

(b) Dan spins the spinner once.

Find the probability that the spinner lands on red or blue.

..... [2]

8

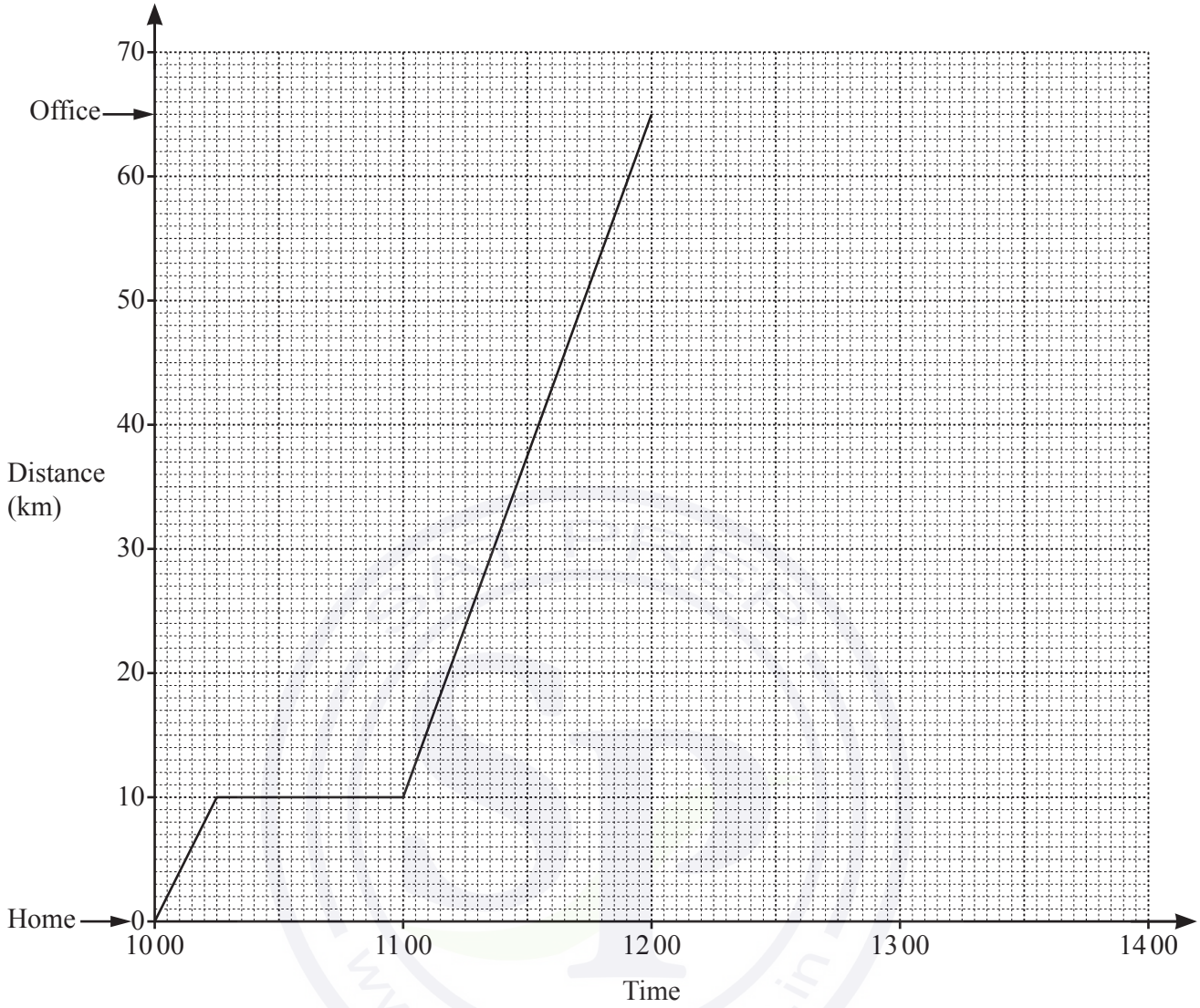


Describe fully the **single** transformation that maps triangle *A* onto triangle *B*.

.....

..... [3]

9 The distance–time graph shows information about Kai's journey from home to the office.



(a) Calculate the average speed, in km/h, for Kai's journey from home to the office.

..... km/h [2]

(b) When Kai arrives at the office, he finds his meeting is cancelled. He immediately returns home at a constant speed of 50 km/h.

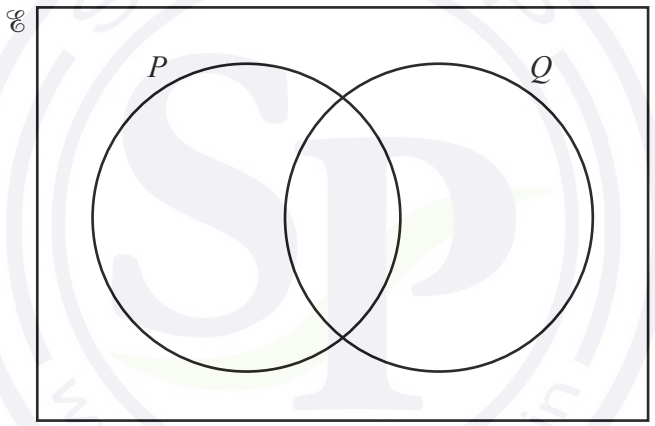
Complete the distance–time graph to show his journey home. [1]

10 **Without using a calculator**, work out $5\frac{11}{12}+2\frac{1}{4}$.

You must show all your working and give your answer as a mixed number in its simplest form.

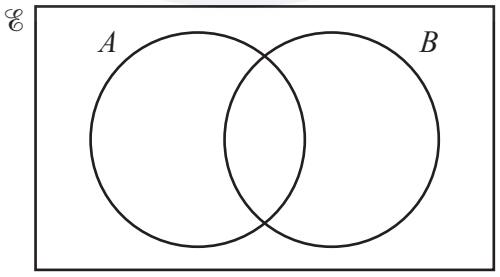
..... [3]

11 **(a)** $\mathscr{E} = \{ a, b, e, g, l, m, o, r, t, y \}$
$P = \{ a, b, e, g, l, r \}$
$Q = \{ e, g, m, o, r, t, y \}$



Complete the Venn diagram. [2]

(b)



Shade the region $A' \cap B$. [1]

12 The position vector of A is $\begin{pmatrix} 5 \\ 3 \end{pmatrix}$ and $\overrightarrow{BA} = \begin{pmatrix} 4 \\ 8 \end{pmatrix}$.

Show that $\left|\overrightarrow{OB}\right| = 5.1$, correct to 1 decimal place.

[3]

13 Calculate $\sqrt{42} + 3^{0.4}$.

..... [1]

14 Write $0.5\dot{8}\dot{1}$ as a fraction.
You must show all your working and give your answer in its simplest form.

..... [3]

15 The number of trees in a forest is decreasing exponentially at a rate of 1.75% per year.
Eleven years ago there were 980 trees.

Calculate the number of trees in the forest now.
Give your answer correct to the nearest integer.

..... [2]

16 The volume of a cylinder is $1970\,\text{cm}^3$.
The height of the cylinder is $12.8\,\text{cm}$.

Calculate the radius of the cylinder.

..... cm [3]

17 Rearrange the formula to make m the subject.

$$R = \frac{2(m-k)}{m}$$

$m =$ ..... [4]

18 y is inversely proportional to the cube root of $(x + 5)$.
When $x = 3$, $y = 12$.

Find y when $x = 22$.

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

19 Solve the equation $x^2 + 5x - 7 = 0$.
You must show all your working and give your answers correct to 2 decimal places.

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

20 $f(x) = 6x - 7$ $g(x) = x^{-3}$

(a) Find $f(x+2)$.
Give your answer in its simplest form.

..... [2]

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

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

(c) Find x when $g(x) = f(22)$.

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

21 Simplify.

$$\frac{2x^2+5x-12}{4x^2-9}$$

..... [4]

22 These are the first four terms of a sequence.

2.75 6 11.25 20

The nth term of this sequence is $\frac{1}{4}n^3+an^2+bn$.

Calculate the value of a and the value of b.

$a =$ .....

$b =$ ..... [5]

23 A train travels between two stations.
The distance between the stations is 220 km, correct to the nearest kilometre.
The speed of the train is 125 km/h, correct to the nearest 5 km/h.

Calculate the upper bound for the time the journey takes.
Give your answer in hours and minutes.

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

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MATHEMATICS **0580/22**

Paper 2 (Extended) **February/March 2023**

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

INFORMATION

- The total mark for this paper is 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages.

1

12	15	27	29	91	93

From the list of numbers, write down

(a) a cube number

..... [1]

(b) a prime number.

..... [1]

2 $\mathbf{v} = \begin{pmatrix} -1 \\ 3 \end{pmatrix}$ $\mathbf{y} = \begin{pmatrix} 2 \\ 5 \end{pmatrix}$

Find

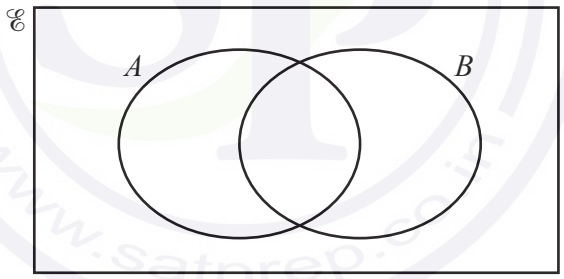
(a) $\mathbf{v} - \mathbf{y}$

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

(b) $2\mathbf{v}$.

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

3



On the Venn diagram, shade the region $A \cap B$. [1]

4 23, 17, 11, 5, ...

(a) Write down the next number in this sequence.

..... [1]

(b) Find the nth term of this sequence.

..... [2]

5 Factorise completely.

$$8g - 2g^2$$

..... [2]

6 **Without using a calculator**, work out $\frac{4}{7} \div 8$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [2]

7 Solve.

(a) $15t + 8 = 4 - t$

$t =$ ..... [2]

(b) $\frac{25 - 2u}{3} = 2$

$u =$ ..... [2]

8 Calculate 0.3^2.
Give your answer in standard form.

..... [2]

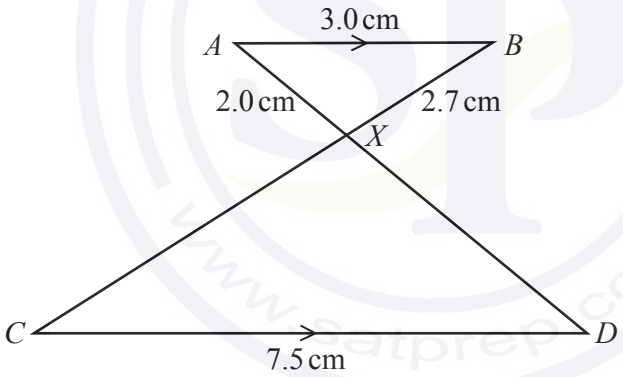
9 Solve the simultaneous equations.
You must show all your working.

$$3x - 2y = 19$$
$$x + y = 3$$

$x =$ .....

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

10



NOT TO SCALE

In the diagram, AB and CD are parallel.
The lines CB and AD intersect at X.
$AB = 3.0$ cm, $AX = 2.0$ cm, $BX = 2.7$ cm and $CD = 7.5$ cm.

Find the length of BC.

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

11 Find the highest common factor (HCF) of $12x^{12}$ and $16x^{16}$.

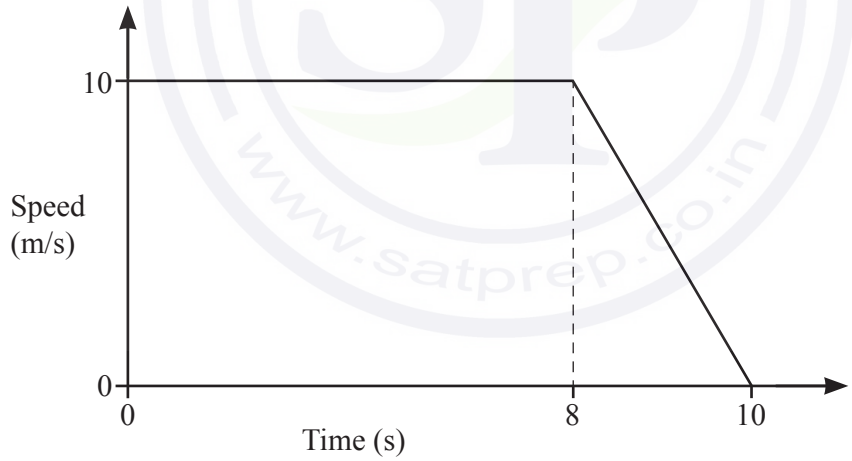
..... [2]

12 In a regular polygon, the interior angle and the exterior angle are in the ratio interior : exterior = 11 : 1.

Find the number of sides of this regular polygon.

..... [3]

13



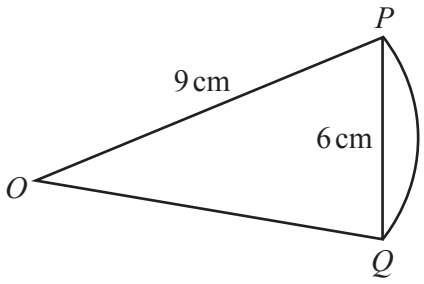
NOT TO SCALE

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

Calculate the total distance travelled during the 10 seconds.

..... m [2]

14



NOT TO SCALE

The diagram shows a sector of a circle with centre O and radius 9 cm.
The length of the chord PQ is 6 cm.

Calculate the length of the arc PQ.

..... cm [3]

15 Simplify $\left(3125w^{3125}\right)^{\frac{1}{5}}$.

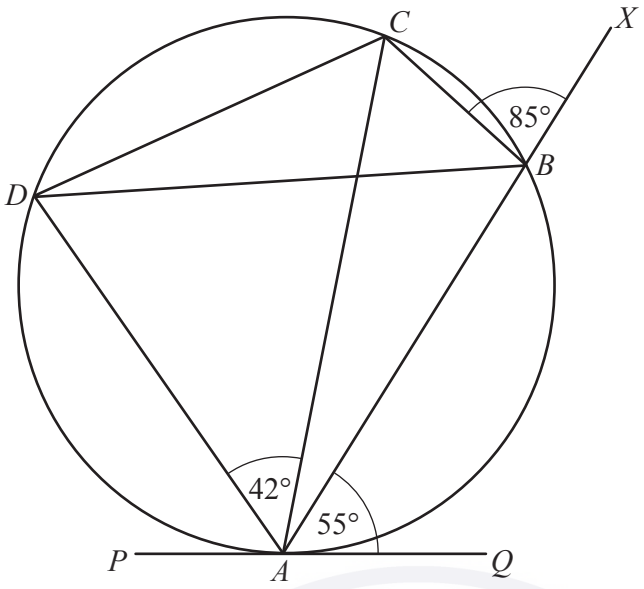
..... [2]

16 y is inversely proportional to x^2.
When $x = 3$, $y = 2$.

Find y when $x = 2$.

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

17



NOT TO SCALE

ABCD is a cyclic quadrilateral, *ABX* is a straight line and *PQ* is a tangent to the circle at *A*.
Angle *CBX* = 85°, angle *BAQ* = 55° and angle *CAD* = 42°.

Find

(a) angle *CBD*

Angle *CBD* = ... [1]

(b) angle *ACB*

Angle *ACB* = ... [1]

(c) angle *ADC*

Angle *ADC* = ... [1]

(d) angle *BCD*

Angle *BCD* = ... [2]

(e) angle *PAD*.

Angle *PAD* = ... [1]

18 Two solids are mathematically similar and have volumes $81\,\text{cm}^3$ and $24\,\text{cm}^3$.
The surface area of the smaller solid is $44\,\text{cm}^2$.

Calculate the surface area of the larger solid.

..... cm^2 [3]

19 Find the values of x when $6x + y = 10$ and $y = x^2 - 3x + 10$.

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

20 Find the nth term of each sequence.

(a) –1, 0, 7, 26, 63, …

..... [2]

(b) 24, 12, 6, 3, 1.5, …

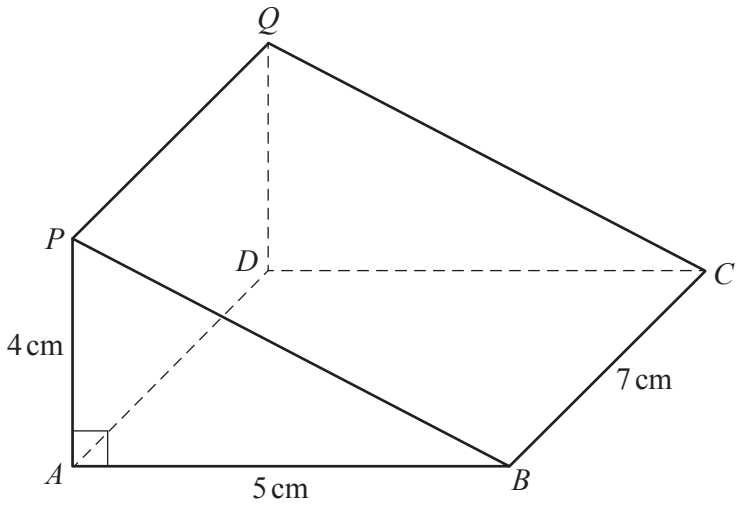
..... [2]

21 A car travels 14 km, correct to the nearest kilometre.
This takes 12 minutes, correct to the nearest minute.

Calculate the lower bound of the speed of the car.
Give your answer in kilometres per minute.

..... km/min [3]

22



NOT TO SCALE

The diagram shows a triangular prism *ABCDQP* of length 7 cm.
The cross-section is triangle *PAB* with $PA = 4$ cm, $AB = 5$ cm and angle $PAB = 90°$.

Calculate the angle between the line *PC* and the base *ABCD*.

..... [4]

23 Simplify.

$$\frac{5x^2 - 19x + 12}{x^2 - 9}$$

..... [4]

24 The probability of Jamie hitting a target is $\frac{1}{3}$.

The probability that he hits the target for the first time on his nth attempt is $\frac{64}{2187}$.

Find the value of n.

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

Question 25 is printed on the next page.

25 $f(x) = x^3 + 1$

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

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

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MATHEMATICS **0580/21**

Paper 2 (Extended) **October/November 2022**

1 hour 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.
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- Do **not** write on any bar codes.
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- 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Any blank pages are indicated.

1 Write down a common multiple of 18 and 24.

..... [1]

2 A train journey starts at 23 40 and finishes at 06 50.

Work out the time taken for this journey.

..... h ..... min [1]

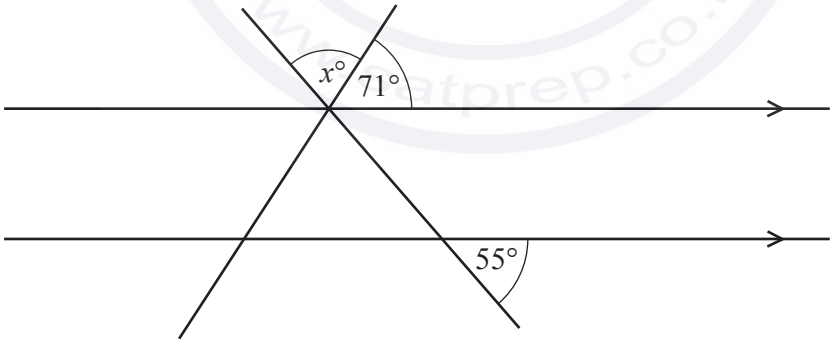
3 Write 32 cm as a fraction of 2 m.
Give your answer in its simplest form.

..... [2]

4 Divide \$200 in the ratio 7 : 3.

\$ ..... , \$ ..... [2]

5



NOT TO SCALE

The diagram shows two straight lines intersecting two parallel lines.

Find the value of x.

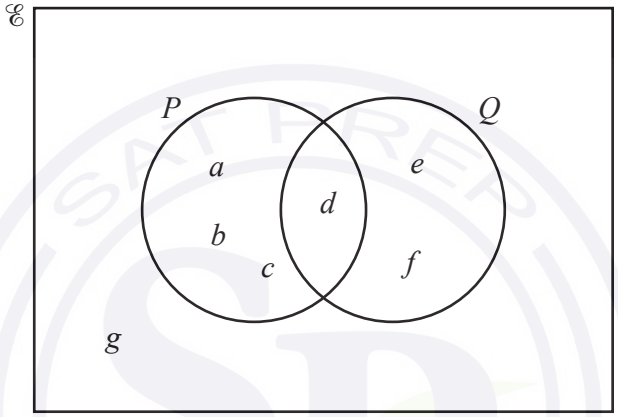
$x =$ ..... [2]

6 The price of a computer is \$520.
This price is reduced by 15% in a sale.

Work out the sale price.

\$ ..... [2]

7



The Venn diagram shows the elements of the sets $\mathscr{E}$, P and Q.

Complete the statements.

(a) $P = \{$ ..... $\}$ [1]

(b) $n(P \cup Q) =$ ..... [1]

8 **(a)** 3, 9, 27, 81, …

Write down the next term in this sequence.

..... [1]

(b) 13, 17, 21, 25, …

Find the nth term of this sequence.

..... [2]

9 **Without using a calculator**, work out $\frac{1}{3}+\frac{5}{6}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [2]

10 Simplify $18x^{18} \div 9x^{9}$.

..... [2]

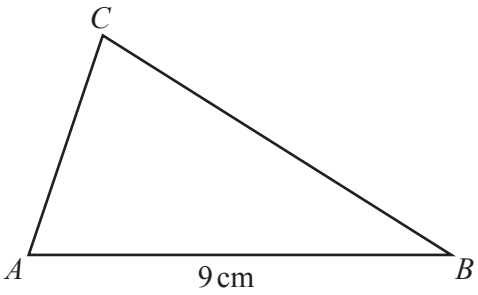
11 Solve the simultaneous equations.

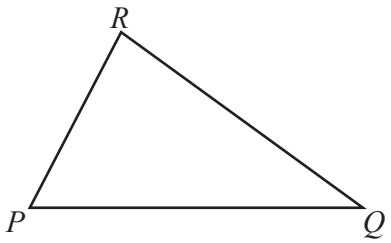
$$x-3y=7$$
$$2x-3y=11$$

$x =$ .....

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

12





NOT TO SCALE

Triangle PQR is similar to triangle ABC with $\frac{PR}{AC} = \frac{2}{3}$.

$AB = 9$ cm and the area of triangle ABC is 18 cm^2.

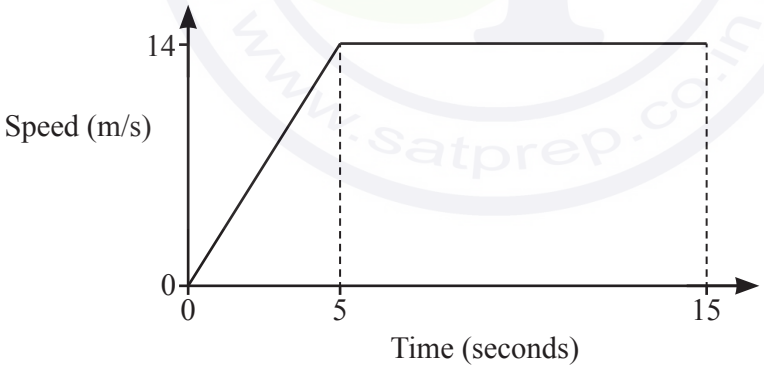
(a) Find the length of PQ.

..... cm [1]

(b) Find the area of triangle PQR.

..... cm^2 [2]

13



NOT TO SCALE

The diagram shows the speed–time graph of the first 15 seconds of a car journey.

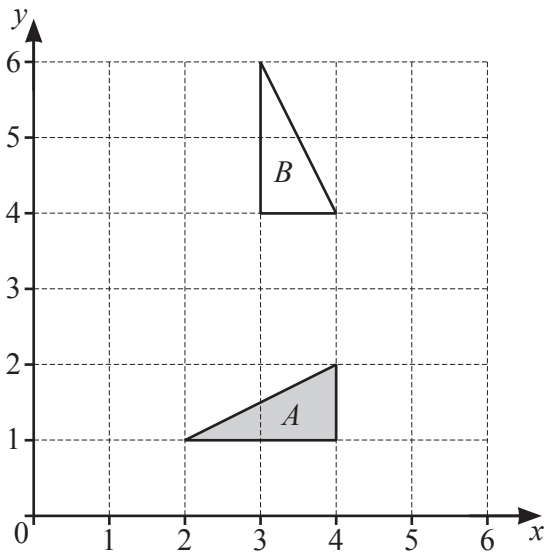
(a) Find the acceleration of the car during the first 5 seconds.

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

(b) Find the distance travelled during the 15 seconds.

..... m [2]

14



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

.....

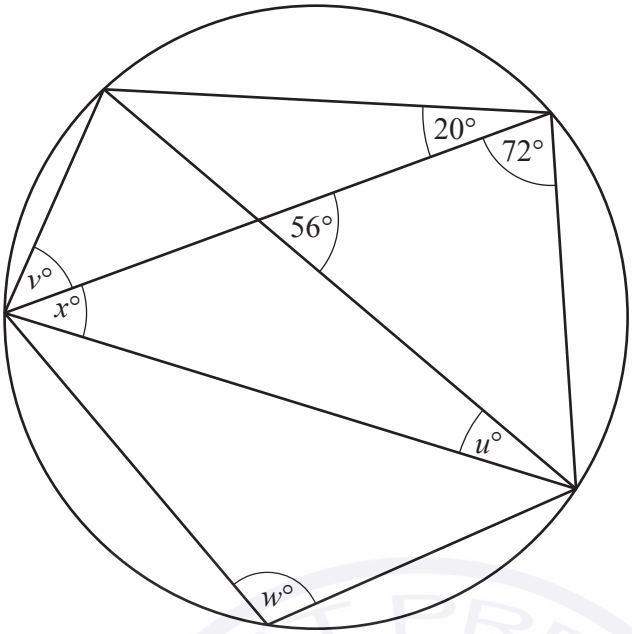
..... [3]

15 The perimeter of a sector of a circle with radius 8 cm is 26 cm.

Calculate the angle of this sector.

..... [3]

16



NOT TO SCALE

The diagram shows a circle and eight chords.

Calculate the values of u, v, w and x.

$u =$ .....

$v =$ .....

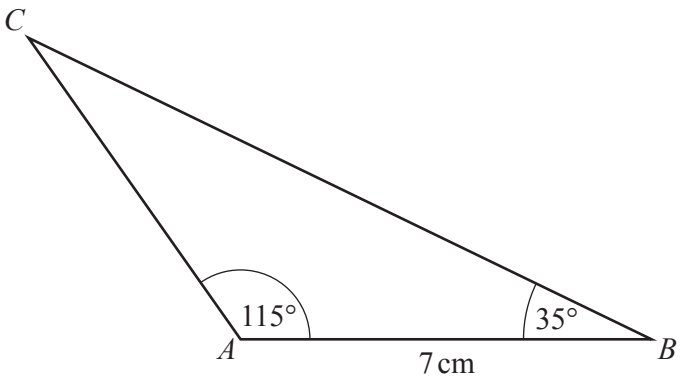
$w =$ .....

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

17 Simplify $\left(3125x^{3125}\right)^{\frac{1}{5}}$.

..... [2]

18



NOT TO SCALE

Calculate the length BC.

$BC =$ ..... cm [4]

19 Expand and simplify.

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

..... [3]

20 Factorise completely.

(a) $1+x-y-xy$

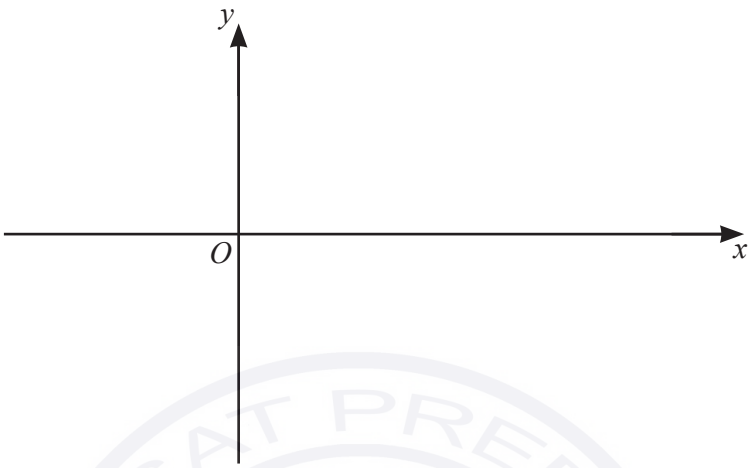
..... [2]

(b) $2x^3-18xy^2$

..... [3]

21 The graph of a cubic function has two turning points.
When $x < 0$ and when $x > 4$ the gradient of the graph is positive.
When $0 < x < 4$ the gradient of the graph is negative.
The graph passes through the origin.

Sketch the graph.



[2]

22

(a) On the diagram, sketch the graph of $y = \cos x$ for $0° \leqslant x \leqslant 360°$. [2]

(b) Solve the equation $\cos x = -\frac{1}{2}$ for $0° \leqslant x \leqslant 360°$.

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

23 y is inversely proportional to $\sqrt{x}$ and x is directly proportional to w^2.
When $w = 12$, $y = 12$.

Find y in terms of w.

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

24 Violet and Wilfred recorded their times to run 200 m, correct to the nearest second.
Violet took 36 seconds and Wilfred took 39 seconds.

Work out the upper bound of the difference between their times.

..... s [2]

25 A bag contains 5 red balls, 4 blue balls and 3 green balls.

(a) (i) Megan picks a ball at random.

Write down the probability that the ball is red or blue.

..... [1]

(ii) Megan replaces the ball.
She picks a ball at random, notes the colour and replaces the ball.
She repeats this 60 times.

Calculate the number of times the ball is expected to be red or blue.

..... [1]

(b) Mick picks 2 of the 12 balls at random, without replacement.

Calculate the probability that the balls are different colours.

..... [4]

(c) Marie picks balls at random, without replacement, from the 12 balls.
When she picks a green ball she stops.

The probability that she picks a green ball on pick n is $\frac{21}{220}$.

Find the value of n.

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

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MATHEMATICS **0580/22**

Paper 2 (Extended) **October/November 2022**

1 hour 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.
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- 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

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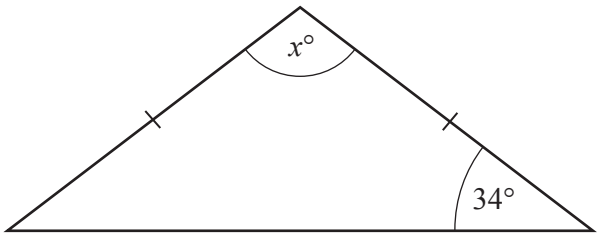
1



NOT TO SCALE

The diagram shows an isosceles triangle.

Find the value of x.

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

2 Simplify.

$$y \times 27 - y \times 77$$

..... [1]

3 Find the sum of 3^2 and -3^2.

..... [1]

4 Expand.

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

..... [2]

5 Jenna buys 2.4 m of ribbon and 4.8 m of fabric.
The total cost is $33.48 .
Ribbon costs $0.85 per metre.

Find the cost of 1 m of fabric.

$ ..... [3]

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

27 26 23 18 11

Find the next two terms in the sequence.

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

(b) The table shows information about two different sequences.

	First five terms of sequence					*n*th term
Sequence A	3	10	17	24	31	
Sequence B	2	11	26	47	74	

Complete the table.

[4]

7 **Without using a calculator**, work out $\frac{5}{9} - \frac{1}{6}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [2]

8 Daryl records the number of hours in a week 8 people spend exercising.

5 2 1.5 3 18 4.5 2 4

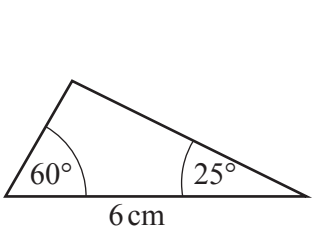
(a) Find the median.

..... h [2]

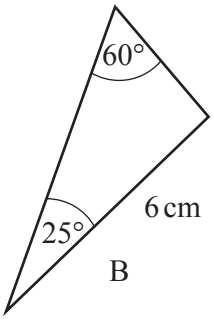
(b) Explain why the mean may not be a suitable average to use.

..... [1]

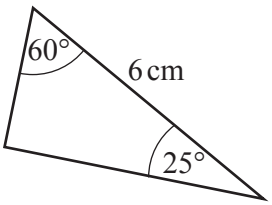
9 The diagram shows three triangles A, B and C.



A



B



C

NOT TO SCALE

(a) Which two of the triangles A, B and C are congruent with each other?

..... [1]

(b) Draw a ring around the congruence criterion that can be used to support your answer to **part (a)**.

SSS ASA SAS RHS

[1]

10 Calculate.

(a) 2000×1.2^3

..... [1]

(b) $2\frac{1}{8} \times \frac{6}{17}$

..... [1]

(c) $\frac{4.5(\cos 30°)}{\sqrt{3}} - 2$

..... [1]

11 The graph of $y = (x-3)(x+b)(x+2)$ intersects the y-axis at -30.

(a) Find the value of b.

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

(b) When $x > 0$ the graph crosses the x-axis once.

Write down the coordinates of this point.

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

12 $x = 3^2 \times 5^2 \times 7 \times 199^{57}$ when written as a product of its prime factors.

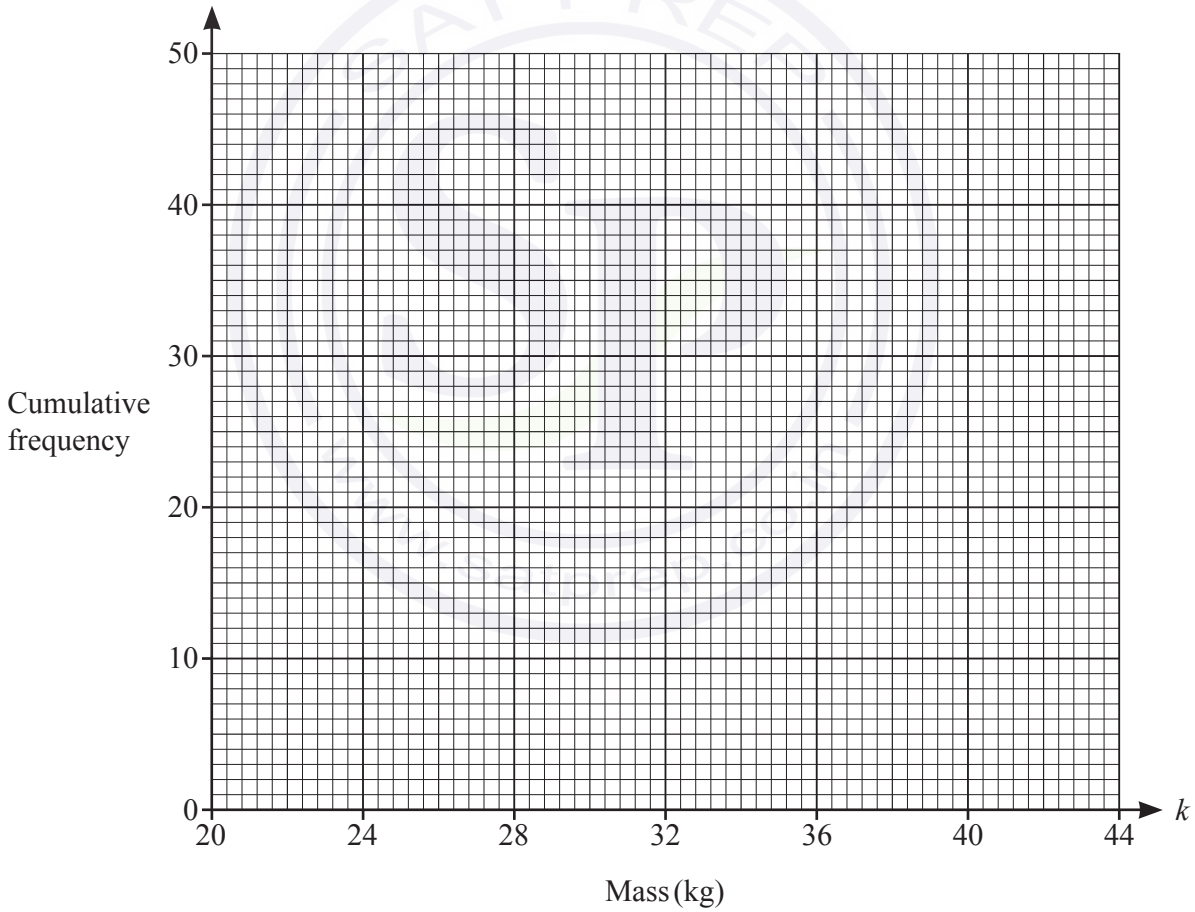
Write $x \div 315$ as a product of its prime factors.

..... [2]

13 The table shows information about the mass of each of 50 children.

Mass (k kg)	Cumulative Frequency
$k \leqslant 20$	0
$k \leqslant 22$	7
$k \leqslant 24$	23
$k \leqslant 28$	35
$k \leqslant 32$	43
$k \leqslant 36$	47
$k \leqslant 42$	50

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

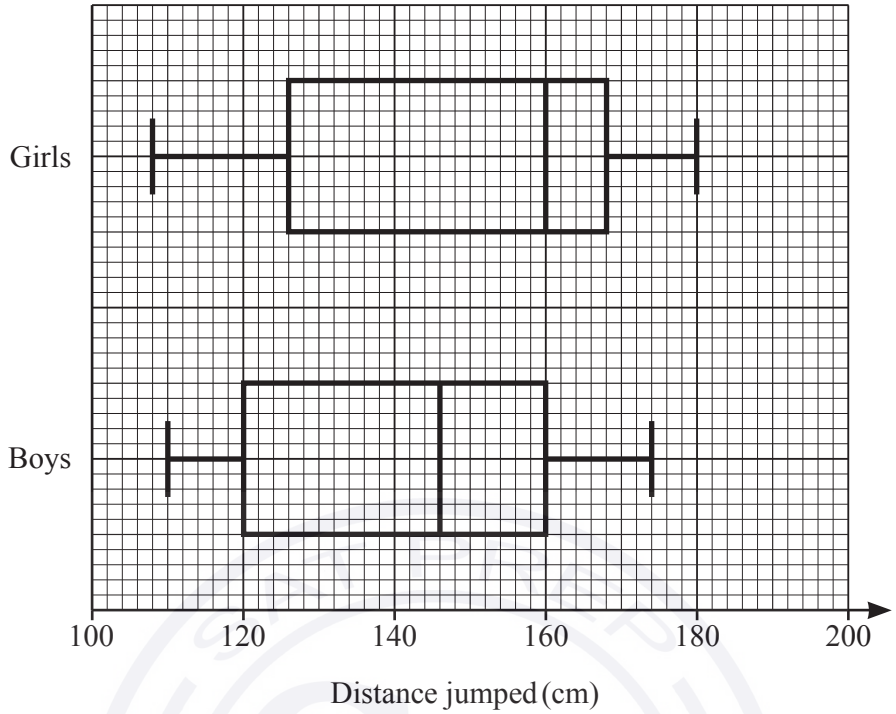


[3]

(b) Use your graph to find an estimate of the 90th percentile.

..... [1]

14 136 girls and 144 boys each measure the distance they jump in centimetres.
The box-and-whisker plots show the distributions of these distances.

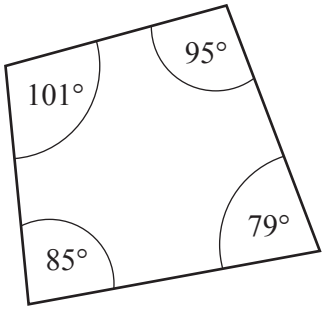


Each child who jumps a distance greater than 160 cm gets a certificate.

Work out an estimate of the total number of children who get a certificate.

..... [2]

15



NOT TO SCALE

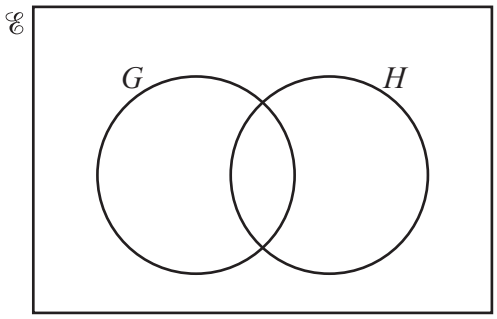
The diagram shows a quadrilateral.

Give a geometrical reason why this is a cyclic quadrilateral.

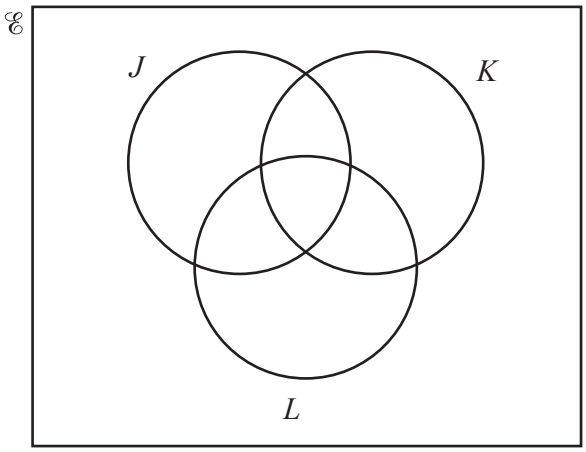
..... [1]

16 **(a)** Shade the region indicated in each Venn diagram.

$G \cap H'$

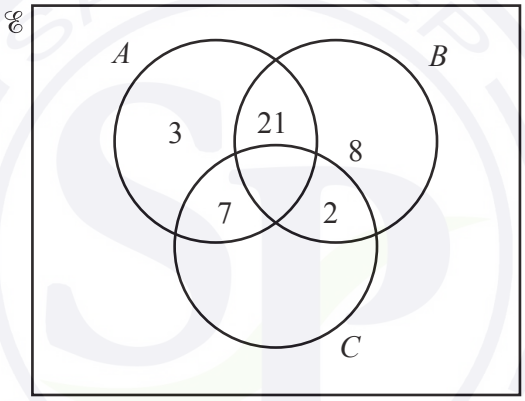


$(J \cup K') \cap L$



[2]

(b) The Venn diagram shows some information about the number of elements in sets A, B, C and $\mathscr{E}$.



Given the following information, complete the Venn diagram.

$n(A \cap B \cap C) = 1$
$n(A \cup B \cup C)' = 17$
$n(C) = 42$

[2]

17 $f(x) = x^2$ $g(x) = \frac{x+5}{2}$ $h(x) = 7x - 3$

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

..... [1]

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

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

(c) Solve $gf(x) = hh^{-1}(63)$ where $x > 0$.

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

18 Write $0.4\dot{1}\dot{9}$ as a fraction in its simplest form.
You must show all your working.

..... [3]

19 Katy picks a number at random from the numbers 2, 3 and 5.
She then picks a number at random from the numbers 5, 6, 7 and 9.
When she adds the two numbers the answer is even.

Find the probability that **exactly one** of the numbers picked is a 5.

..... [3]

20 Simplify fully.

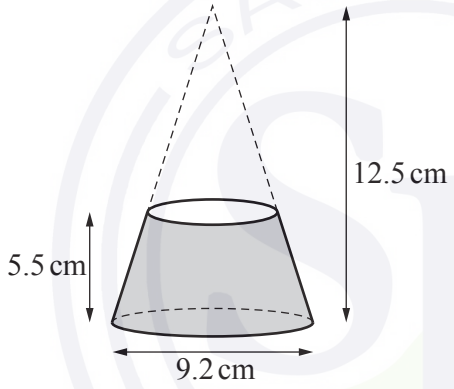
(a) $(81x^{16})^{\frac{3}{4}}$

..... [2]

(b) $\left(\frac{1}{y^2}\right)^{-\frac{1}{2}}$

..... [1]

21



NOT TO SCALE

A solid is made by cutting a small cone from a larger cone, as shown in the diagram.
The height of the larger cone is 12.5 cm.
The height of the solid is 5.5 cm.
The diameter of the base of the larger cone is 9.2 cm.

Work out 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 [4]

Questions 22 and 23 are printed on the next page.

22 The volumes of two mathematically similar objects are $56\,\text{cm}^3$ and $875\,\text{cm}^3$.
The height of the smaller object is 18 cm.

Find the height of the larger object.

..... cm [3]

23 Solve $\frac{4}{x+1} + \frac{2}{2x-5} = 3$.

You must show all your working.

$x =$ ..... or $x =$ ..... [7]

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MATHEMATICS **0580/23**

Paper 2 (Extended) **October/November 2022**

1 hour 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.
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- You may use tracing paper.
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- For π, use either your calculator value or 3.142.

INFORMATION

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

This document has **12** pages.

1 Marco starts work at 20 45 and finishes at 02 08 the next day.

Find the length of time, in hours and minutes, he works.

..... h ..... min [1]

2

120 121 149 164 216

From this list, write down

(a) a square number

..... [1]

(b) a cube number.

..... [1]

3 Calculate.

$$\sqrt{15} + \frac{4.8}{2.2}$$

..... [1]

4 The mean mass of four men in a rowing team is 97.5 kg.
The modal mass is 101 kg.
The range of the masses is 8 kg.

Find the mass of each of the four men.

..... kg , ... kg , ... kg, ... kg [3]

5 **Without using a calculator**, work out $\frac{5}{7} - \frac{2}{3}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [2]

6 A spinner can land on the colours green, black or red.
The table shows the probabilities of the spinner landing on green or black.

Colour	Green	Black	Red
Probability	$\frac{2}{5}$	$\frac{1}{4}$	

(a) Complete the table. [2]

(b) Chang spins the spinner 120 times.

Find the expected number of times it lands on green.

..... [1]

7 Find the lowest common multiple (LCM) of 36 and 60.

..... [2]

8 A is the point $(-3, 5)$ and B is the point $(5, 2)$.

Find the coordinates of the midpoint of the line AB.

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

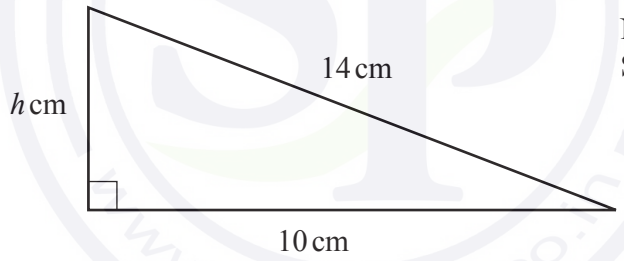
9 Solve the simultaneous equations.

$$3x - 2y = 21$$
$$5x + 2y = 51$$

$x =$ .....

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

10



The diagram shows a right-angled triangle.

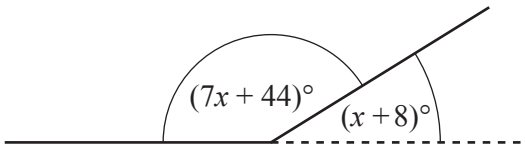
(a) Calculate the value of h.

$h =$ ..... [3]

(b) Find the perimeter of this triangle.

..... cm [1]

11



NOT TO SCALE

The diagram shows two sides of a regular polygon.
The interior angle of the polygon is $(7x + 44)°$ and the exterior angle is $(x + 8)°$.

Find the number of sides of this polygon.

..... [4]

12 Keita invests \$4000 at a rate of 2.6% per year compound interest.

Work out the interest earned on the investment at the end of 3 years.

\$ ..... [3]

13 Convert $0.2\dot{4}$ to a fraction.
You must show all your working and give your answer in its simplest form.

..... [2]

14 A map has a scale of 1 : 200 000.

Find the area, in square kilometres, of a lake that has an area of 12.4 cm^2 on the map.

..... km^2 [2]

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

NOT TO SCALE

The car starts from rest and accelerates at a uniform rate for 15 seconds before reaching a constant speed of 30 m/s.

(a) Calculate the acceleration for the first 15 seconds.

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

(b) After T **minutes**, the total distance travelled is 45 **kilometres**.

Find the value of T.

$T =$ ..... min [4]

16 A kite is drawn on a coordinate grid.
The diagonals of the kite intersect at the point $(-2, -5)$.

One diagonal has equation $y = 4x + 3$.

Find the equation of the other diagonal of the kite.
Give your answer in the form $y = mx + c$.

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

17 y is proportional to the square of $(x - 7)$.
When $x = 12$, $y = 2$.

Find y when $x = 17$.

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

18 Two bottles are mathematically similar.
The small bottle has a capacity of 324 ml and a height of 12 cm.
The large bottle has a capacity of 768 ml.

Calculate the height of the large bottle.

..... cm [3]

19 $f(x) = 5x - 3,\ x > 1$

$g(x) = \dfrac{10}{x-2},\ x \neq 2$

(a) Find $gf(x)$.
Give your answer in its simplest form.

..... [2]

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

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

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

..... [1]

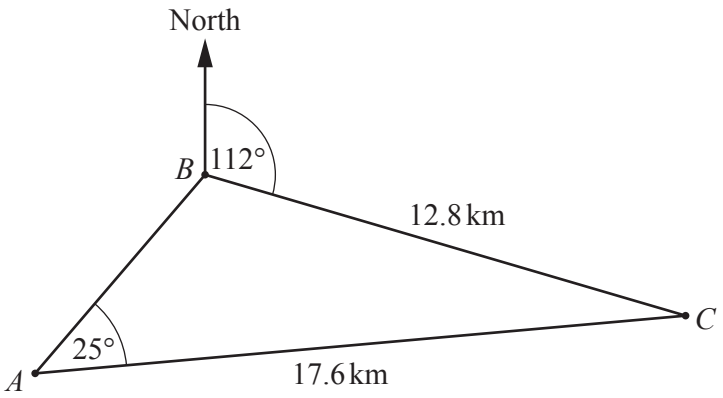
20 (a)

Sketch the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$. [2]

(b) Solve $3 - 2\sin x = \frac{13}{4}$ for $0° \leqslant x \leqslant 360°$.

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

21



NOT TO SCALE

The diagram shows the positions of three ships A, B and C.
$AC = 17.6$ km, $BC = 12.8$ km and angle $BAC = 25°$.
The bearing of C from B is 112° and angle ABC is obtuse.

Calculate the bearing of B from A.

..... [5]

Question 22 is printed on the next page.

22 **(a)** Expand and simplify.

$$(2x-1)(x+4)(x-3)$$

..... [3]

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

$$\frac{4}{2x-3} \div \frac{2x^2+14x}{2x^2+11x-21}$$

..... [4]

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0918260453

MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2022**

1 hour 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.
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- 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Any blank pages are indicated.

1 Write down a prime number between 30 and 40.

..... [1]

2 Calculate $4^5 - 5^4$.

..... [1]

3 Jason starts a run at 10.05 am and finishes at 1.02 pm.

Work out the time Jason takes to complete the run.

..... h ..... min [1]

4 Calculate $\frac{1-0.7}{0.45-0.38}$, giving your answer correct to 4 significant figures.

..... [2]

5 Kirsty changes \$380.80 into pounds (£) when £1 = \$1.19.

Calculate the amount Kirsty receives.

£ ..... [2]

6 Write 180 as a product of its prime factors.

..... [2]

7 **Without using a calculator**, work out $\frac{3}{7} - \frac{2}{21}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [2]

8 $s = \frac{1}{2}at^2$

(a) Work out the value of s when $a = 0.9$ and $t = 4$.

$s =$ ..... [1]

(b) Rearrange the formula to find t in terms of s and a.

$t =$ ..... [2]

9 Factorise completely.

$$14xy - 7y^2$$

..... [2]

10 22, 17, 12, 7, 2, …

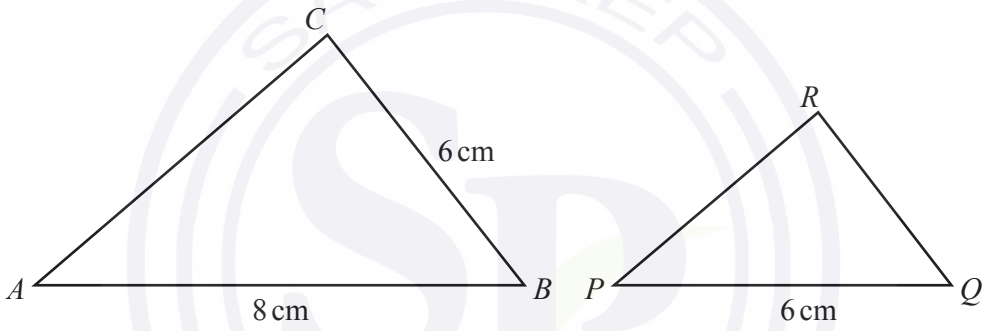
(a) Find the next term of the sequence.

..... [1]

(b) Find the nth term of the sequence.

..... [2]

11



NOT TO SCALE

Triangle ABC is mathematically similar to triangle PQR.

(a) Calculate QR.

$QR =$ ..... cm [2]

(b) The two triangles are the cross-sections of two mathematically similar prisms.
The volume of the larger prism is $320\,cm^3$.

Calculate the volume of the smaller prism.

..... cm^3 [2]

12 The interior angles of a pentagon are in the ratio $4 : 5 : 5 : 7 : 9$.

Find the size of the largest angle.

..... [3]

13 Work out $2 \times 10^{100} - 2 \times 10^{98}$, giving your answer in standard form.

..... [2]

14 A train passes through a station at a speed of 108 km/h.
The length of the station is 120 m.
The train takes 7 seconds to completely pass through the station.

Work out the length of the train.

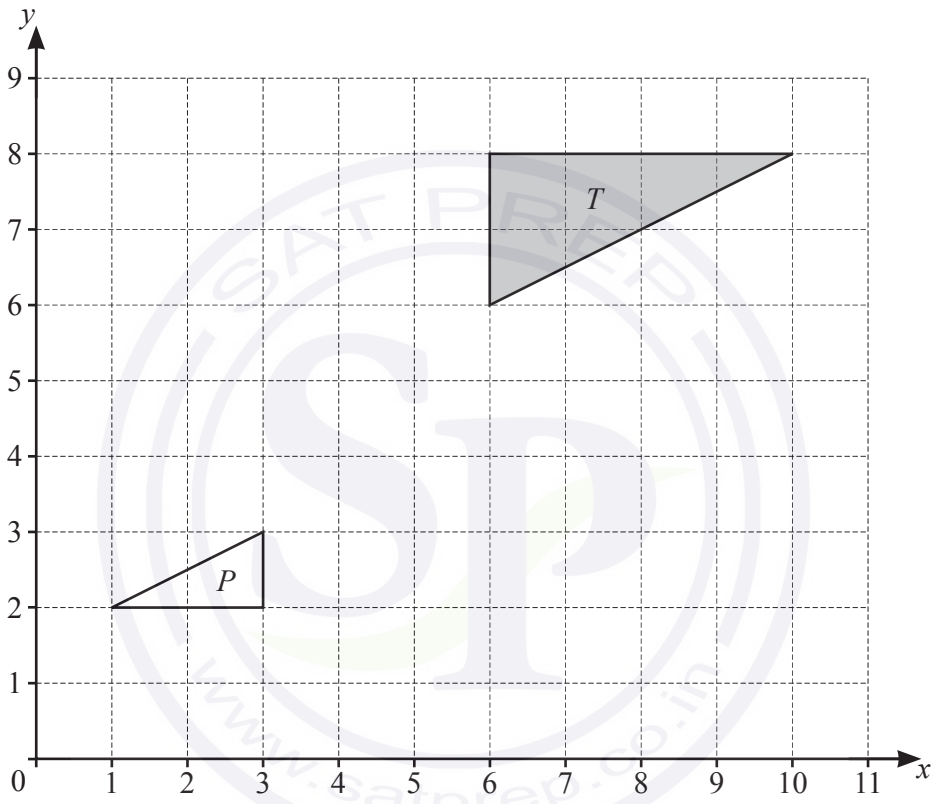
..... m [3]

15 $4^x = \frac{1}{64}$

Find the value of x.

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

16



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

.....

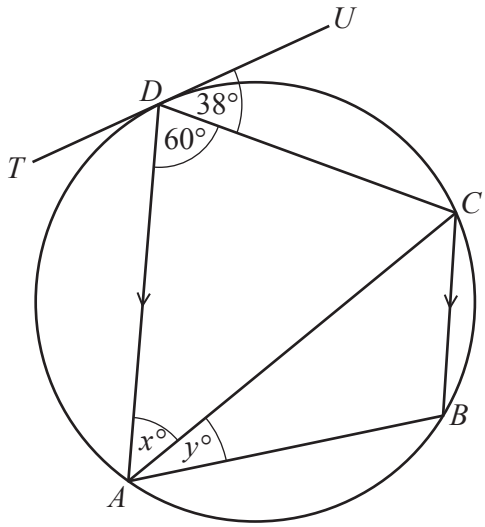
..... [3]

17 Find the radius of a hemisphere of volume $80\,\text{cm}^3$.

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

..... cm [3]

18



NOT TO SCALE

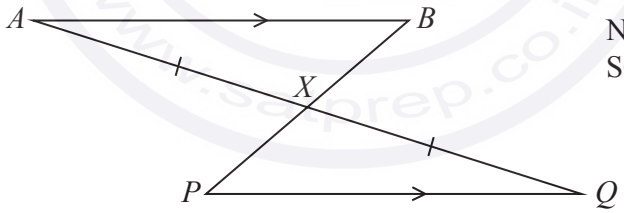
A, B, C and D are points on a circle.
TU is a tangent to the circle at D.
DA is parallel to CB.

Find the value of x and the value of y.

$x =$ .....

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

19



NOT TO SCALE

In the diagram, AB is parallel to PQ.
AQ and PB intersect at X with $AX = XQ$.

Complete the following statements.

In triangles ABX and QPX,

$AX = XQ$ is given information.

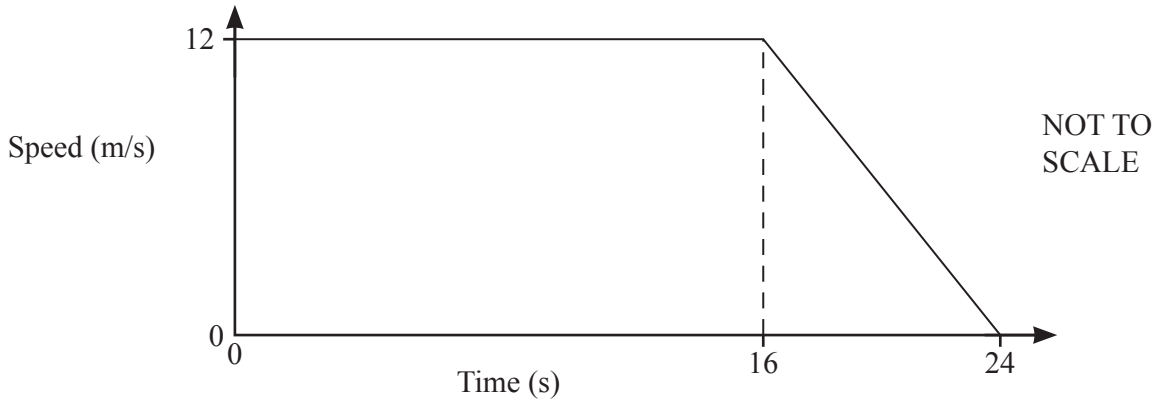
Angle BAX = Angle ..... because .....

Angle AXB = Angle ..... because .....

Triangle ABX is congruent to triangle QPX because of the congruency criterion .....

PX = ... because the triangles are congruent. [4]

20



The diagram shows the speed–time graph for 24 seconds of a car journey.

Calculate

(a) the deceleration of the car in the final 8 seconds,

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

(b) the total distance travelled during the 24 seconds.

..... m [2]

21 Factorise completely.

$1 - q - a + aq$

..... [2]

22 Simplify fully $(216y^{216})^{\frac{2}{3}}$.

..... [2]

23 $x^2 + 8x + 10 = (x+p)^2 + q$

(a) Find the value of p and the value of q.

$p =$ .....

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

(b) Solve.

$x^2 + 8x + 10 = 30$

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

24 A cuboid measures 24 cm by 12 cm by 8 cm.

Calculate the length of a diagonal of the cuboid.

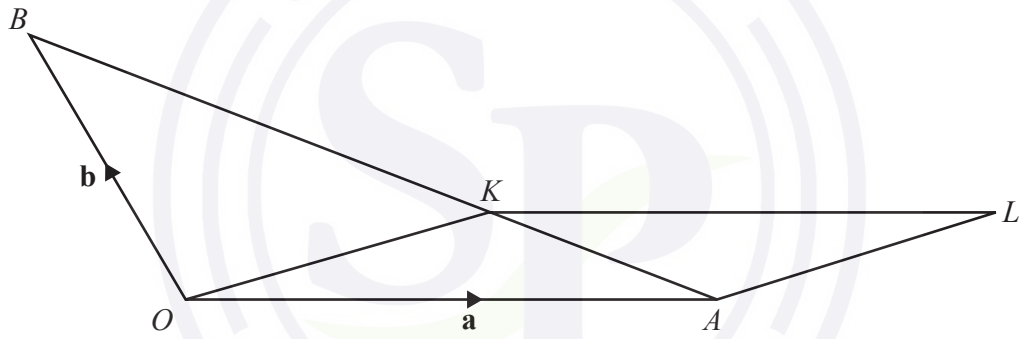
..... cm [3]

25 w is proportional to the square root of y.
y is inversely proportional to x.
When $x = 4$, $y = 16$ and $w = 8$.

Find w in terms of x.

$w =$ ..... [3]

26



NOT TO SCALE

The diagram shows a triangle OAB and a parallelogram $OALK$.
The position vector of A is **a** and the position vector of B is **b**.
K is a point on AB so that $AK : KB = 1 : 2$.

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

..... [4]

27 The line $y = x + 1$ intersects the graph of $y = x^2 - 3x - 11$ at the points A and B.

Find the coordinates of A and the coordinates of B.
You must show all your working.

A (..... , ...)

B (..... , ...) [4]

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3296413975

MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2022**

1 hour 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.
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- 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Any blank pages are indicated.

1 At noon, the temperature is 4 °C.
At midnight, the temperature is −9 °C.

Work out the difference in temperature between noon and midnight.

..... °C [1]

2 Thibault records the number of cars of each colour in a car park.

Colour	Black	White	Silver	Red
Number of cars	8	5	4	3

He draws a pie chart to show this information.

Calculate the sector angle for the red cars.

..... [2]

3 Figs cost 43 cents each.
Lyra has $5 to buy some figs.

Calculate the largest number of figs Lyra can buy and the amount of change, in cents, she receives.

..... figs and ..... cents change [3]

4 Find the value of $\sqrt{68} \times \sqrt{153}$.

..... [1]

5 Find the total surface area of a cuboid with length 8 cm, width 6 cm and height 3 cm.

..... cm^2 [3]

6 Some cards have either a square, a circle or a triangle drawn on them.
Piet chooses one of the cards at random.

Complete the table to show the probability of choosing a card with each shape.

Shape	Square	Circle	Triangle
Probability	0.2	0.32	

[2]

7 The price of a coat is \$126.
In a sale, this price is reduced by 18%.

Find the sale price of the coat.

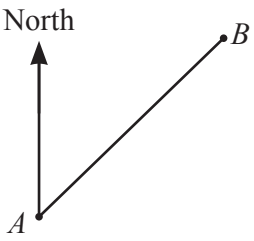
\$ ..... [2]

8 The nth term of a sequence is $n^2 + 12$.

Find the first three terms of this sequence.

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

9



NOT TO SCALE

The bearing of B from A is 059°.

Work out the bearing of A from B.

..... [2]

10 $\mathbf{p} = \begin{pmatrix} 2 \\ 8 \end{pmatrix}$ $\mathbf{q} = \begin{pmatrix} -1 \\ 4 \end{pmatrix}$

(a) Find

(i) $\mathbf{p} - \mathbf{q}$,

( ) [1]

(ii) $6\mathbf{p}$.

( ) [1]

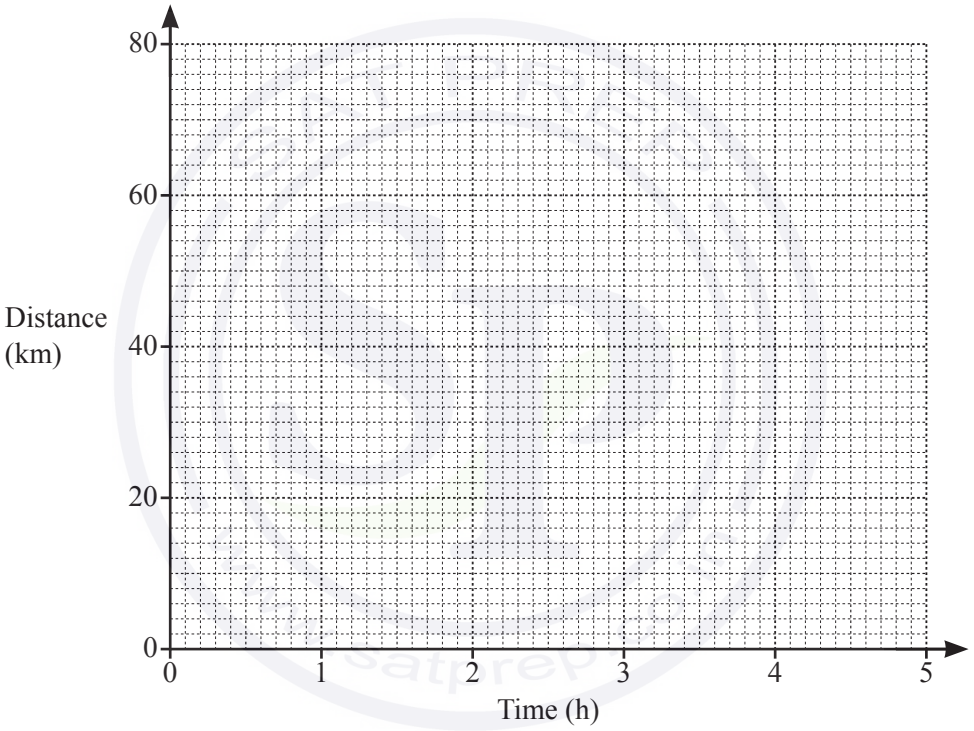
(b) Find $|\mathbf{p} - \mathbf{q}|$.

..... [2]

11 Find the value of p when $6^p \times 6^4 = 6^{28}$.

$p =$ ..... [1]

12 Annette cycles a distance of 70 km from Midville to Newtown.
Leaving Midville, she cycles for 1 hour 30 minutes at a constant speed of 20 km/h and then stops for 30 minutes.
She then continues the journey to Newtown at a constant speed of 16 km/h.



(a) On the grid, draw the distance–time graph for the journey. [3]

(b) Calculate the average speed for the whole journey.

..... km/h [3]

13 **Without using a calculator**, work out $4\frac{1}{8} - 2\frac{5}{6}$.
You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

14 Carlos invests \$4540 at a rate of r% per year compound interest.
At the end of 10 years he has earned \$1328.54 in interest.

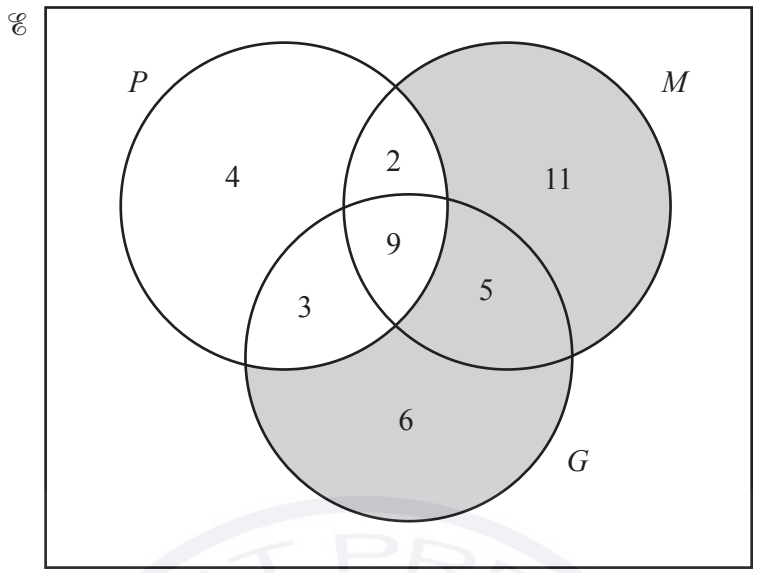
Calculate the value of r.

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

15 Find the highest common factor (HCF) of $12a^3b$ and $20a^2b^2$.

..... [2]

16 The Venn diagram shows the number of students in a class of 40 who study physics (P), mathematics (M) and geography (G).



(a) Use set notation to describe the shaded region.

..... [1]

(b) Find $\mathrm{n}((P \cap G) \cup M')$.

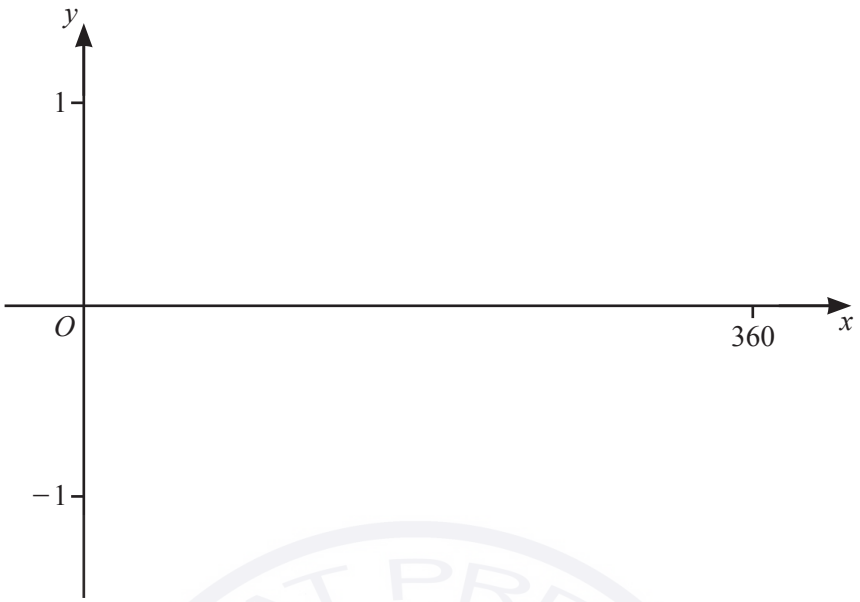
..... [1]

(c) A student is chosen at random from those studying geography.

Find the probability that this student also studies physics or mathematics but not both.

..... [2]

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



[2]

(b) Solve the equation $3\sin x + 1 = 0$ for $0° \leqslant x \leqslant 360°$.

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

18 **(a)** y is directly proportional to the cube root of $(x+1)$.
When $x = 7$, $y = 1$.

Find the value of y when $x = 124$.

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

(b) F is inversely proportional to the square of d.

Explain what happens to F when d is halved.

..... [1]

19 $f(x) = 7x - 8$ $g(x) = \frac{4}{x} + 5$ $h(x) = 2^x + 1$

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

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

(b) Find the value of x when $h(x) = g\left(\frac{1}{3}\right)$.

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

20 Factorise completely.

(a) $2m + 3p - 8km - 12kp$

..... [2]

(b) $5x^2 - 20y^2$

..... [3]

21 The nth term of a sequence is $an^2 + bn - 4$.

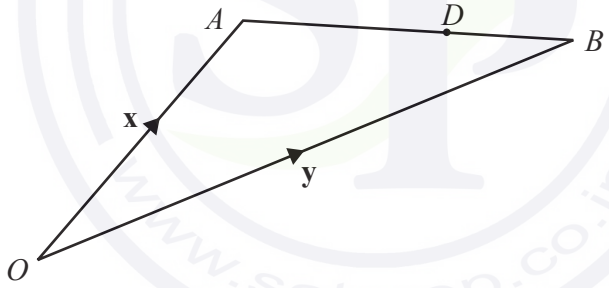
The first term is -3 and the second term is 2.

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [5]

22



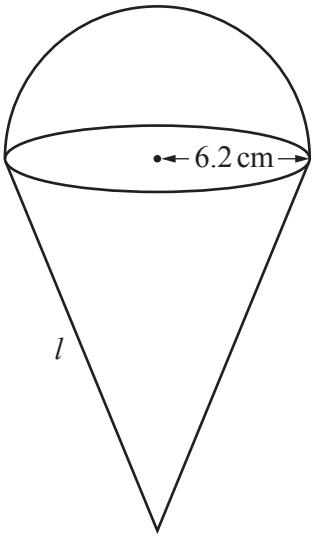
NOT TO SCALE

$\overrightarrow{OA} = \mathbf{x}$, $\overrightarrow{OB} = \mathbf{y}$ and $\overrightarrow{OD} = \frac{3}{7}\mathbf{x} + \frac{4}{7}\mathbf{y}$.

Calculate the ratio $AD : DB$.

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

23



NOT TO SCALE

The diagram shows a solid metal shape made from a cone and a hemisphere, both with radius 6.2 cm. The total surface area of the solid shape is 600 cm^2.

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

$l =$ ..... cm [4]

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MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2022**

1 hour 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

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- 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

DC (CJ/SG) 303990/3

1 The probability of picking a red sweet from a bag is 0.05 .

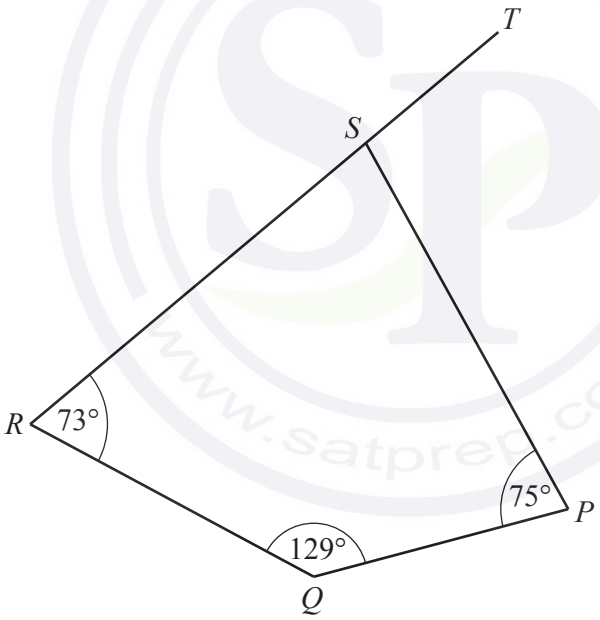
Find the probability of not picking a red sweet.

..... [1]

2 Work out the value of $\frac{m\,k^3}{\sqrt{3}}$ when $m = 4$ and $k = 7$.

..... [2]

3



NOT TO SCALE

PQRS is a quadrilateral.
RST is a straight line.

Find angle *PST*.

Angle *PST* = ... [2]

4 These are the masses, in kg, of 12 parcels.

0.3 0.4 1.2 0.8 1.1 2.1 1.7 1.8 1.2 2.3 0.7 1.1

(a) Complete the stem-and-leaf diagram for the 12 parcels.

0	3 4
1	
2	

Key: 0 | 3 represents 0.3 kg

[2]

(b) Find the median.

..... kg [1]

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

Find the first three terms of this sequence.

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

6 Simplify.

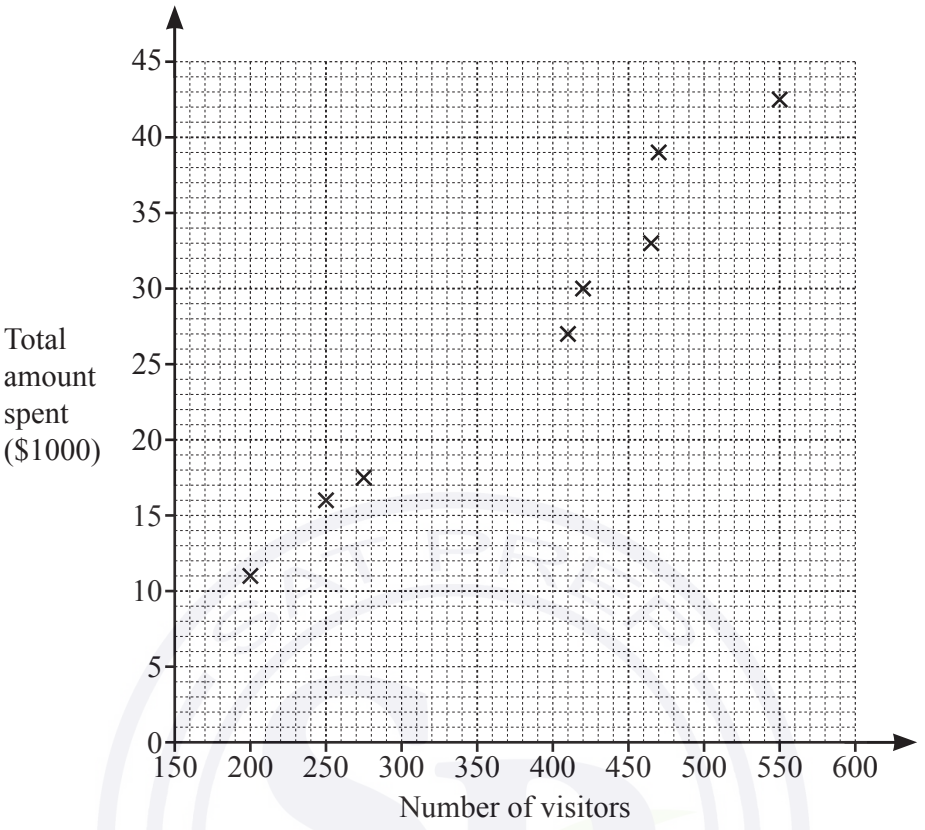
(a) $y^3 \div y^5$

..... [1]

(b) $7x^0$

..... [1]

7 The scatter diagram shows the number of visitors and the total amount spent, in thousands of dollars, at a zoo on each of eight days.



(a) On one of the eight days there are 410 visitors.

Find the total amount spent by visitors during this day.

$ ..... [1]

(b) Information for the ninth day is shown in the table.

Number of visitors	175
Total amount spent ($1000)	9

Plot this information on the scatter diagram. [1]

(c) Draw a line of best fit on the scatter diagram. [1]

(d) On the tenth day the total amount spent is $22 000.

Estimate the number of visitors on this day.

..... [1]

8 **Without using a calculator**, work out $\frac{2}{9} \div \frac{5}{6}$.

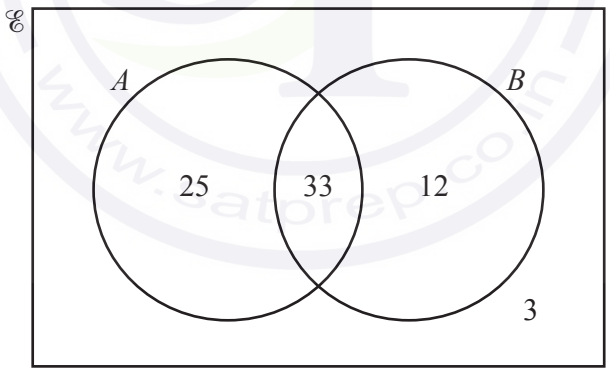
You must show all your working and give your answer as a fraction in its simplest form.

..... [2]

9 Change 300 m / min to km / h.

..... km / h [2]

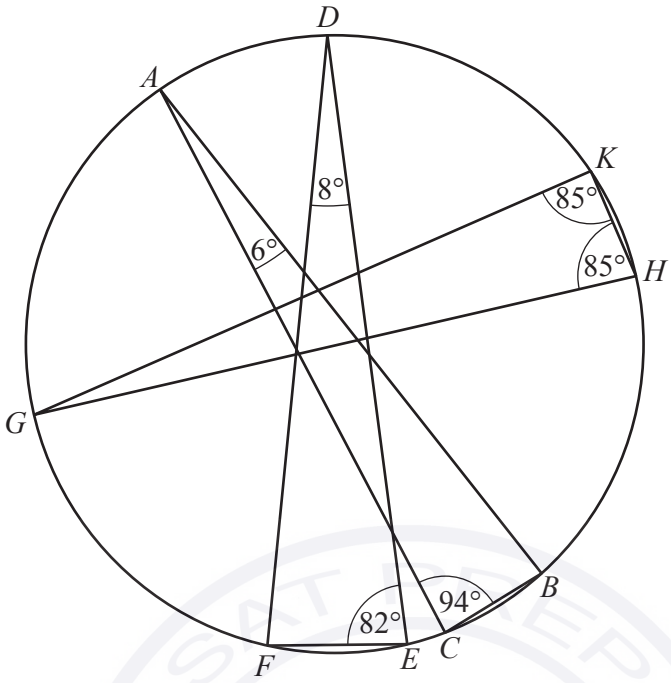
10



Find $\mathrm{n}(A \cap B)'$.

..... [1]

11 *ABC*, *DEF* and *GHK* are triangles with all vertices on the circumference of a circle.



NOT TO SCALE

From the list, draw a ring around the line that is a diameter of the circle.

AB *AC* *DE* *DF* *GH* *GK*

[1]

12 *f* is a common factor of 14 and 28.
m is a common multiple of 10 and 25.
p is a prime number.

Work out the largest possible value of $\frac{f}{mp}$.

..... [4]

13 Factorise completely.

(a) $18px - 27p$

..... [2]

(b) $mt - n - m + nt$

..... [2]

14 Find the nth term of this sequence.

8, 17, 32, 53, 80, …

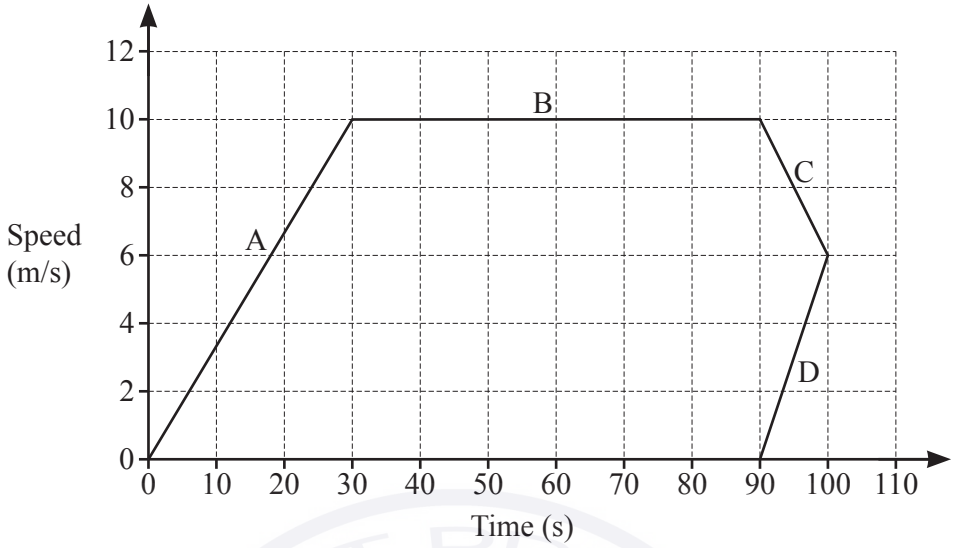
..... [2]

15 Solve.

$12x - 3 \geqslant 4x + 13$

..... [2]

16 Abdul draws this speed–time graph for a journey.
The graph has four sections A, B, C and D.



Complete these statements about the speed–time graph.

Section ..... cannot be correct.

Section ..... shows constant speed.

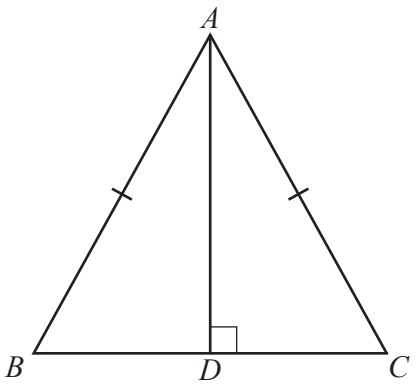
Section ..... shows deceleration.

Section A shows acceleration of ..... m/s^2.

The distance travelled in the first 30 seconds of the journey is ..... m.

[4]

17



NOT TO SCALE

In triangle ABC, $AC = AB$.
D is the point on BC such that AD is perpendicular to BC.

Complete the following statements to show that triangle ACD and triangle ABD are congruent.

AD is perpendicular to BC so that Angle ..... = Angle ..... = ... °

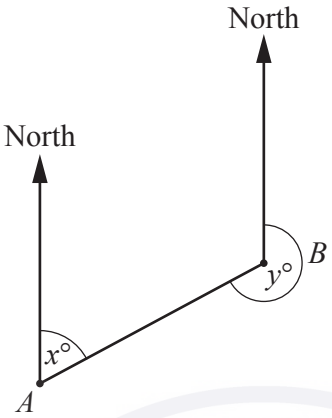
$AC = AB$ is given information.

Side ..... is common to both triangles.

Triangle ACD is congruent to triangle ABD because of the congruency criterion ..... [3]

18 The bearing of B from A is $x°$.
The bearing of A from B is $y°$.
$x : y = 2 : 7$

Calculate the value of y.



NOT TO SCALE

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

19 $f(x) = kx^2$ $g(x) = \frac{1}{x}$ $h(x) = \frac{7x-2}{5}$ $j(x) = \frac{3-10x}{14}$

(a) $f(-5k) = 675$

Find the value of k.

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

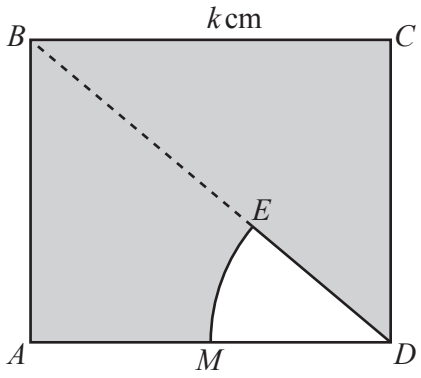
(b) Find $gh(x)$.

..... [1]

(c) Find $h^{-1}(x) + j(x)$.
Give your answer in its simplest form.

..... [4]

20



NOT TO SCALE

The diagram shows a square $ABCD$ with side length k cm.
MDE is a sector of a circle, centre D.
E lies on the diagonal, BD, of the square.
M is the midpoint of AD.

Find the percentage of the square that is shaded.

..... % [4]

21 Neha has a piece of ribbon of length 23 cm, correct to the nearest cm.
From this ribbon she cuts off a piece with length 87 mm, correct to the nearest mm.

Work out the lower bound and the upper bound for the length of the remaining ribbon.
Give your answer in centimetres.

Lower bound = ... cm

Upper bound = ...cm [3]

22 Simplify.

$$\frac{5x-x^2}{25-x^2}$$

..... [3]

23 Solve the equation $3\sin x + 3 = 1$ for $0° \leqslant x \leqslant 360°$.

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

24 y is inversely proportional to the cube of $(x-1)$.
$y = 9.45$ when $x = 3$.

Find y when $x = 4$.

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

25 $m^{-\frac{1}{4}} = 27m^{-1}$

Find the value of m.

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

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CENTRE NUMBER						CANDIDATE NUMBER				

4890138067

MATHEMATICS **0580/22**

Paper 2 (Extended) **February/March 2022**

1 hour 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

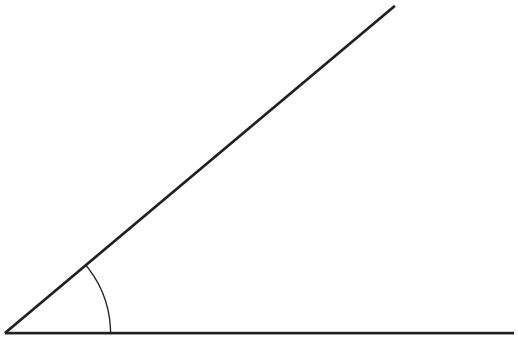
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Any blank pages are indicated.

1



Measure the marked angle.

..... [1]

2 Work out $\sqrt{5} \times 6^2$.
Give your answer correct to 2 decimal places.

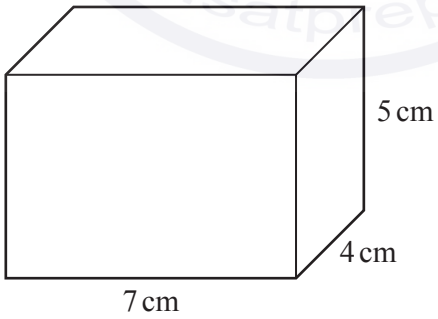
..... [2]

3 A journey starts at 21 15 one day and ends at 04 33 the next day.

Calculate the time taken, in hours and minutes.

..... h ..... min [1]

4



NOT TO SCALE

Calculate the **total** surface area of this cuboid.

..... cm^2 [3]

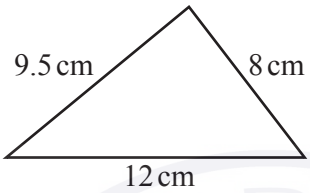
5 **(a)** Write down the gradient of the line $y = 5x + 7$.

..... [1]

(b) Find the coordinates of the point where the line $y = 5x + 7$ crosses the y-axis.

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

6

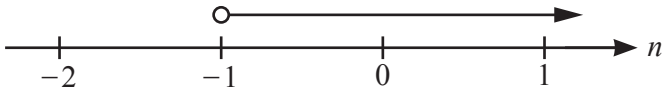


NOT TO SCALE

Using a ruler and compasses only, construct this triangle.
Leave in your construction arcs.
The side of length 12 cm has been drawn for you.

[2]

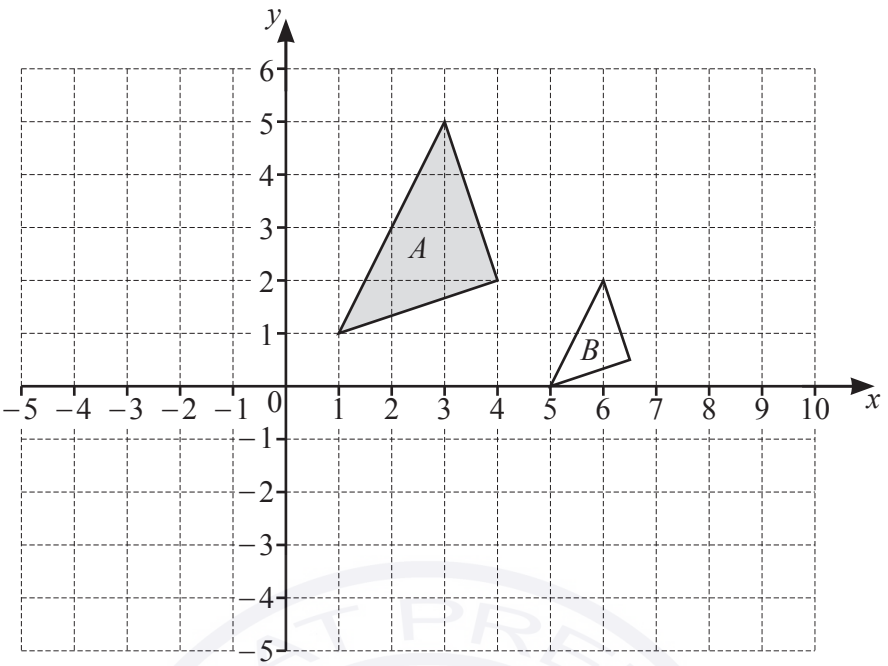
7



Write down the inequality, in terms of n, shown by the number line.

..... [1]

8



(a) On the grid, draw the image of

(i) triangle A after a reflection in the y-axis, [1]

(ii) triangle A after a translation by the vector $\begin{pmatrix}-3\\-4\end{pmatrix}$. [2]

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

.....

..... [3]

9 Factorise completely.

$$12a^3 - 21a$$

..... [2]

10 **(a)** The nth term of a sequence is $n^2 + 7$.

Find the first three terms of this sequence.

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

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

15 7 − 1 −9

Find the nth term of this sequence.

..... [2]

11 As the temperature increases, people eat more ice cream.

What type of correlation does this statement describe?

..... [1]

12 **(a)** Sanjay invests \$700 in an account paying simple interest at a rate of 2.5% per year.

Calculate the value of his investment at the end of 6 years.

\$ ..... [3]

(b) Meera invests \$700 in an account paying compound interest at a rate of r% per year.
At the end of 17 years the value of her investment is \$1030.35 .

Find the value of r.

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

13 **(a)** Simplify $h^2 \times h^5$.

..... [1]

(b) Simplify $\left(\frac{7}{x}\right)^{-3}$.

..... [1]

(c) $a^8 \div a^p = a^2$

Find the value of p.

$p =$ ..... [1]

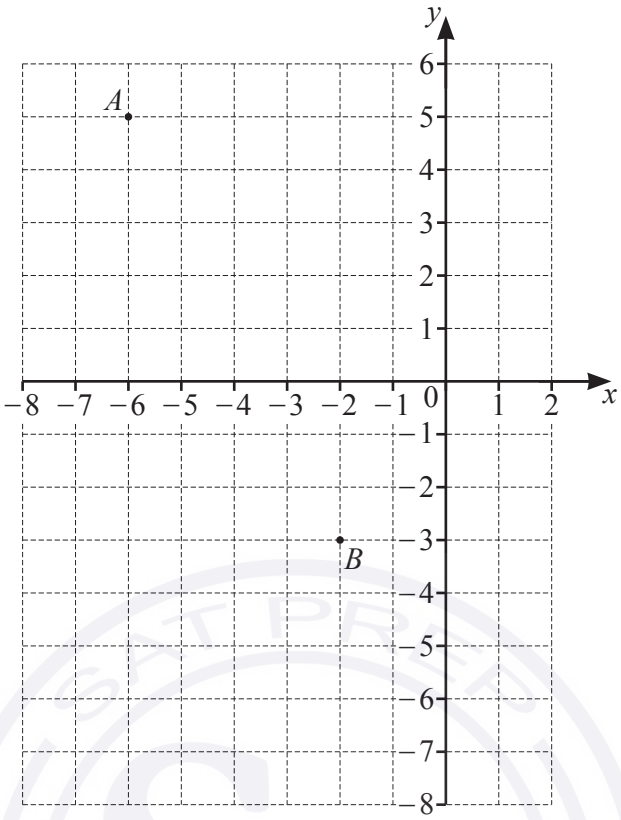
14 Calculate the circumference of a circle with radius 4.7 cm.

..... cm [2]

15 **Without using a calculator**, work out $2\frac{1}{3} \times \frac{11}{14}$.
You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

16



A is the point $(-6, 5)$ and B is the point $(-2, -3)$.

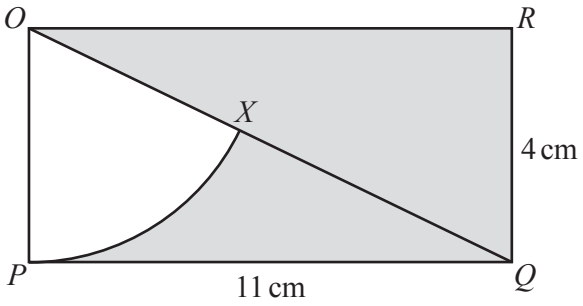
(a) Find the equation of the straight line, l, that passes through point A and point B.
Give your answer in the form $y = mx + c$.

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

(b) Find the equation of the line that is perpendicular to l and passes through the origin.

..... [2]

17



NOT TO SCALE

The diagram shows a rectangle $OPQR$ with length 11 cm and width 4 cm.
OQ is a diagonal and OPX is a sector of a circle, centre O.

Calculate the percentage of the rectangle that is shaded.

..... % [5]

18 Mrs Kohli buys a jacket, 2 shirts and a hat.
The jacket costs $\$x$.
The shirts each cost \$24 less than the jacket and the hat costs \$16 less than the jacket.
Mrs Kohli spends exactly \$100.

Write down an equation in terms of x.
Solve this equation to find the cost of the jacket.

\$ ..... [3]

19 y is inversely proportional to the square root of $(x+4)$.
When $x = 5$, $y = 2$.

Find y when $x = 77$.

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

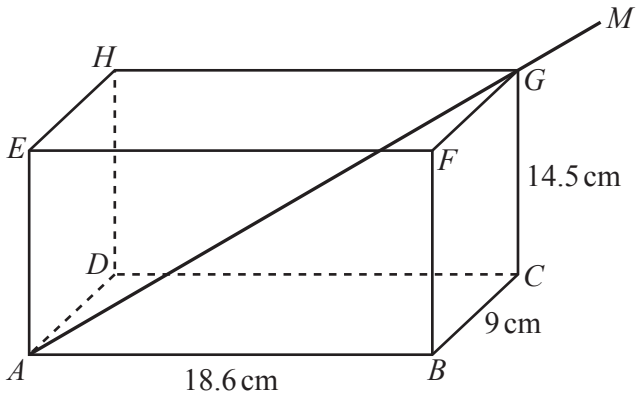
20 Solve the simultaneous equations.
You must show all your working.

$$3x + y = 11$$
$$x^2 - 2y = 18$$

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

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

21



NOT TO SCALE

The diagram shows an open rectangular box $ABCDEFGH$.
$AB = 18.6$ cm, $BC = 9$ cm and $CG = 14.5$ cm.
A straight stick AGM rests against A and G and extends outside the box to M.

(a) Calculate the angle between the stick and the base of the box.

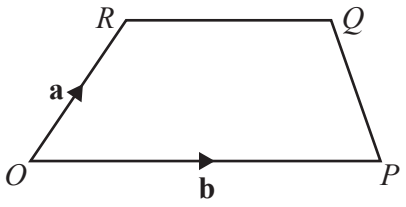
..... [4]

(b) $AM = 30$ cm.

Show that $GM = 4.8$ cm, correct to 1 decimal place.

[3]

22



NOT TO SCALE

The diagram shows a trapezium $OPQR$.
O is the origin, $\overrightarrow{OR} = \mathbf{a}$ and $\overrightarrow{OP} = \mathbf{b}$.

$|\overrightarrow{RQ}| = \frac{3}{5}|\overrightarrow{OP}|$

(a) Find $\overrightarrow{PQ}$ in terms of **a** and **b** in its simplest form.

$\overrightarrow{PQ} =$ ..... [2]

(b) When PQ and OR are extended, they intersect at W.

Find the position vector of W.

..... [2]

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MATHEMATICS **0580/21**

Paper 2 (Extended) **October/November 2021**

1 hour 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.
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- 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

DC (LK/SG) 212501/3

[Turn over

1 P is a prime number where $60 < P < 80$.
P is 2 less than a square number.

Find the value of P.

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

2 Hank flies from Los Angeles to Shanghai.

(a) The flight departs on Friday 22 July at 21 40.
The flight takes 13 hours 35 minutes.
The local time in Shanghai is 15 hours ahead of the local time in Los Angeles.

Find the day, date and time in Shanghai when Hank's flight arrives.

Day ....., Date ....., Time ..... [3]

(b) The cost of the flight is \$920.
The exchange rate is \$1 = 6.87 Chinese yuan.

Find the cost of the flight in yuan.

..... yuan [1]

3 Calculate.

$$\frac{4.87 - 2.7}{-0.2 + \sqrt[3]{0.729}}$$

..... [1]

4 The number of items that each of 22 people buy in a supermarket is shown in the stem-and-leaf diagram.

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

Key: 1 | 1 represents 11 items

(a) Find the mode.

..... [1]

(b) Find the median.

..... [1]

5 The table shows the relative frequency of the games won by a football team.

Result of game	won	lost	drawn
Relative frequency	0.1		

The number of games lost is twice the number of games drawn.

Complete the table.

[3]

6 The scale drawing shows the positions of two towns, P and Q.
The scale is 1 cm represents 4 km.

Scale: 1 cm to 4 km

(a) Find the actual distance between town P and town Q.

..... km [2]

(b) Measure the bearing of town Q from town P.

..... [1]

(c) Town X is 28 km from town P on a bearing of 140°.

On the scale drawing, mark the position of town X. [2]

7 **Without using a calculator**, work out $1\frac{5}{6}+\frac{2}{5}$.
You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

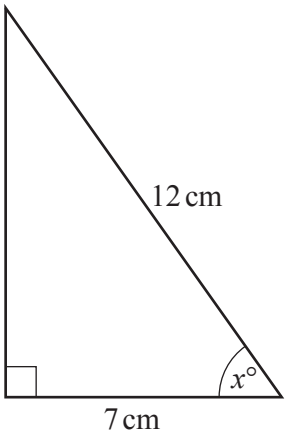
8 Solve the simultaneous equations.
You must show all your working.

$$4x-2y=-13$$
$$-3x+4y=\ 11$$

$x=$ .....

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

9



NOT TO SCALE

Calculate the value of x.

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

10 A regular polygon has an interior angle of 174°.

Find the number of sides of this polygon.

..... [2]

11 Line L has equation $y = 4 - 5x$.

Find the equation of a line that is perpendicular to line L and passes through the point (0, 6).

..... [3]

12 Chai invests some money.
By the end of the first year, the value of the investment has decreased by 35%.
By the end of the second year, the value of the investment has increased by 40% of its value at the end of the first year.

Find the overall percentage change in the value of the investment.

..... % [3]

13 Solve.

$$4-3x \geqslant \frac{6-x}{5}$$

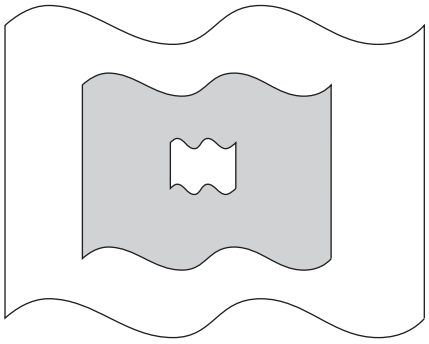
..... [3]

14 y is inversely proportional to the square root of $(x-2)$.
When $x = 4.25$, $y = 12$.

Find x when $y = 3$.

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

15



NOT TO SCALE

The diagram shows three shapes that are mathematically similar.
The heights of the shapes are in the ratio small : medium : large = 1 : 5 : 8.

Find the ratio shaded area : total unshaded area.
Give your answer in its simplest form.

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

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

(a) 8, 15, 34, 71, 132, ...

..... [2]

(b) $\frac{2}{1}$, $\frac{3}{4}$, $\frac{4}{16}$, $\frac{5}{64}$, $\frac{6}{256}$, ...

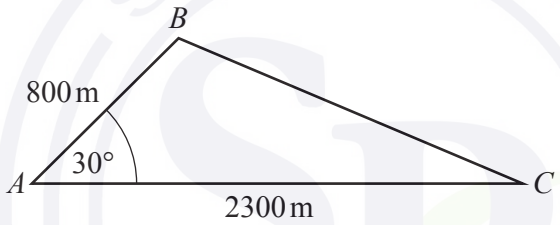
..... [3]

17 $y = \dfrac{3x-2}{1-x}$

Make x the subject of the formula.

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

18



NOT TO SCALE

The diagram shows some land in the shape of a triangle ABC.
Houses are built on this land.
Each house requires $400\,m^2$ of land.

Find the greatest number of houses that can be built on this land.

..... [3]

19 Write as a single fraction in its simplest form.

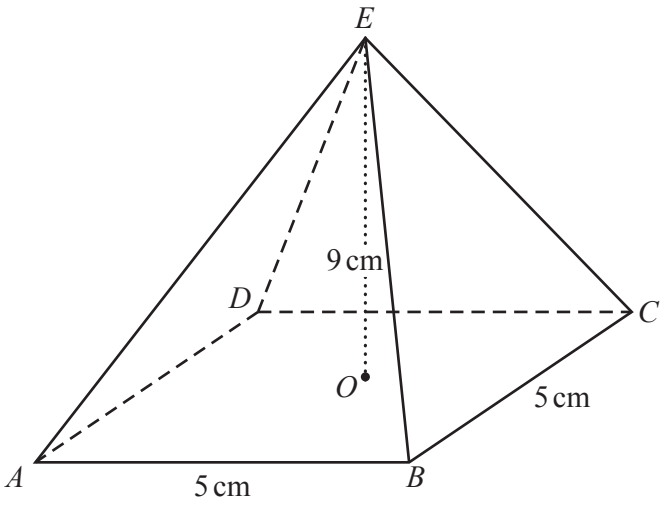
$$\frac{2}{x+3} - \frac{x+2}{7}$$

..... [3]

20 Solve $3(2+\cos x) = 5$ for $0° \leqslant x \leqslant 360°$.

..... [3]

21



NOT TO SCALE

The diagram shows a pyramid $ABCDE$.
The pyramid has a square horizontal base $ABCD$ with side 5 cm.
The vertex E is vertically above the centre O of the base.
The height OE of the pyramid is 9 cm.

Calculate the angle that EC makes with the base $ABCD$.

..... [4]

Question 22 is printed on the next page.

22 **(a)** Simplify.

$$\frac{x^{\frac{2}{3}}}{x^{\frac{8}{3}}}$$

..... [1]

(b) $16 = 64^k$

Find the value of k.

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

(c) Solve.

$$3^{3x} \times \left(\frac{1}{9}\right)^{4-3x} = 3$$

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

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CENTRE NUMBER						CANDIDATE NUMBER				

9418926981

MATHEMATICS **0580/22**

Paper 2 (Extended) **October/November 2021**

1 hour 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.
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- 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages.

1 The temperature at midnight is −8.5 °C.
The temperature at 11 am is −1 °C.

Work out the difference between the temperature at midnight and the temperature at 11 am.

..... °C [1]

2 The stem-and-leaf diagram shows the age, in years, of each of 15 women.

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

Key: 3 | 1 represents 31 years

Complete these statements.

The modal age is .....

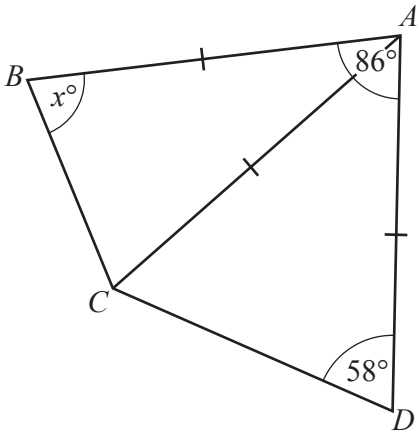
The median age is .....

The percentage of women that are older than 51 years is ..... %. [3]

3 Change 2.15 hours into minutes.

..... min [1]

4



NOT TO SCALE

Triangle ABC and triangle ACD are isosceles.
Angle $DAB = 86°$ and angle $ADC = 58°$.

Find the value of x.

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

5 Angelique rents a room for a party.
The cost of renting the room is \$15.50 for the first hour and then \$7.25 for each additional hour.
She pays \$95.25 in total.

Work out the total number of hours she rents the room for.

..... hours [3]

6 **Without using a calculator**, work out $\frac{1}{3} \div \frac{7}{6} + \frac{1}{5}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [4]

7 Katy has 5 white flowers, x red flowers and $(2x + 1)$ yellow flowers.
She picks a flower at random.

The probability that it is white is $\frac{1}{12}$.

Find the probability that it is yellow.

..... [4]

8 Calculate $\sqrt[4]{39\frac{1}{16}}$.

..... [1]

9 2.1×10^{-1} $0.\dot{2}$ 22% $\sqrt{0.2}$ $\frac{24}{1000}$

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

..... < ..... < ..... < ..... < ..... [2]
smallest

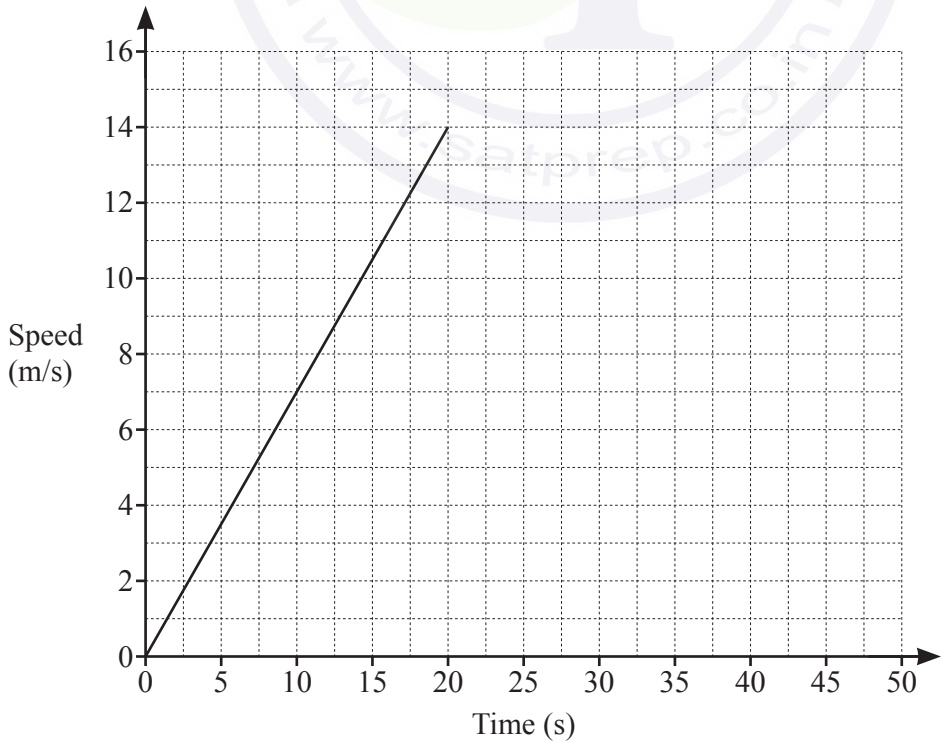
10 The interior angle of a regular polygon is 156°.

Work out the number of sides of this polygon.

..... [2]

11 A car starts its journey by accelerating from rest at a constant rate of 0.7 m/s^2 for 20 seconds, before reaching a constant speed of 14 m/s.
It then travels at 14 m/s for a distance of 210 m.
The car then decelerates at a constant rate of 1.4 m/s^2, before coming to a stop.

On the grid, complete the speed–time graph for the car's journey.



[3]

12 The table shows the first five terms of sequences A, B and C.

	1st term	2nd term	3rd term	4th term	5th term	nth term
Sequence A	8	3	-2	-7	-12	
Sequence B	2	$\frac{3}{2}$	$\frac{4}{3}$	$\frac{5}{4}$	$\frac{6}{5}$	
Sequence C	$\frac{1}{2}$	1	2	4	8	

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

[5]

13 **(a)** Write 243×27^{2n} as a single power of 3 in terms of n.

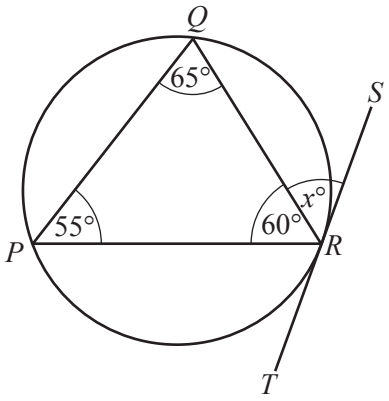
..... [2]

(b) $k = 2 \times 3^2 \times p^3$, where p is a prime number greater than 3.

Write $6k^2$ as a product of prime factors in terms of p.

..... [2]

14



NOT TO SCALE

P, *Q* and *R* are points on a circle.
ST is a tangent to the circle at *R*.

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

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

..... [2]

(b) Another tangent from the point *S* touches the circle at *V*.

Give a geometrical reason why triangle *SVR* is isosceles.

.....

..... [1]

15 **(a)** *A* is the point (3, 16) and *B* is the point (8, 31).

Find the equation of the line that passes through *A* and *B*.
Give your answer in the form $y = mx + c$.

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

(b) The line *CD* has equation $y = 0.5x - 11$.

Find the gradient of a line that is perpendicular to the line *CD*.

..... [1]

16 Sachin picks a number at random from the first three multiples of 3.
He then picks a number at random from the first three prime numbers.
He adds the two numbers to find a score.

(a) Complete the table.

		Multiples of 3		
		3		9
Prime numbers	2	5		11
	3	6		

[2]

(b) Given that the score is even, find the probability that one of the numbers he picks is 9.

..... [2]

17 Solve.

$(5x-3)(2x+7)=0$

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

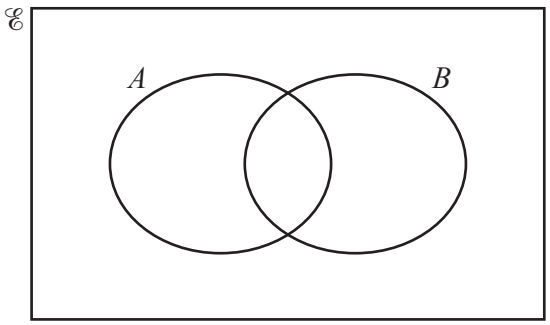
18 Solve the simultaneous equations.
You must show all your working.

$$y = x^2 - 9x + 21$$
$$y = 2x - 3$$

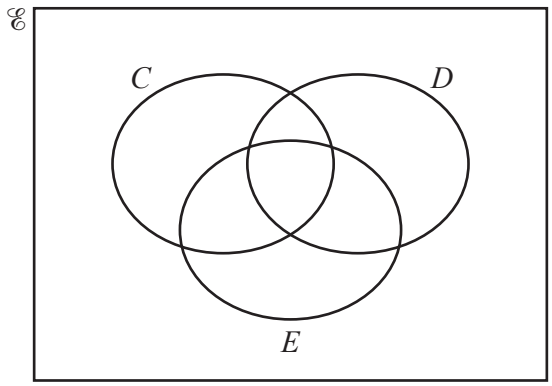
$x =$ ..... $y =$ .....

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

19 In these Venn diagrams, shade the given regions.



$A' \cup B'$



$(C \cup D) \cap E'$

[2]

20 $\mathrm{f}(x) = 2^{x-3}$ $\mathrm{g}(x) = 2x - 1$ $\mathrm{h}(x) = \dfrac{5}{x-4}$

(a) Find ff(6).

..... [2]

(b) Find $\mathrm{g}^{-1}\mathrm{g}(x+21)$.

..... [1]

(c) Find x when $\mathrm{f}(x) = \mathrm{h}(84)$.

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

21 Expand and simplify.

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

..... [3]

22 Solve the equation $7\sin x + 2 = 0$ for $0° \leqslant x \leqslant 360°$.

..... [3]

Question 23 is printed on the next page.

23 Simplify.

$$\frac{3xy + 36y - 5x - 60}{2x^2 - 288}$$

..... [4]

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2897957022

MATHEMATICS **0580/23**

Paper 2 (Extended) **October/November 2021**

1 hour 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

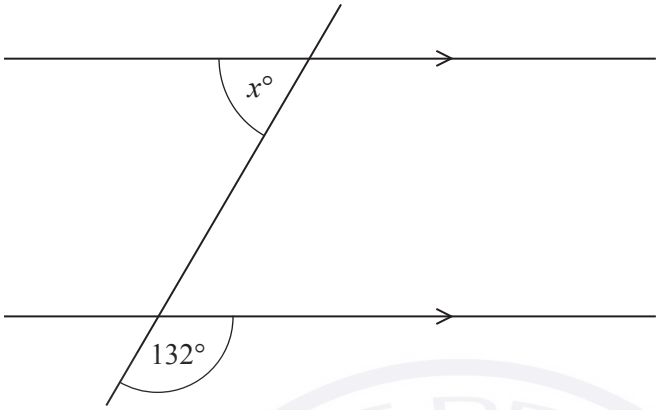
- The total mark for this paper is 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Any blank pages are indicated.

1 Write 26 g as a percentage of 208 g.

..... % [1]

2



NOT TO SCALE

The diagram shows two parallel lines intersecting a straight line.

Find the value of x.

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

3

11 13 15 17 19

From this list, write down the number that is both a prime number and a factor of 195.

..... [1]

4 **(a)** = ≠ > <

Put a ring around each of the symbols that make this statement correct.

0.5 ..... 5% [1]

(b) Insert one pair of brackets to make this statement correct.

$7 - 3 - 1 + 2 = 7$ [1]

5 Nina changes 153 euros into dollars when the exchange rate is \$1 = 0.9 euros.

Calculate the amount Nina receives.

\$ ..... [1]

6 Marek buys a computer for \$420.
He sells it at a loss of 15%.

Calculate the selling price of this computer.

\$ ..... [2]

7 Simplify.

$32g^{32} \div 4g^{4}$

..... [2]

8 Beatrice walks 1 km at a speed of 4 km/h and then 2 km at a speed of 4.5 km/h.

Work out Beatrice's average speed for the whole journey.

..... km/h [3]

9 Write the recurring decimal $0.\dot{2}\dot{7}$ as a fraction.

..... [1]

10 These are the first four terms of a sequence.

$$3 \quad -1 \quad -5 \quad -9$$

(a) Find the next term in this sequence.

..... [1]

(b) Find the nth term.

..... [2]

11 $P = M(g^2 + h^2)$

(a) Find the value of P when $M = 100$, $g = 3$ and $h = 4.5$.

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

(b) Rearrange the formula to write g in terms of P, M and h.

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

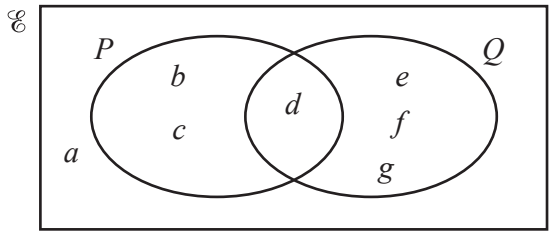
12 **Without using a calculator**, work out $\frac{11}{12} + \frac{3}{4}$.
You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

13 Calculate $0.04^2 + 0.03 \times 0.28$.
Give your answer in standard form.

..... [2]

14



(a) Complete the statement.

$P \cup Q = \{$ ..... $\}$ [1]

(b) Find $n(Q)$.

..... [1]

(c) Find $n(P' \cap Q)$.

..... [1]

15 The cost of a train journey is increased by 6% to a new cost of \$153.70 .

Calculate the original cost of the train journey.

\$ ..... [2]

16 Jo and Mo share \$26.
Jo receives \$5 more than Mo.

Find the ratio Jo's money : Mo's money.
Give your answer in its simplest form.

..... : ..... [3]

17 Each interior angle of a regular polygon is 178.5°.

Calculate the number of sides of this polygon.

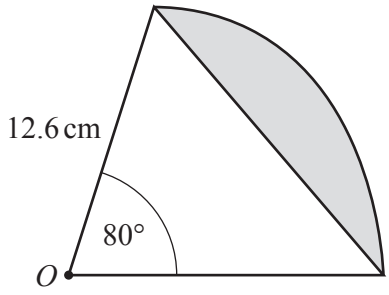
..... [2]

18 Find the equation of the straight line that passes through the points (2, −2) and (3, 10).

Give your answer in the form $y = mx + c$.

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

19



NOT TO SCALE

The diagram shows a sector of a circle, centre O, radius 12.6 cm.

Calculate the perimeter of the shaded segment.

..... cm [4]

20 A lake has an area of 3 km^2.
On a map the area of the lake is 18.75 cm^2.

Find the scale of the map in the form 1 : n.

1 : ..... [3]

21 Simplify fully.

$$\left(243y^{10}\right)^{\frac{3}{5}}$$

..... [2]

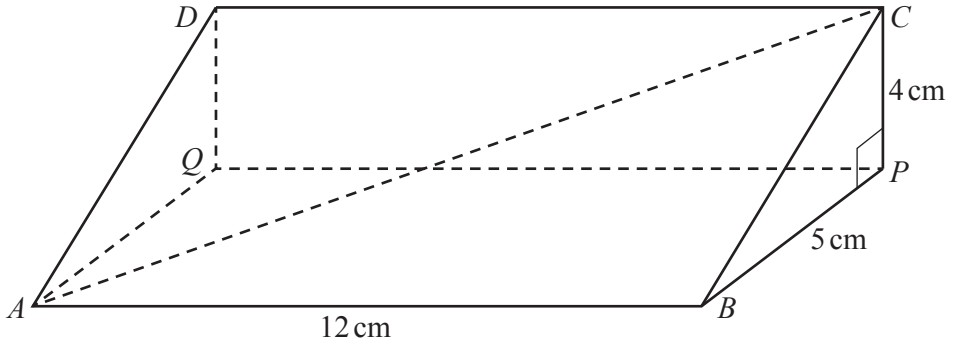
22 Solve the simultaneous equations.
You must show all your working.

$$y = x^2 - 3x - 13$$
$$y = x - 1$$

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

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

23



NOT TO SCALE

The diagram shows a triangular prism.
Angle $BPC = 90°$.

(a) Calculate AC.

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

(b) Calculate the angle between AC and the base $ABPQ$.

..... [3]

24 $\tan x = \sqrt{3}$ and $0° \leqslant x \leqslant 360°$.

Find all the possible values of x.

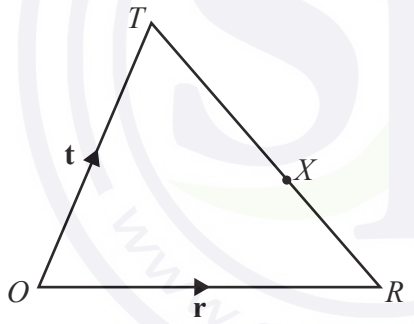
..... [2]

25 Simplify.

$$\frac{3x^2 - 18x}{ax - 6a + 2cx - 12c}$$

..... [4]

26



NOT TO SCALE

ORT is a triangle.
X is a point on *TR* so that $TX : XR = 3 : 2$.
O is the origin, $\overrightarrow{OR} = \mathbf{r}$ and $\overrightarrow{OT} = \mathbf{t}$.

Find the position vector of *X*.
Give your answer in terms of **r** and **t** in its simplest form.

..... [3]

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8731750610

MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2021**

1 hour 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

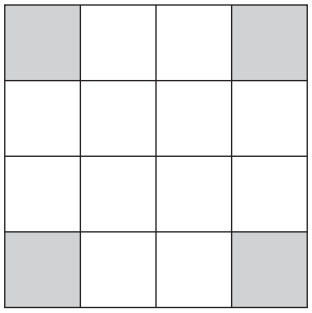
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Any blank pages are indicated.

1



(a) Write down the order of rotational symmetry of this diagram.

..... [1]

(b) On the diagram, draw all the lines of symmetry. [2]

2 The probability that a train is late is 0.15 .

Write down the probability that the train is not late.

..... [1]

3 The stem-and-leaf diagram shows the number of hours that each of 16 students studied last week.

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

Key: 1 | 2 represents 12 hours

Find

(a) the median,

..... h [1]

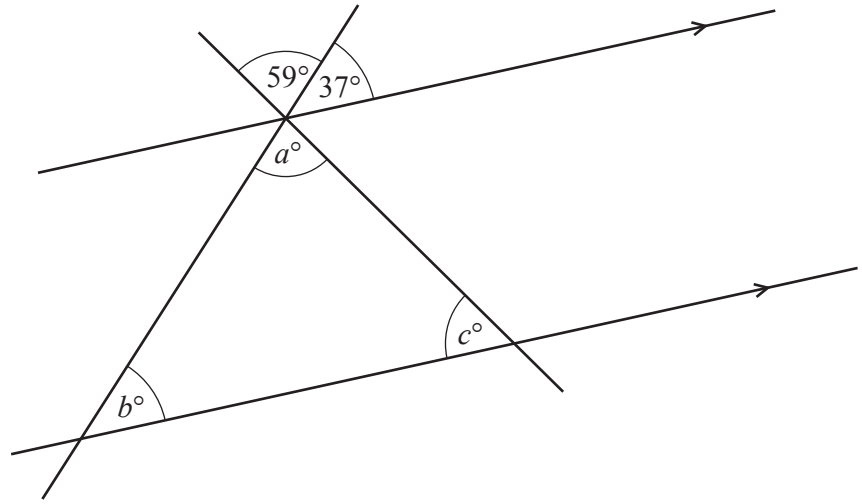
(b) the mode,

..... h [1]

(c) the range.

..... h [1]

4



NOT TO SCALE

The diagram shows two parallel lines intersected by two straight lines.

Find the values of a, b and c.

$a =$ .....

$b =$ .....

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

5 Work out.

(a) $\begin{pmatrix} 6 \\ -5 \end{pmatrix} + \begin{pmatrix} 8 \\ -1 \end{pmatrix}$

( ) [1]

(b) $3\begin{pmatrix} -4 \\ 7 \end{pmatrix}$

( ) [1]

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

Find the first three terms of this sequence.

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

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

25 18 11 4 −3

Find the nth term of this sequence.

..... [2]

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

$$2x + y = 3$$
$$x - 5y = 40$$

$x =$ .....

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

8 **Without using a calculator**, work out $1\frac{3}{8} - \frac{5}{6}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [3]

9 A is the point $(5, -5)$ and B is the point $(9, 3)$.

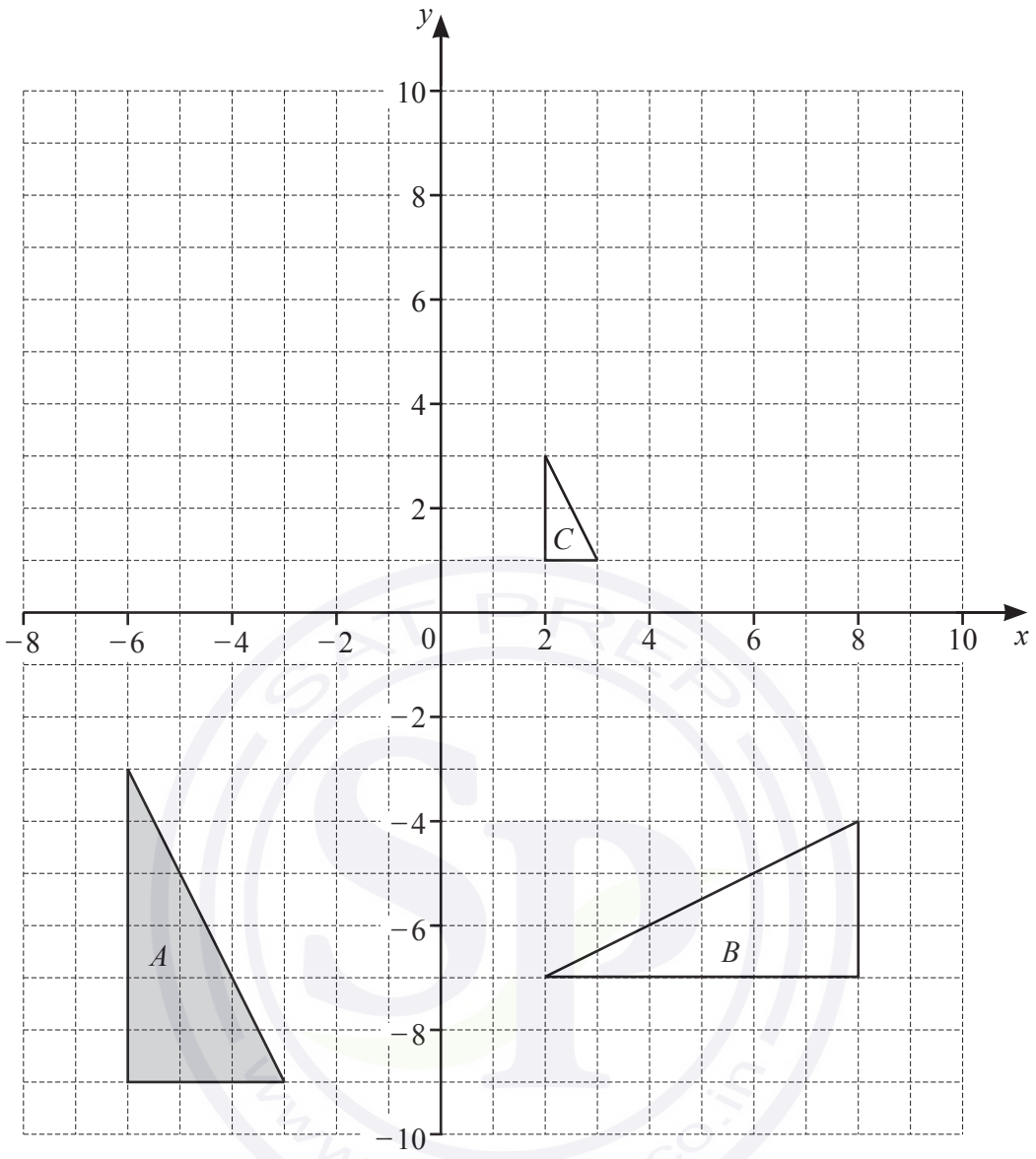
(a) Find the coordinates of the midpoint of AB.

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

(b) Find the length of AB.

..... [3]

10



(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 $\begin{pmatrix} 2 \\ 10 \end{pmatrix}$. [2]

11 **(a)** Simplify fully.

$(4ab^5)^4$

..... [2]

(b) $2p^{\frac{1}{3}} = 6$

Find the value of p.

$p =$ ..... [1]

(c) $81^2 \div 3^t = 9$

Find the value of t.

$t =$ ..... [2]

12 The profit a company makes decreases exponentially at a rate of 0.9% per year.
In 2014, the profit was \$9500.

Calculate the profit in 2019.

\$ ..... [2]

13 On a map, a lake has an area of $32\,cm^2$.
The scale of the map is 1 : 24 000.

Calculate the actual area of the lake.
Give your answer in km^2.

..... km^2 [2]

14 y is directly proportional to the square root of $(x-3)$.
When $x = 28$, $y = 20$.

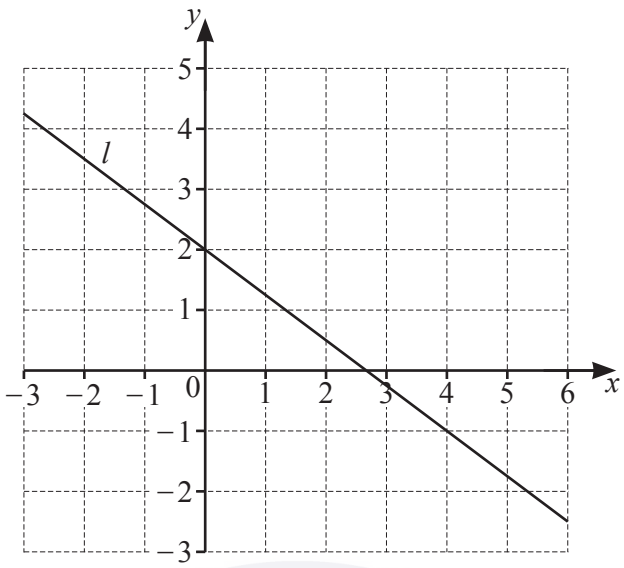
Find y when $x = 39$.

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

15 Make h the subject of the formula $2mh = g(1-h)$.

$h =$ ..... [4]

16



(a) Find the gradient of line l.

..... [2]

(b) Find the equation of line l in the form $y = mx + c$.

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

(c) Find the equation of the line that is perpendicular to line l and passes through the point $(12, -7)$. Give your answer in the form $y = mx + c$.

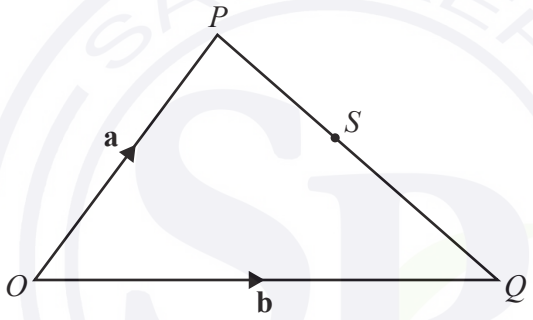
$y =$ ..... [3]

17 A bag contains 3 blue buttons, 8 white buttons and 5 red buttons.
Two buttons are picked at random from the bag, without replacement.

Work out the probability that the two buttons are either both red or both white.

..... [3]

18



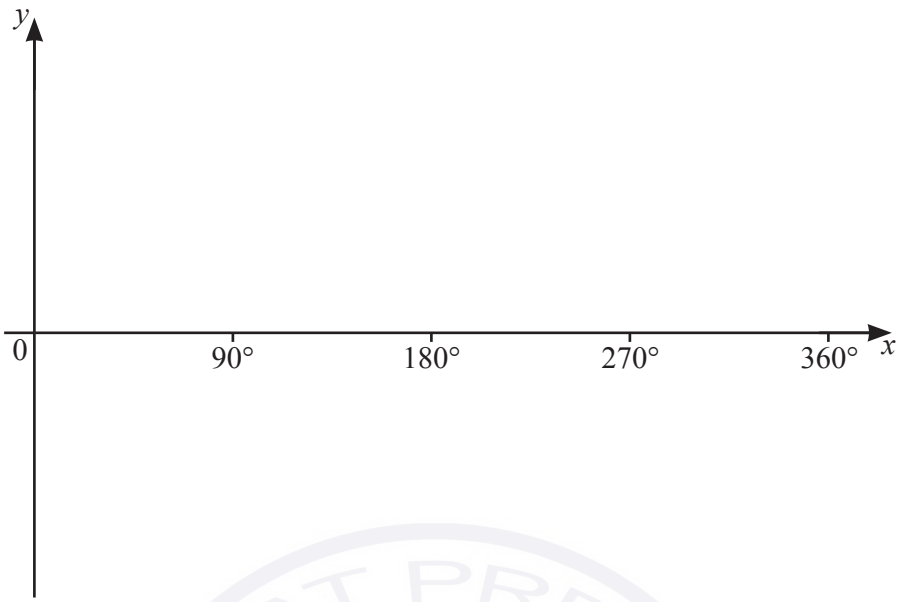
NOT TO SCALE

S is a point on *PQ* such that $PS : SQ = 4 : 5$.

Find $\overrightarrow{OS}$, in terms of **a** and **b**, in its simplest form.

$\overrightarrow{OS}$ = ... [2]

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



[2]

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

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

20 The distance between two towns is 600 km, correct to the nearest 10 km.
A car takes 8 hours 40 minutes, correct to the nearest 10 minutes, to travel this distance.

Calculate the lower bound for the average speed of the car in km/h.

..... km/h [3]

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8980282381

MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2021**

1 hour 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.
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- 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages. Any blank pages are indicated.

1 The probability that Jane wins a game is $\frac{7}{10}$.

(a) Find the probability that Jane does not win the game.

..... [1]

(b) Jane plays this game 50 times.

Find the number of times she is expected to win the game.

..... [1]

2 Calculate $\sqrt[4]{0.0256}$.

..... [1]

3 Emma has 15 mathematics questions to complete.
The stem-and-leaf diagram shows the time, in minutes, it takes her to complete each question.

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

Key: 2 | 0 = 20 minutes

Complete the table.

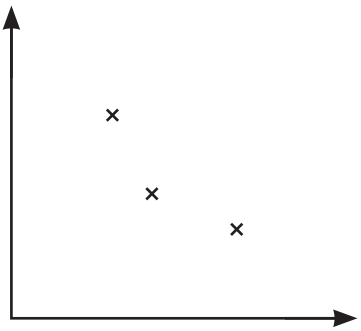
Mode	..... min
Median	..... min
Range	..... min

[3]

4 Write down an expression for the range of k consecutive integers.

..... [1]

5 **(a)** Henrik draws this scatter diagram.



Put a ring around the **one** correct statement about this scatter diagram.

It shows no correlation.	It is not possible to tell if there is correlation as there are not enough points.	It shows negative correlation.	It shows positive correlation.

[1]

(b) Each of the four scatter diagrams shows the same set of data.
A line has been drawn on each diagram.

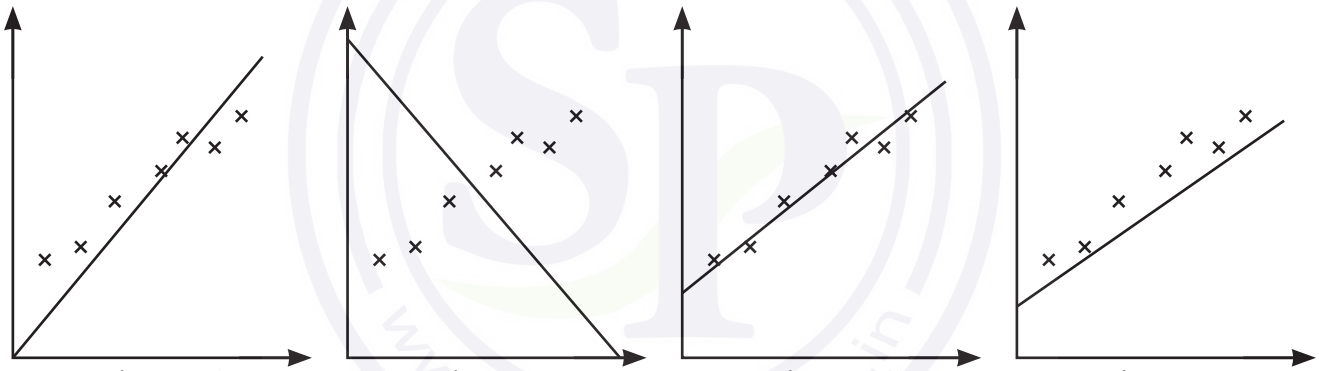


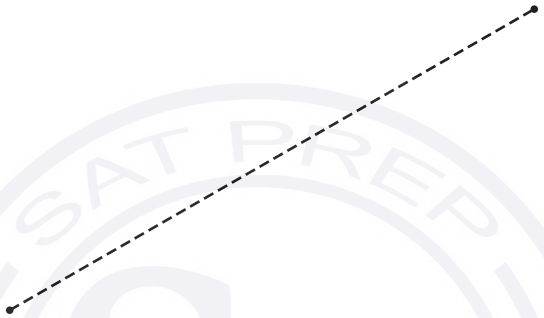
Diagram A Diagram B Diagram C Diagram D

Complete the statement.

The line in Diagram ..... is the most appropriate line of best fit. [1]

6 A rhombus has side length 6.5 cm.
The rhombus can be constructed by drawing two triangles.

Using a ruler and compasses only, construct the rhombus.
Leave in your construction arcs.
One diagonal of the rhombus has been drawn for you.



[2]

7 **(a)** Complete these statements.

The reciprocal of 0.2 is .....

A prime number between 90 and 100 is ..... [2]

(b)

$\frac{7}{5}$ 0.6 $\sqrt{7}$ 8 $\sqrt{9}$

From this list, write down an irrational number.

..... [1]

8 $a = \dfrac{b^2}{5c}$

Find b when $a = 5.625$ and $c = 2$.

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

9 **Without using a calculator**, work out $\dfrac{2}{3} \div 1\dfrac{3}{7}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [3]

10 **(a)** Write 0.006 54 in standard form.

..... [1]

(b) The number 1.467×10^{102} is written as an ordinary number.

Write down the number of zeros that follow the digit 7.

..... [1]

11 Write $0.\dot{0}\dot{4}$ as a fraction in its simplest form.

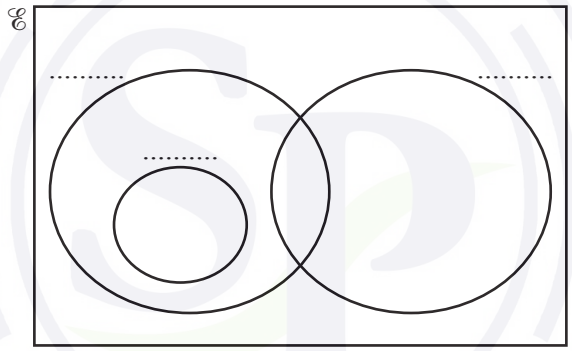
..... [1]

12 **(a)** $\mathscr{E}$ = {integers greater than 2}
A = {prime numbers}
B = {odd numbers}
C = {square numbers}

(i) Describe the type of numbers in the set $B' \cap C$.

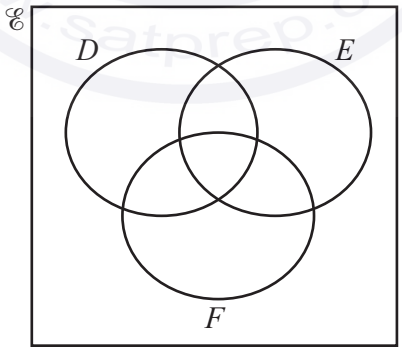
..... [1]

(ii) Complete the set labels on the Venn diagram.



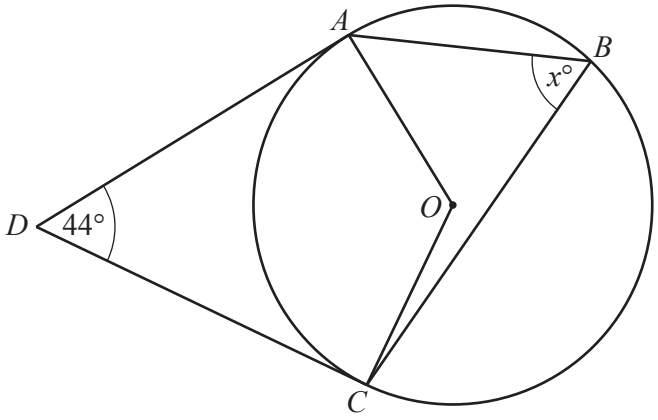
[1]

(b)



Shade the region $D' \cup (E \cap F)'$. [1]

13



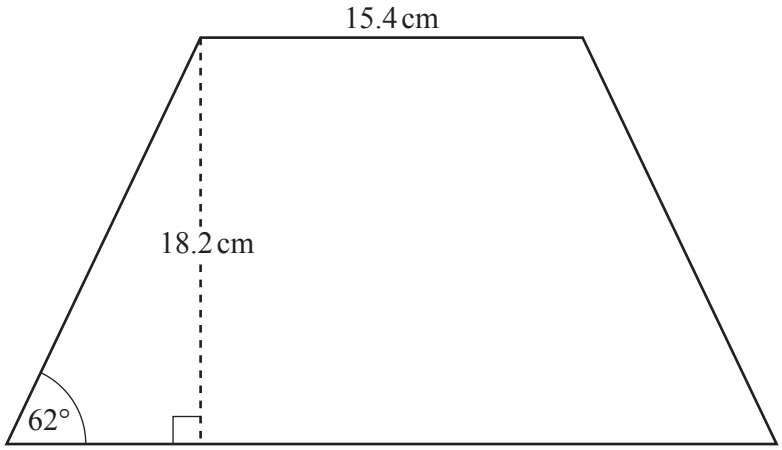
NOT TO SCALE

A, B and C are points on a circle, centre O.
DA and DC are tangents.
Angle $ADC = 44°$.

Work out the value of x.

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

14



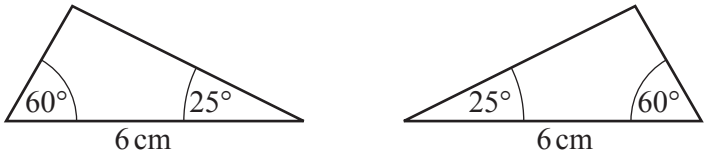
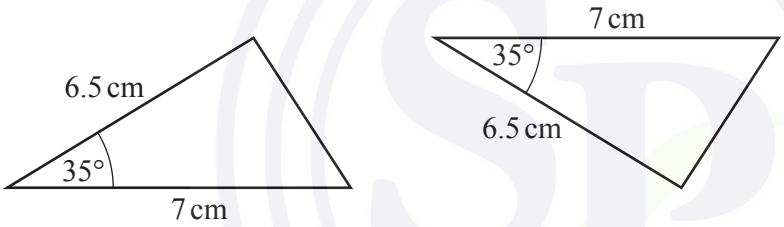
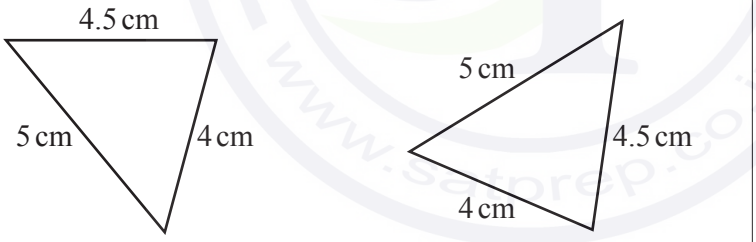
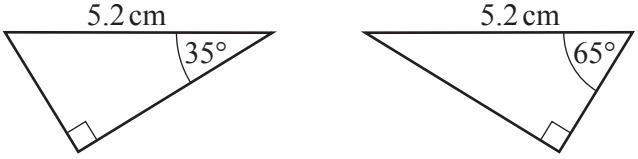
NOT TO SCALE

The diagram shows a trapezium.
The trapezium has one line of symmetry.

Work out the area of the trapezium.

..... cm^2 [4]

15 Complete the table showing information about the congruence of pairs of triangles.
The first two rows have been completed for you.
All diagrams are not to scale.

Pair of triangles	Congruent or not congruent	Congruence criterion
	Congruent	ASA
	Not congruent	None
		
		
		

[3]

16 A is the point (5, 7) and B is the point (9, −1).

(a) Find the length AB.

..... [3]

(b) Find the equation of the line AB.

..... [3]

17 Find the gradient of the line that is perpendicular to the line $3y = 4x - 5$.

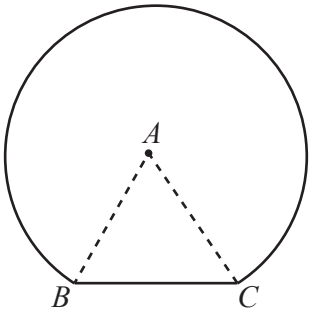
..... [2]

18 $f(x) = x^2 - 25$ $g(x) = x + 4$

Solve $fg(x+1) = gf(x)$.

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

19 (a)



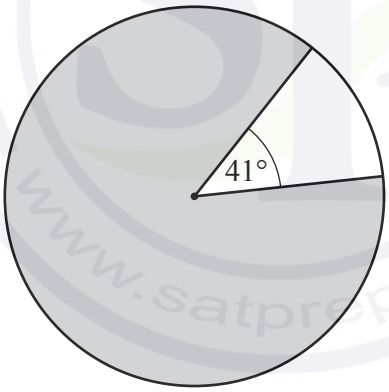
NOT TO SCALE

The diagram shows a shape made from an equilateral triangle ABC and a sector of a circle.
Points B and C lie on the circle, centre A.
The side length of the equilateral triangle is 12.4 cm.

Work out the perimeter of the shape.

..... cm [3]

(b)



NOT TO SCALE

The diagram shows two sectors of a circle.
The major sector is shaded.
The area of the major sector is 74.5 cm^2.

Calculate the radius of the circle.

..... cm [3]

20 Expand and simplify.

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

..... [3]

21 The force of attraction, F Newtons, between two magnets is inversely proportional to the square of the distance, d cm, between the magnets.

When $d = 1.5$, $F = 48$.

(a) Find an expression for F in terms of d.

$F =$ ..... [2]

(b) When the distance between the two magnets is doubled the new force is n times the original force.

Work out the value of n.

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

[Turn over

22 Simplify.

$$\frac{2x^2 - 5x - 12}{3x^2 - 12x}$$

..... [4]

23 Find all the solutions of $4\sin x = 3$ for $0° \leqslant x \leqslant 360°$.

..... [2]

24 Solve.

$$\frac{1}{x+1}+\frac{9}{x+9}=1$$

$x =$ ..... or $x =$ ..... [5]

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MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2021**

1 hour 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages.

1 Write down the number that is 23 less than -1.6 .

..... [1]

2 Write as a fraction in its simplest form.

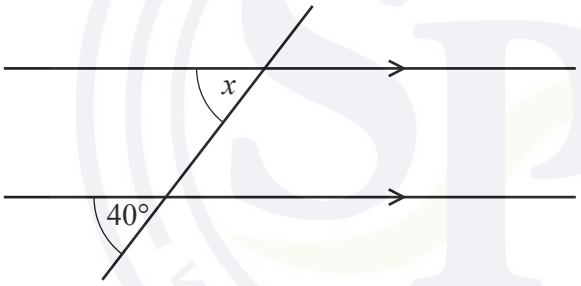
(a) 72%

..... [1]

(b) 0.004

..... [1]

3



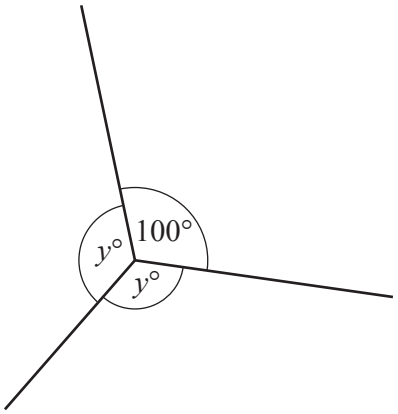
NOT TO SCALE

The diagram shows a pair of parallel lines and a straight line.

Complete the statement with the correct geometrical reason.

$x = 40°$ because the angles are ..... [1]

4



NOT TO SCALE

Find the value of y.

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

5 Jo invests \$600 for 7 years at a rate of 1.5% per year simple interest.

Calculate the total interest earned during the 7 years.

\$ ..... [2]

6 Maria buys n pencils that cost p cents each.
She pays with a \$$y$ note.

Find, in terms of n, p and y, the amount of change Maria receives.
Give your answer in cents.

..... cents [2]

7 12 18 29 49 91 125

From the list of numbers, write down

(a) a cube number,

..... [1]

(b) a prime number.

..... [1]

8 Alex changes 190 euros (€) into pounds (£) when £1 = €1.1723 .

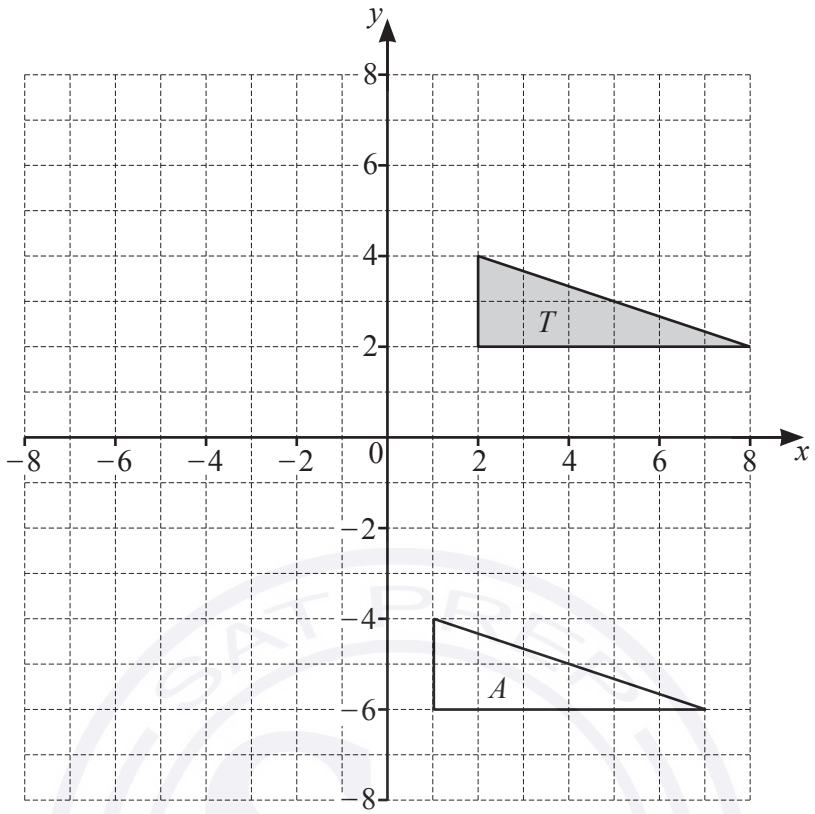
Calculate the amount Alex receives.
Give your answer correct to 2 decimal places.

£ ..... [2]

9 **Without using a calculator**, work out $1\frac{2}{3} \div 7\frac{1}{2}$.
You must show all your working and give your answer as a fraction in its simplest form.

..... [3]

10



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

.....

..... [2]

(b) Draw the image of triangle T after an enlargement, scale factor $-\frac{1}{2}$, centre (0, 0). [2]

11 Simplify $3x^3 \times 4x^4$.

..... [2]

12 x is an integer and $-3 \leqslant 2x-1 < 3$.

Find the values of x.

..... [2]

13 Expand and simplify.

$$6(t-q)-2(t-3q)$$

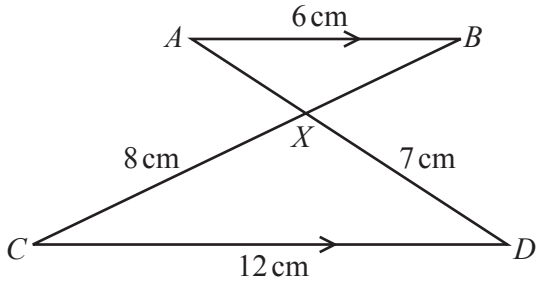
..... [2]

14 The magnitude of the vector $\begin{pmatrix} 20 \\ k \end{pmatrix}$ is 29.

Find the value of k.

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

15



NOT TO SCALE

In the diagram, AB is parallel to CD.
AD and BC intersect at X.
$AB = 6\,\text{cm}$, $CD = 12\,\text{cm}$, $CX = 8\,\text{cm}$ and $DX = 7\,\text{cm}$.

(a) Complete the statement.

Triangle ABX is ..... to triangle DCX. [1]

(b) Work out the length of BX.

$BX =$ ..... cm [2]

(c) The area of triangle DCX is $26.906\,\text{cm}^2$.

Use this value to find the area of

(i) triangle ABX,

..... cm^2 [2]

(ii) triangle ACX.

..... cm^2 [1]

16 The sides of a regular hexagon are 80 mm, correct to the nearest millimetre.

Calculate the lower bound of the perimeter of the hexagon.

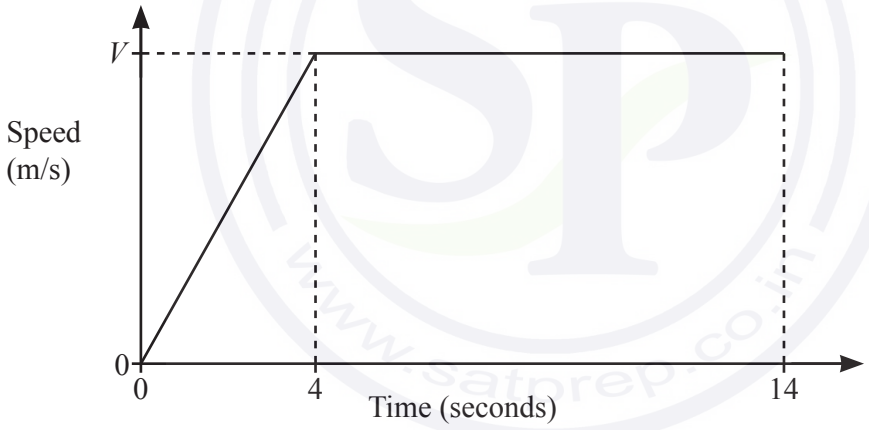
..... mm [2]

17 The interior angle of a regular polygon is 175°.

Calculate the number of sides.

..... [2]

18 A car starts from rest and accelerates at a rate of 3 m/s^2 for 4 seconds.
The car then travels at a constant speed for 10 seconds.



NOT TO SCALE

The diagram shows the speed–time graph for this journey.

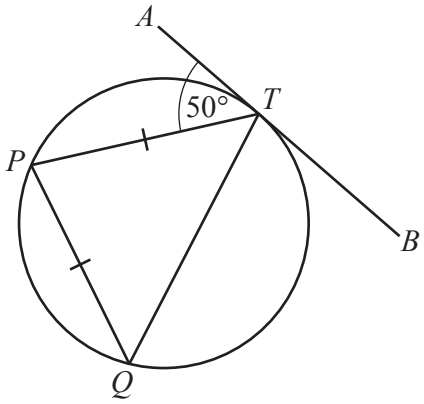
(a) Find the value of V.

V = ... [1]

(b) Calculate the total distance travelled by the car during the 14 seconds.

..... m [2]

19 (a)



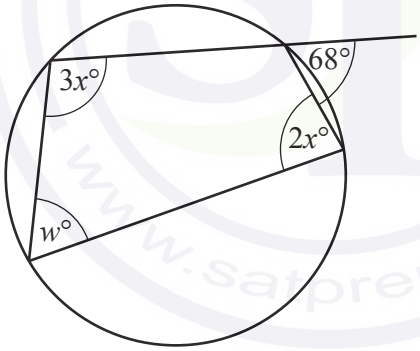
NOT TO SCALE

P, Q and T are points on a circle.
ATB is a tangent to the circle at T and $PT = PQ$.

Find angle TPQ.

Angle TPQ = ... [2]

(b)



NOT TO SCALE

The diagram shows a cyclic quadrilateral with an exterior angle of 68°.

Find the value of w and the value of x.

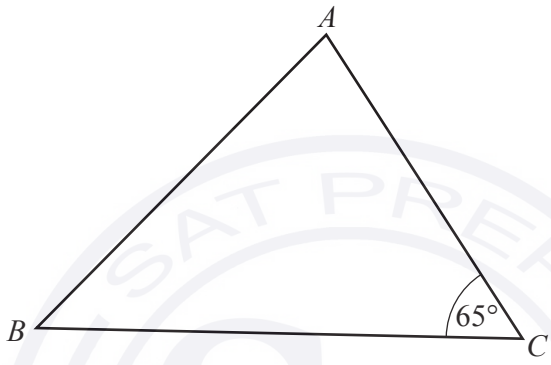
w = ...

x = ... [3]

20 Simplify $2.1 \times 10^{p} + 2.1 \times 10^{p-1}$.
Give your answer in standard form.

..... [2]

21



NOT TO SCALE

The shortest distance from B to AC is 12.8 cm.

Calculate BC.

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

22 z is inversely proportional to the square of $(y-2)$.
When $y = 5$, $z = 9$.

Find z in terms of y.

$z =$ ..... [2]

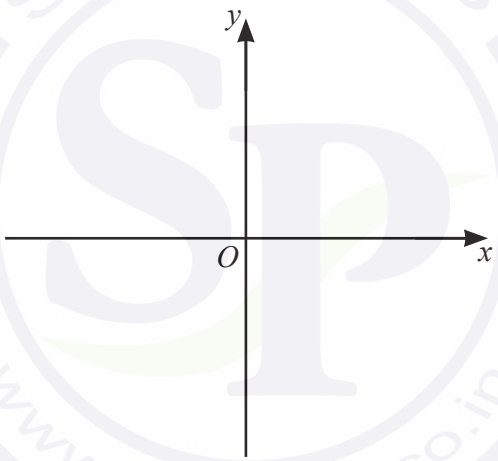
23 A triangle has sides of length 11 cm, 10 cm and 9 cm.

Calculate the largest angle in the triangle.

..... [4]

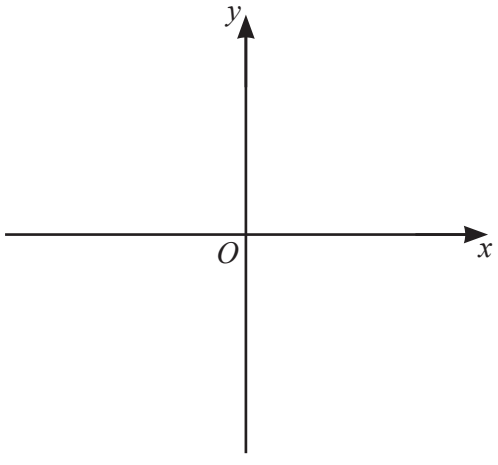
24 On the axes, sketch the graph of each of these functions.

(a) $y = \frac{2}{x}$



[2]

(b) $y = 2^{-x}$



[2]

Questions 25 and 26 are printed on the next page.

25 Find the x-coordinates of the points on the graph of $y = x^5 - 5x^4$ where the gradient is 0.

..... [4]

26 Malik goes to a shop every day to buy bread.

On any day, the probability that Malik goes to the shop in the morning is 0.7 .

If he goes in the morning, the probability that there is bread for Malik to buy is 0.95 .
If he goes later, the probability that there is bread for Malik to buy is 0.6 .

Calculate the probability that, on any day, there is bread for Malik to buy.

..... [3]

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3190611897

MATHEMATICS **0580/22**

Paper 2 (Extended) **February/March 2021**

1 hour 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.
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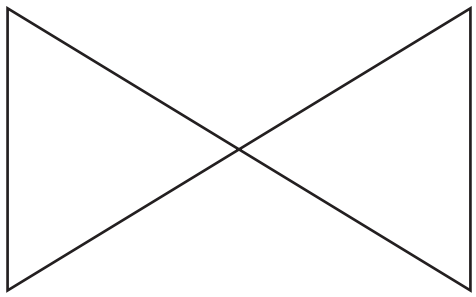
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages.

1



(a) Complete this statement.

The diagram has rotational symmetry of order ..... [1]

(b) On the diagram, draw all the lines of symmetry. [2]

2 Sahil and Anika share \$78 in the ratio 5 : 8.

Calculate the amount each receives.

Sahil \$ .....

Anika \$ ..... [2]

3 The number of passengers on a bus is recorded each day for 14 days.

15	18	22	17	35	38	24
19	19	24	25	31	36	29

(a) Complete the stem-and-leaf diagram.

1	
2	
3	

Key: 1 | 5 represents 15 passengers

[2]

(b) Find the median.

..... [1]

4 By writing each number correct to 1 significant figure, find an estimate for the value of

$$\frac{2.8 \times 82.6}{27.8 - 13.9}.$$

..... [2]

5 The number of bowls of hot soup sold decreases when the temperature rises.

What type of correlation does this statement describe?

..... [1]

6 Joseph spends $\frac{5}{24}$ of one week's earnings to buy a jacket.
The cost of the jacket is \$56.50 .

Calculate the amount Joseph earns in a week.

\$ ..... [2]

7 **Without using a calculator,** work out $2\frac{1}{4} \times 3\frac{2}{3}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

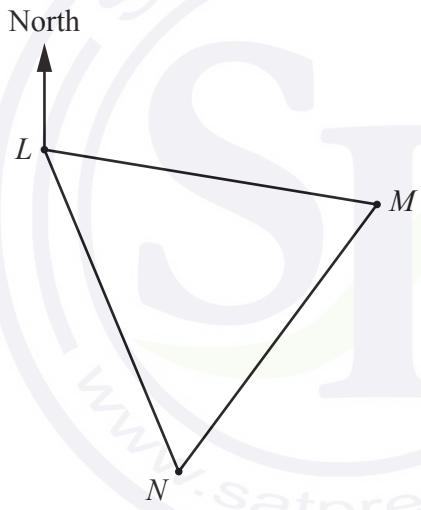
8 Write $0.\dot{3}\dot{7}$ as a fraction.

..... [1]

9 Calculate $4.8 \times 10^6 + 3.7 \times 10^7$.
Give your answer in standard form.

..... [1]

10



NOT TO SCALE

On a map, the positions of the towns L, M and N form an equilateral triangle.
The bearing of M from L is 103°.

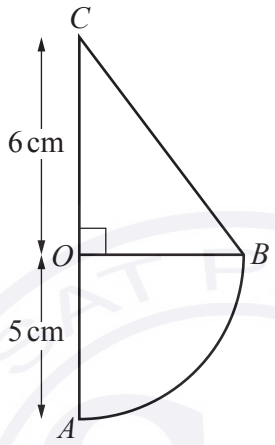
Work out the bearing of L from N.

..... [2]

11 Find the highest common factor (HCF) of 36 and 84.

..... [2]

12



NOT TO SCALE

The diagram shows a shape made from a quarter-circle, OAB, and a right-angled triangle OBC. The radius of the circle is 5 cm and $OC = 6$ cm.

Calculate the area of the shape.

..... cm^2 [3]

13 The population of one variety of butterfly is decreasing exponentially at a rate of 34% per year. At the end of 2014, the population was 125.9 million.

Calculate the population at the end of 2019.

..... million [2]

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

29 22 15 8

Write down the next two terms.

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

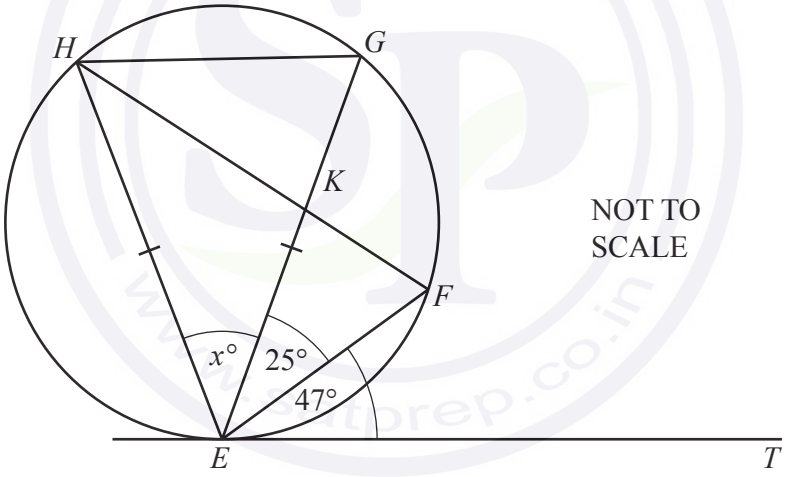
(b) These are the first five terms of another sequence.

4 7 12 19 28

Find the nth term.

..... [2]

15

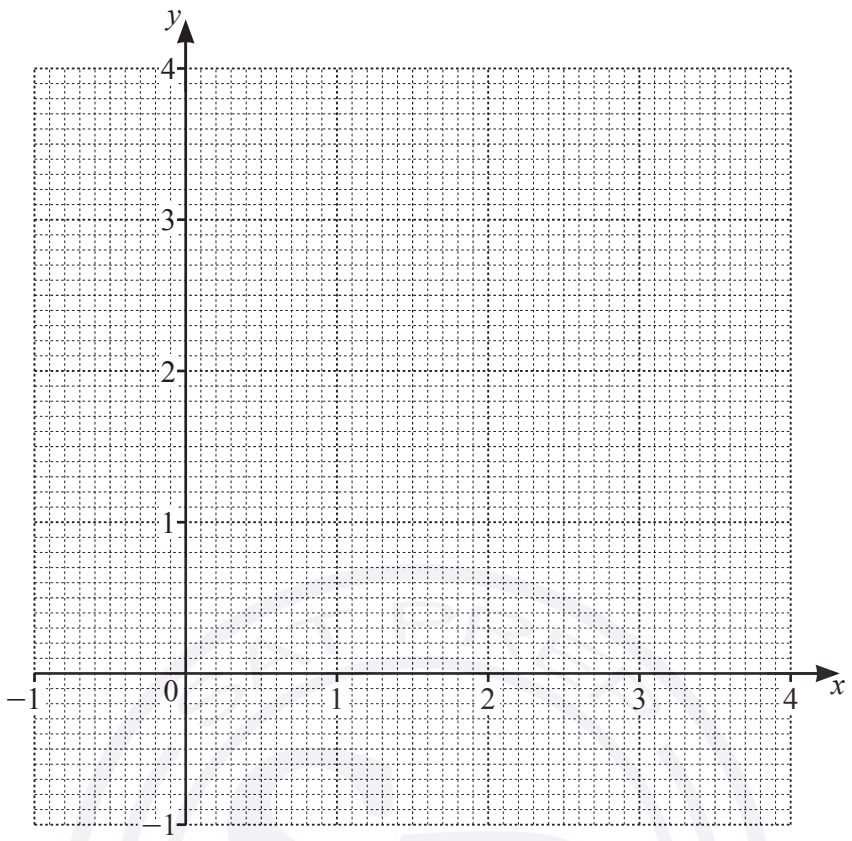


Points E, F, G and H lie on the circle and $EG = EH$.
HF and EG intersect at K.
ET is a tangent to the circle at E.
Angle $FET = 47°$ and angle $FEG = 25°$.

Find the value of x.

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

16



The region R satisfies these three inequalities.

$$y > 1 \qquad y < 2x + 2 \qquad x + y \leqslant 3$$

By drawing three suitable lines, and shading unwanted regions, find and label the region R. [5]

17 Some students were asked how many books they each had in their school bags.
The table shows some of this information.

Number of books	5	6	7	8	9	10
Frequency	4	5	x	11	7	5

The mean number of books is 7.6 .

Calculate the value of x.

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

18 Simplify $\left(343x^9\right)^{\frac{2}{3}}$.

..... [2]

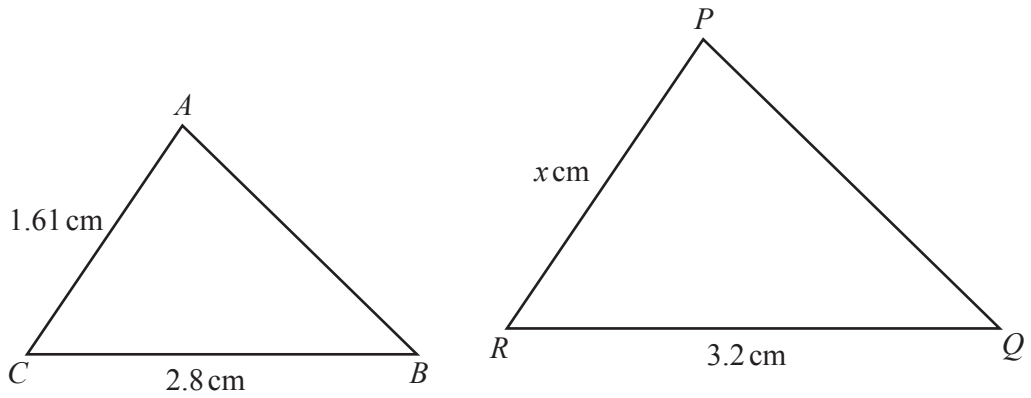
19 Solve the simultaneous equations.
You must show all your working.

$$x - y = 7$$
$$x^2 + y = 149$$

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

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

20 (a)



NOT TO SCALE

Triangle ABC is mathematically similar to triangle PQR.

Find the value of x.

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

(b)

NOT TO SCALE

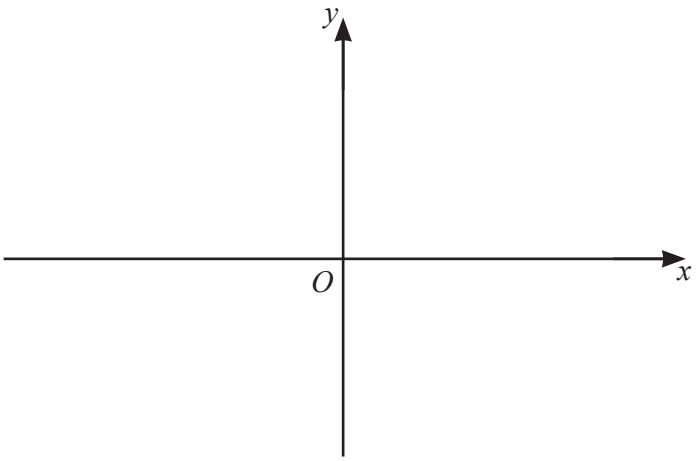
The diagram shows two mathematically similar bowls.
The larger bowl has capacity 7.8 litres and height 11.5 cm.
The smaller bowl has capacity 4 litres.

Calculate the height of the smaller bowl.

..... cm [3]

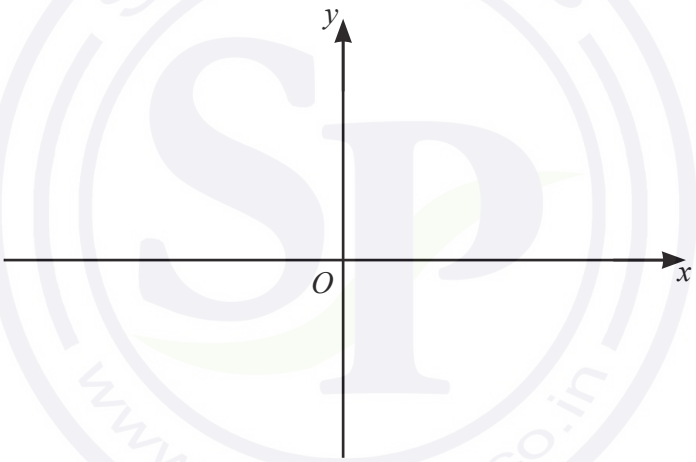
21 On the axes, sketch the graph of each of these functions.

(a) $y = \frac{1}{x}$



[2]

(b) $y = 4^x$



[2]

22 **(a)** A bag of rice has a mass of 25 kg, correct to the nearest kilogram.

Calculate the lower bound of the total mass of 10 of these bags.

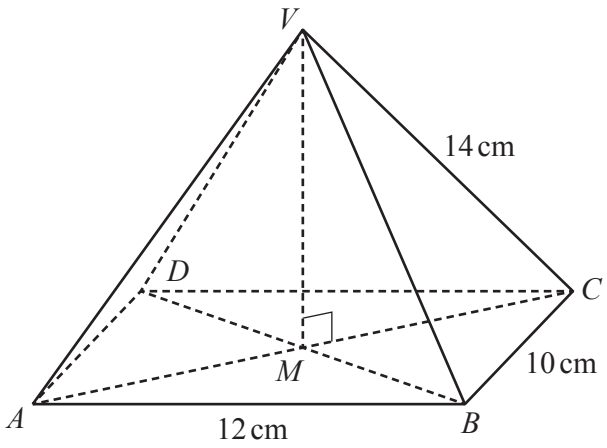
..... kg [1]

(b) Virat has 200 metres of wire, correct to the nearest metre.
He cuts the wire into n pieces of length 3 metres, correct to the nearest 20 centimetres.

Calculate the largest possible value of n.

$n =$ ..... [3]

23



NOT TO SCALE

The diagram shows a pyramid $VABCD$ with a rectangular base.
V is vertically above M, the intersection of the diagonals AC and BD.
$AB = 12$ cm, $BC = 10$ cm and $VC = 14$ cm.

Calculate the angle that VC makes with the base $ABCD$.

..... [4]

Question 24 is printed on the next page.

24 A curve has equation $y = x^3 - 2x^2 + 5$.

Find the coordinates of its two stationary points.

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

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MATHEMATICS **0580/21**

Paper 2 (Extended) **October/November 2020**

1 hour 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.
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- 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Blank pages are indicated.

1 Simplify.

$3a + 7b - 4a + b$

..... [2]

2 A field, ABC, is in the shape of a triangle.
$AC = 500$ m and $BC = 650$ m.

Using a ruler and compasses only, complete the scale drawing of the field ABC.
Leave in your construction arcs.
Use a scale of 1 cm to represent 100 m.
The side AB has been drawn for you.

Scale: 1 cm to 100 m

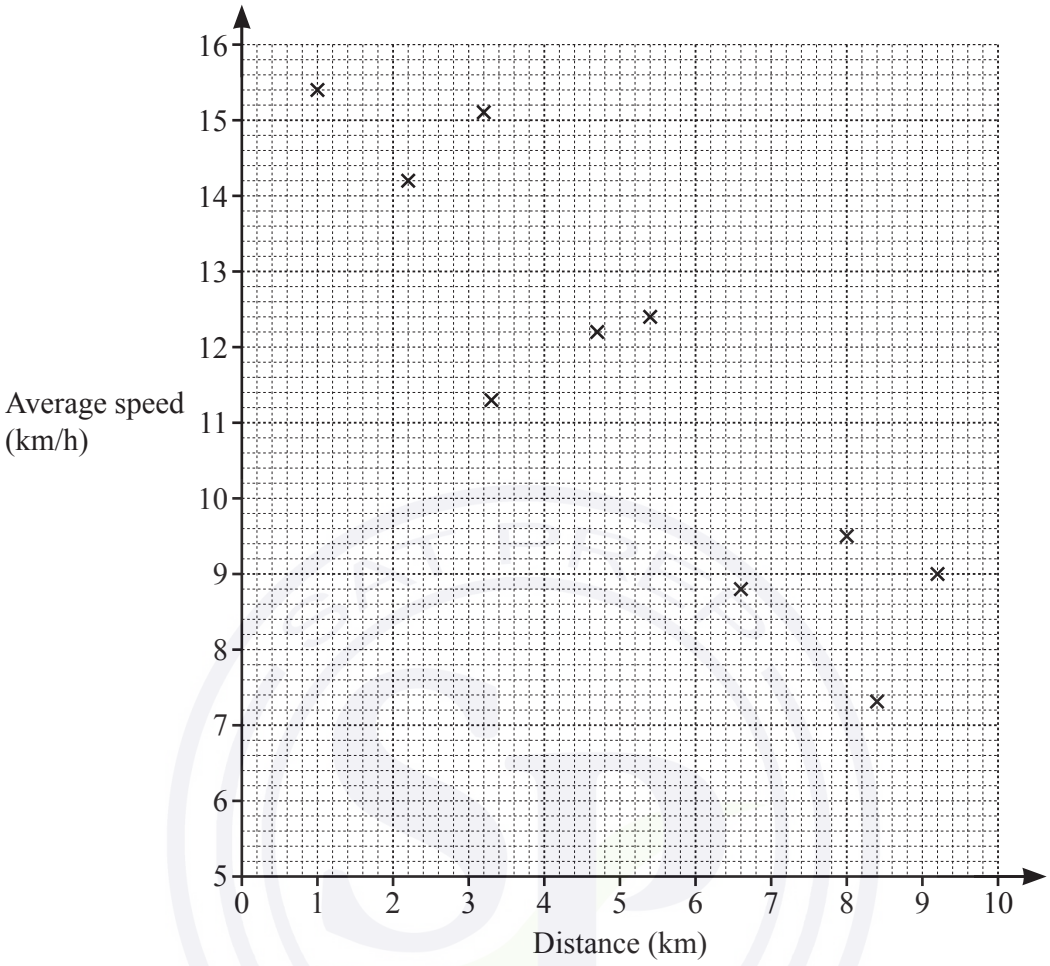
[3]

3 Rangan buys 3.6 kg of potatoes and 2.8 kg of leeks.
The total cost is \$13.72 .
Leeks cost \$2.65 per kilogram.

Find the cost of 1 kg of potatoes.

\$ ..... [3]

4 Aisha records the distance she runs and her average speed.
The results are shown in the scatter diagram.



(a) The table shows the results of four more runs.

Distance (km)	4.2	5.7	7.1	8.8
Average speed (km/h)	13.4	11.8	9.8	8.3

On the scatter diagram, plot these points. [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 estimate her average speed when she runs a distance of 6 km.

..... km/h [1]

5 $$T = \frac{49.2 - 9.59}{4.085 \times 2.35}$$

By writing each number correct to 1 significant figure, work out an estimate for T.
You must show all your working.

..... [2]

6 **Without using a calculator**, work out $2\frac{2}{3} \times 2\frac{3}{4}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

7 Make x the subject of this formula.

$$2y = 5x - 7$$

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

8 **(a)** 1, 2, 3, 5 and 7 are all common factors of two numbers.

Write down the digit that the two numbers must end in.

..... [1]

(b) Write 84 as a product of its prime factors.

..... [2]

9 **(a)** Ahmed increases 40 by 300%.

From this list, put a ring around the correct calculation.

40×1.300 40×3 40×400 40×4 40×300

[1]

(b) Ahmed finds the magnitude of the vector $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$.

From this list, put a ring around the correct calculation.

$\sqrt{2^2 + -3^2}$ $2^2 - 3^2$ $\sqrt{2^2 - 3^2}$ $2^2 + (-3)^2$ $\sqrt{2^2 + (-3)^2}$

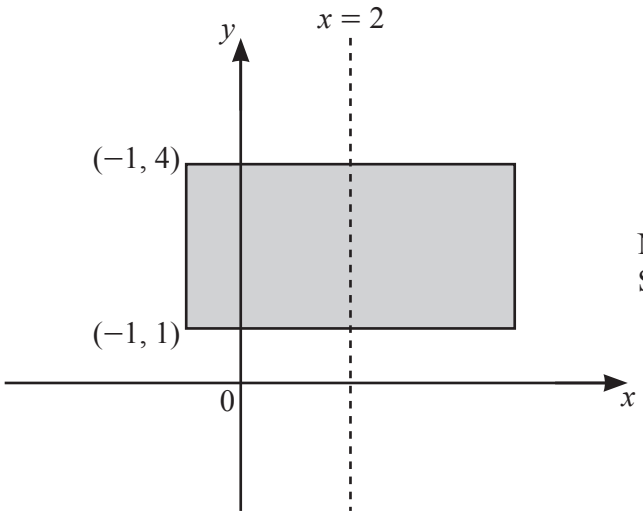
[1]

10 A town has a population of 45 000.
This population increases exponentially at a rate of 1.6% per year.

Find the population of the town at the end of 5 years.
Give your answer correct to the nearest hundred.

..... [3]

11



The diagram shows a rectangle with a line of symmetry at $x = 2$.
Two vertices of the rectangle are at $(-1, 1)$ and $(-1, 4)$.

The shaded region is defined by the inequalities $a \leqslant x \leqslant b$ and $c \leqslant y \leqslant d$.

Find the values of a, b, c and d.

$a =$ .....

$b =$ .....

$c =$ .....

$d =$ ..... [2]

12 The interior angle of a regular polygon with n sides is 156°.

Work out the value of n.

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

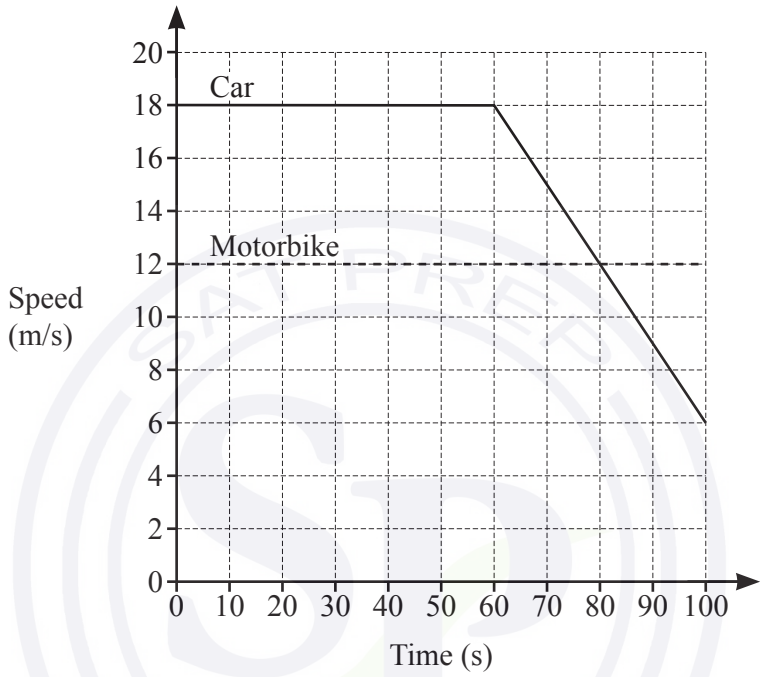
13 Write the recurring decimal $0.1\dot{7}$ as a fraction in its simplest form.
You must show all your working.

..... [3]

14 Find the gradient of a line that is perpendicular to $8y + 4x = 5$.

..... [2]

15



The diagram shows the speed–time graph for 100 seconds of the journey of a car and of a motorbike.

(a) Find the deceleration of the car between 60 and 100 seconds.

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

(b) Calculate how much further the car travelled than the motorbike during the 100 seconds.

..... m [3]

16 Factorise $6x^2 + 7x - 20$.

..... [2]

17 **(a)** $f(x) = 3x^2 + a$ where a is an integer.
$f(-2) = 19$

Find the value of a.

$a =$ ..... [2]

(b) $g(x) = 2x + 7$ $h(x) = 3x - 8$

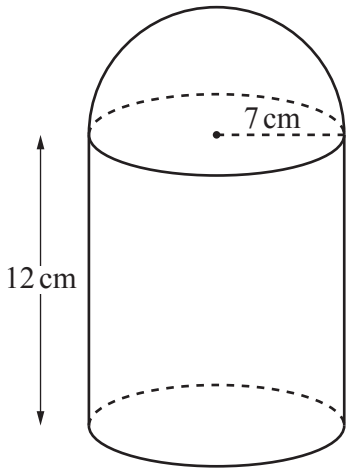
(i) Find $gh(x)$ in its simplest form.

..... [2]

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

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

18



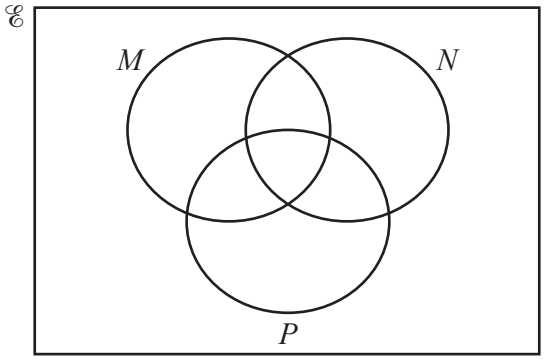
NOT TO SCALE

The diagram shows a solid made from a cylinder and a hemisphere, both of radius 7 cm. The cylinder has length 12 cm.

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

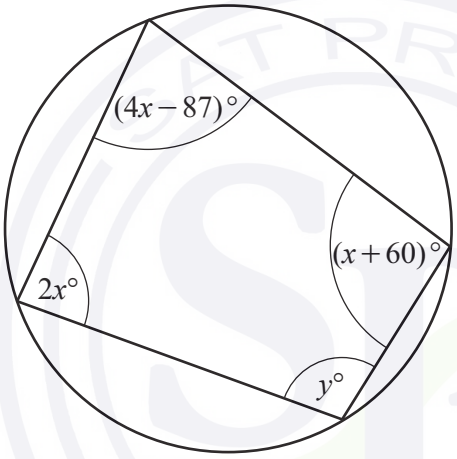
..... cm^2 [4]

19 In this Venn diagram, shade the region $M' \cup N \cup P$.



[1]

20



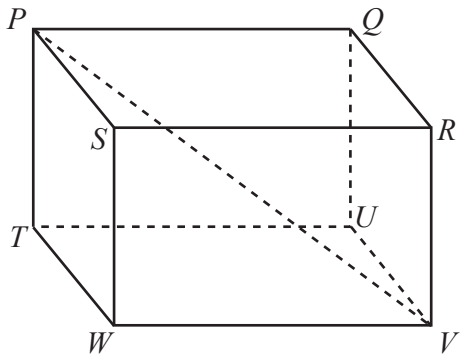
NOT TO SCALE

The diagram shows a cyclic quadrilateral.

Find the value of y.

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

21



NOT TO SCALE

The diagram shows a cuboid $PQRSTUVW$.
$PV = 17.2$ cm
The angle between the line PV and the base $TUVW$ of the cuboid is 43°.

Calculate PT.

$PT =$ ..... cm [3]

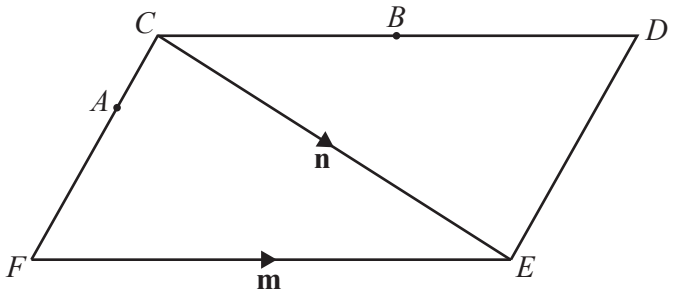
22 Simplify.

$$\frac{x^2 - 5x}{2x^2 - 50}$$

..... [4]

Question 23 is printed on the next page.

23 (a)



NOT TO SCALE

The diagram shows a parallelogram $CDEF$.
$\overrightarrow{FE} = \mathbf{m}$ and $\overrightarrow{CE} = \mathbf{n}$.
B is the midpoint of CD.
$FA = 2AC$

Find an expression, in terms of **m** and **n**, for $\overrightarrow{AB}$.
Give your answer in its simplest form.

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

(b) $\overrightarrow{GH} = \frac{5}{6}(2\mathbf{p} + \mathbf{q})$ $\overrightarrow{JK} = \frac{5}{18}(2\mathbf{p} + \mathbf{q})$

Write down **two** facts about vectors $\overrightarrow{GH}$ and $\overrightarrow{JK}$.

.....

..... [2]

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MATHEMATICS **0580/22**

Paper 2 (Extended) **October/November 2020**

1 hour 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Blank pages are indicated.

1 Write two hundred thousand and seventeen in figures.

..... [1]

2 Insert one pair of brackets to make this calculation correct.

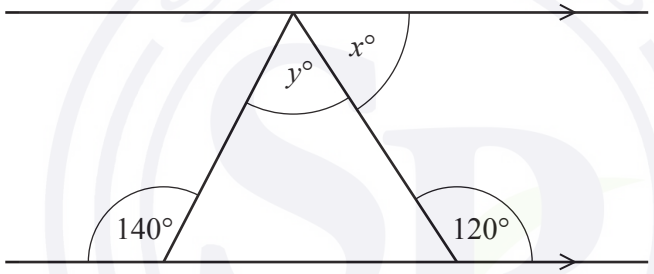
$$7 - 5 - 3 + 4 = 9$$ [1]

3 Solve the equation.

$$6 - 2x = 3x$$

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

4



NOT TO SCALE

The diagram shows a triangle drawn between a pair of parallel lines.

Find the value of x and the value of y.

$x =$ .....

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

5 Increase 42 by 16%.

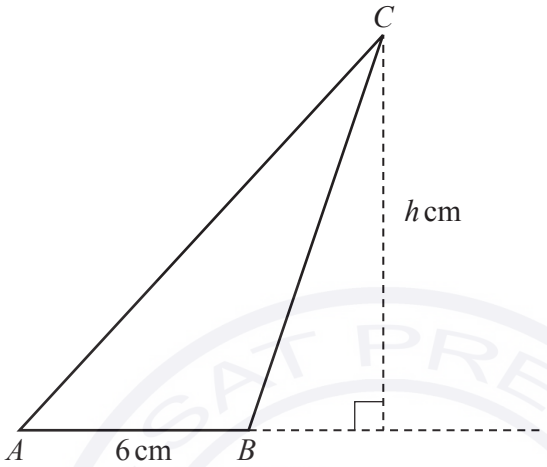
..... [2]

6 Factorise completely.

$4 - 8x$

..... [1]

7



NOT TO SCALE

The area of triangle ABC is $27\,\text{cm}^2$ and $AB = 6\,\text{cm}$.

Calculate the value of h.

$h =$ ..... [2]

8 Calculate the size of one interior angle of a regular polygon with 40 sides.

..... [2]

9 Solve the simultaneous equations.

$$2x + y = 7$$
$$3x - y = 8$$

$x =$ .....

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

10 **Without using a calculator**, work out $\frac{5}{6} \div 1\frac{1}{3}$.
You must show all your working and give your answer as a fraction in its simplest form.

..... [3]

11 Simplify.

$$2x^2 \times 5x^5$$

..... [2]

12 Alex and Chris share sweets in the ratio Alex : Chris = 7 : 3.
Alex receives 20 more sweets than Chris.

Work out the number of sweets Chris receives.

..... [2]

13 The length of one side of a rectangle is 12 cm.
The length of the diagonal of the rectangle is 13 cm.

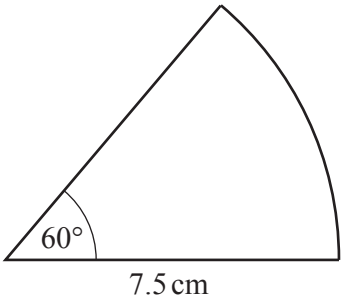
Calculate the area of the rectangle.

..... cm^2 [3]

14 Work out $(3 \times 10^{199}) + (2 \times 10^{201})$.
Give your answer in standard form.

..... [2]

15



NOT TO SCALE

Calculate the area of this sector of a circle.

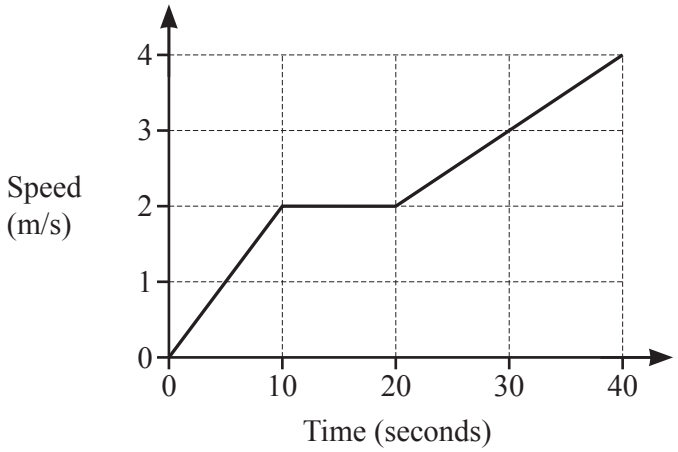
..... cm^2 [2]

16 The selling price of a shirt is \$26.50 .
This includes a tax of 6%.

Calculate the price of the shirt before the tax was added.

\$ ..... [2]

17



The diagram shows the speed–time graph for the first 40 seconds of a cycle ride.

(a) Find the acceleration between 20 and 40 seconds.

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

(b) Find the total distance travelled.

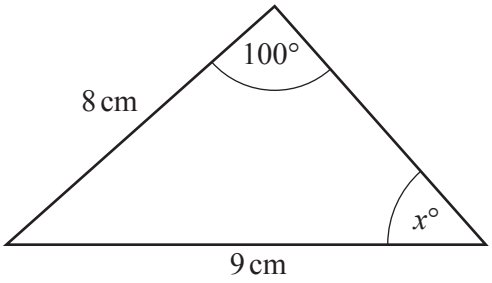
..... m [3]

18 The sides of an isosceles triangle are measured correct to the nearest millimetre.
One side has a length of 8.2 cm and another has a length of 9.4 cm.

Find the largest possible value of the perimeter of this triangle.

..... cm [3]

19



NOT TO SCALE

(a) Calculate the value of x.

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

(b) Calculate the area of the triangle.

..... cm^2 [3]

20 A model of a statue has a height of 4 cm.
The volume of the model is 12 cm^3.
The volume of the statue is 40 500 cm^3.

Calculate the height of the statue.

..... cm [3]

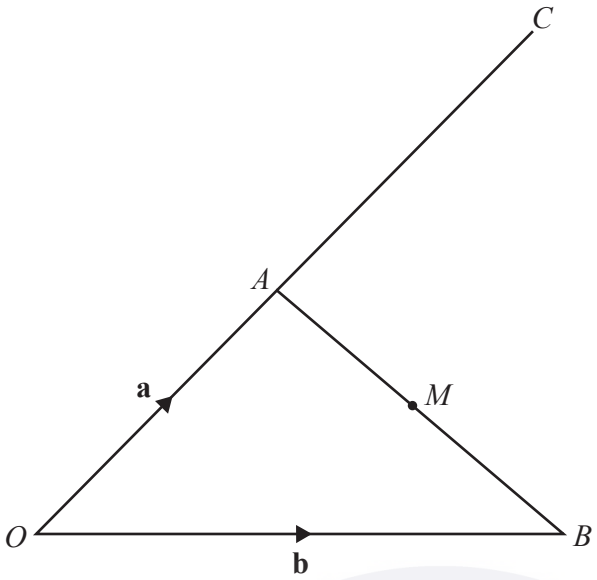
21 **(a)** Differentiate $6+4x-x^2$.

..... [2]

(b) Find the coordinates of the turning point of the graph of $y = 6+4x-x^2$.

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

22



NOT TO SCALE

The diagram shows a triangle OAB and a straight line OAC.
$OA : OC = 2 : 5$ and M is the midpoint of AB.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

Find, in terms of **a** and **b**, in its simplest form

(a) $\overrightarrow{AB}$,

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

(b) $\overrightarrow{MC}$.

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

23 Write as a single fraction in its simplest form.

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

..... [3]

24 A line from the point (2, 3) is perpendicular to the line $y = \frac{1}{3}x + 1$.
The two lines meet at the point P.

Find the coordinates of P.

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

Questions 25 and 26 are printed on the next page.

25 Solve the equation $\tan x = 2$ for $0° \leqslant x \leqslant 360°$.

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

26 Simplify.

$$\frac{ux - 2u - x + 2}{u^2 - 1}$$

..... [4]

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MATHEMATICS **0580/23**

Paper 2 (Extended) **October/November 2020**

1 hour 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Blank pages are indicated.

1 Write down the cube number that is greater than 50 but less than 100.

..... [1]

2 Calculate.

$$\frac{4}{\sqrt{0.0025}}$$

..... [1]

3 In triangle ABC, $BC = 7.6\,\text{cm}$ and $AC = 6.2\,\text{cm}$.

Using a ruler and compasses only, construct triangle ABC.
Leave in your construction arcs.
The side AB has been drawn for you.

[2]

4 Simplify.

$a^2 \div a^6$

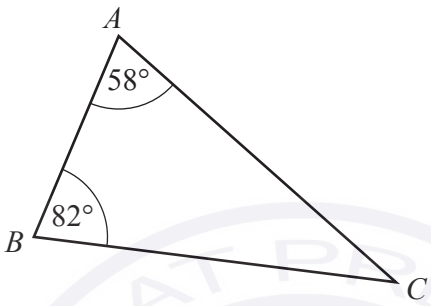
..... [1]

5 Thor changes 40 000 Icelandic Krona into dollars when the exchange rate is 1 krona = \$0.0099 .

Work out how many dollars he receives.

\$ ..... [1]

6



NOT TO SCALE

The diagram shows triangle *ABC*.
The triangle is reflected in the line *BC* to give a quadrilateral *ABDC*.

(a) Write down the mathematical name of the quadrilateral *ABDC*.

..... [1]

(b) Find angle *ACD*.

Angle *ACD* = ... [2]

7 Change 457 000 cm^2 into m^2.

.....m^2 [1]

8 The length, l cm, of a line is 18.3 cm, correct to the nearest millimetre.

Complete this statement about the value of l.

..... $\leqslant l <$ ..... [2]

9 **Without using a calculator**, work out $1\frac{1}{7} \times 2\frac{1}{10}$.
You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

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

$$3x - 8y = 22$$
$$x + 4y = 4$$

$x =$ .....

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

11 A bag contains 7 red discs, 5 green discs and 2 pink discs.

(a) Helen takes one disc at random, records the colour and replaces it in the bag.
She does this 140 times.

Find how many times she expects to take a green disc.

..... [2]

(b) Helen adds 9 green discs and some pink discs to the discs already in the bag.
The probability of taking a green disc is now $\frac{2}{7}$.

Find the number of pink discs that Helen added to the bag.

..... [2]

12 A straight line, l, has equation $y = 5x + 12$.

(a) Write down the gradient of line l.

..... [1]

(b) Find the coordinates of the point where line l crosses the x-axis.

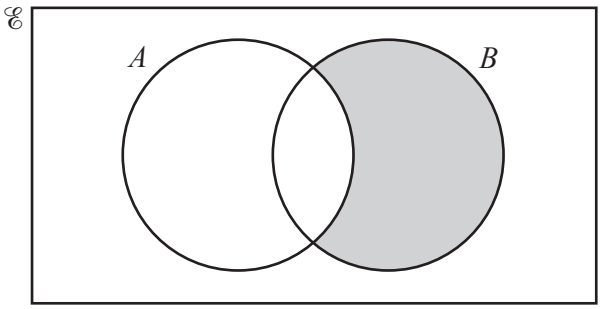
(..... , ...) [2]

(c) A line perpendicular to line l has gradient k.

Find the value of k.

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

13



Use set notation to describe the shaded region.

..... [1]

14 $N = 2^4 \times 3 \times 7^5$

$PN = K$, where P is an integer and K is a square number.

Find the smallest value of P.

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

15 $m = 2p + \sqrt{\frac{x}{y}}$

Make x the subject of this formula.

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

16 A paperweight has height 4 cm and volume 38.4 cm^3.
A mathematically similar paperweight has height 7 cm.

Calculate the volume of this paperweight.

..... cm^3 [3]

17 Adil and Brian are paid the same wage.
Adil is given a 7% pay decrease and his new wage is $427.80 .
Brian is given a 7% pay increase.

Work out Brian's new wage.

$ ..... [3]

18 **(a)** Simplify. $\left(4xy^2\right)^3$

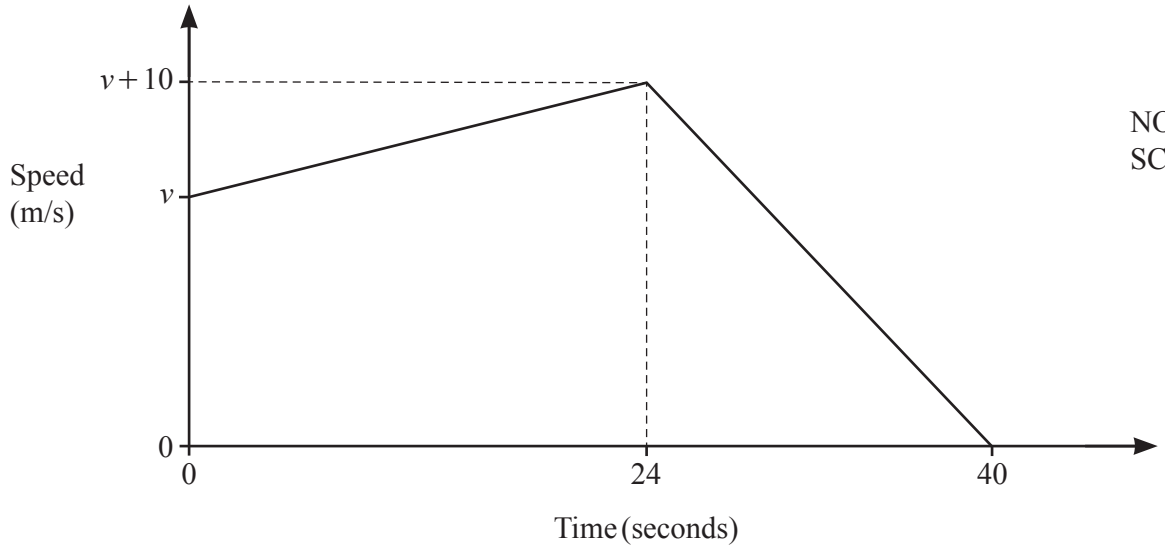
..... [2]

(b) $25 = 125^k$

Find the value of k.

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

19



The diagram shows the speed–time graph for the final 40 seconds of a car journey.
At the start of the 40 seconds the speed is v m/s.

(a) Find the acceleration of the car during the first 24 seconds.

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

(b) The total distance travelled during the 40 seconds is 1.24 **kilometres**.

Find the value of v.

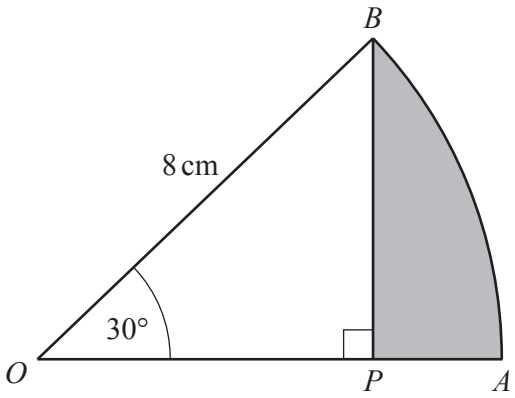
$v =$ ..... [4]

20 Factorise.

$3x + 8y - 6ax - 16ay$

..... [2]

21



NOT TO SCALE

OAB is the sector of a circle, centre *O*.
OB = 8 cm and angle *AOB* = 30°.
BP is perpendicular to *OA*.

(a) Calculate *AP*.

AP = ... cm [3]

(b) Work out the area of the shaded region *APB*.

..... cm^2 [3]

22 The table shows information about the times, t seconds, taken by each of 100 students to solve a puzzle.

Time (t seconds)	$0 < t \leqslant 10$	$10 < t \leqslant 15$	$15 < t \leqslant 20$	$20 < t \leqslant 40$	$40 < t \leqslant 75$
Frequency	9	18	22	30	21

(a) Calculate an estimate of the mean time.

..... s [4]

(b) Emmanuel draws a histogram to show this information.
The table shows the heights, in cm, of some of the bars for this histogram.

Complete the table.

Time (t seconds)	$0 < t \leqslant 10$	$10 < t \leqslant 15$	$15 < t \leqslant 20$	$20 < t \leqslant 40$	$40 < t \leqslant 75$
Height of bar (cm)	3.6	14.4	17.6		

[3]

23 y is inversely proportional to the square root of x.
When $y = 7$, $x = 2.25$.

Write y in terms of x.

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

24 Simplify.

$$\frac{x^2 - 25}{x^2 - 17x + 60}$$

..... [4]

Question 25 is printed on the next page.

25 Solve $3\tan x = -4$ for $0° \leqslant x \leqslant 360°$.

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

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4684519284

MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2020**

1 hour 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.
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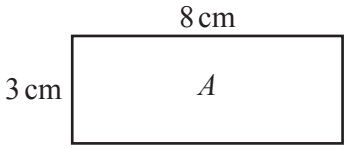
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 70.
- The number of marks for each question or part question is shown in brackets [ ].

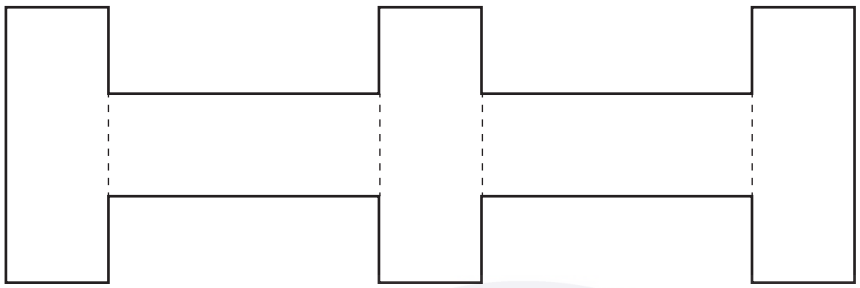
This document has **16** pages. Blank pages are indicated.

1 Rectangle A measures 3 cm by 8 cm.



NOT TO SCALE

Five rectangles congruent to A are joined to make a shape.



NOT TO SCALE

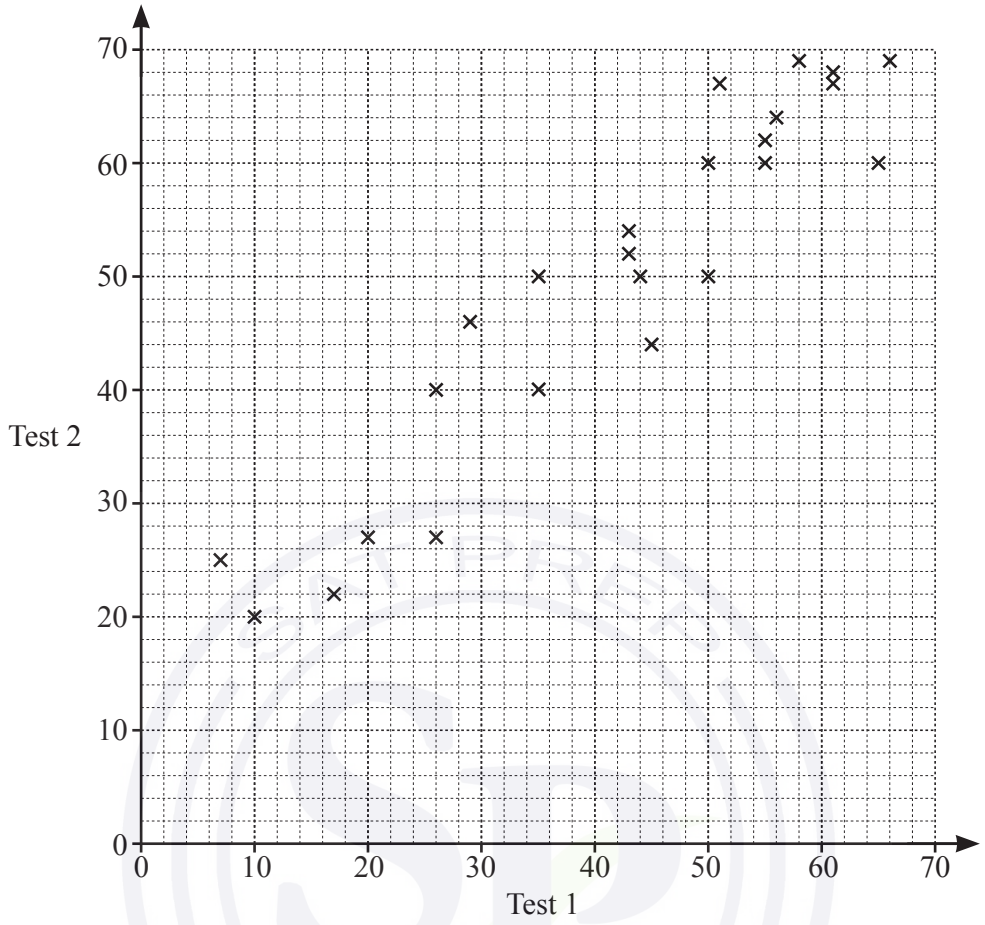
Work out the perimeter of this shape.

..... cm [2]

2 Find the highest **odd** number that is a factor of 60 and a factor of 90.

..... [1]

3 Mrs Salaman gives her class two mathematics tests.
The scatter diagram shows information about the marks each student scored.



(a) Write down the highest mark scored on test 1.

..... [1]

(b) Write down the type of correlation shown in the scatter diagram.

..... [1]

(c) Draw a line of best fit on the scatter diagram. [1]

(d) Hamish scored a mark of 40 on test 1.
He was absent for test 2.

Use your line of best fit to find an estimate for his mark on test 2.

..... [1]

4 A bag contains blue, red, yellow and green balls only.
A ball is taken from the bag at random.
The table shows some information about the probabilities.

Colour	Blue	Red	Yellow	Green
Probability	0.15	0.2		0.43

(a) Complete the table.

[2]

(b) Abdul takes a ball at random and replaces it in the bag.
He does this 200 times.

Find how many times he expects to take a red ball.

..... [1]

5 **(a)** The nth term of a sequence is $60 - 8n$.

Find the largest number in this sequence.

..... [1]

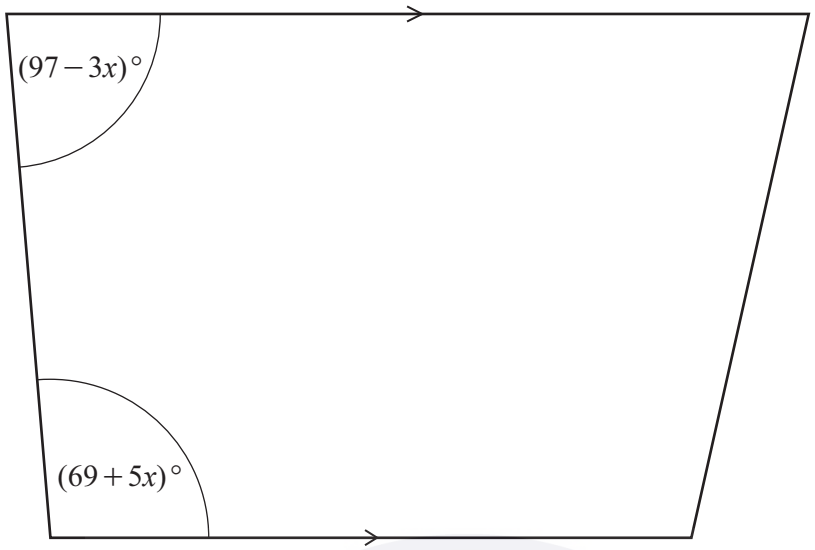
(b) Here are the first five terms of a different sequence.

12 19 26 33 40

Find an expression for the nth term of this sequence.

..... [2]

6 The diagram shows a trapezium.



NOT TO SCALE

Work out the value of x.

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

7 $234 = 2\times3^2\times13$ $\quad 1872 = 2^4\times3^2\times13$ $\quad 234\times1872 = 438\,048$

Use this information to write 438 048 as a product of its prime factors.

..... [1]

8 **Without using a calculator**, work out $\left(2\frac{1}{3}-\frac{7}{8}\right)\times\frac{6}{25}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [4]

9 Factorise completely.

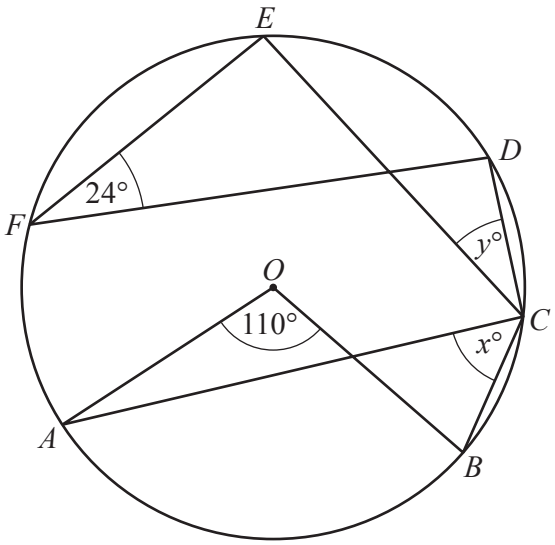
(a) $21a^2+28ab$

..... [2]

(b) $20x^2-45y^2$

..... [3]

10



NOT TO SCALE

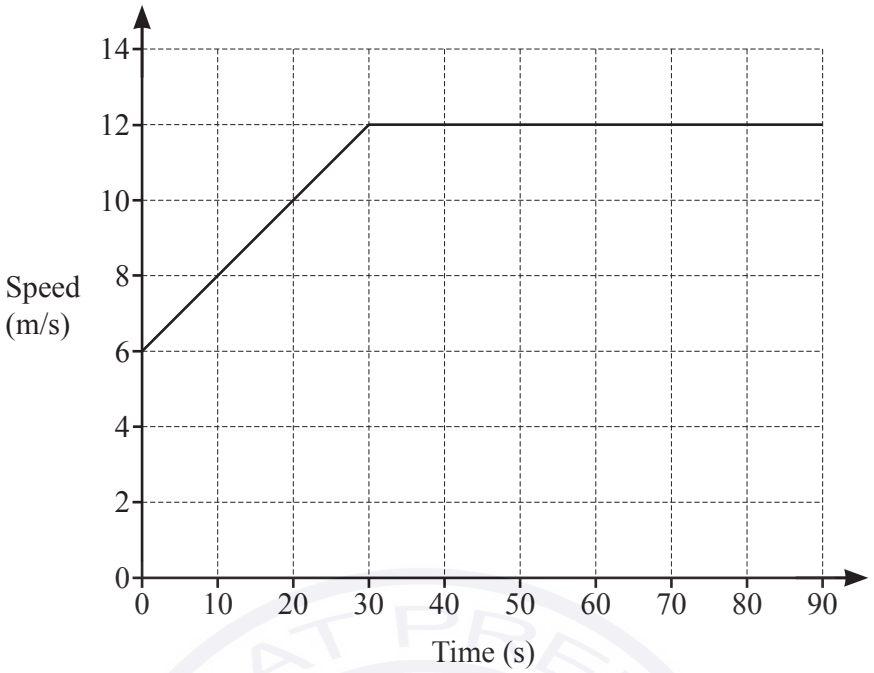
Points A, B, C, D, E and F lie on the circle, centre O.

Find the value of x and the value of y.

$x =$ .....

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

11

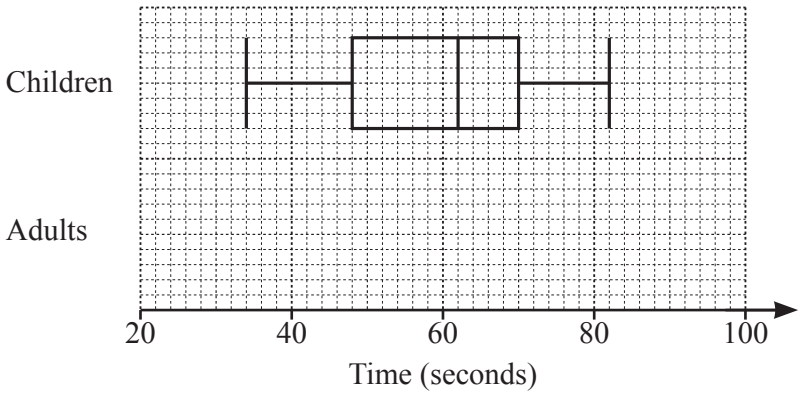


The diagram shows the speed–time graph for 90 seconds of a journey.

Calculate the total distance travelled during the 90 seconds.

..... m [3]

12 Gemma records the times, in seconds, taken for a group of children and a group of adults to complete a puzzle.
The box-and-whisker plot shows information about the times taken for the children to complete the puzzle.



(a) Find the interquartile range of the times taken for the children to complete the puzzle.

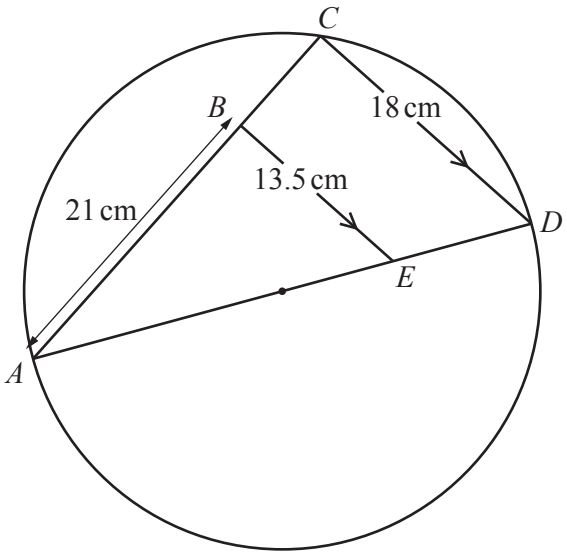
..... seconds [2]

(b) The table shows some information about the times, in seconds, taken for the adults to complete the puzzle.

Minimum	Lower quartile	Median	Upper quartile	Maximum
28	42	58	70	75

On the grid above, draw the box-and-whisker plot for the adults. [2]

13



NOT TO SCALE

C lies on a circle with diameter *AD*.
B lies on *AC* and *E* lies on *AD* such that *BE* is parallel to *CD*.
AB = 21 cm, *CD* = 18 cm and *BE* = 13.5 cm.

Work out the radius of the circle.

..... cm [5]

14 (a) $f(x) = 4x + 3$ $g(x) = 5x - 4$

$fg(x) = 20x + p$

Find the value of p.

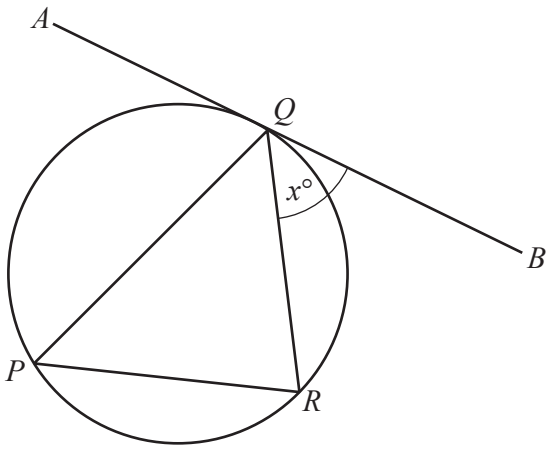
$p =$ ..... [2]

(b) $h(x) = \frac{5x - 1}{3}$

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

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

15



NOT TO SCALE

P, R and Q are points on the circle.
AB is a tangent to the circle at Q.
QR bisects angle PQB.
Angle $BQR = x°$ and $x < 60$.

Use this information to show that triangle PQR is an isosceles triangle.
Give a geometrical reason for each step of your work.

[3]

16 m is inversely proportional to the square of $(p-1)$.
When $p = 4$, $m = 5$.

Find m when $p = 6$.

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

17 (a) (i) $\mathbf{m} = \begin{pmatrix} 5 \\ 7 \end{pmatrix}$

Find $3\mathbf{m}$.

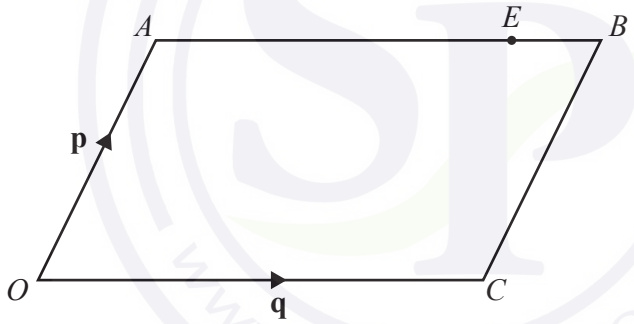
$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(ii) $\overrightarrow{VW} = \begin{pmatrix} 10 \\ -24 \end{pmatrix}$

Find $\left|\overrightarrow{VW}\right|$.

..... [2]

(b)



NOT TO SCALE

$OABC$ is a parallelogram.
$\overrightarrow{OA} = \mathbf{p}$ and $\overrightarrow{OC} = \mathbf{q}$.
E is the point on AB such that $AE : EB = 3 : 1$.

Find $\overrightarrow{OE}$, in terms of $\mathbf{p}$ and $\mathbf{q}$, in its simplest form.

$\overrightarrow{OE} =$ ..... [2]

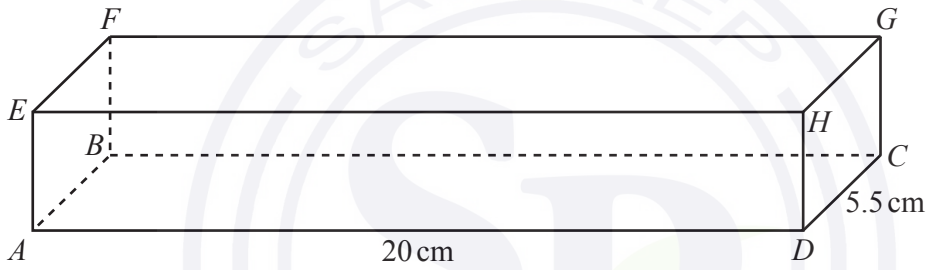
18 $P = 2(w + h)$

$w = 12$ correct to the nearest whole number.
$h = 4$ correct to the nearest whole number.

Work out the upper bound for the value of P.

..... [2]

19



NOT TO SCALE

The diagram shows cuboid $ABCDEFGH$ of length 20 cm and width 5.5 cm.
The volume of the cuboid is 495 cm^3.

Find the angle between the line AG and the base of the cuboid $ABCD$.

..... [5]

20 The curve $y = x^2 - 2x + 1$ is drawn on a grid.
A line is drawn on the same grid.
The points of intersection of the line and the curve are used to solve the equation $x^2 - 7x + 5 = 0$.

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

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

21 Expand and simplify $(x + 3)(x - 5)(3x - 1)$.

..... [3]

Question 22 is printed on the next page.

22 Find the area of a regular hexagon with side length 7.4 cm.

..... cm^2 [3]

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MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2020**

1 hour 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

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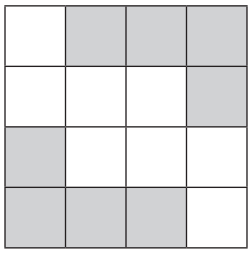
1



Write down the order of rotational symmetry of the diagram.

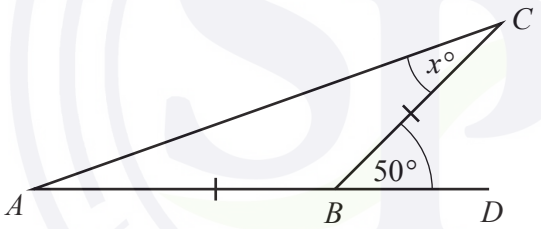
..... [1]

2 At noon the temperature in Maseru was 21 °C.
At midnight the temperature had fallen by 26 °C.

Work out the temperature at midnight.

..... °C [1]

3



NOT TO SCALE

$AB = BC$ and ABD is a straight line.

Find the value of x.

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

4 Write down

(a) a square number greater than 10,

..... [1]

(b) an irrational number.

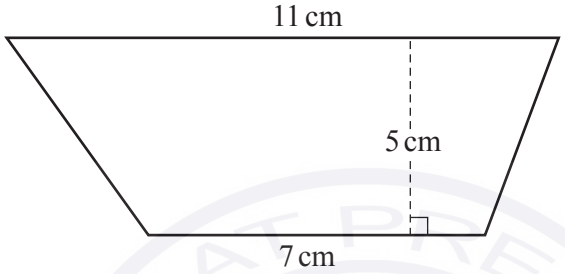
..... [1]

5 $y = mx + c$

Find the value of y when $m = -3$, $x = -2$ and $c = -8$.

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

6

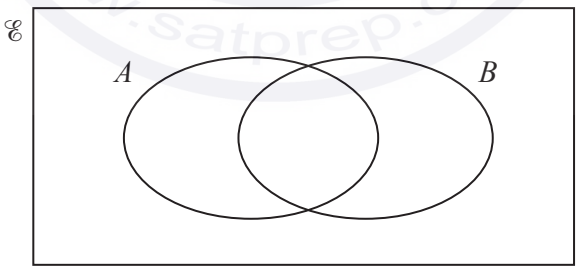


NOT TO SCALE

Calculate the area of the trapezium.

..... cm^2 [2]

7

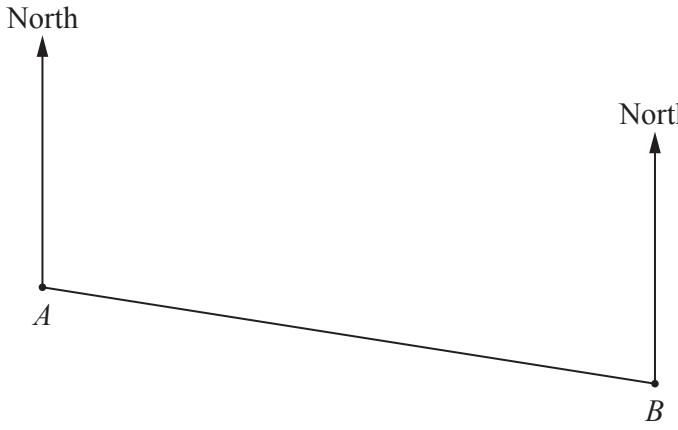


On the Venn diagram, shade the region $A \cap B$. [1]

8 Write 2^{-4} as a decimal.

..... [1]

9



The bearing of B from A is 105°.

Find the bearing of A from B.

..... [2]

10 Simplify.

$$\frac{p}{2q} \times \frac{4pq}{t}$$

..... [2]

11 **Without using a calculator**, work out $1\frac{3}{4} - \frac{11}{12}$.
You must show all your working and give your answer as a fraction in its simplest form.

..... [3]

12 Roberto buys a toy for \$5.00 .
He then sells it for \$4.60 .

Calculate his percentage loss.

..... % [2]

13 Simplify $8t^8 \div 4t^4$.

..... [2]

14 Solve the equation.

$$\frac{1-x}{3} = 5$$

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

15 Ella's height is 175 cm, correct to the nearest 5 cm.

Write down the upper bound of Ella's height.

..... cm [1]

16 Calculate $(3 \times 10^{-3})^3$.
Give your answer in standard form.

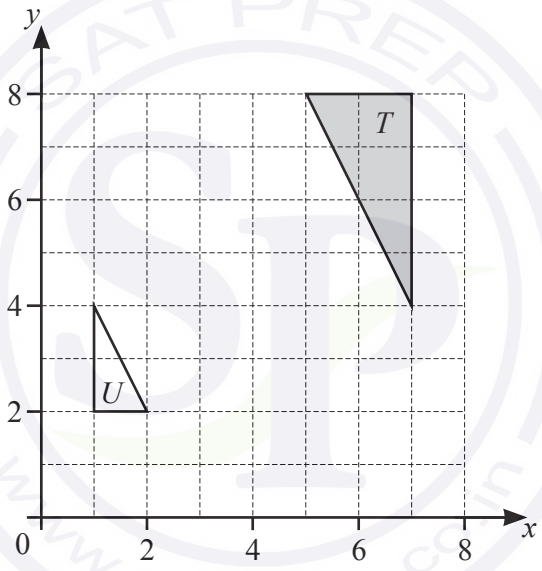
..... [1]

17 A train of length 105 m takes 11 seconds to pass completely through a station of length 225 m.

Calculate the speed of the train in km/h.

..... km/h [3]

18



Describe fully the **single** transformation that maps triangle *T* onto triangle *U*.

.....

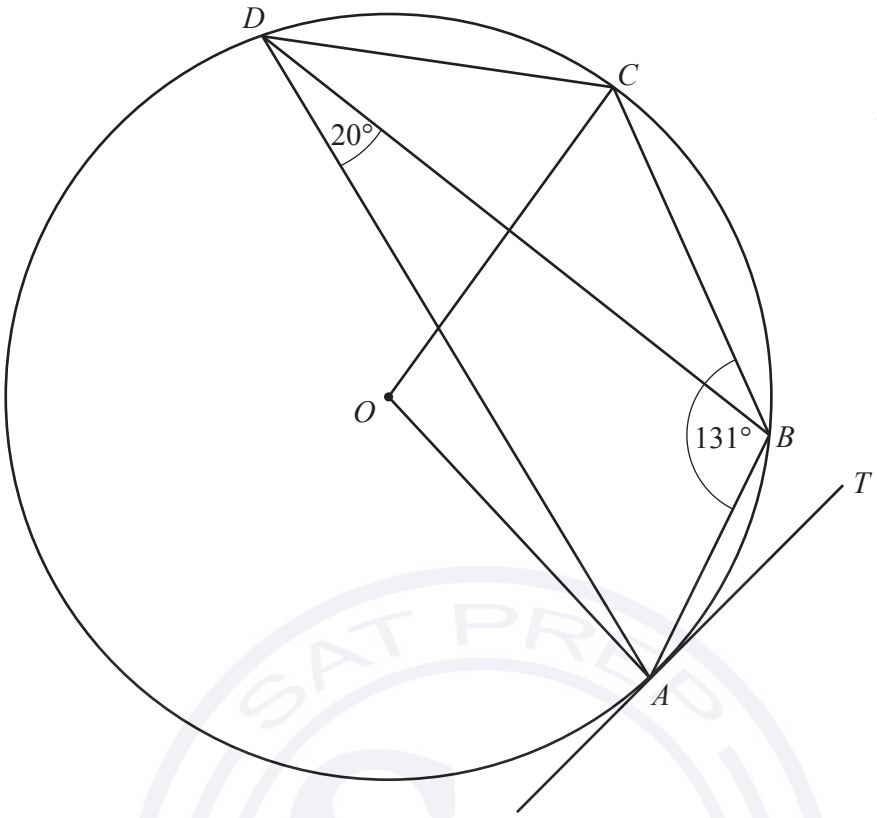
..... [3]

19 Make *y* the subject of the formula.

$$h^2 = x^2 + 2y^2$$

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

20



NOT TO SCALE

A, B, C and D lie on the circle, centre O.
TA is a tangent to the circle at A.
Angle $ABC = 131°$ and angle $ADB = 20°$.

Find

(a) angle ADC,

Angle $ADC =$ ..... [1]

(b) angle AOC,

Angle $AOC =$ ..... [1]

(c) angle BAT,

Angle $BAT =$ ..... [1]

(d) angle OAB.

Angle $OAB =$ ..... [1]

21 Simplify.

(a) $(5x^4)^3$

..... [2]

(b) $(256x^{256})^{\frac{3}{8}}$

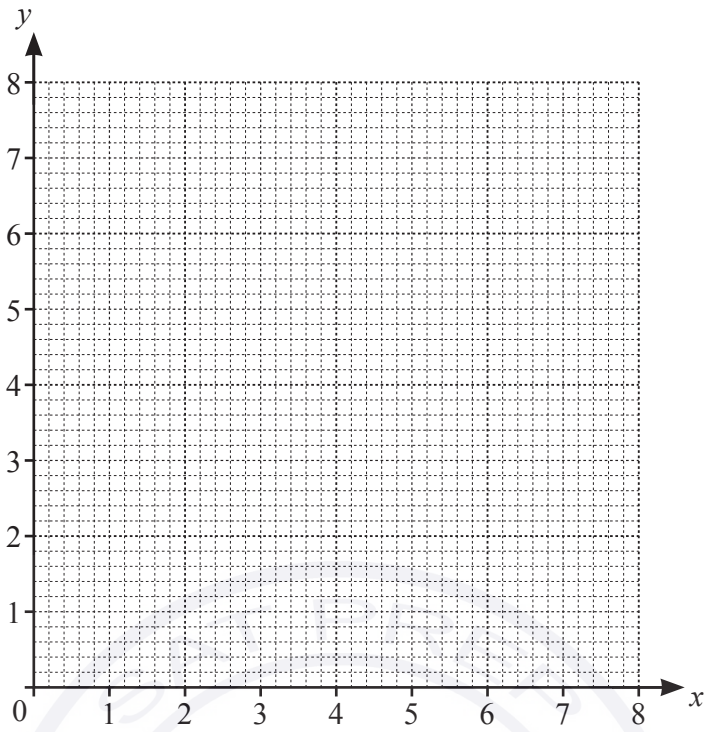
..... [2]

22 p is directly proportional to $(q+2)^2$.
When $q = 1$, $p = 1$.

Find p when $q = 10$.

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

23



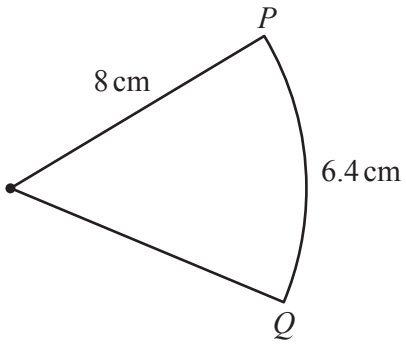
(a) By drawing suitable lines and shading unwanted regions, find the region, R, where

$$x \geqslant 2, \quad y \geqslant x \text{ and } 2x + y \leqslant 8.$$ [5]

(b) Find the largest value of $x + y$ in the region R.

..... [1]

24



NOT TO SCALE

The diagram shows a sector of a circle of radius 8 cm.
The length of the arc PQ is 6.4 cm.

Find the area of the sector.

..... cm^2 [4]

25 Simplify.

$$\frac{2x^2+x-15}{ax+3a-2bx-6b}$$

..... [5]

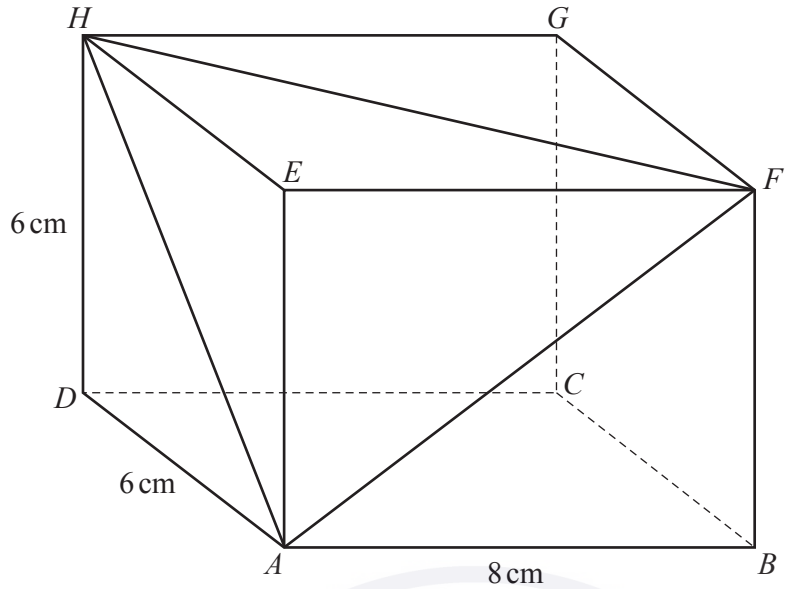
26 $\sqrt[3]{y^2} = \sqrt[6]{x}$ and $y = \sqrt[n]{x}$.

Find the value of n.

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

Question 27 is printed on the next page.

27



NOT TO SCALE

The diagram shows a cuboid.
$AB = 8\,\text{cm}$, $AD = 6\,\text{cm}$ and $DH = 6\,\text{cm}$.

Calculate angle HAF.

Angle $HAF =$ ..... [6]

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MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2020**

1 hour 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.
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- 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Blank pages are indicated.

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1

32 33 34 35 36 37 38 39

From this list of numbers, write down

(a) a multiple of 8,

..... [1]

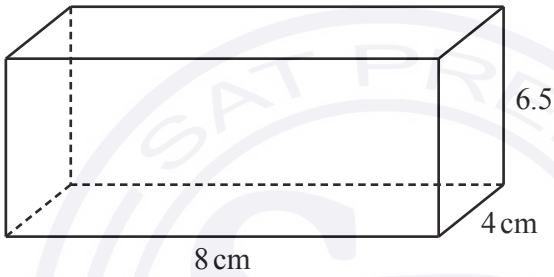
(b) a square number,

..... [1]

(c) a prime number.

..... [1]

2



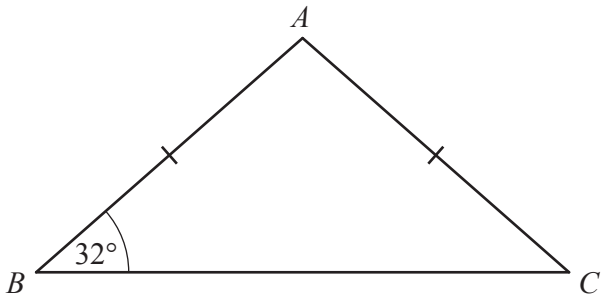
NOT TO SCALE

The diagram shows a cuboid.

Calculate the volume of the cuboid.

..... cm^3 [1]

3



NOT TO SCALE

Triangle ABC is isosceles.
Angle $ABC = 32°$ and $AB = AC$.

Find angle BAC.

Angle $BAC =$ ..... [2]

4 A train journey takes 5 hours 54 minutes.

(a) The journey starts at 09 15.

Find the time that the journey ends.

..... [1]

(b) The average speed of the train for this journey is 80 km/h.

Calculate the distance travelled.

..... km [2]

5 Sofia has a bag containing 8 blue beads and 7 red beads only.
She takes one bead out of the bag at random and replaces it.
She does this 90 times.

Find the number of times she expects to take a red bead.

..... [2]

6 Simplify.

(a) $p^2 \times p^4$

..... [1]

(b) $m^{15} \div m^5$

..... [1]

(c) $(k^3)^5$

..... [1]

7 **Without using a calculator**, work out $3\frac{1}{4} - 2\frac{2}{3}$.
You must show all your working and give your answer as a fraction in its simplest form.

..... [3]

8 The bearing of X from Y is 274°.

Calculate the bearing of Y from X.

..... [2]

9 Calculate the area of the sector of a circle with radius 65 mm and sector angle 42°.
Give your answer in square centimetres.

..... cm^2 [3]

10 A solid cylinder has radius 3 cm and height 4.5 cm.

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

..... cm^2 [4]

11 y is directly proportional to the cube root of $(x+3)$.
When $x = 5$, $y = \frac{2}{3}$.

Find y when $x = 24$.

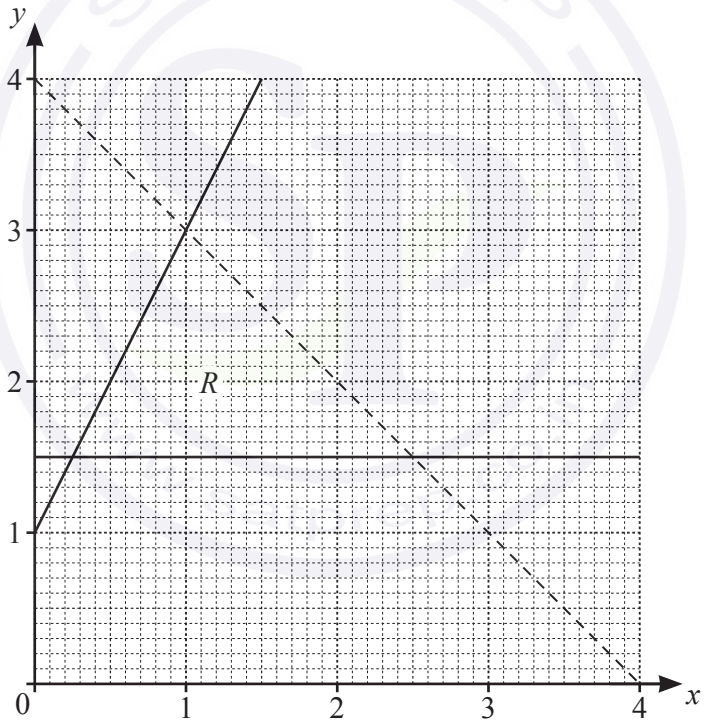
$y =$ ..... [3]

12 The total perimeter of a semicircle is 19.02 cm.

Calculate the radius of the semicircle.

..... cm [3]

13



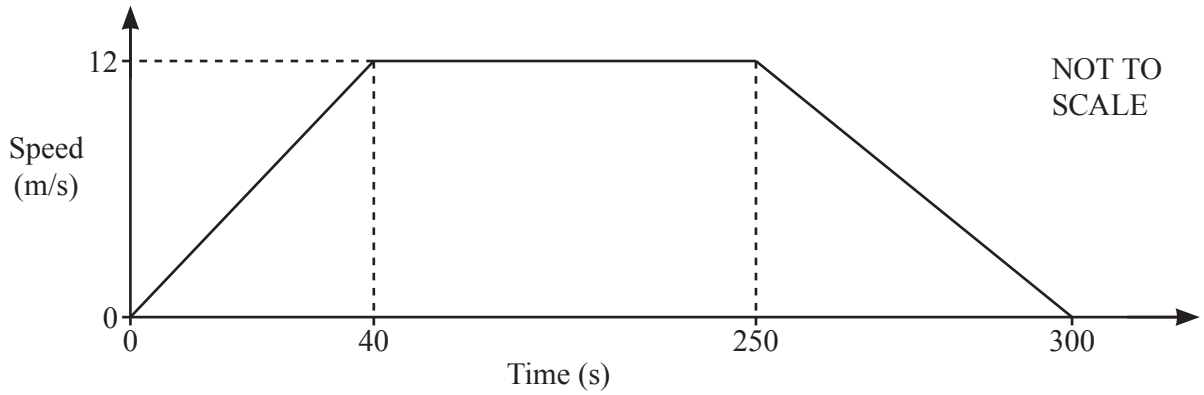
Write down the three inequalities that define the region R.

.....

.....

..... [4]

14 The diagram shows the speed–time graph of a train journey between two stations.



(a) Find the acceleration of the train during the first 40 seconds.

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

(b) Calculate the distance between the two stations.

..... m [3]

15 The table shows the amount of money, $\$x$, given to a charity by each of 60 people.

Amount ($\$x$)	$0 < x \leqslant 20$	$20 < x \leqslant 25$	$25 < x \leqslant 35$	$35 < x \leqslant 50$	$50 < x \leqslant 100$
Frequency	21	16	6	10	7

Calculate an estimate of the mean.

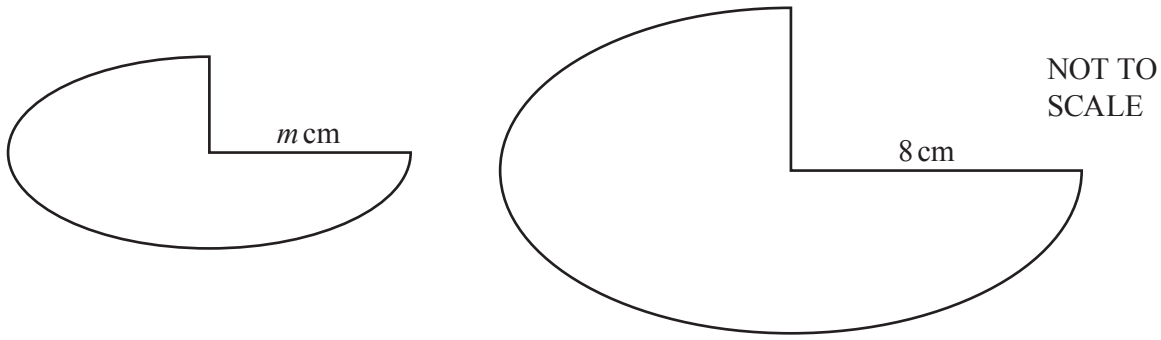
$ ..... [4]

16 Paddy and Anna each invest $2000 for 5 years.
Paddy earns simple interest at a rate of 1.25% per year.
Anna earns compound interest at a rate of r% per year.
At the end of 5 years, Paddy's investment is worth the same as Anna's investment.

Calculate the value of r.

$r =$ ..... [5]

17



The diagram shows two shapes that are mathematically similar.
The smaller shape has area 52.5 cm^2 and the larger shape has area 134.4 cm^2.

Calculate the value of m.

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

18 **(a)** Write $x^2 - 18x - 27$ in the form $(x+k)^2 + h$.

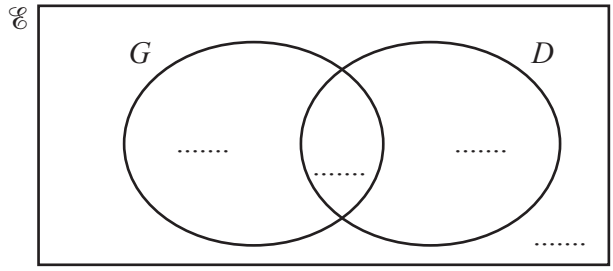
..... [2]

(b) Use your answer to **part (a)** to solve the equation $x^2 - 18x - 27 = 0$.

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

19 **(a)** In a class of 40 students:

- 28 wear glasses (G)
- 13 have driving lessons (D)
- 4 do not wear glasses and do not have driving lessons.

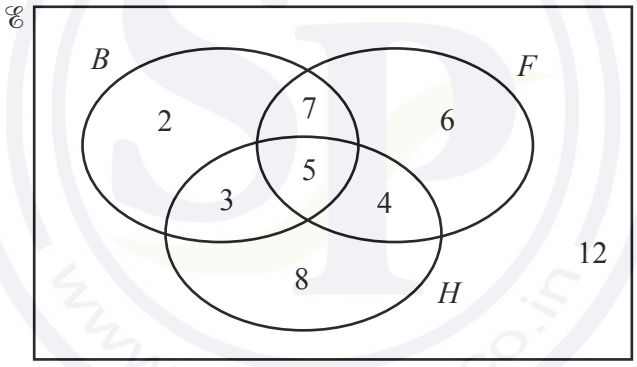


(i) Complete the Venn diagram. [2]

(ii) Use set notation to describe the region that contains a total of 32 students.

..... [1]

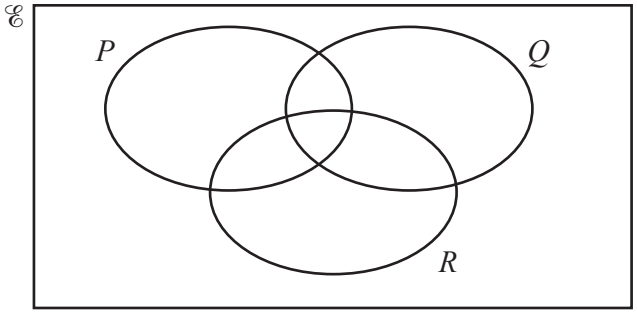
(b) This Venn diagram shows information about the number of students who play basketball (B), football (F) and hockey (H).



Find $\mathrm{n}((B \cup F) \cap H')$.

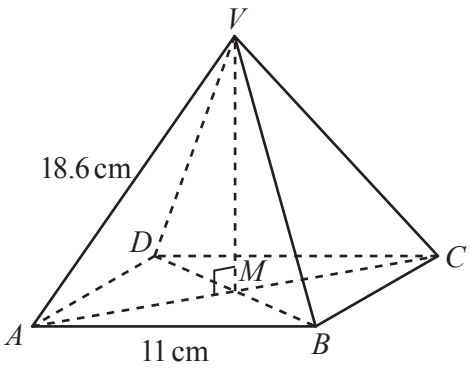
..... [1]

(c)



Shade the region $P \cup (Q \cap R)'$. [1]

20



NOT TO SCALE

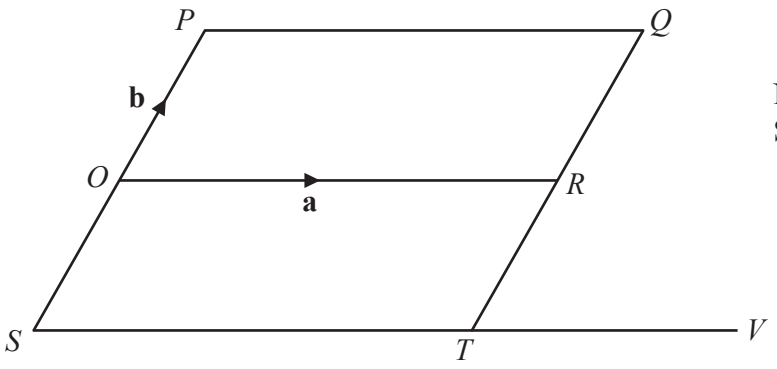
The diagram shows a pyramid with a square base $ABCD$.
The diagonals AC and BD intersect at M.
The vertex V is vertically above M.
$AB = 11$ cm and $AV = 18.6$ cm.

Calculate the angle that AV makes with the base.

..... [4]

Question 21 is printed on the next page.

21



NOT TO SCALE

O is the origin and $OPQR$ is a parallelogram.
SOP is a straight line with $SO = OP$.
TRQ is a straight line with $TR = RQ$.
STV is a straight line and $ST : TV = 2 : 1$.
$\overrightarrow{OR} = \mathbf{a}$ and $\overrightarrow{OP} = \mathbf{b}$.

(a) Find, in terms of **a** and **b**, in its simplest form,

(i) the position vector of T,

..... [2]

(ii) $\overrightarrow{RV}$.

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

(b) Show that PT is parallel to RV.

[2]

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1172955684

MATHEMATICS **0580/22**

Paper 2 (Extended) **February/March 2020**

1 hour 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 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Blank pages are indicated.

[Turn over

1 3.56 5 $\sqrt{196}$ 8 $\sqrt{7}$ 12

From the list, write down a number that is

(a) a multiple of 3,

..... [1]

(b) a cube number,

..... [1]

(c) a prime number,

..... [1]

(d) an irrational number.

..... [1]

2 The number of people swimming in a pool is recorded each day for 12 days.

24	28	13	38	15	26
45	21	48	36	18	38

(a) Complete the stem-and-leaf diagram.

1	
2	
3	
4	

Key: 1 | 3 represents 13 swimmers

[2]

(b) Find the median number of swimmers.

..... [1]

3 Point A has coordinates (6, 4) and point B has coordinates (2, 7).

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

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

4 Find the interior angle of a regular polygon with 24 sides.

..... [2]

5 **Without using a calculator,** work out $\frac{15}{28} \div \frac{4}{7}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [3]

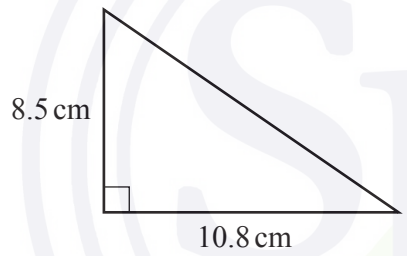
6 The table shows the marks scored by 40 students in a test.

Mark	5	6	7	8	9	10
Frequency	8	5	11	7	5	4

Calculate the mean mark.

..... [3]

7



NOT TO SCALE

The diagram shows a right-angled triangle.

(a) Calculate the area.

..... cm^2 [2]

(b) Calculate the perimeter.

..... cm [3]

8 Calculate the value of $(2.3 \times 10^{-3}) + (6.8 \times 10^{-4})$.
Give your answer in standard form.

..... [1]

9 **(a)** Factorise completely.

$3x^2 - 12xy$

..... [2]

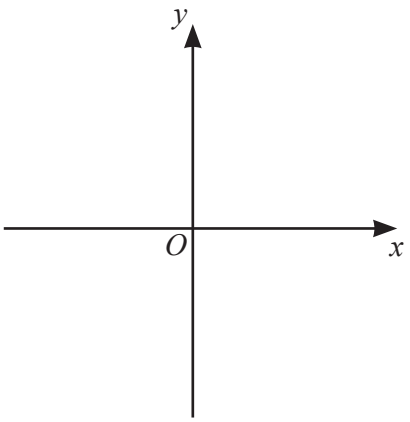
(b) Expand and simplify.

$(m-3)(m+2)$

..... [2]

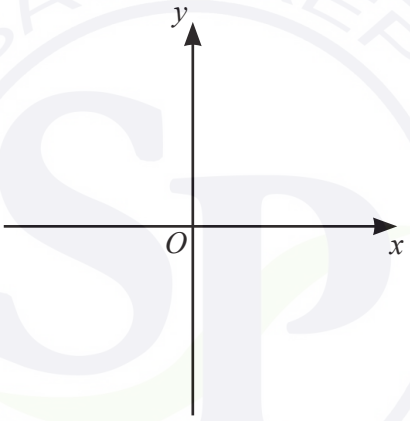
10 Sketch the graph of each function.

(a) $y = x - 3$



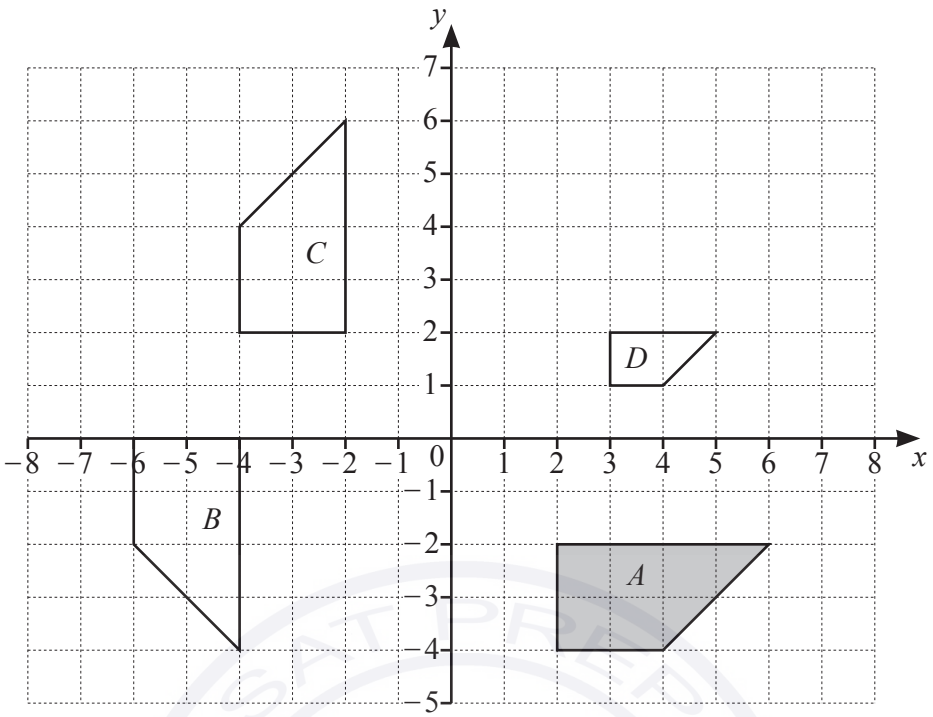
[1]

(b) $y = \frac{1}{x}$



[2]

11



Describe fully the **single** transformation that maps

(a) shape *A* onto shape *B*,

.....

..... [3]

(b) shape *A* onto shape *C*,

.....

..... [2]

(c) shape *A* onto shape *D*.

.....

..... [3]

12 The population of a town decreases exponentially at a rate of 1.7% per year.
The population now is 250 000.

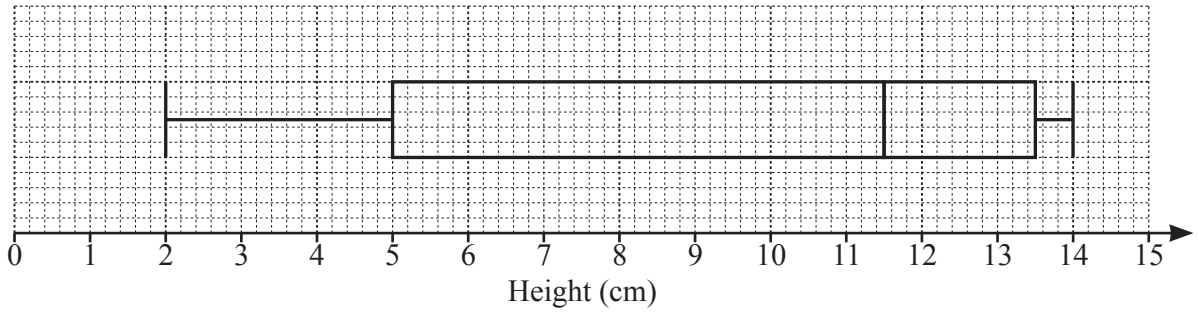
Calculate the population at the end of 5 years.
Give your answer correct to the nearest hundred.

..... [3]

13 Write the recurring decimal $0.2\dot{6}$ as a fraction.
You must show all your working.

..... [2]

14 The box-and-whisker plot gives information about the heights, in centimetres, of some plants.



(a) Write down the median.

..... cm [1]

(b) Find

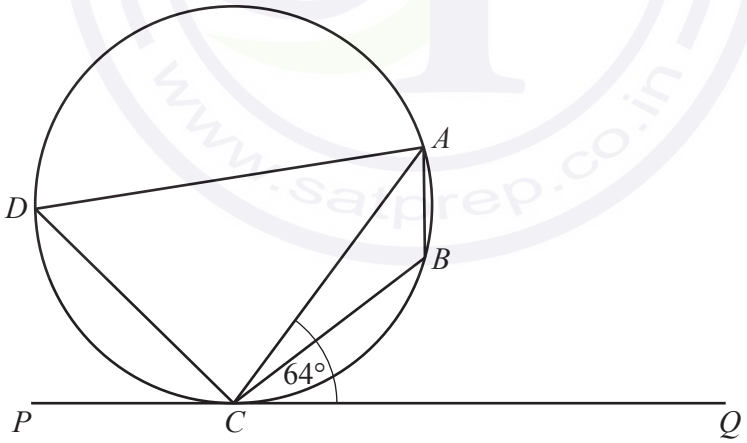
(i) the range,

..... cm [1]

(ii) the interquartile range.

..... cm [1]

15



NOT TO SCALE

A, *B*, *C* and *D* lie on the circle.
PCQ is a tangent to the circle at *C*.
Angle *ACQ* = 64°.

Work out angle *ABC*, giving reasons for your answer.

Angle *ABC* = ... because .....

.....

..... [3]

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

$$x = 7 - 3y$$
$$x^2 - y^2 = 39$$

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

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

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

Find the equation of the line perpendicular to AB that passes through the point A.
Give your answer in the form $y = mx + c$.

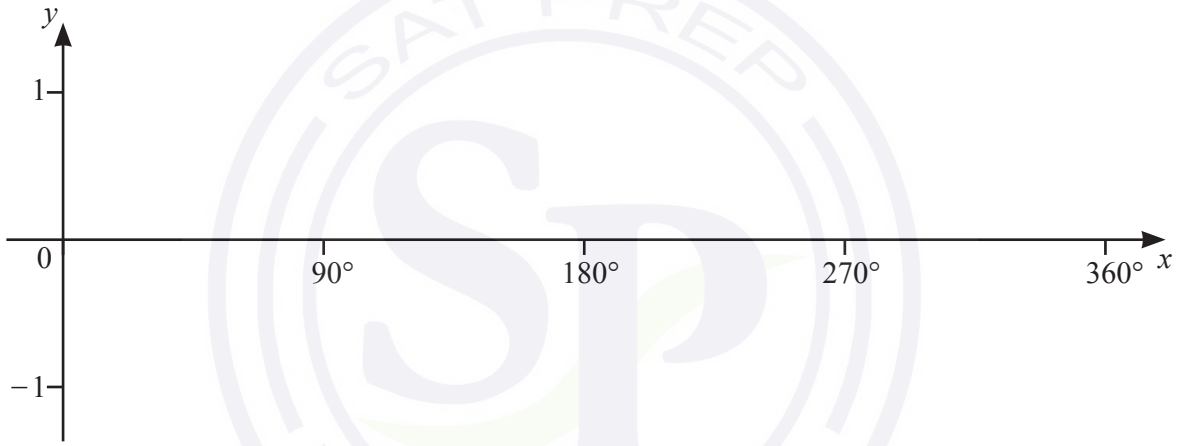
$y =$ ..... [4]

18 A car travels at a constant speed.
It travels a distance of 146.2 m, correct to 1 decimal place.
This takes 7 seconds, correct to the nearest second.

Calculate the upper bound for the speed of the car.

..... m/s [3]

19



(a) On the diagram, sketch the graph of $y = \cos x$ for $0° \leqslant x \leqslant 360°$. [2]

(b) Solve the equation $4\cos x + 2 = 3$ for $0° \leqslant x \leqslant 360°$.

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

Questions 20 and 21 are printed on the next page.

20 $x^2 - 12x + a = (x + b)^2$

Find the value of a and the value of b.

$a =$ .....

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

21 $\overrightarrow{XY} = 3\mathbf{a} + 2\mathbf{b}$ and $\overrightarrow{ZY} = 6\mathbf{a} + 4\mathbf{b}$.

Write down two statements about the relationship between the points X, Y and Z.

1 .....

2 ..... [2]

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MATHEMATICS **0580/21**

Paper 2 (Extended) **October/November 2019**

1 hour 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 70.

DC (LK/TP) 172358/2

1 Work out 5% of $25.

$ ..... [1]

2 Factorise $5p + pt$.

..... [1]

3 Calculate.

$$\frac{16.379 - 0.879}{4.2} \times 1.241$$

Give your answer correct to 2 significant figures.

..... [2]

4 Write 15 060

(a) in words,

..... [1]

(b) in standard form.

..... [1]

5 Simplify $5c - d - 3d - 2c$.

..... [2]

6 Solve.

$$\frac{x-2}{3} = 3$$

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

7 Simplify $2x^3 \times 3x^2$.

..... [2]

8 **Without using a calculator**, work out $\frac{5}{16} \times 1\frac{1}{7}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [2]

9 Paula invests \$600 at a rate of r% per year simple interest.
At the end of 10 years, the total interest earned is \$90.

Find the value of r.

$r =$ ..... [2]

10 Simplify.

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

..... [2]

11 $P = 2r + \pi r$

Rearrange the formula to write r in terms of P and π.

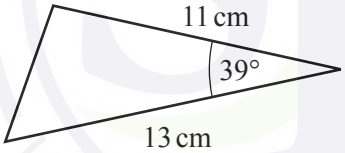
$r =$ ..... [2]

12 The sides of a square are 15.1 cm, correct to 1 decimal place.

Find the upper bound of the area of the square.

..... cm^2 [2]

13



NOT TO SCALE

Calculate the area of the triangle.

..... cm^2 [2]

14 The scale of a map is 1 : 10 000 000.
On the map, the area of Slovakia is 4.9 cm^2.

Calculate the actual area of Slovakia.
Give your answer in square kilometres.

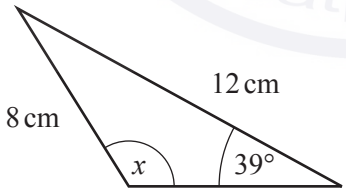
..... km^2 [3]

15 y is inversely proportional to x^2.
When $x = 4$, $y = 2$.

Find y when $x = \frac{1}{2}$.

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

16

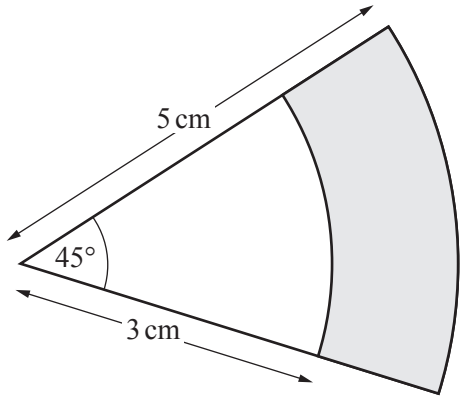


NOT TO SCALE

Calculate the **obtuse** angle x in this triangle.

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

17



NOT TO SCALE

The diagram shows two sectors of circles with the same centre.

Calculate the shaded area.

..... cm^2 [3]

18 Write $\frac{x}{2} - \frac{2x+4}{x+1}$ as a single fraction, in its simplest form.

..... [3]

19 $\mathbf{M} = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ $\mathbf{P} = \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix}$

(a) Find **MP**.

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

(b) Find $|\mathbf{M}|$.

..... [1]

20 The probability that the school bus is late is $\frac{9}{10}$.

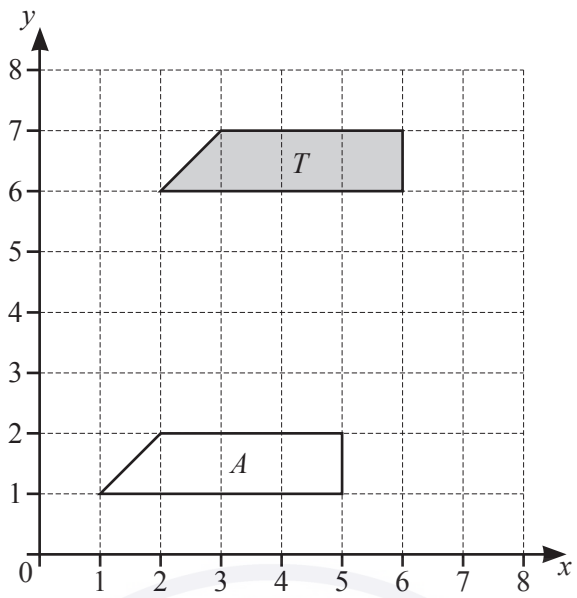
If the school bus is late, the probability that Seb travels on the bus is $\frac{15}{16}$.

If the school bus is on time, the probability that Seb travels on the bus is $\frac{3}{4}$.

Find the probability that Seb travels on the bus.

..... [3]

21



(a) Describe fully the **single** transformation that maps shape T onto shape A.

.....

..... [2]

(b) On the grid, reflect shape T in the line $y = x$. [2]

22 A pipe is completely full of water.
Water flows through the pipe at a speed of 1.2 m/s into a tank.
The cross-section of the pipe has an area of 6 cm^2.

Calculate the number of litres of water flowing into the tank in 1 hour.

..... litres [4]

23 $\mathscr{E} = \{0, 1, 2, 3, 4, 5, 6\}$ $A = \{0, 2, 4, 5, 6\}$ $B = \{1, 2, 5\}$

Complete each of the following statements.

$A \cap B =$ {.....}

$n(B) =$ .....

$\{0, 4, 6\} =$ ..... $\cap$ .....

$\{2, 4\}$ ..... A [4]

24 $f(x) = 3x - 5$ $g(x) = 2^x$

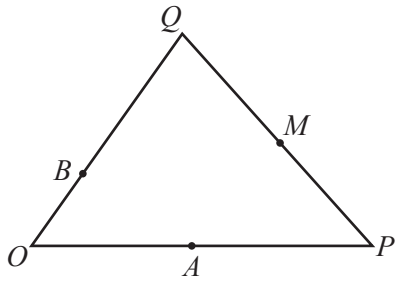
(a) Find fg(3).

..... [2]

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

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

25



NOT TO SCALE

O is the origin, $\overrightarrow{OP} = 2\overrightarrow{OA}$, $\overrightarrow{OQ} = 3\overrightarrow{OB}$ and $\overrightarrow{PM} = \overrightarrow{MQ}$.

$\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OQ} = \mathbf{q}$.

Find, in terms of **p** and **q**, in its simplest form

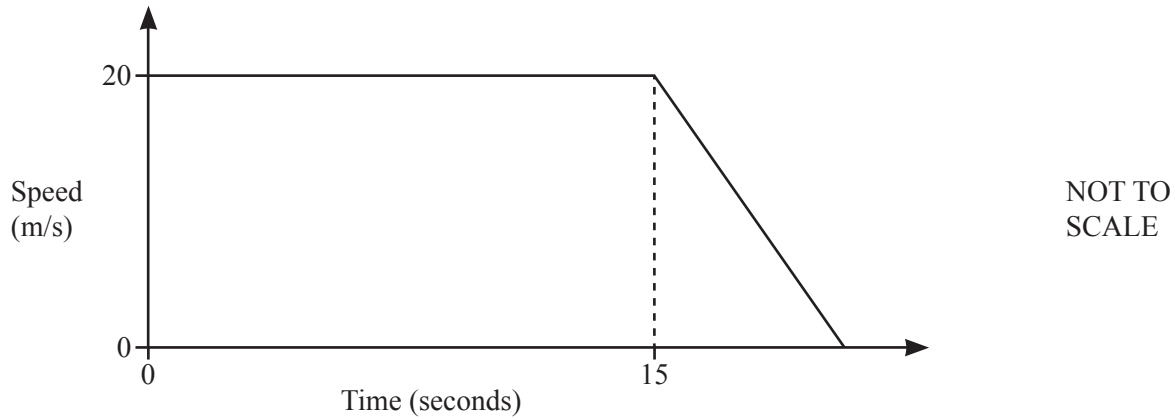
(a) $\overrightarrow{BA}$,

$\overrightarrow{BA} =$ ..... [2]

(b) the position vector of M.

..... [2]

26



A car travels at 20 m/s for 15 seconds before it comes to rest by decelerating at 2.5 m/s^2.

Find the total distance travelled.

..... m [5]

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CENTRE NUMBER

CANDIDATE NUMBER

5676838059

MATHEMATICS **0580/22**

Paper 2 (Extended) **October/November 2019**

1 hour 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 70.

This document consists of **11** printed pages and **1** blank page.

1 The lowest temperature recorded at Scott Base in Antarctica is $-57.0\,°C$.
The highest temperature recorded at Scott Base is $63.8\,°C$ more than this.

What is the highest temperature recorded at Scott Base?

..... °C [1]

2 Calculate.

$$\frac{5}{8} + \sqrt[3]{340}$$

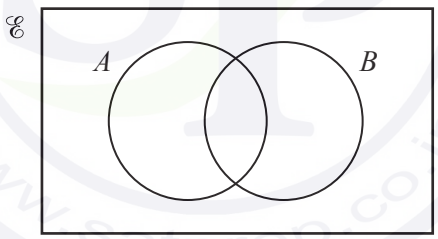
..... [1]

3 Expand.

$$a(a^3 + 3)$$

..... [1]

4 On the Venn diagram, shade the region $(A \cap B)'$.



[1]

5 The mass, correct to the nearest kilogram, of each of 11 parcels is shown below.

24 23 23 26 25 27 18 96 16 17 32

(a) Find the mode.

..... kg [1]

(b) Give a reason why the mean would be an unsuitable average to use.

..... [1]

6 The table shows how children in Ivan's class travel to school.

Travel to school	Number of children
Walk	12
Car	7
Bicycle	9
Bus	4

Ivan wants to draw a pie chart to show this information.

Find the sector angle for children who walk to school.

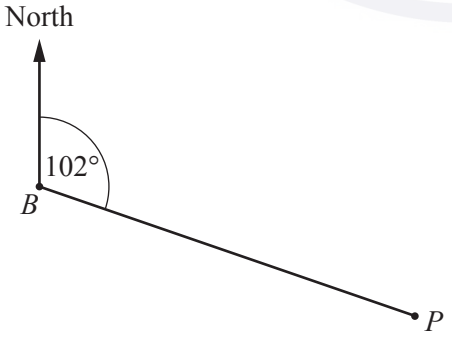
..... [2]

7 Rashid changes 30 000 rupees to dollars when the exchange rate is \$1 = 68.14 rupees.

How many dollars does he receive?

\$ ..... [2]

8



NOT TO SCALE

The bearing of P from B is 102°.

Find the bearing of B from P.

..... [2]

9 Solve the inequality.

$$\frac{x}{2} - 13 > 12 + 3x$$

..... [2]

10 Write the recurring decimal $0.6\dot{7}$ as a fraction.
Show all your working and give your answer in its simplest form.

..... [2]

11 **Without using a calculator**, work out $3\frac{5}{8} - 1\frac{2}{3}$.
You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

12 A regular polygon has an interior angle of 176°.

Find the number of sides of this polygon.

..... [3]

13 Two mathematically similar containers have heights of 30 cm and 75 cm.
The larger container has a capacity of 5.5 litres.

Calculate the capacity of the smaller container.
Give your answer in millilitres.

..... ml [3]

14 Show that the line $4y = 5x - 10$ is perpendicular to the line $5y + 4x = 35$.

[3]

15 Esme buys x magazines at \$2.45 each and y cards at \$3.15 each.

(a) Write down an expression, in terms of x and y, for the total cost, in dollars, of the magazines and the cards.

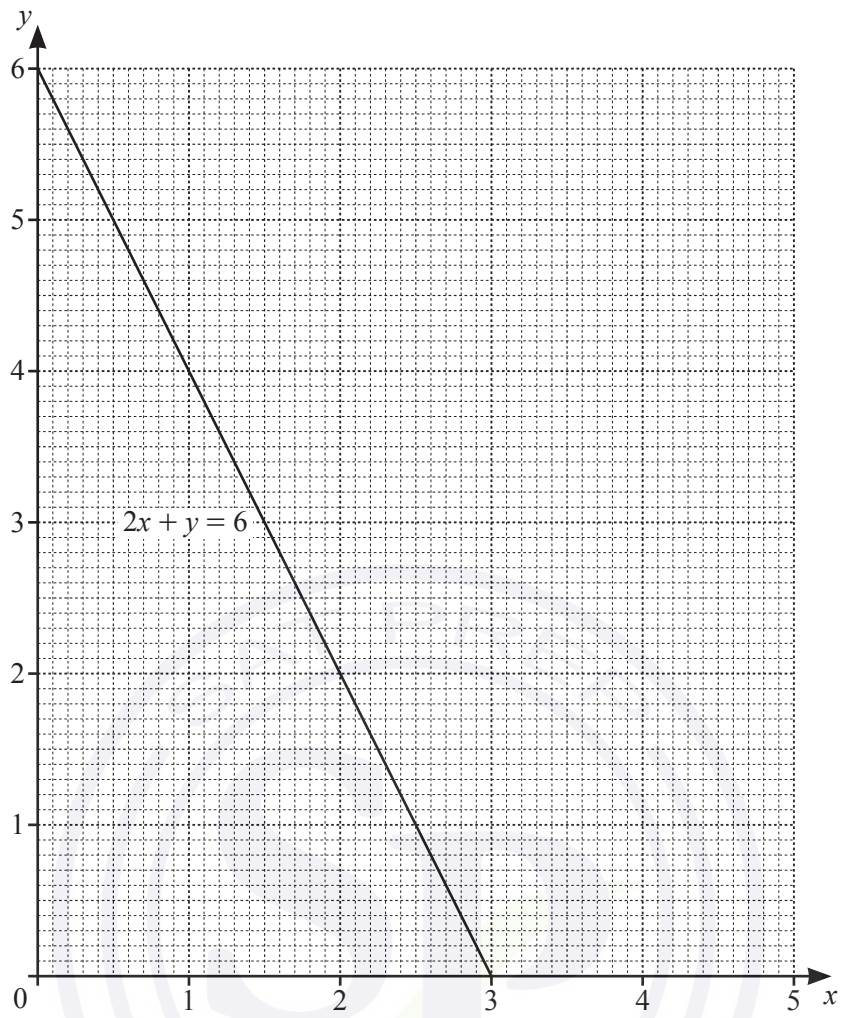
\$ ..... [2]

(b) Esme spends \$60.55 in total.
She buys 8 magazines.

How many cards does she buy?

..... [2]

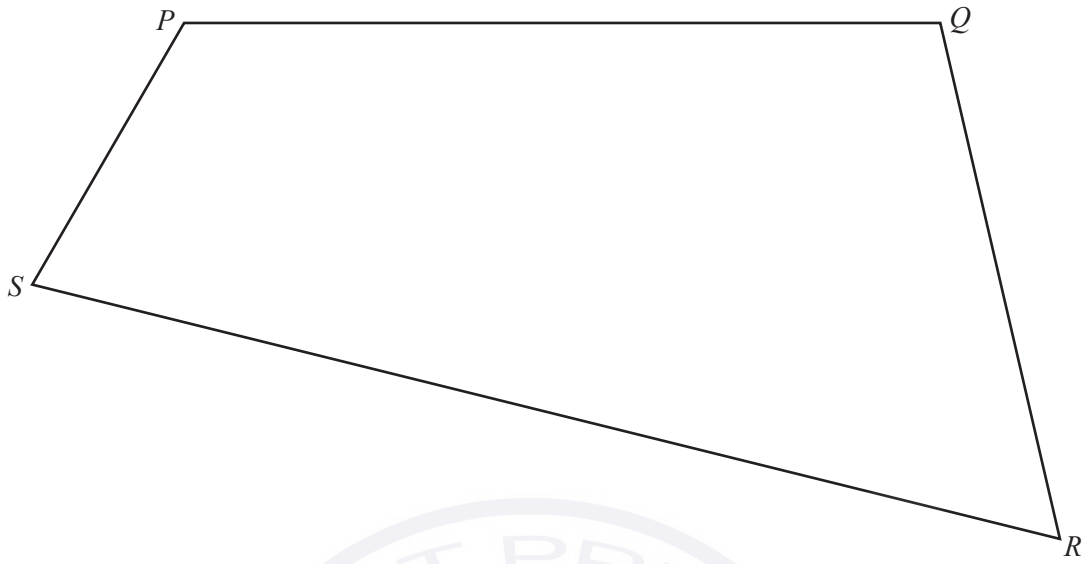
16



By shading the **unwanted** regions of the grid, find and label the region R that satisfies the following inequalities.

$y \leqslant 5$ $2x + y \geqslant 6$ $y \geqslant x + 1$ [4]

17 The diagram shows a scale drawing of Lei's garden, *PQRS*.
The scale is 1 centimetre represents 2 metres.



Scale: 1 cm to 2 m

Lei has a bird table in the garden that is

- equidistant from *PQ* and *QR*

and

- 13 m from *R*.

On the diagram, construct the position of the bird table.
Use a ruler and compasses only and show all your construction arcs. [4]

18 Harris is taking a driving test.
The probability that he passes the driving test at the first attempt is 0.6 .
If he fails, the probability that he passes at any further attempt is 0.75 .

Calculate the probability that Harris

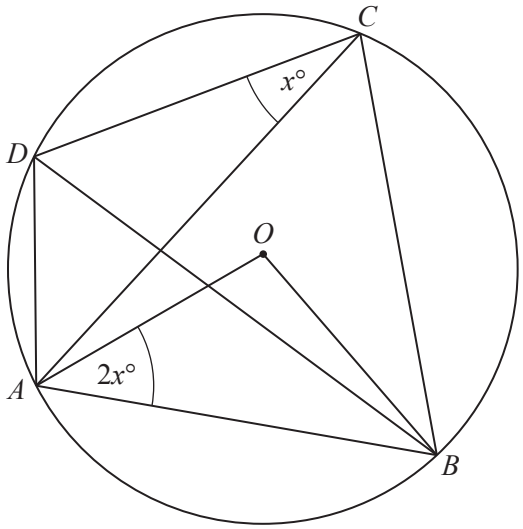
(a) passes the driving test at the second attempt,

..... [2]

(b) takes no more than three attempts to pass the driving test.

..... [2]

19



NOT TO SCALE

In the diagram, A, B, C and D lie on the circumference of a circle, centre O.
Angle $ACD = x°$ and angle $OAB = 2x°$.

Find an expression, in terms of x, in its simplest form for

(a) angle AOB,

Angle AOB = ... [1]

(b) angle ACB,

Angle ACB = ... [1]

(c) angle DAB.

Angle DAB = ... [2]

20 **(a)** Factorise.

$$18y - 3ay + 12x - 2ax$$

..... [2]

(b) Factorise.

$$3x^2 - 48y^2$$

..... [3]

21 **(a)** $3^{-2} \times 3^x = 81$

Find the value of x.

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

(b) $x^{-\frac{1}{3}} = 32x^{-2}$

Find the value of x.

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

[Turn over

22 $\mathbf{A} = \begin{pmatrix} 3 & 2 \\ -5 & 0 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} -2 & 5 \\ 4 & 1 \end{pmatrix}$ $\mathbf{C} = (-1 \quad k)$

(a) Find **AB**.

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

(b) $\mathbf{CA} = (-13 \quad -2)$

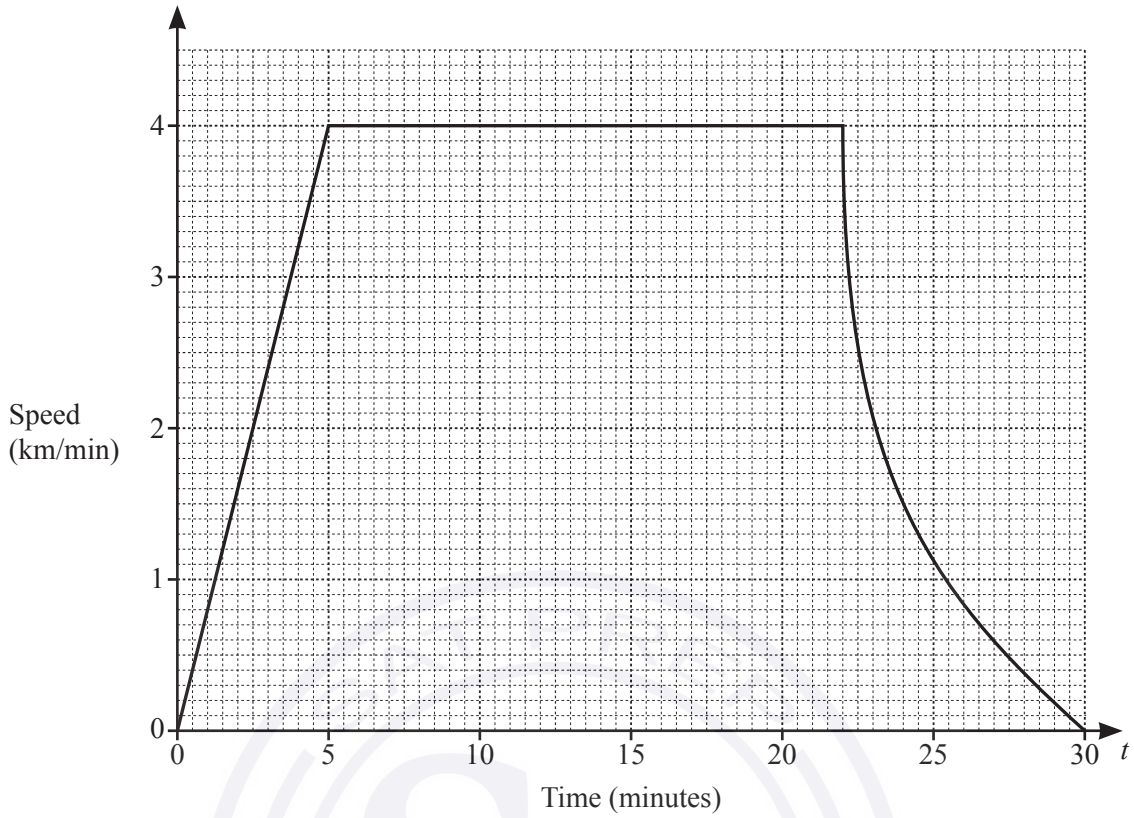
Find the value of k.

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

(c) Find $\mathbf{A}^{-1}$.

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

23



The speed–time graph shows information about a train journey.

(a) By drawing a suitable tangent to the graph, estimate the gradient of the curve at $t = 24$.

..... [3]

(b) What does this gradient represent?

..... [1]

(c) Work out the distance travelled by the train when it is travelling at constant speed.

..... km [2]

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7334800620

MATHEMATICS **0580/23**

Paper 2 (Extended) **October/November 2019**

1 hour 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.
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Answer **all** questions.
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For π, use either your calculator value or 3.142.

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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 70.

1 Write down the temperature that is 7 °C below −3 °C.

..... °C [1]

2 Calculate $\sqrt{256^{0.25} + 4 \times 8}$.

..... [1]

3 Here is a list of numbers.

87 77 57 47 27

From this list, write down

(a) a cube number,

..... [1]

(b) a prime number.

..... [1]

4 Find the highest common factor (HCF) of 84 and 105.

..... [2]

5 Write in standard form.

(a) 72000

..... [1]

(b) 0.0018

..... [1]

6 Expand and simplify $(x+3)(x+5)$.

..... [2]

7 Find the gradient of the line that is perpendicular to the line $2y = 3 + 5x$.

..... [2]

8 When $\sin x° = 0.36$, find

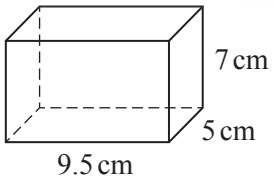
(a) the acute angle $x°$,

..... [1]

(b) the obtuse angle $x°$.

..... [1]

9 A cuboid measures 5 cm by 7 cm by 9.5 cm.



NOT TO SCALE

Work out the surface area of this cuboid.

..... cm^2 [3]

10 $5n$ is the mean of the three numbers 391, n and $n - 1$.

Find the value of n.

$n =$ ..... [3]

11 Factorise.

(a) $12x + 15$

..... [1]

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

..... [2]

12 A is the point (2, 1) and B is the point (9, 4).

Find the length of AB.

..... [3]

13 A straight line joins the points $(3k, 6)$ and $(k, -5)$.
The line has a gradient of 2.

Find the value of k.

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

14 Find the nth term of each sequence.

(a) $\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \frac{1}{8}, \frac{1}{10}, \ldots$

..... [1]

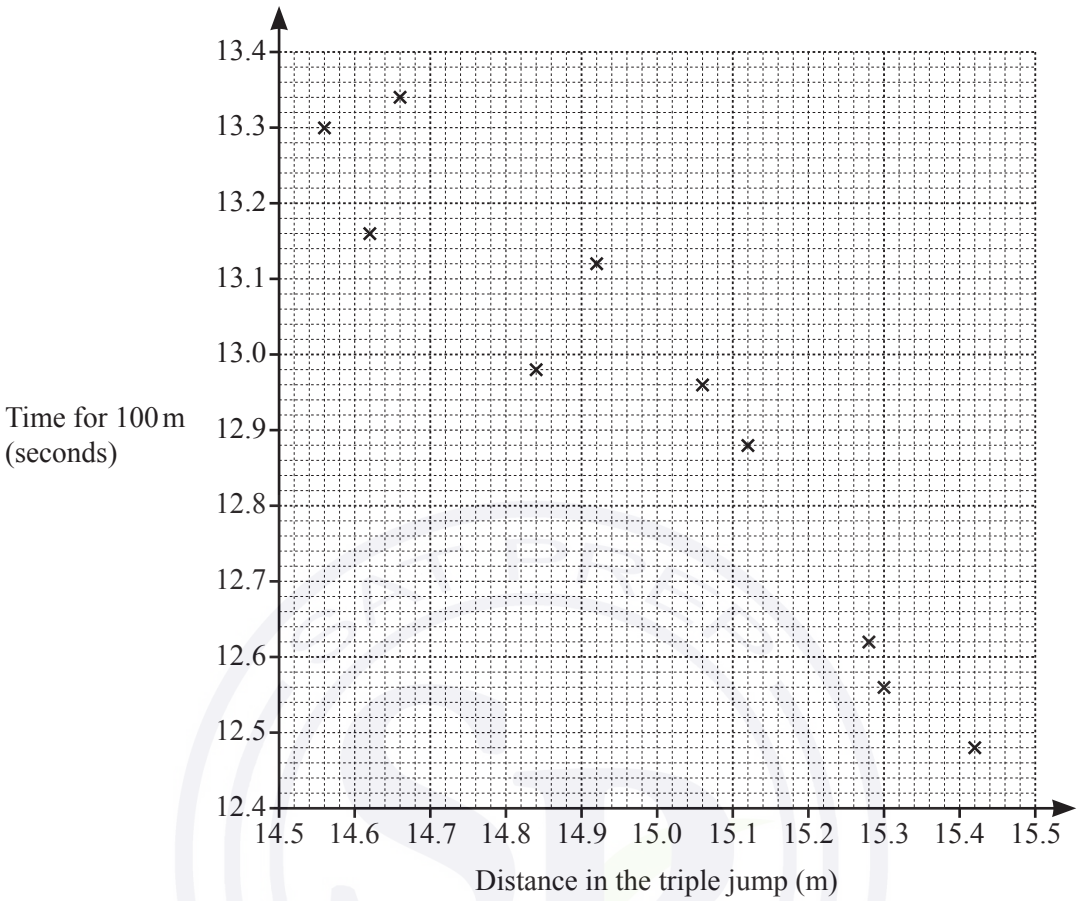
(b) 1, 5, 25, 125, 625, ...

..... [2]

15 **Without using a calculator**, work out $\frac{2}{3} + \frac{1}{4} \times \frac{2}{3}$.
Write down all the steps of your working and give your answer as a fraction in its simplest form.

..... [4]

16 Ten athletes compete in both the 100 metre race and the triple jump.
Their results are shown in the scatter diagram.



(a) One of these athletes jumps 15.12 m in the triple jump.

Write down his time for the 100 metre race.

..... s [1]

(b) The values for two other athletes are shown in the table.

Distance in the triple jump (m)	14.74	15.2
Time for 100 m (seconds)	13.2	12.76

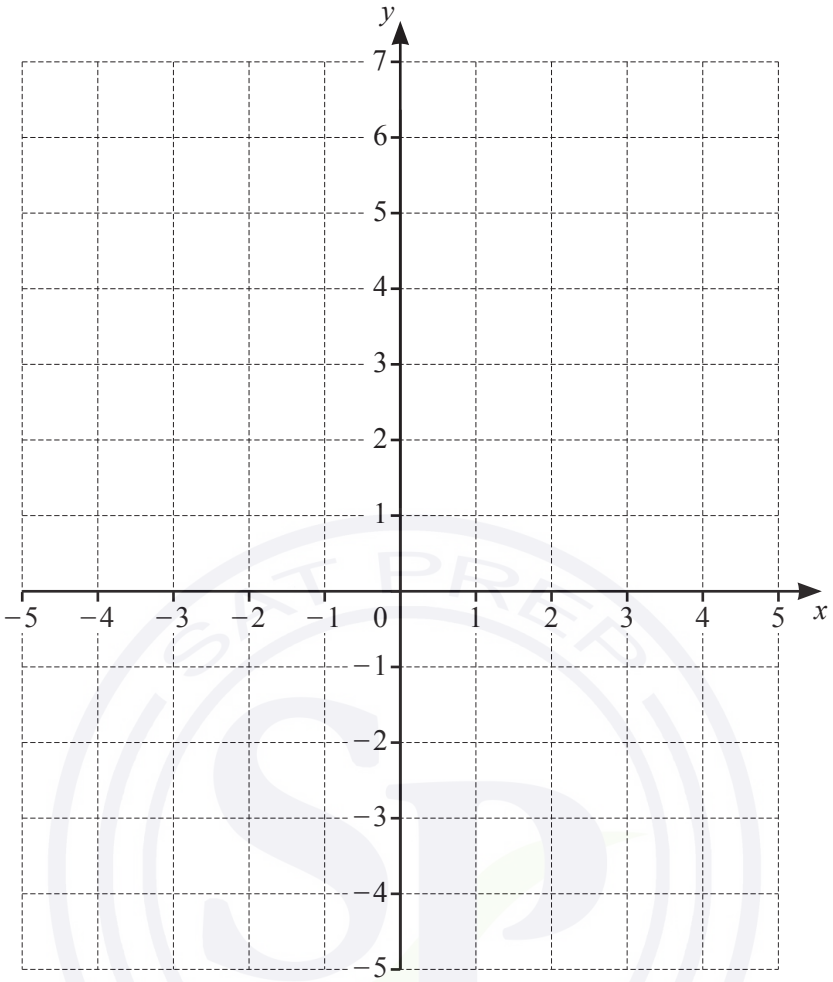
On the scatter diagram, plot these points. [1]

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

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

..... [1]

17



By shading the **unwanted** regions on the grid, draw and label the region R that satisfies the following inequalities.

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

[4]

18 **(a)** $M = \{x : x \text{ is an integer and } 2 \leqslant x < 6\}$

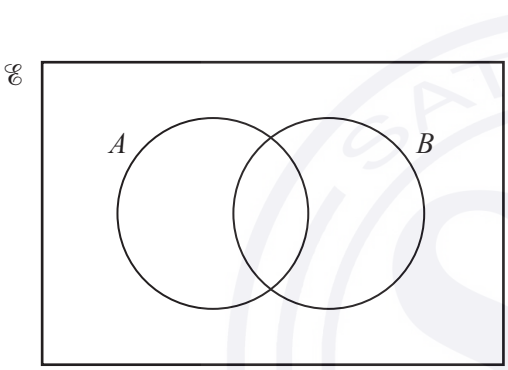
(i) Find n(M).

..... [1]

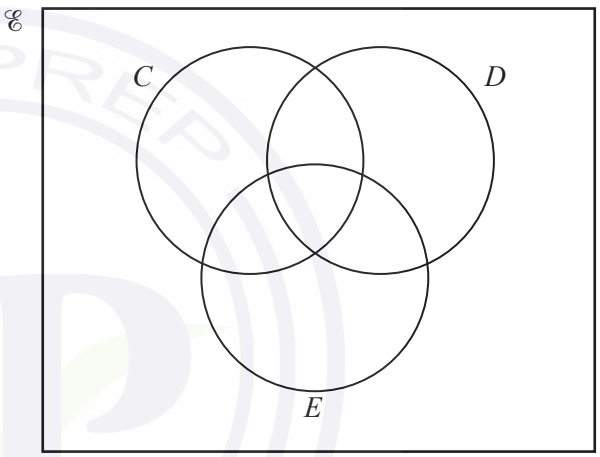
(ii) Write down a set N where $N \subset M$ and $N \neq \varnothing$.

{.....} [1]

(b) In each Venn diagram, shade the required region.



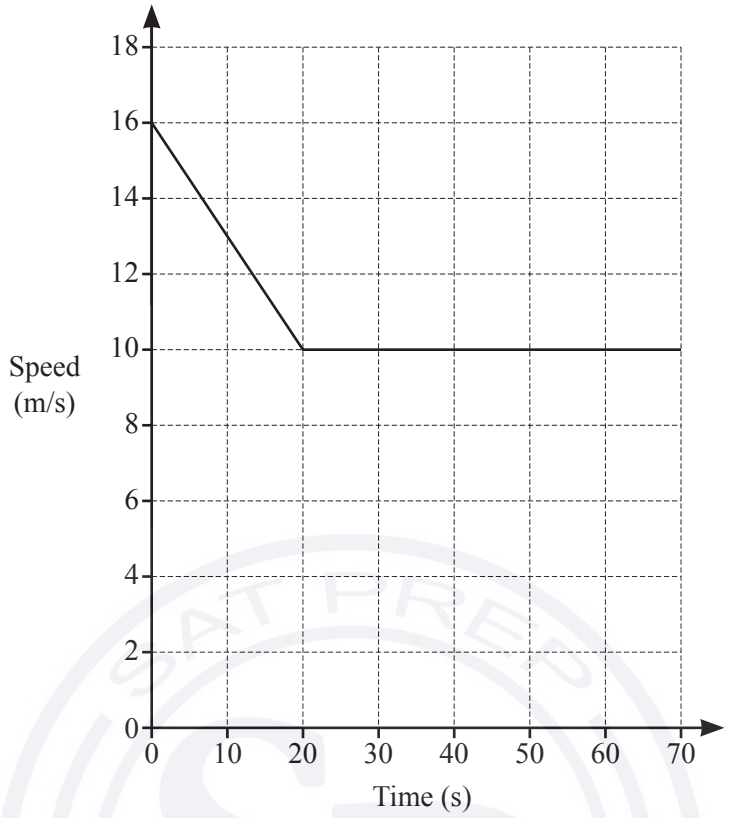
$(A \cup B)'$



$(C \cap D') \cup E$

[2]

19



The diagram shows the speed–time graph for 70 seconds of a car journey.

(a) Calculate the deceleration of the car during the first 20 seconds.

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

(b) Calculate the total distance travelled by the car during the 70 seconds.

..... m [3]

[Turn over

20 t is inversely proportional to the square of $(x + 1)$.
When $x = 2$, $t = 5$.

(a) Write t in terms of x.

$t =$ ..... [2]

(b) When $t = 1.8$, find the positive value of x.

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

21 **(a)** Work out the inverse of the matrix $\begin{pmatrix} -3 & 10 \\ 1 & -5 \end{pmatrix}$.

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

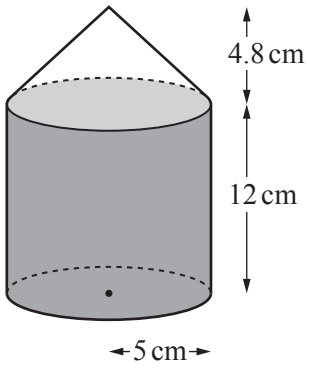
(b) Work out the value of x and the value of y in this matrix calculation.

$$\begin{pmatrix} 1 & 5 \\ 2 & y \end{pmatrix}\begin{pmatrix} -4 & 1 \\ 2 & 9 \end{pmatrix} = \begin{pmatrix} x & 46 \\ 6 & 65 \end{pmatrix}$$

$x =$ .....

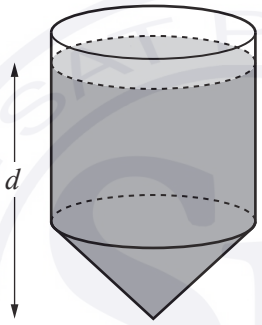
$y =$ ..... [3]

22 A container is made from a cylinder and a cone, each of radius 5 cm.
The height of the cylinder is 12 cm and the height of the cone is 4.8 cm.



NOT TO SCALE

The cylinder is filled completely with water.
The container is turned upside down as shown below.



NOT TO SCALE

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

d = ... cm [5]

Question 23 is printed on the next page.

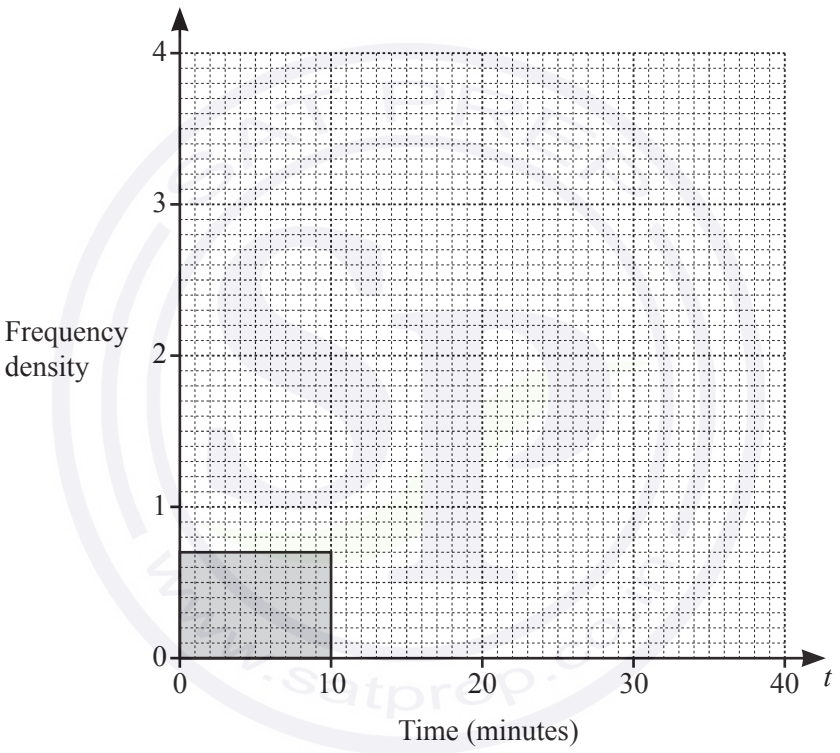
23 The time, t minutes, it takes each of 50 students to travel to school is recorded.
The table shows the results.

Time (t minutes)	$0 < t \leqslant 10$	$10 < t \leqslant 15$	$15 < t \leqslant 20$	$20 < t \leqslant 40$
Frequency	7	19	16	8

(a) Write down the modal class.

..... $< t \leqslant$ ..... min [1]

(b) On the grid, complete the histogram to show the information in the table.



[3]

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

1227953771

MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2019**

1 hour 30 minutes

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1 Work out \$1.20 as a percentage of \$16.

.....% [1]

2 Factorise $5y - 6py$.

..... [1]

3 Calculate $\sqrt[3]{8.1^2 - 1.3^{0.8}}$.

..... [1]

4 An equilateral triangle has sides of length 15 cm, correct to the nearest centimetre.

Calculate the upper bound of the perimeter of this triangle.

..... cm [1]

5 The volume of a cuboid is 180 cm^3.
The base is a square of side length 6 cm.

Calculate the height of this cuboid.

..... cm [2]

6 Simplify.

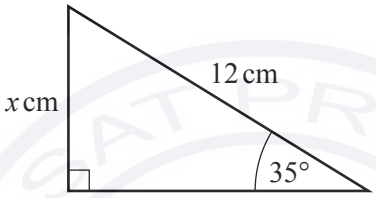
(a) $t^{21} \div t^7$

..... [1]

(b) $(u^5)^5$

..... [1]

7



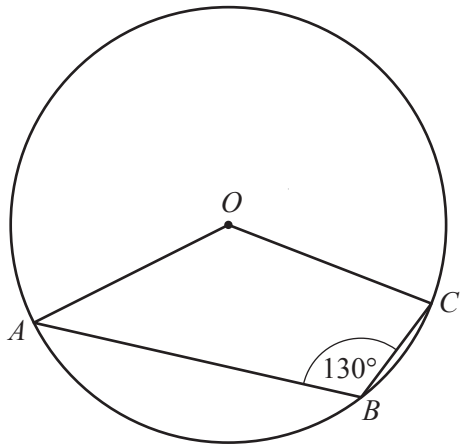
NOT TO SCALE

The diagram shows a right-angled triangle.

Calculate the value of x.

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

8



NOT TO SCALE

A, B and C are points on the circle, centre O.

Find the obtuse angle AOC.

Angle AOC = ... [2]

9 Write the recurring decimal $0.4\dot{7}$ as a fraction.
Show all your working.

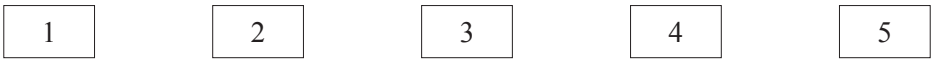
..... [2]

10 $f(x) = 2x + 3$

Find $f(1 - x)$ in its simplest form.

..... [2]

11



The diagram shows five cards.
Two of the cards are taken at random, without replacement.

Find the probability that both cards show an even number.

..... [2]

12 27 28 29 30 31 32 33

From the list of numbers, write down

(a) a multiple of 7,

..... [1]

(b) a cube number,

..... [1]

(c) a prime number.

..... [1]

13 $x^2 + 4x - 9 = (x + a)^2 + b$

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [3]

14 **Without using a calculator**, work out $\frac{5}{6}+\frac{2}{3}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

15 Expand and simplify.

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

..... [3]

16 y is inversely proportional to the square root of $(x + 1)$.
When $x = 8$, $y = 2$.

Find y when $x = 99$.

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

17 **(a)** Factorise $p^2 - q^2$.

..... [1]

(b) $p^2 - q^2 = 7$ and $p - q = 2$.

Find the value of $p + q$.

..... [2]

18 **(a)** Simplify $\left(81y^{16}\right)^{\frac{3}{4}}$.

..... [2]

(b) $2^3 = 4^p$

Find the value of p.

$p =$ ..... [1]

19 A model of a car has a scale 1 : 20.
The volume of the actual car is $12\,\text{m}^3$.

Find the volume of the model.
Give your answer in cubic centimetres.

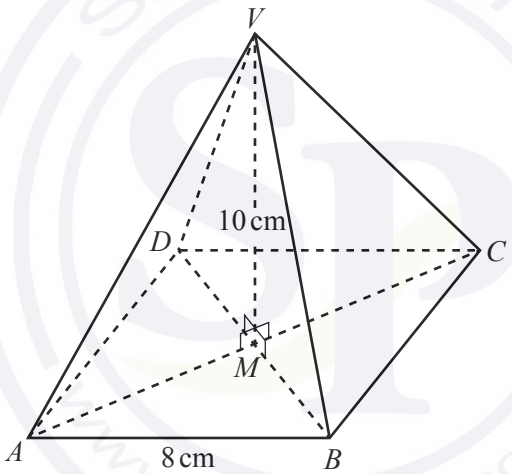
.....cm^3 [3]

20 Write as a single fraction in its simplest form.

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

..... [3]

21



NOT TO SCALE

The diagram shows a pyramid with a square base $ABCD$ of side length 8 cm.
The diagonals of the square, AC and BD, intersect at M.
V is vertically above M and $VM = 10$ cm.

Calculate the angle between VA and the base.

..... [4]

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

5 8 11 14

(i) Write down the next term.

..... [1]

(ii) Find an expression, in terms of n, for the nth term.

..... [2]

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

$\frac{1}{2}$ $\frac{3}{4}$ $\frac{7}{6}$ $\frac{13}{8}$ $\frac{21}{10}$

Find the next term.

..... [1]

23 $\mathbf{P} = \begin{pmatrix} 3 & 1 \\ 2 & 4 \end{pmatrix}$

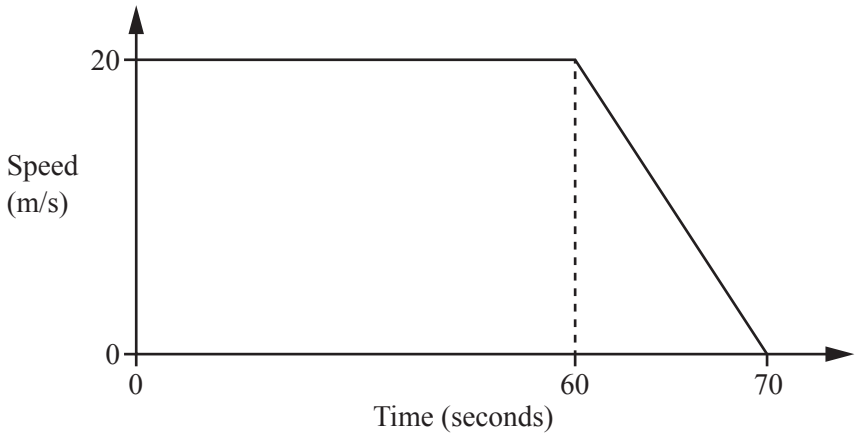
(a) Find $\mathbf{P}^2$.

( ) [2]

(b) Find $\mathbf{P}^{-1}$.

( ) [2]

24



NOT TO
SCALE

The diagram shows information about the final 70 seconds of a car journey.

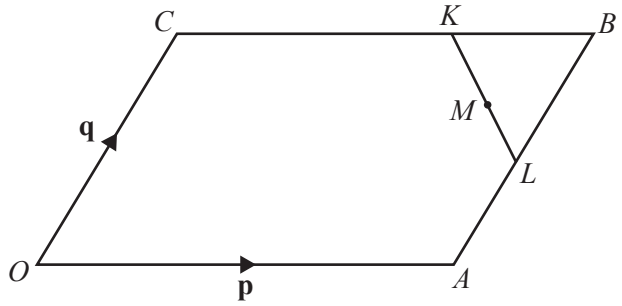
(a) Find the deceleration of the car between 60 and 70 seconds.

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

(b) Find the distance travelled by the car during the 70 seconds.

.....m [3]

25



NOT TO SCALE

$OABC$ is a parallelogram and O is the origin.
$CK = 2KB$ and $AL = LB$.
M is the midpoint of KL.
$\overrightarrow{OA} = \mathbf{p}$ and $\overrightarrow{OC} = \mathbf{q}$.

Find, in terms of **p** and **q**, giving your answer in its simplest form

(a) $\overrightarrow{KL}$,

$\overrightarrow{KL} =$ ..... [2]

(b) the position vector of M.

..... [2]

Question 26 is printed on the next page.

26 Line L passes through the points $(0, -3)$ and $(6, 9)$.

(a) Find the equation of line L.

..... [3]

(b) Find the equation of the line that is perpendicular to line L and passes through the point $(0, 2)$.

..... [2]

Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

1416105171

MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2019**

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1 Write down a prime number between 50 and 60.

..... [1]

2 Use your calculator to work out $\sqrt{1-(\sin 33°)^2}$.

..... [1]

3 Write the recurring decimal $0.\dot{7}$ as a fraction.

..... [1]

4 Complete each statement.

(a) A quadrilateral with only one pair of parallel sides is called a ..... . [1]

(b) An angle greater than 90° but less than 180° is called ..... . [1]

5 The distance between Prague and Vienna is 254 kilometres.
The local time in Prague is the same as the local time in Vienna.
A train leaves Prague at 15 20 and arrives in Vienna at 19 50 the same day.

Calculate the average speed of the train.

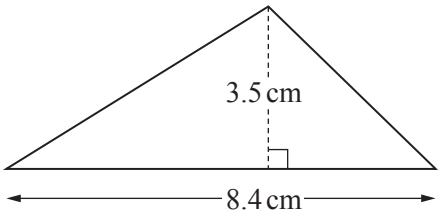
..... km/h [2]

6 Solve the equation.

$$9f + 11 = 3f + 23$$

$f =$ ..... [2]

7



NOT TO SCALE

Calculate the area of this triangle.

..... cm^2 [2]

8 **(a)** Write 0.047 883 correct to 2 significant figures.

..... [1]

(b) Write 0.005 27 in standard form.

..... [1]

9 Find the highest common factor (HCF) of 90 and 48.

..... [2]

10 On a map with scale 1 : 25 000, the area of a lake is 33.6 square centimetres.

Calculate the actual area of the lake, giving your answer in square kilometres.

..... km^2 [2]

11 Write down the matrix that represents an enlargement, scale factor 3, centre (0, 0).

$\left(\quad\quad\right)$ [2]

12 Simplify.

(a) $5m^2 \times 2m^3$

..... [2]

(b) $\left(x^8\right)^3$

..... [1]

13 **Without using a calculator**, work out $2\frac{1}{4} \div \frac{3}{7}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

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

$$5x + 8y = 4$$
$$\tfrac{1}{2}x + 3y = 7$$

$x =$ .....

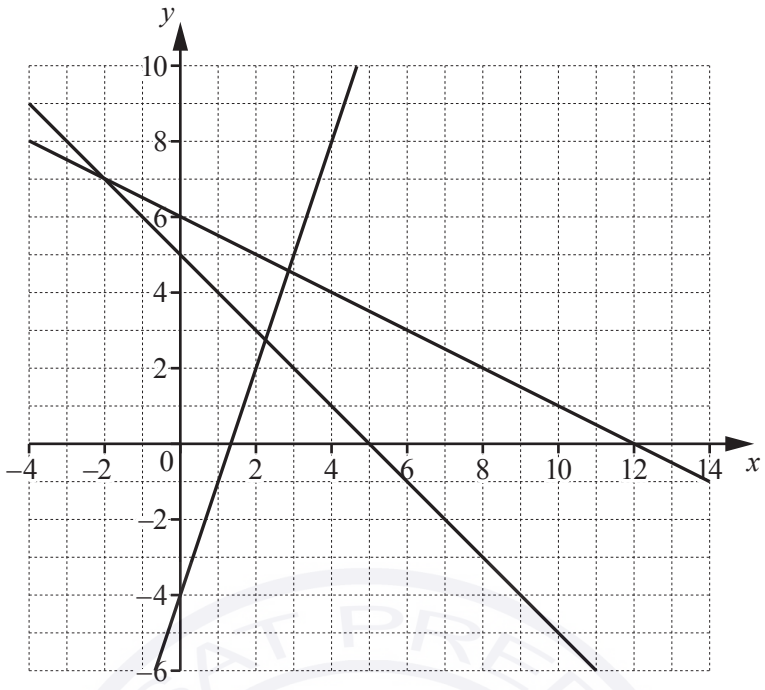
$y =$ ..... [3]

15 Shona buys a chair in a sale for \$435.60 .
This is a reduction of 12% on the original price.

Calculate the original price of the chair.

\$..... [3]

16



$y \leqslant -\frac{1}{2}x + 6 \qquad y \geqslant 3x - 4 \qquad x + y \geqslant 5$

(a) By shading the **unwanted** regions of the grid, find and label the region R that satisfies the three inequalities. [2]

(b) Find the largest value of $x + y$ in the region R, where x and y are integers.

..... [1]

17 Write as a single fraction in its simplest form.

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

..... [3]

18 The table shows the number of people in different age groups at a cinema.

Age (y years)	$15 < y \leqslant 25$	$25 < y \leqslant 30$	$30 < y \leqslant 50$	$50 < y \leqslant 80$
Number of people	35	32	44	12

Dexter draws a histogram to show this information.
The height of the bar he draws for the group $15 < y \leqslant 25$ is 7 cm.

Calculate the height of each of the remaining bars.

$25 < y \leqslant 30$ ..... cm

$30 < y \leqslant 50$ ..... cm

$50 < y \leqslant 80$ ..... cm [3]

19 Rearrange this formula to make m the subject.

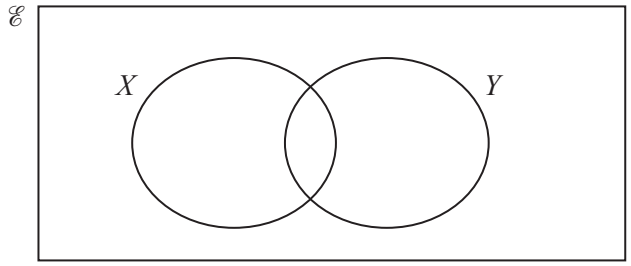
$$P = \frac{k+m}{m}$$

..... [4]

20 Solve the equation $3x^2 - 2x - 10 = 0$.
Show all your working and give your answers correct to 2 decimal places.

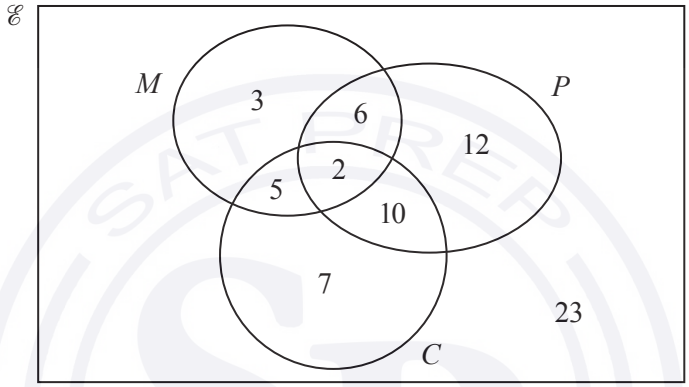
$x =$ ..... or $x =$ ..... [4]

21 **(a)** In the Venn diagram, shade $X' \cap Y$.



[1]

(b) The Venn diagram below shows information about the number of gardeners who grow melons (M), potatoes (P) and carrots (C).



(i) A gardener is chosen at random from the gardeners who grow melons.

Find the probability that this gardener does not grow carrots.

..... [2]

(ii) Find $\mathrm{n}((M \cap P) \cup C')$.

..... [1]

22 $\mathbf{A} = \begin{pmatrix} 2 & 7 \\ 1 & 3 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 3 & 4 \\ 0 & 1 \end{pmatrix}$

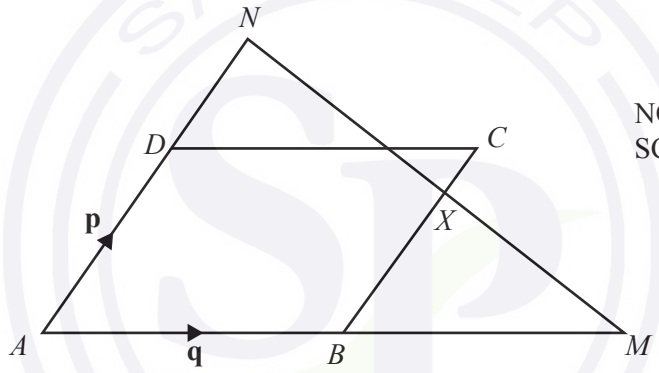
(a) Calculate **AB**.

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

(b) Find $\mathbf{A}^{-1}$, the inverse of **A**.

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

23



NOT TO SCALE

ABCD is a parallelogram with $\overrightarrow{AB} = \mathbf{q}$ and $\overrightarrow{AD} = \mathbf{p}$.
ABM is a straight line with $AB : BM = 1 : 1$.
ADN is a straight line with $AD : DN = 3 : 2$.

(a) Write $\overrightarrow{MN}$, in terms of **p** and **q**, in its simplest form.

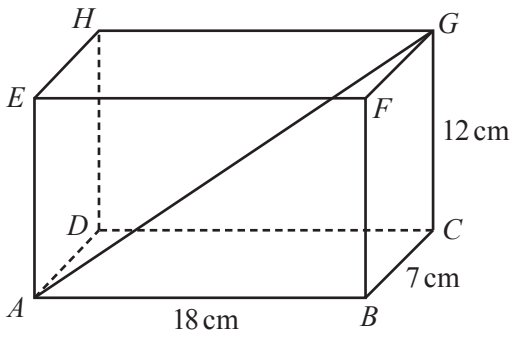
$\overrightarrow{MN} =$ ..... [2]

(b) The straight line *NM* cuts *BC* at *X*.
X is the midpoint of *MN*.
$\overrightarrow{BX} = k\mathbf{p}$

Find the value of *k*.

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

24



NOT TO SCALE

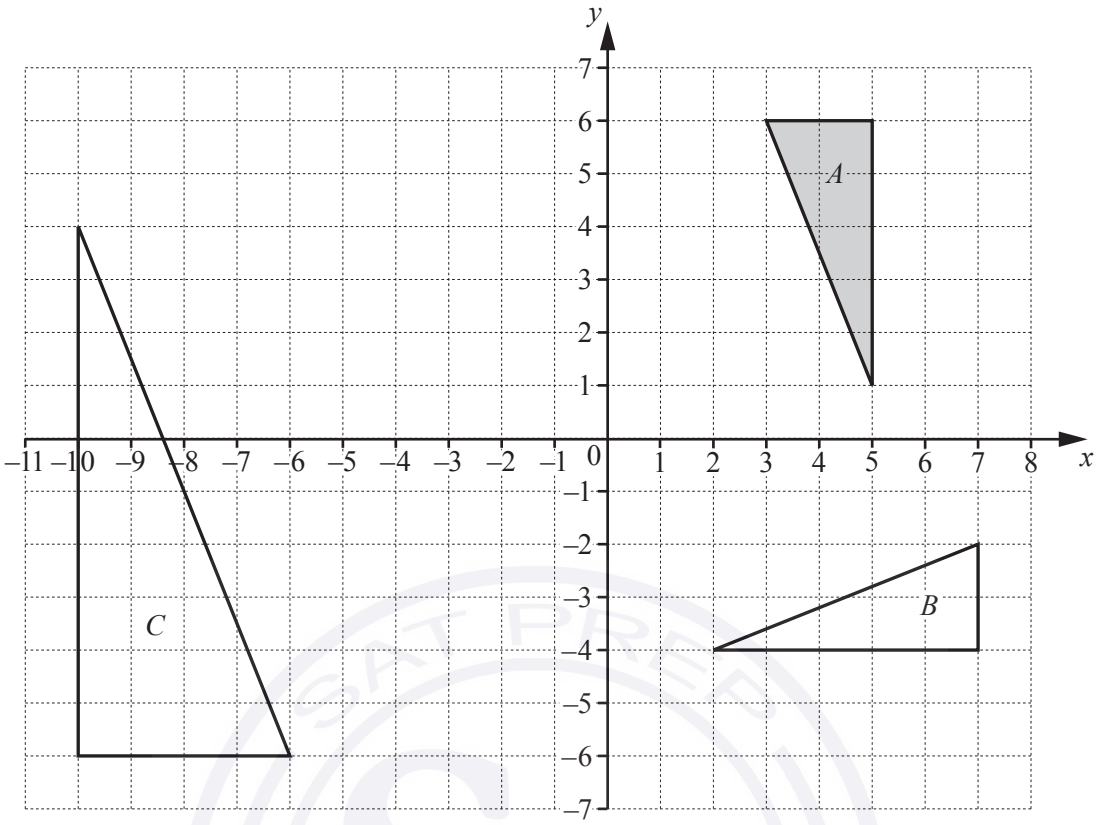
ABCDEFGH is a cuboid.
$AB = 18$ cm, $BC = 7$ cm and $CG = 12$ cm.

Calculate the angle that the diagonal *AG* makes with the base *ABCD*.

..... [4]

Question 25 is printed on the next page.

25



Describe fully the **single** transformation that maps

(a) triangle A onto triangle B,

.....

..... [3]

(b) triangle A onto triangle C.

.....

..... [3]

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CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

2869692078

MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2019**

1 hour 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 70.

This document consists of **15** printed pages and **1** blank page.

Cambridge Assessment International Education

[Turn over

1 Write 1.8972 correct to 2 decimal places.

..... [1]

2 Factorise $2x^2 - x$.

..... [1]

3 Giulio's reaction times are measured in two games.
In the first game his reaction time is $\frac{1}{3}$ of a second.
In the second game his reaction time is $\frac{1}{8}$ of a second.

Find the difference between the two reaction times.

..... s [1]

4 The table shows the different methods of travel for 20 people going to work.

Method of travel	Frequency
Car	10
Walk	5
Bike	3
Bus	2

Which type of average, mean, median or mode, can be used for this information?

..... [1]

5 **(a)** Find the co-ordinates of the point where the line $y = 3x - 8$ crosses the y-axis.

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

(b) Write down the gradient of the line $y = 3x - 8$.

..... [1]

6 Calculate.

(a) $-12 \div -2$

..... [1]

(b) $\sqrt[3]{2^3 + 2}$

..... [1]

7 Here is a list of numbers.

21 $\frac{2}{3}$ $\sqrt{13}$ 31 $\sqrt{121}$ 51 0.7

From this list, write down

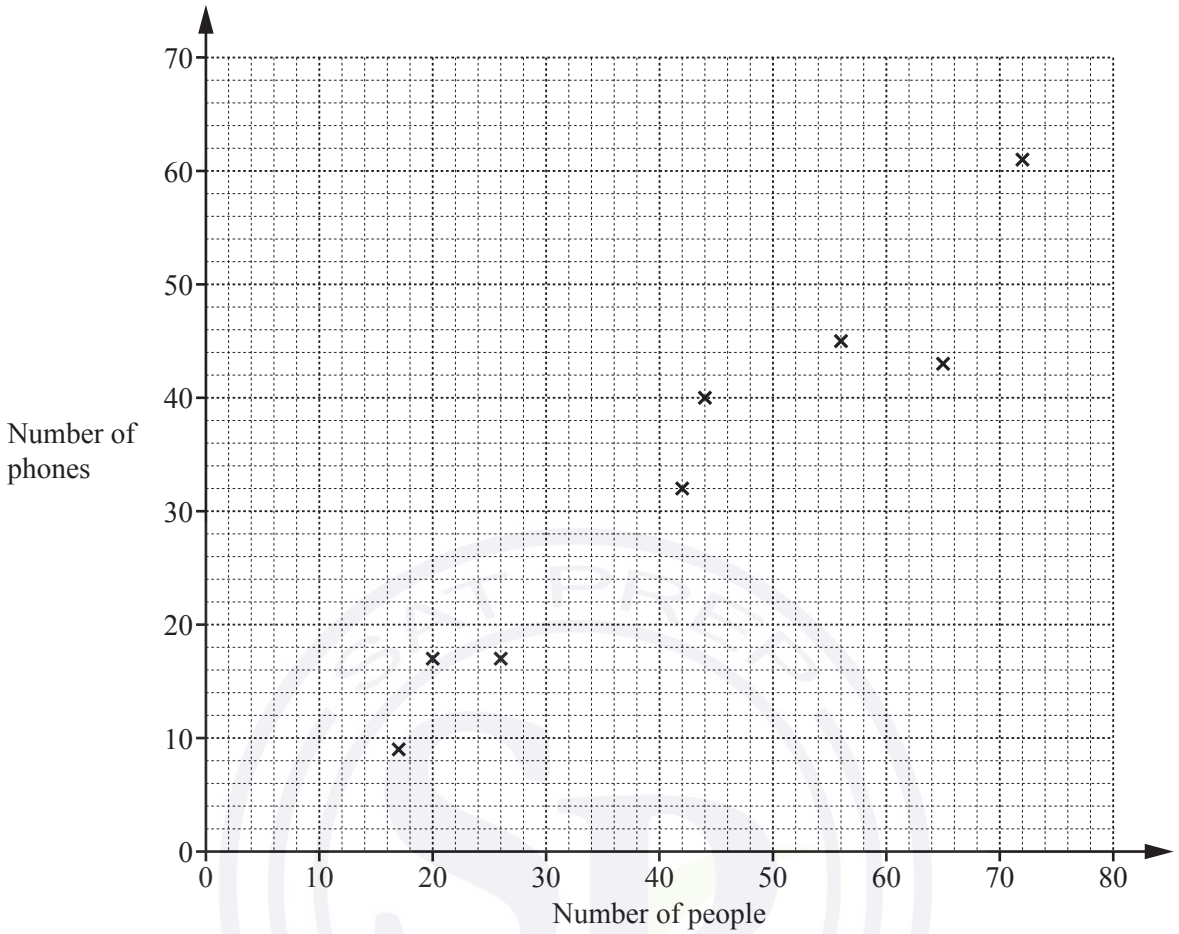
(a) a prime number,

..... [1]

(b) an irrational number.

..... [1]

8 The scatter diagram shows the number of people and the number of phones in each of 8 buildings.



(a) One of the buildings contains 42 people.

Write down the number of phones in this building.

..... [1]

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

..... [1]

9 **Without using a calculator**, work out $\frac{12}{35} \times \frac{7}{9}$.
You must show all your working and give your answer as a fraction in its simplest form.

..... [2]

10 Rearrange $2(w+h) = P$ to make w the subject.

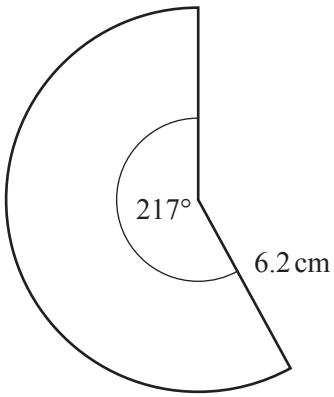
$w =$ ..... [2]

11 Complete this statement with an expression in terms of m.

$$18m^3 + 9m^2 + 14m + 7 = (9m^2 + 7)(\text{.....})$$

[2]

12



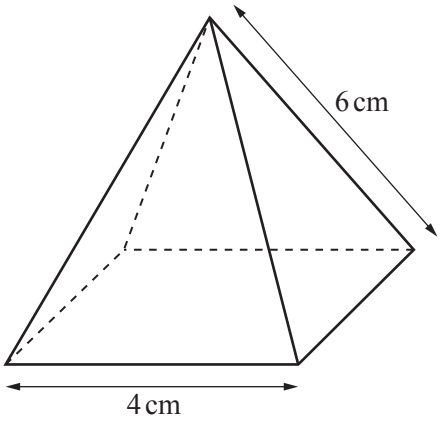
NOT TO SCALE

The diagram shows a sector of a circle with radius 6.2 cm and sector angle 217°.

Calculate the area of this sector.

..... cm^2 [2]

13



NOT TO SCALE

The diagram shows a pyramid with a square base.
The triangular faces are congruent isosceles triangles.

(a) Write down the number of planes of symmetry of this pyramid.

..... [1]

(b) **Using a ruler and compasses only**, construct an accurate drawing of one of the triangular faces of the pyramid.

[2]

14 One solution of the equation $ax^2 + a = 150$ is $x = 7$.

(a) Find the value of a.

$a =$ ..... [2]

(b) Find the other solution.

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

15 A is the point $(7, 12)$ and B is the point $(2, -1)$.

Find the length of AB.

..... [3]

16 $A = \frac{b \times h}{2}$

$A = 10$, correct to the nearest whole number.
$h = 4$, correct to the nearest whole number.

Work out the upper bound for the value of b.

..... [3]

17 Simplify $\dfrac{x^3+5x^2}{x^2-25}$, giving your answer as a single fraction.

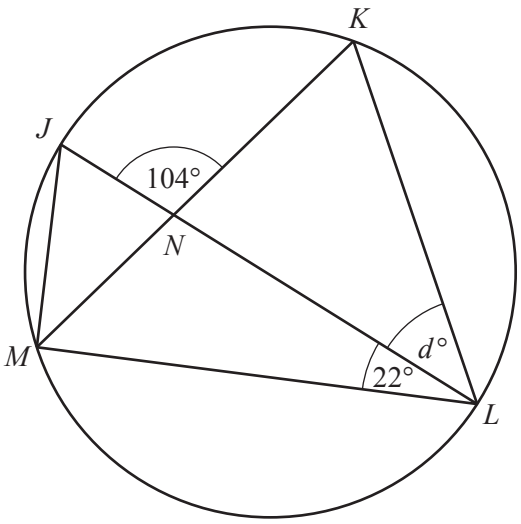
..... [3]

18 y is inversely proportional to the square of $(x+1)$.
$y = 0.875$ when $x = 1$.

Find y when $x = 4$.

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

19



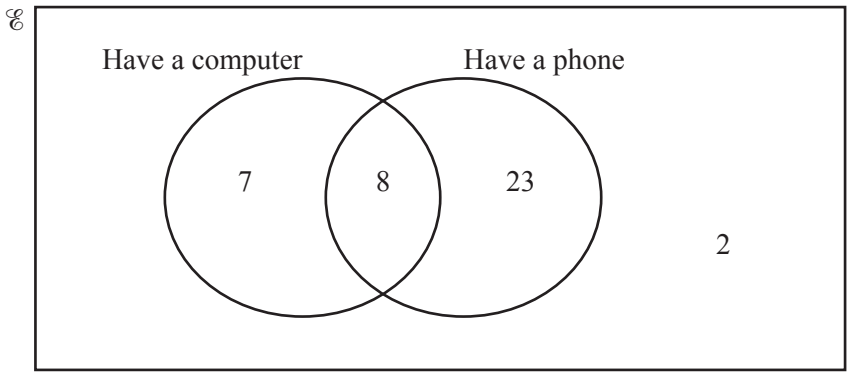
NOT TO SCALE

J, K, L and M are points on the circumference of a circle with diameter JL.
JL and KM intersect at N.
Angle $JNK = 104°$ and angle $MLJ = 22°$.

Work out the value of d.

$d =$ ..... [4]

20 **(a)** 40 children were asked if they have a computer or a phone or both.
The Venn diagram shows the results.

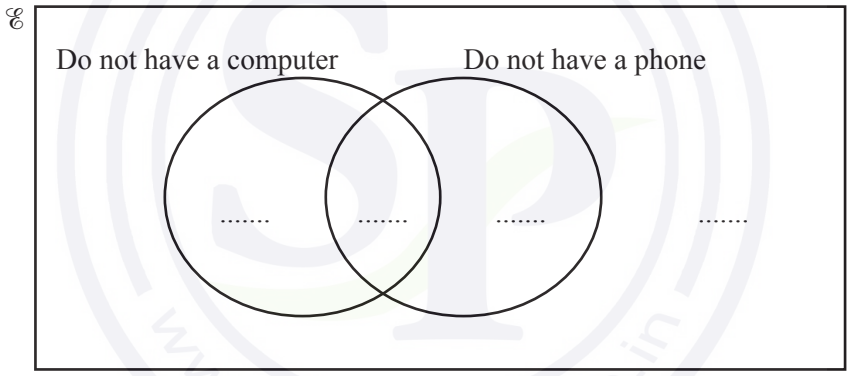


(i) A child is chosen at random from the children who have a computer.

Write down the probability that this child also has a phone.

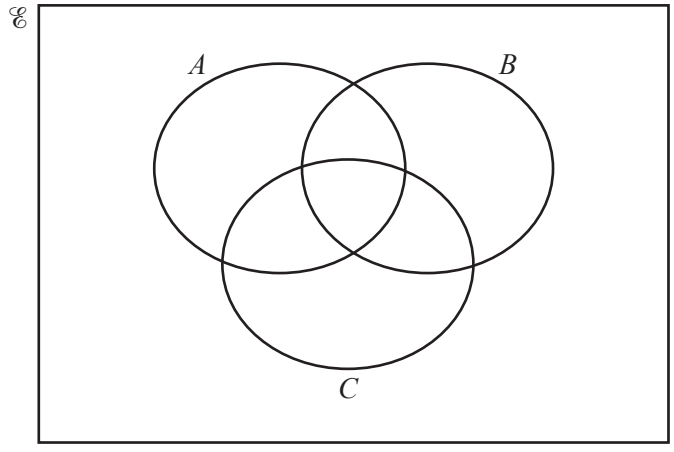
..... [1]

(ii) Complete the Venn diagram.



[2]

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



[1]

21 $\mathbf{A} = \begin{pmatrix} 3 & 4 \\ 5 & 0 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 1 & 4 \\ -3 & 2 \end{pmatrix}$

Find

(a) $5\mathbf{A}$,

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

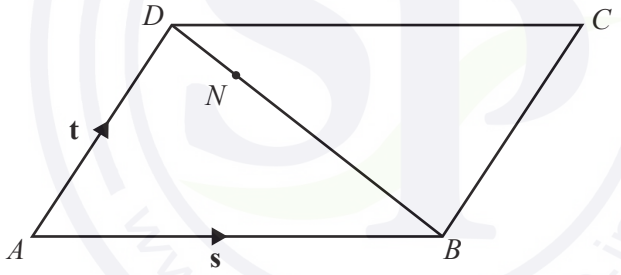
(b) $\mathbf{A} + \mathbf{B}$,

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

(c) $\mathbf{AB}$.

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

22



NOT TO SCALE

$ABCD$ is a parallelogram.
N is the point on BD such that $BN : ND = 4 : 1$.
$\overrightarrow{AB} = \mathbf{s}$ and $\overrightarrow{AD} = \mathbf{t}$.

Find, in terms of $\mathbf{s}$ and $\mathbf{t}$, an expression in its simplest form for

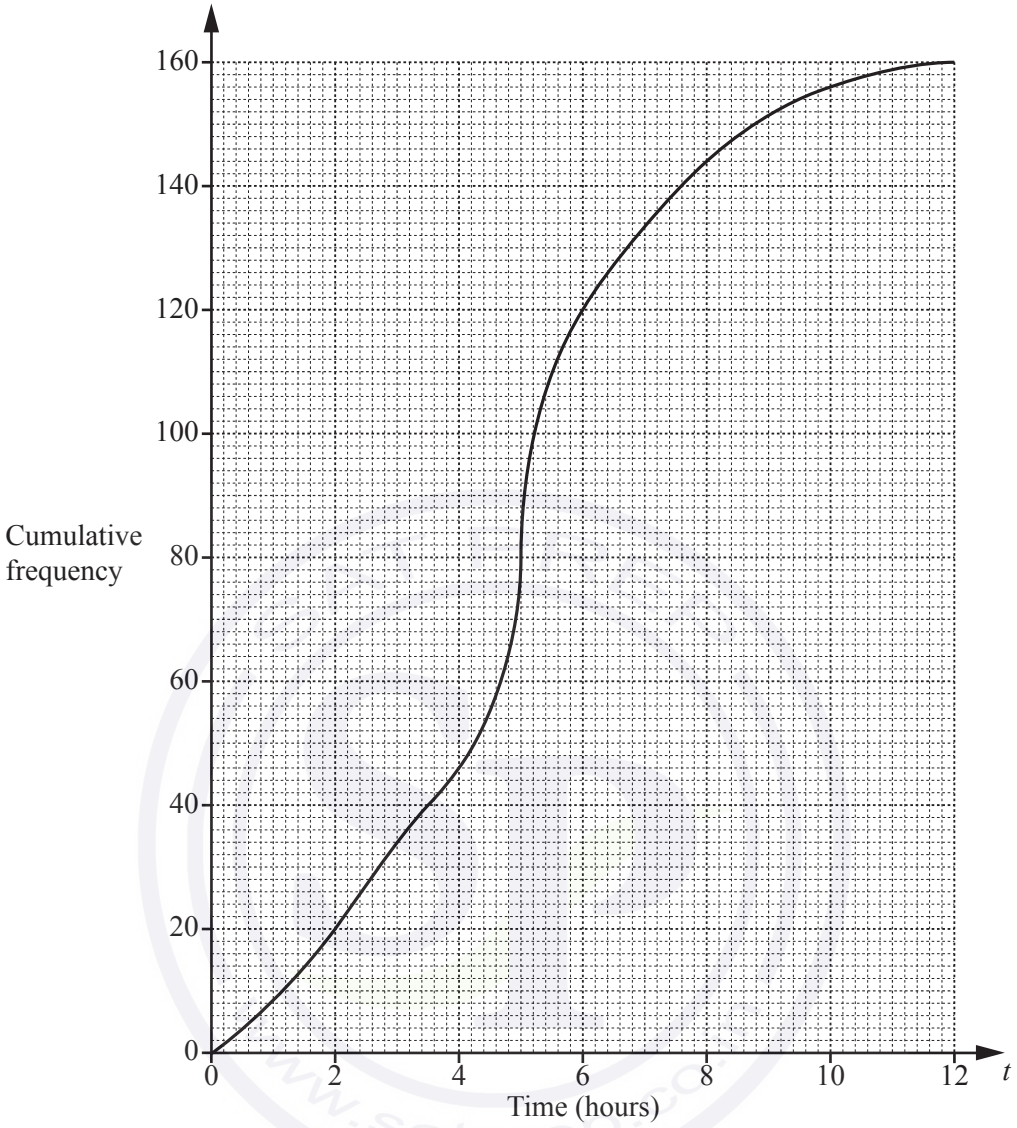
(a) $\overrightarrow{BD}$,

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

(b) $\overrightarrow{CN}$.

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

23 160 students record the amount of time, t hours, they each spend playing computer games in a week. This information is shown in the cumulative frequency diagram.



(a) Use the diagram to find an estimate of

(i) the median,

..... hours [1]

(ii) the interquartile range.

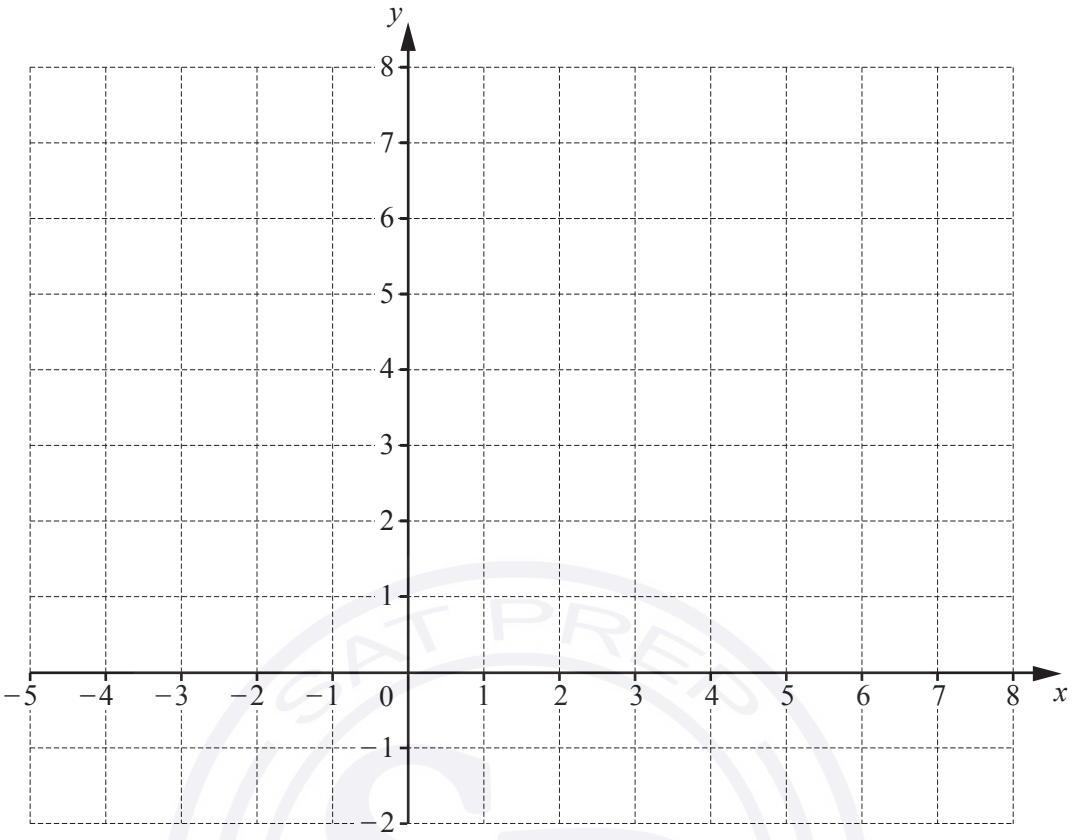
..... hours [2]

(b) Use the diagram to complete this frequency table.

Time (t hours)	$0 < t \leqslant 2$	$2 < t \leqslant 4$	$4 < t \leqslant 6$	$6 < t \leqslant 8$	$8 < t \leqslant 10$	$10 < t \leqslant 12$
Frequency	20			24	12	4

[2]

24

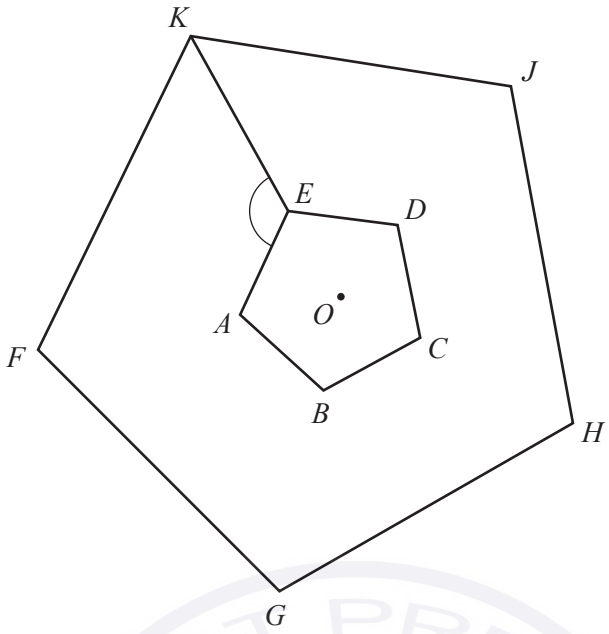


By shading the **unwanted** regions of the grid, draw and label the region R which satisfies the following three inequalities.

$y \leqslant 2$ $\quad x < 3$ $\quad y \leqslant x + 4$

[5]

25



NOT TO SCALE

The diagram shows two regular pentagons.
Pentagon *FGHJK* is an enlargement of pentagon *ABCDE*, centre *O*.

(a) Find angle *AEK*.

Angle *AEK* = ... [4]

(b) The area of pentagon *FGHJK* is 73.5 cm^2.
The area of pentagon *ABCDE* is 6 cm^2.

Find the ratio perimeter of pentagon *FGHJK* : perimeter of pentagon *ABCDE* in its simplest form.

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

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CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

9234847966

MATHEMATICS **0580/22**

Paper 2 (Extended) **February/March 2019**

1 hour 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.
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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 70.

This document consists of **11** printed pages and **1** blank page.

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[Turn over

1 The temperature at 07 00 is −3 °C.
This temperature is 11 °C higher than the temperature at 01 00.

Find the temperature at 01 00.

..... °C [1]

2 Jodi swims 22 lengths of a swimming pool to raise money for charity.
She receives $15 for each length she swims.

Calculate how much money Jodi raises for charity.

$ ..... [1]

3 Write the recurring decimal $0.\dot{2}\dot{3}$ as a fraction.

..... [1]

4 **(a)** Write 0.046 875 correct to 2 significant figures.

..... [1]

(b) Write 2 760 000 in standard form.

..... [1]

5 A tourist changes $500 to euros (€) when the exchange rate is €1 = $1.0697 .

Calculate how many euros he receives.

€ ..... [2]

6 The probability that a sweet made in a factory is the wrong shape is 0.0028 .
One day, the factory makes 25 000 sweets.

Calculate the number of sweets that are expected to be the wrong shape.

..... [2]

7 The bearing of Alexandria from Paris is 128°.

Calculate the bearing of Paris from Alexandria.

..... [2]

8 O is the origin, $\overrightarrow{OA} = 2\mathbf{x} + 3\mathbf{y}$ and $\overrightarrow{BA} = \mathbf{x} - 4\mathbf{y}$.

Find the position vector of B, in terms of $\mathbf{x}$ and $\mathbf{y}$, in its simplest form.

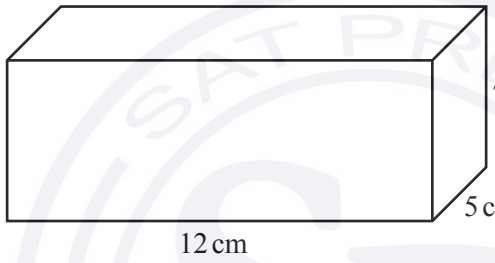
..... [2]

9 y is directly proportional to $(x-4)$.
When $x = 16$, $y = 3$.

Find y in terms of x.

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

10



NOT TO SCALE

Calculate the total surface area of the cuboid.

..... cm^2 [3]

11 The number of passengers on a train increases from 63 to 77.

Calculate the percentage increase.

..... % [3]

12 A cone with height 14.8 cm has volume 275 cm^3.

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]

13 Factorise.

(a) $7k^2 - 15k$

..... [1]

(b) $12(m+p) + 8(m+p)^2$

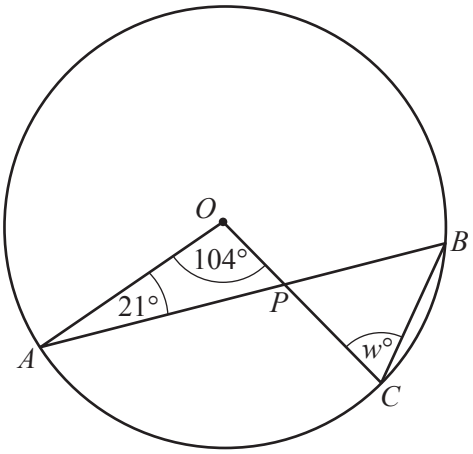
..... [2]

14 Eric invests an amount in a bank that pays compound interest at a rate of 2.16% per year.
At the end of 5 years, the value of his investment is \$6 999.31 .

Calculate the amount Eric invests.

\$ ..... [3]

15



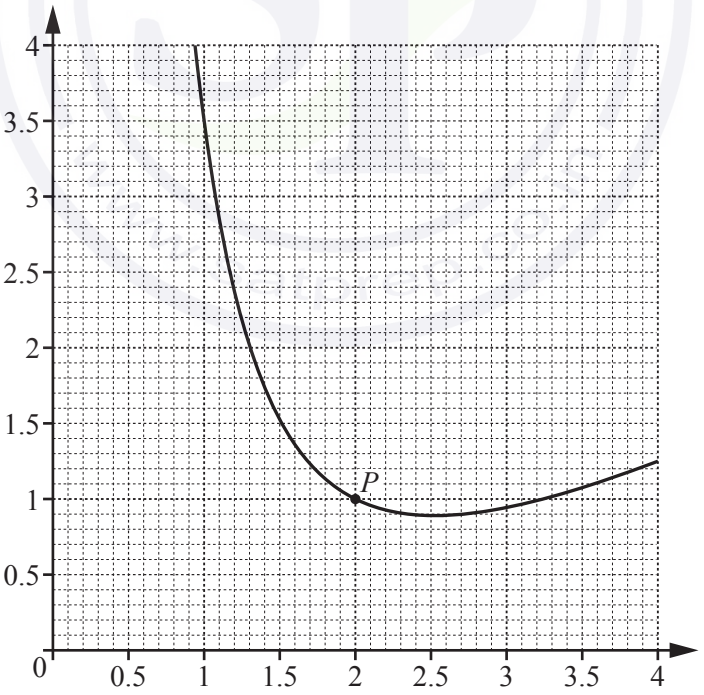
NOT TO SCALE

A, B and C are points on the circle, centre O.
AB and OC intersect at P.

Find the value of w.

$w =$ ..... [3]

16



By drawing a suitable tangent, estimate the gradient of the curve at the point P.

..... [3]

17 **(a)** Find the value of n when $5^n = \frac{1}{125}$.

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

(b) Simplify $\left(\frac{64}{m^3}\right)^{-\frac{1}{3}}$.

..... [2]

18 A pipe is full of water.
The cross-section of the pipe is a circle, radius 2.6 cm.
Water flows through the pipe into a tank at a speed of 12 centimetres per second.

Calculate the number of litres that flow into the tank in one hour.

..... litres [3]

19 Simplify. $\frac{ab - b^2}{a^2 - b^2}$

..... [3]

20 **(a)** Work out $\begin{pmatrix} 2 & -1 \\ 4 & 3 \end{pmatrix}\begin{pmatrix} 1 & 6 \\ -5 & 4 \end{pmatrix}$.

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

(b) Find the value of x when the determinant of $\begin{pmatrix} 3 & -1 \\ -7 & x \end{pmatrix}$ is 5.

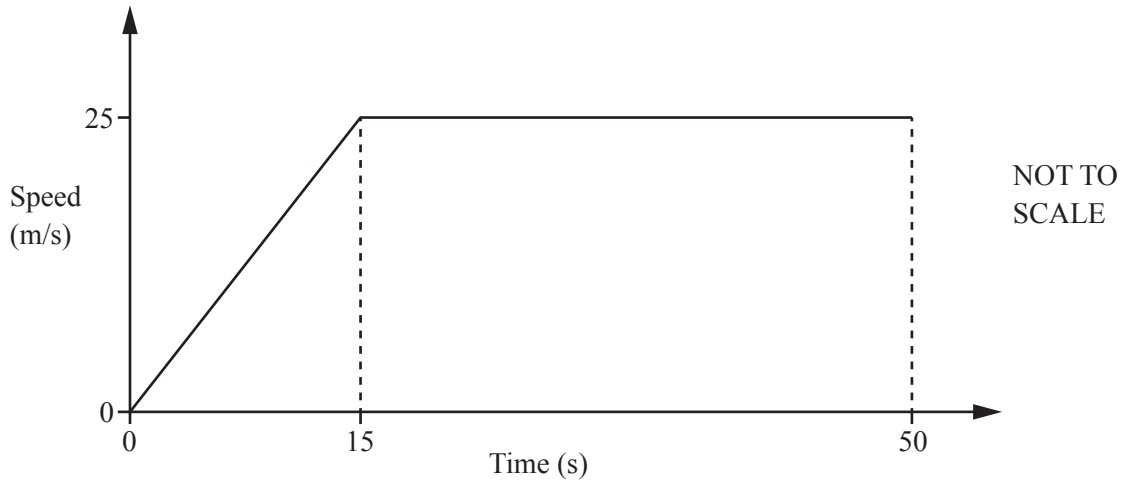
$x =$ ..... [2]

21 **Without using a calculator**, work out $3\frac{1}{8} \div \frac{5}{12}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [4]

22



The speed–time graph shows the first 50 seconds of a journey.

Calculate

(a) the acceleration during the first 15 seconds,

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

(b) the distance travelled in the 50 seconds.

..... m [3]

23 A is the point (2, 3) and B is the point (7, −5).

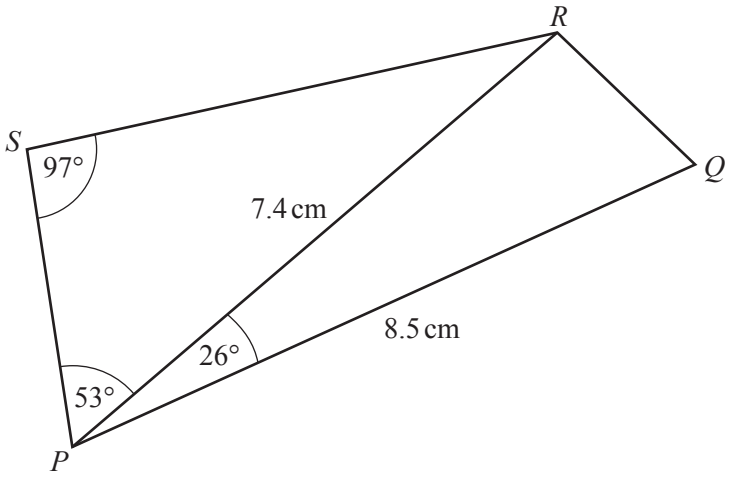
(a) Find the co-ordinates of the midpoint of AB.

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

(b) Find the equation of the line through A that is perpendicular to AB.
Give your answer in the form $y = mx + c$.

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

24



NOT TO SCALE

Calculate

(a) SR,

$SR =$ ..... cm [3]

(b) RQ.

$RQ =$ ..... cm [4]

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

8383126027

MATHEMATICS **0580/21**

Paper 2 (Extended) **October/November 2018**

1 hour 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.
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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.

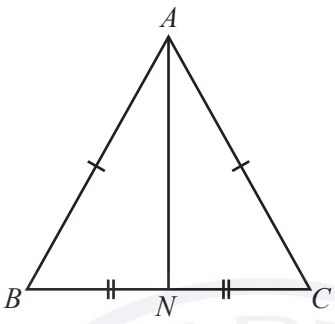
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 70.

1 Carlos starts work at 21 20 and finishes at 06 15 the next day.

Calculate how long Carlos is at work.

..... h ..... min [1]

2



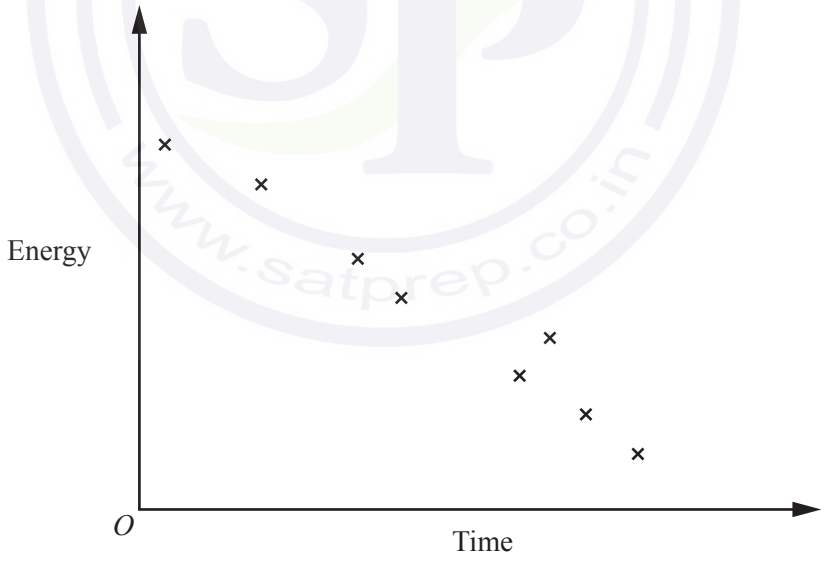
NOT TO SCALE

In the diagram, $AB = AC$ and $BN = NC$.

Complete the statement using a mathematical term.

Triangle ABN is ..... to triangle ACN. [1]

3



What type of correlation does the scatter diagram show?

.....[1]

4 Work out $(6.4 \times 10^7) + (9.6 \times 10^6)$.
Give your answer in standard form.

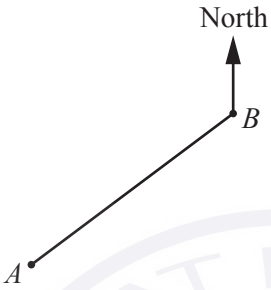
.....[2]

5 Expand and simplify.

$$(3x-7)(2x+9)$$

..... [2]

6



NOT TO SCALE

The bearing of A from B is 227°.

Find the bearing of B from A.

..... [2]

7 y is inversely proportional to x^3.
When $x = 2$, $y = 0.5$.

Find y in terms of x.

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

8 Saafia has a barrel containing 6000 millilitres of oil, correct to the nearest 100 ml.
She uses the oil to fill bottles which each hold exactly 50 ml.

Calculate the upper bound for the number of bottles she can fill.

..... [2]

9 Jan invests \$800 at a rate of 3% per year simple interest.

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

\$ ..... [3]

10 A water tank in the shape of a cuboid has length 1.5 metres and width 1 metre.
The water in the tank is 60 centimetres deep.

Calculate the number of litres of water in the tank.

..... litres [3]

11 These are the first five terms in a sequence.

8 11 14 17 20

(a) Find the next term.

..... [1]

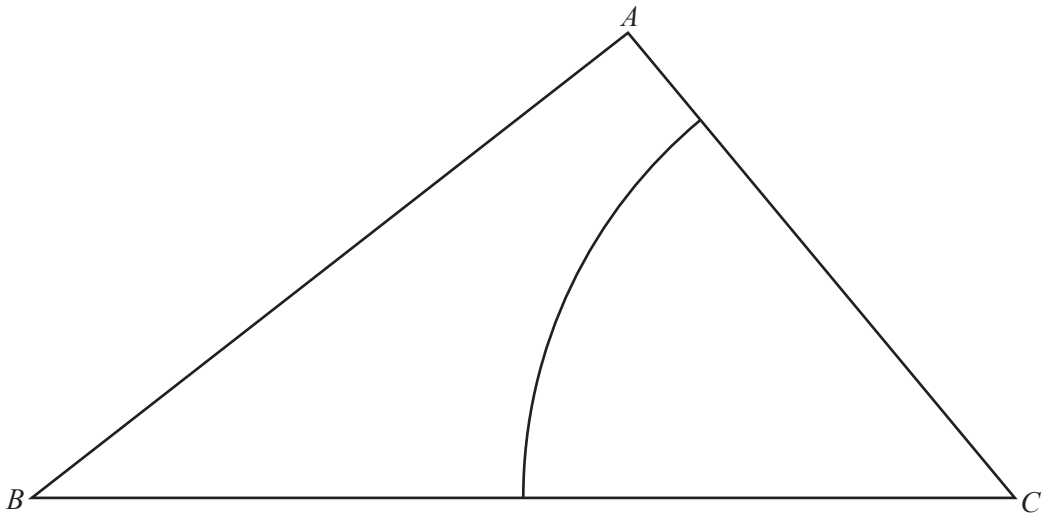
(b) Find an expression for the nth term.

..... [2]

12 Find the integer values of n that satisfy the inequality $15 \leqslant 4n < 28$.

..... [3]

13



The diagram shows a triangle ABC and an arc with centre C and radius 6.5 cm.

(a) **Using a straight edge and compasses only**, construct the locus of points inside the triangle that are equidistant from BA and BC. [2]

(b) Shade the region inside the triangle that is

- more than 6.5 cm from C

and

- nearer to BA than to BC. [1]

14 **Without using your calculator**, work out $\frac{3}{8} \div 2\frac{1}{4}$.

You must show all your working and give your answer as a fraction in its simplest form.

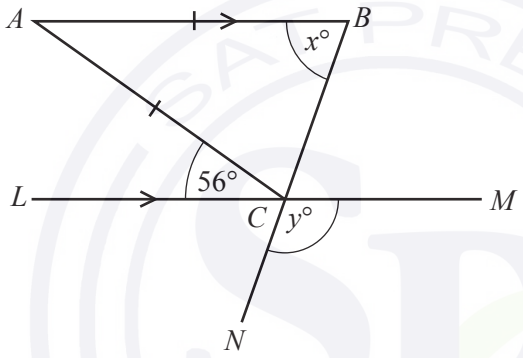
..... [3]

15 Write as a single fraction in its simplest form.

$$\frac{x-5}{3}+\frac{6}{x+2}$$

..... [3]

16



NOT TO SCALE

The diagram shows an isosceles triangle ABC with $AB = AC$.
LCM and BCN are straight lines and LCM is parallel to AB.
Angle $ACL = 56°$.

Find the value of x and the value of y.

$x =$ .....

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

17 **(a)** $t^x \times t^2 = t^{10}$

Find the value of x.

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

(b) Simplify.

(i) $\left(\frac{4}{x}\right)^{-2}$

..... [1]

(ii) $a^3b^7 \div a^6b^2$

..... [2]

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

$$2x + 3y = -12$$
$$5x + 2y = 14$$

$x =$ .....

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

19 Use the quadratic formula to solve the equation $3x^2 + 7x - 11 = 0$.
You must show all your working and give your answers correct to 2 decimal places.

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

20 $\mathbf{M} = \begin{pmatrix} 8 & 2 \\ 7 & 3 \end{pmatrix}$ $\mathbf{N} = \begin{pmatrix} 4 & -1 \\ -3 & 5 \end{pmatrix}$

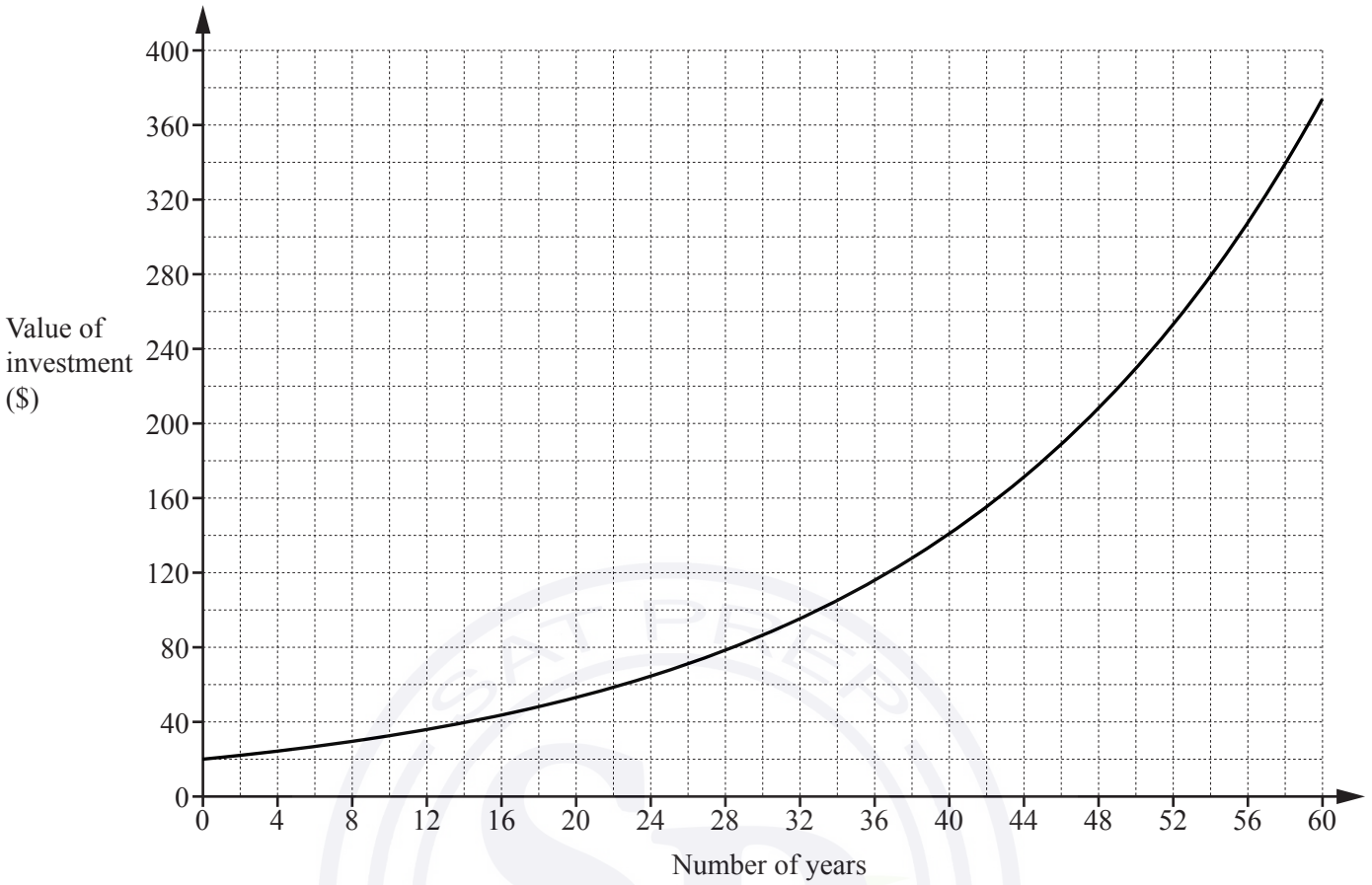
(a) Find **MN**.

$\mathbf{MN} =$ $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(b) Find $\mathbf{M}^{-1}$.

$\mathbf{M}^{-1} =$ $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

21



When Heidi was born, her grandfather invested some money in an account that paid compound interest. The graph shows the exponential growth of this investment.

(a) Use the graph to find

(i) the original amount of money invested,

$ ..... [1]

(ii) the number of years it took for the original amount to double,

..... years [1]

(iii) the value of the investment after 54 years.

$ ..... [1]

(b) This account earned compound interest at a rate of r% per year.

Use your answers to **part (a)(i)** and **part (a)(ii)** to write down an equation in terms of r.
You do not have to solve your equation.

..... [2]

22 A group of 200 people were asked which city they would like to visit next.
The table shows the results.

City	London	Paris	New York	Tokyo
Number of people	50	48	56	46

(a) A person from the group is chosen at random.

Write down the probability that this person would like to visit either Paris or Tokyo next.

..... [2]

(b) Two people are chosen at random from the group of 200.

Find the probability that one person would like to visit London next and the other person would like to visit New York next.
Give your answer as a percentage.

..... % [3]

23 $f(x) = 7 + 3x$ $g(x) = x^4$ $h(x) = 3^x$

(a) $h(3x) = k^x$

Find the value of k.

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

(b) Find the value of x when $f(x) = g(2)$.

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

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

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

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CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

5014752797

MATHEMATICS **0580/22**

Paper 2 (Extended) **October/November 2018**

1 hour 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.

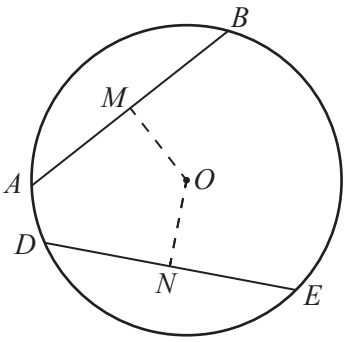
Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees 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 70.

1 Write 23 000 in standard form.

..... [1]

2



NOT TO SCALE

The diagram shows a circle, centre O.
AB and DE are chords of the circle.
M is the mid-point of AB and N is the mid-point of DE.
$AB = DE = 9$ cm and $OM = 5$ cm.

Find ON.

$ON =$ ..... cm [1]

3 Calculate $0.125^{-\frac{2}{3}}$.

..... [1]

4 Expand.

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

..... [2]

5 **Without using a calculator**, work out $\frac{1}{15}+\frac{2}{5}$.

Write down all the steps of your working and give your answer as a fraction in its simplest form.

..... [2]

6 Solve.

$$7m - 2 \geqslant 19$$

..... [2]

7 $C = \{x : x \text{ is an integer and } 5 < x < 12\}$ $D = \{5, 10\}$

(a) Put a ring around the correct statement from the list below.

$D = \varnothing$ $C \cap D = \{10\}$ $6 \in D$ $D \subset C$ [1]

(b) Find $\mathrm{n}(C \cup D)$.

..... [1]

8 Factorise.

$$xy + 5y + 2x + 10$$

..... [2]

9 There are 30 000 lions in Africa.
The number of lions in Africa decreases exponentially by 2% each year.

Find the number of lions in Africa after 6 years.
Give your answer correct to the nearest hundred.

..... [2]

10 Find the mid-point of AB where $A = (w, r)$ and $B = (3w, t)$.
Give your answer in its simplest form in terms of w, r and t.

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

11 An equilateral triangle has side length 12 cm, correct to the nearest centimetre.

Find the lower bound and the upper bound of the perimeter of the triangle.

Lower bound = ... cm

Upper bound = ... cm [2]

12 $x°$ is an **obtuse** angle and $\sin x° = 0.43$.

Find the value of x.

x = ... [2]

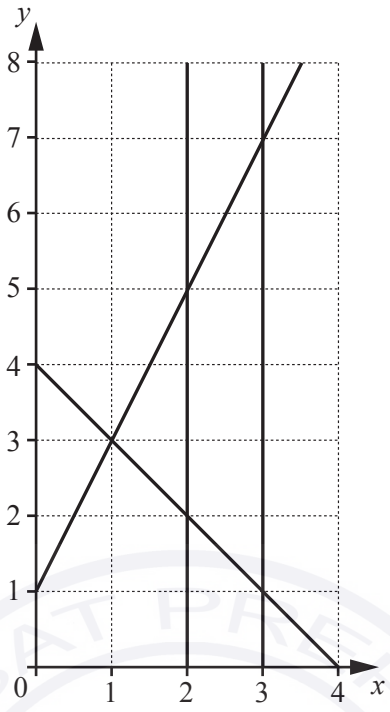
13 These are the first five terms of a sequence.

$-4 \quad 2 \quad 8 \quad 14 \quad 20$

Find an expression for the nth term of this sequence.

..... [2]

14



By shading the **unwanted** regions of the grid, find and label the region R that satisfies the following four inequalities.

$x \leqslant 3$ $\quad x \geqslant 2$ $\quad y \leqslant 2x+1$ $\quad y \geqslant 4-x$

[3]

15 $\mathbf{M} = \begin{pmatrix} 5 & -3 \\ -1 & 2 \end{pmatrix}$

(a) Find $3\mathbf{M}$.

$3\mathbf{M} =$ $\begin{pmatrix} & \\ & \end{pmatrix}$ [1]

(b) Find $\mathbf{M}^{-1}$.

$\mathbf{M}^{-1} =$ $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

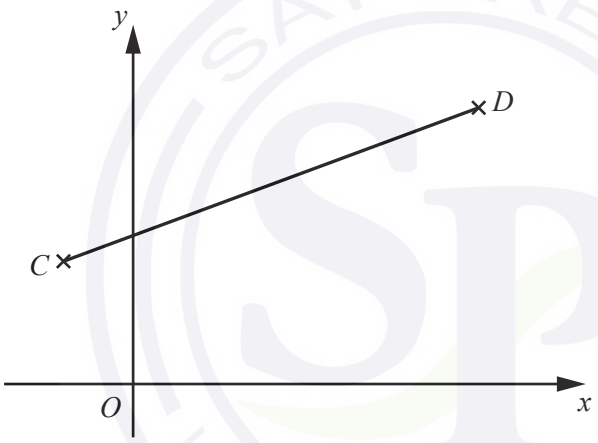
16 $x^2 - 12x + a = (x + b)^2$

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [3]

17



NOT TO SCALE

The diagram shows the points $C(-1, 2)$ and $D(9, 7)$.

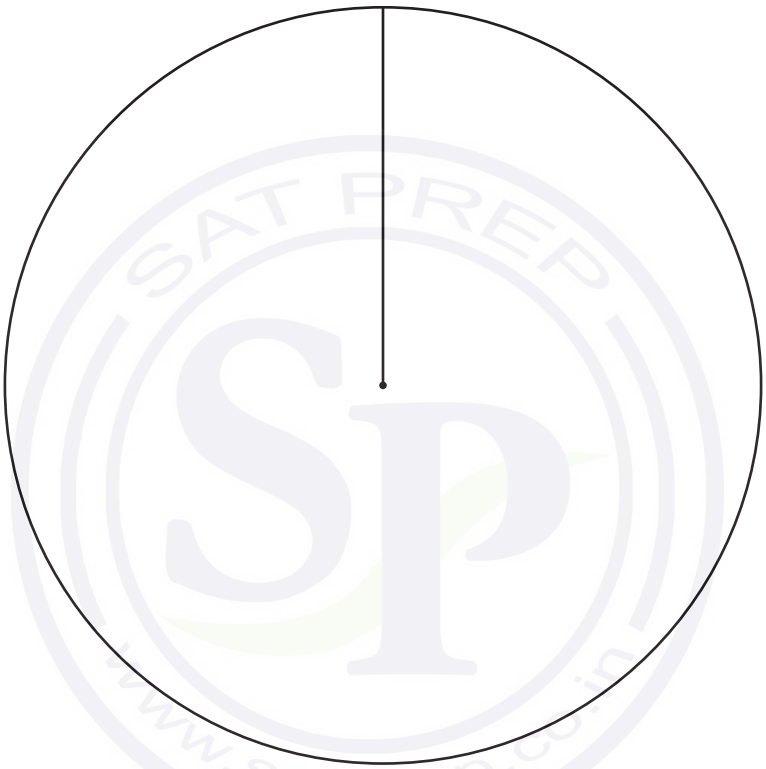
Find the equation of the line perpendicular to CD that passes through the point $(1, 3)$.
Give your answer in the form $y = mx + c$.

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

18 120 students choose what they want to do when they leave school.
Their choices are shown in the table.

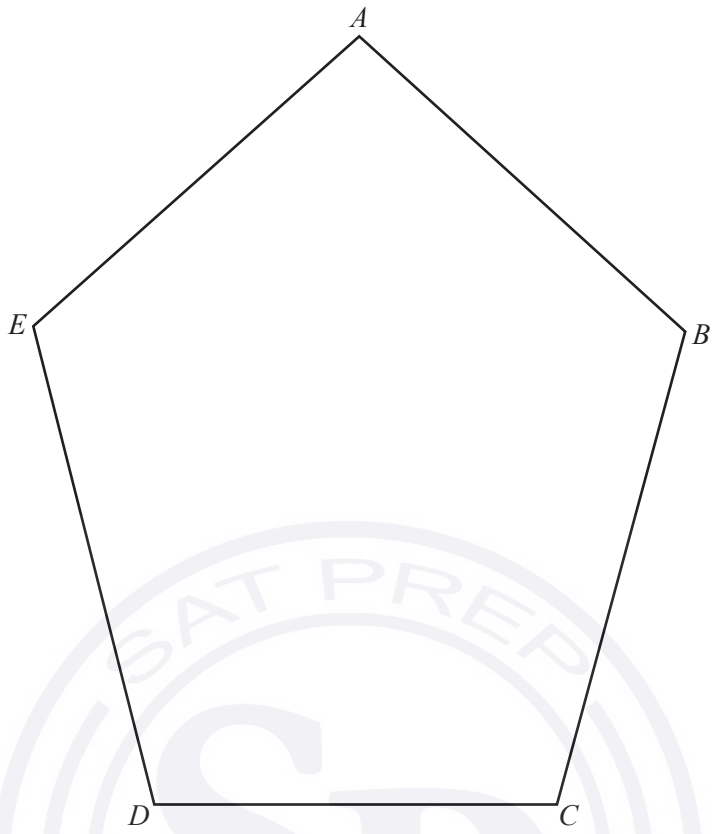
Choice	Number of students
University	57
Training	45
Work	18

Complete the pie chart to show this information.
Label each sector clearly.



[4]

19 The diagram shows a pentagon *ABCDE*.



(a) **Using a straight edge and compasses only**, construct the bisector of angle *BCD*. [2]

(b) Draw the locus of the points inside the pentagon that are 3 cm from *E*. [1]

(c) Shade the region inside the pentagon that is

- less than 3 cm from *E*

and

- nearer to *DC* than to *BC*.

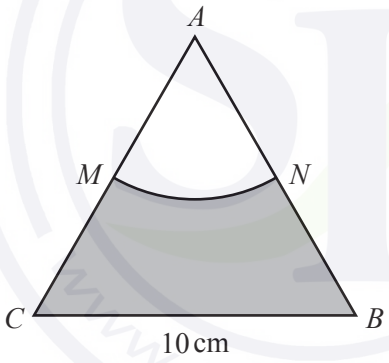
[1]

20 Make m the subject of the formula.

$$x = \frac{3m}{2-m}$$

$m =$ ..... [4]

21



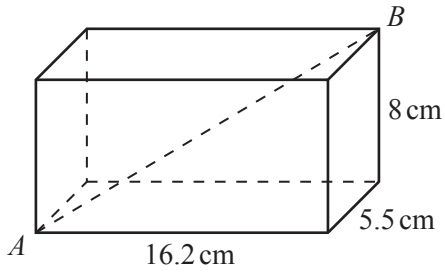
NOT TO SCALE

The diagram shows an equilateral triangle ABC with sides of length 10 cm.
AMN is a sector of a circle, centre A.
M is the mid-point of AC.

Work out the area of the shaded region.

..... cm^2 [4]

22



NOT TO SCALE

The diagram shows a cuboid with dimensions 5.5 cm, 8 cm and 16.2 cm.

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

..... [4]

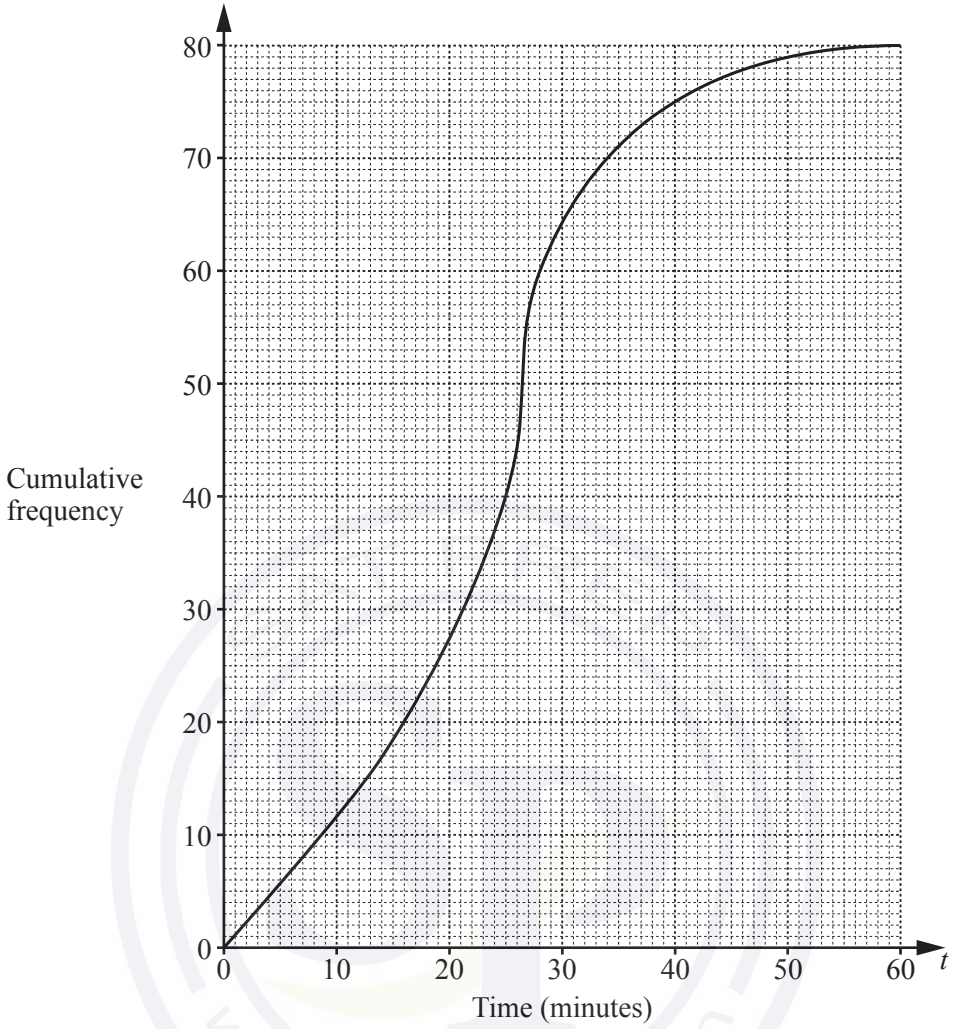
23 **(a)** Write 56 as a product of its prime factors.

..... [2]

(b) Find the lowest common multiple (LCM) of 56 and 42.

..... [2]

24 The time, t minutes, 80 students each spend completing their homework is recorded.
The cumulative frequency diagram shows the results.



Use the cumulative frequency diagram to find an estimate of

(a) the median,

..... min [1]

(b) the interquartile range,

..... min [2]

(c) the number of students who spend more than 40 minutes completing their homework.

..... [2]

Question 25 is printed on the next page.

25 **(a)** $f(x) = x^3$ $\quad\quad$ $g(x) = 5x + 2$

(i) Find $gf(x)$.

..... [1]

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

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

(b) $h(x) = ax^2 + 1$

Find the value of a when $h(-2) = 21$.

$a =$ ..... [2]

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

9495433655

MATHEMATICS **0580/23**

Paper 2 (Extended) **October/November 2018**

1 hour 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.
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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 70.

1 Work out $\frac{7}{11}$ of 198 kg.

..... kg [1]

2 Factorise.

$$y - 2y^2$$

.....[1]

3 Work out \$1.45 as a percentage of \$72.50.

..... % [1]

4 Calculate.

$$\frac{5.39 - 0.98}{0.743 - 0.0743}$$

.....[1]

5 Work out.

$$\left(\frac{125}{27}\right)^{-\frac{2}{3}}$$

.....[1]

6 **(a)** Write the number five million, two hundred and seven in figures.

.....[1]

(b) Write 0.008 13 in standard form.

.....[1]

7 Simplify.

$$2p - q - 3q - 5p$$

..... [2]

8 Write these numbers correct to 2 significant figures.

(a) 0.076 499

..... [1]

(b) 10 100

..... [1]

9 **Without using a calculator**, work out $\frac{1}{4} \div \frac{2}{3}$.

You must show all your working and give your answer as a fraction.

..... [2]

10 Solve.

$$3w - 7 = 32$$

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

11 $A = \pi rl + \pi r^2$

Rearrange this formula to make l the subject.

$l =$ ..... [2]

12 The area of a square is $42.5\,cm^2$, correct to the nearest $0.5\,cm^2$.

Calculate the lower bound of the length of the side of the square.

..... cm [2]

13 Change the recurring decimal $0.1\dot{8}$ to a fraction.
You must show all your working.

..... [2]

14 Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$.

.....

..... [2]

15 A car travels at 108 km/h for 20 seconds.

Calculate the distance the car travels.
Give your answer in metres.

..... m [3]

16 **(a)** Simplify $\frac{w^2}{w^3}$.

..... [1]

(b) Simplify $(3w^3)^3$.

..... [2]

17 y is directly proportional to the square root of x.
When $x = 9$, $y = 6$.

Find y when $x = 25$.

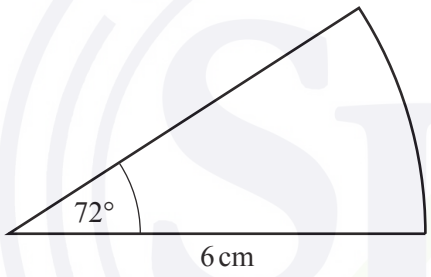
$y =$ ..... [3]

18 Write as a single fraction in its simplest form.

$$\frac{1}{x} - \frac{1}{x+1}$$

..... [3]

19



NOT TO SCALE

The diagram shows a sector of a circle with radius 6 cm and sector angle 72°.
The perimeter of this sector is $(p + q\pi)$ cm.

Find the value of p and the value of q.

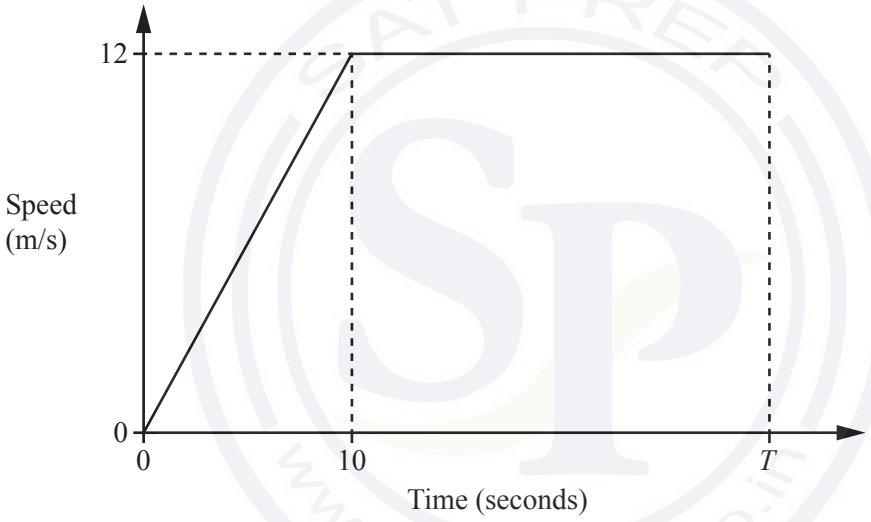
p = ...

q = ... [3]

20 Solve the equation $3x^2 - 2x - 2 = 0$.
Show all your working and give your answers correct to 2 decimal places.

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

21



NOT TO
SCALE

The diagram shows the speed−time graph for the first T seconds of a car journey.

(a) Find the acceleration during the first 10 seconds.

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

(b) The total distance travelled during the T seconds is 480 m.

Find the value of T.

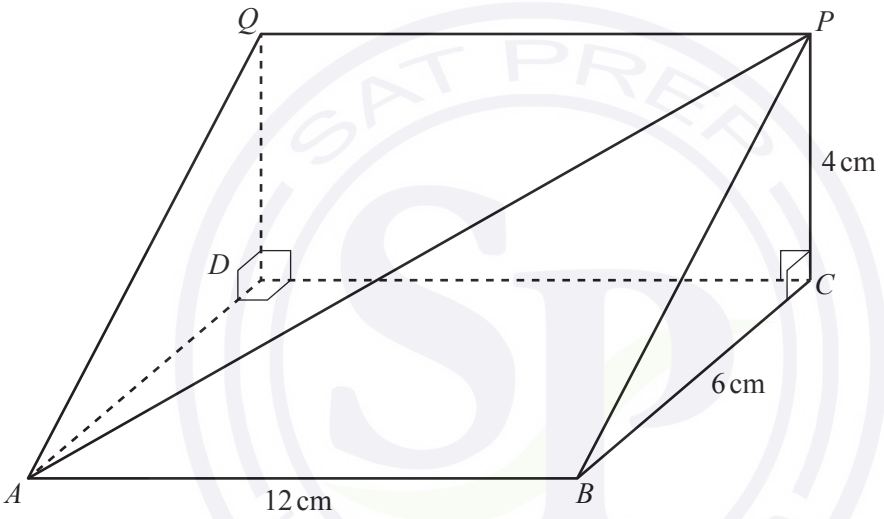
$T =$ ..... [3]

22 Simplify.

$$\frac{2x^2 - x - 1}{2x^2 + x}$$

..... [4]

23



NOT TO SCALE

The diagram shows a triangular prism.
$AB = 12$ cm, $BC = 6$ cm, $PC = 4$ cm, angle $BCP = 90°$ and angle $QDC = 90°$.

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

..... [4]

24 $\mathbf{P} = \begin{pmatrix} 3 & 1 \\ 2 & 3 \end{pmatrix}$ $\mathbf{Q} = \begin{pmatrix} 1 & 2 \\ -1 & 4 \end{pmatrix}$

Find

(a) $3\mathbf{P}$,

$3\mathbf{P} =$ ( ) [1]

(b) $\mathbf{PQ}$,

$\mathbf{PQ} =$ ( ) [2]

(c) $\mathbf{Q}^{-1}$.

$\mathbf{Q}^{-1} =$ ( ) [2]

25 Factorise completely.

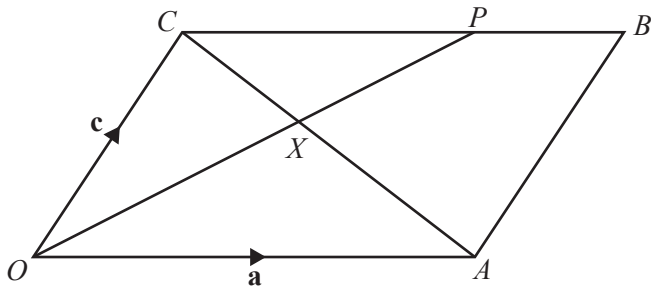
(a) $px+py-x-y$

..... [2]

(b) $2t^2-98m^2$

..... [3]

26



NOT TO SCALE

In the diagram, $OABC$ is a parallelogram.
OP and CA intersect at X and $CP : PB = 2 : 1$.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$.

(a) Find $\overrightarrow{OP}$, in terms of **a** and **c**, in its simplest form.

$\overrightarrow{OP} =$ ..... [2]

(b) $CX : XA = 2 : 3$

(i) Find $\overrightarrow{OX}$, in terms of **a** and **c**, in its simplest form.

$\overrightarrow{OX} =$ ..... [2]

(ii) Find $OX : XP$.

$OX : XP =$ ..... : ..... [2]

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

7549220925

MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2018**

1 hour 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.
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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 70.

1 Write down a prime number between 20 and 30.

..... [1]

2 Write 0.000 038 7 in standard form.

..... [1]

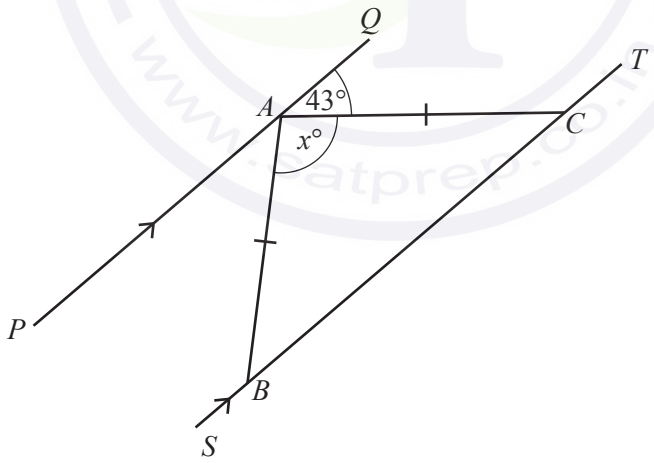
3 Write the recurring decimal $0.\dot{6}\dot{3}$ as a fraction.

..... [1]

4 Find the value of $7x + 3y$ when $x = 12$ and $y = -6$.

..... [2]

5



NOT TO SCALE

The diagram shows two parallel lines PAQ and $SBCT$.
$AB = AC$ and angle $QAC = 43°$.

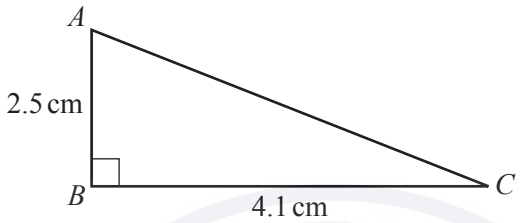
Find the value of x.

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

6 Calculate the area of a circle with radius 5.1 cm.

.....cm^2 [2]

7



NOT TO SCALE

Calculate the length of AC.

$AC =$ ..... cm [2]

8 Expand and simplify.

$$6(2y - 3) - 5(y + 1)$$

..... [2]

9 $3^{-q} \times \frac{1}{27} = 81$

Find the value of q.

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

10 **(a)** Calculate $\sqrt{2.38 + 6.4^2}$, writing down your full calculator display.

..... [1]

(b) Write your answer to **part (a)** correct to 4 decimal places.

..... [1]

11 Find the exact value of $8^{\frac{2}{3}} \times 49^{-\frac{1}{2}}$.

..... [2]

12 Solve the inequality.

$$3n - 5 > 17 + 8n$$

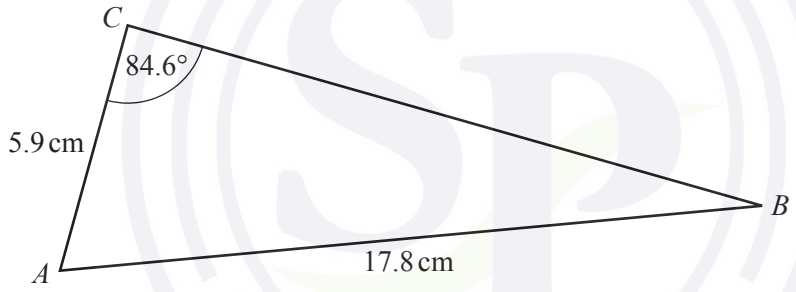
..... [2]

13 **Without using your calculator**, work out $1\frac{3}{4} \times \frac{6}{35}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [3]

14



NOT TO SCALE

Use the sine rule to find angle ABC.

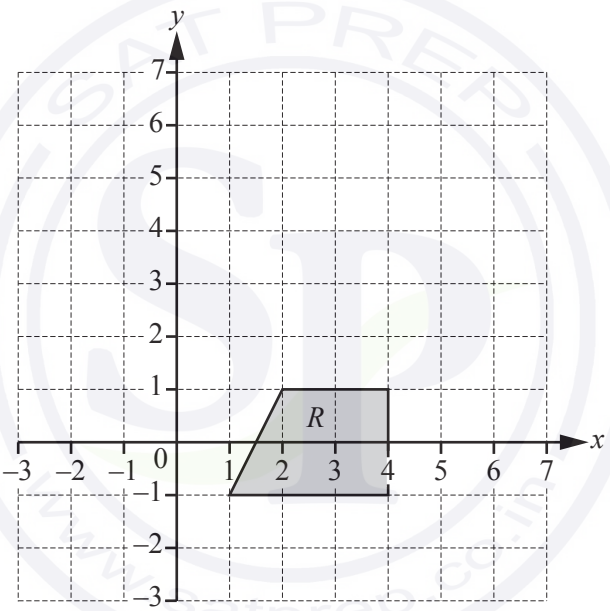
Angle ABC = ... [3]

15 y is directly proportional to $(x-1)^2$.
When $x = 5$, $y = 4$.

Find y when $x = 7$.

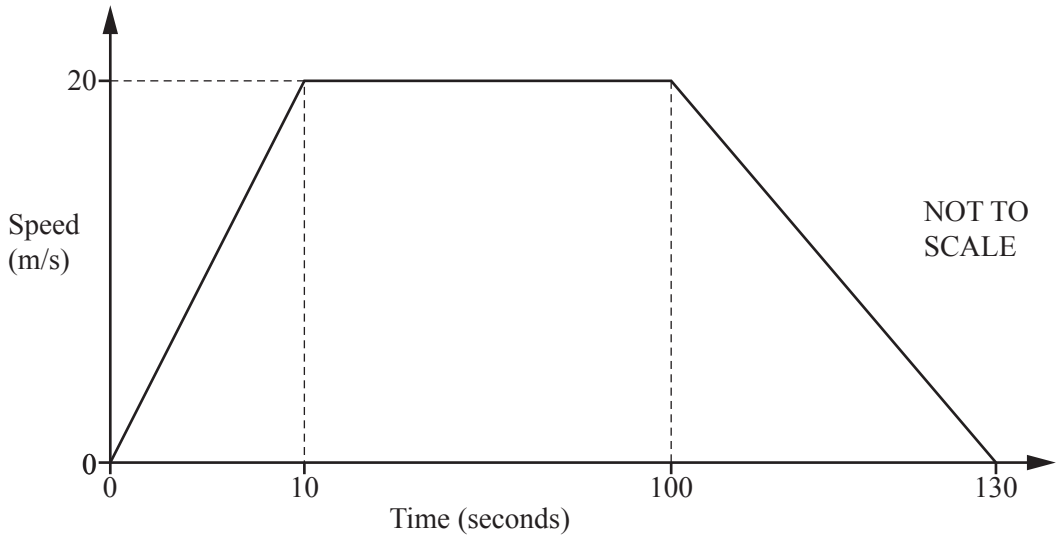
$y =$ ..... [3]

16



On the grid, draw the image of shape R after the transformation represented by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$. [3]

17



The speed−time graph shows information about the journey of a tram between two stations.

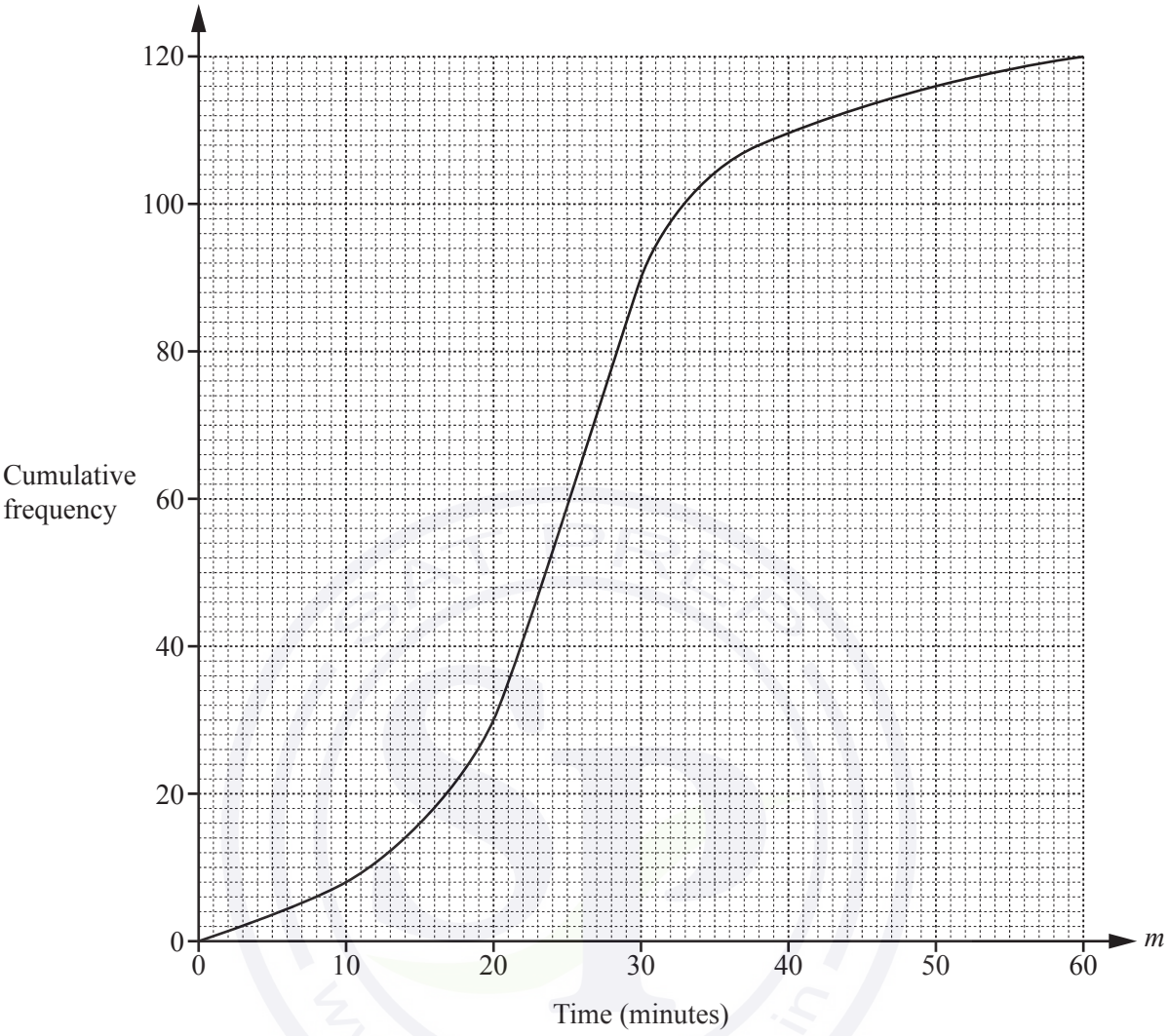
(a) Calculate the distance between the two stations.

..... m [3]

(b) Calculate the average speed of the tram for the whole journey.

..... m/s [1]

18 The cumulative frequency diagram shows information about the time, m minutes, taken by 120 students to complete some homework.



Use the cumulative frequency diagram to find an estimate of

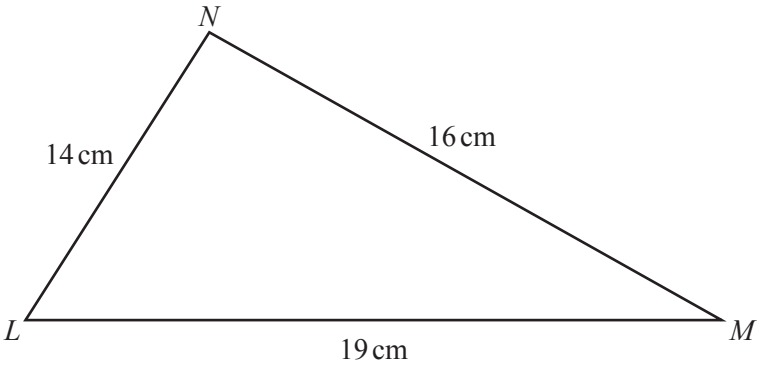
(a) the interquartile range,

.....min [2]

(b) the number of students who took more than 50 minutes to complete the homework.

..... [2]

19



NOT TO SCALE

Calculate angle *LMN*.

Angle *LMN* = ... [4]

20 **(a)** A box contains 3 blue pens, 4 red pens and 8 green pens only.
A pen is chosen at random from the box.

Find the probability that this pen is green.

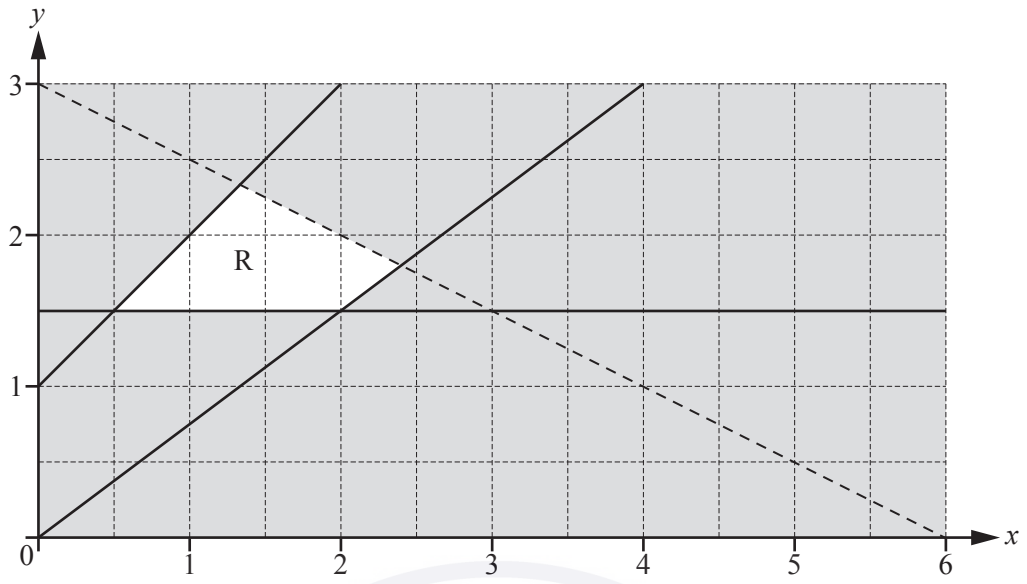
..... [1]

(b) Another box contains 7 black pens and 8 orange pens only.
Two pens are chosen at random from this box without replacement.

Calculate the probability that at least one orange pen is chosen.

..... [3]

21



There are four inequalities that define the region R.
One of these is $y \leqslant x + 1$.

Find the other three inequalities.

.....

.....

..... [4]

22 $f(x) = 5 - 2x$ $g(x) = x^2 + 8$

(a) Calculate $ff(-3)$.

..... [2]

(b) Find

(i) $g(2x)$,

..... [1]

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

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

23 40 people were asked how many times they visited the cinema in one month.
The table shows the results.

Number of cinema visits	0	1	2	3	4	5	6	7
Frequency	5	5	6	6	7	3	6	2

(a) **(i)** Find the mode.

..... [1]

(ii) Calculate the mean.

..... [3]

(b) Omar wants to show the information from the table in a pie chart.

Calculate the sector angle for the people who visited the cinema 5 times.

..... [2]

Question 24 is printed on the next page.

24 **(a)** Point A has co-ordinates (1, 0) and point B has co-ordinates (2, 5).

Calculate the angle between the line AB and the x-axis.

..... [3]

(b) The line PQ has equation $y = 3x - 8$ and point P has co-ordinates (6, 10).

Find the equation of the line that passes through P and is perpendicular to PQ.
Give your answer in the form $y = mx + c$.

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

Cambridge IGCSE

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MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2018**

1 hour 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 70.

1 One morning, Marcia works from 08 20 to 11 15.

Find how long she works for.
Give your answer in hours and minutes.

..... h ..... min [1]

2 Expand.

$7(x - 8)$

..... [1]

3 Here is a sequence.

a, 13, 9, 3, –5, –15, b, …

Find the value of a and the value of b.

$a =$ .....

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

4 Complete these statements.

(a) When $w =$ ..... , $10w = 70$. [1]

(b) When $5x = 15$, $12x =$ ..... [1]

5 22 17 25 41 39 4

Work out the difference between the two prime numbers in the list above.

..... [2]

6 **Without using your calculator**, work out $\frac{2}{3} - \frac{1}{12}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [2]

7 A and B are two towns on a map.
The bearing of A from B is 140°.

Work out the bearing of B from A.

..... [2]

8 Here are some numbers written in standard form.

3.4×10^{-1} 1.36×10^{6} 7.9×10^{0} 2.4×10^{5} 5.21×10^{-3} 4.3×10^{-2}

From these numbers, write down

(a) the largest number,

..... [1]

(b) the smallest number.

..... [1]

9 **Using a straight edge and compasses only**, construct the locus of points that are equidistant from A and B.

A •

• B

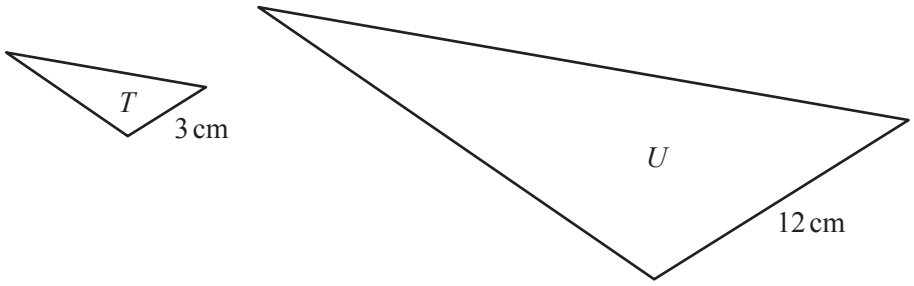
[2]

10 Factorise completely.

$xy + 2y + 3x + 6$

..... [2]

11



NOT TO SCALE

The diagram shows two mathematically similar triangles, T and U.
Two corresponding side lengths are 3 cm and 12 cm.
The area of triangle T is 5 cm^2.

Find the area of triangle U.

..... cm^2 [2]

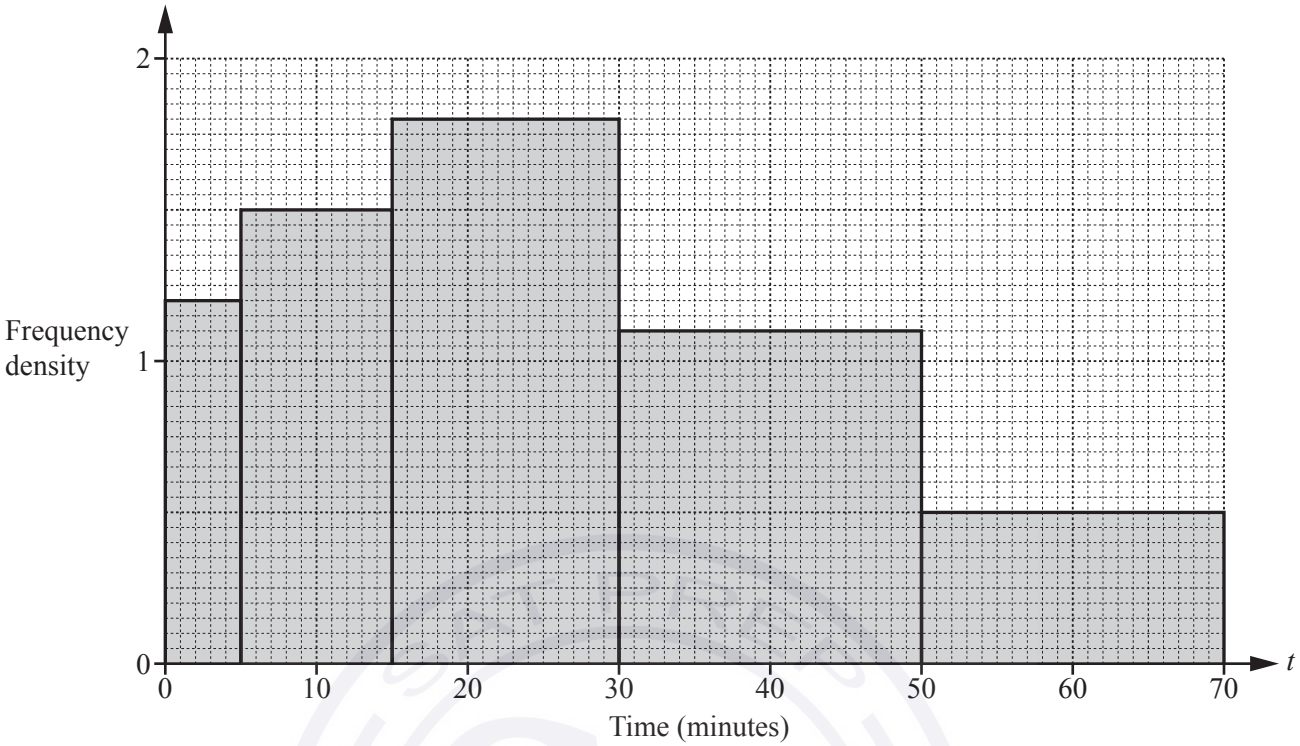
12 Anna walks 31 km at a speed of 5 km/h.
Both values are correct to the nearest whole number.

Work out the upper bound of the time taken for Anna's walk.

..... hours [2]

[Turn over

13 The histogram shows information about the time, t minutes, spent in a shop by each of 80 people.

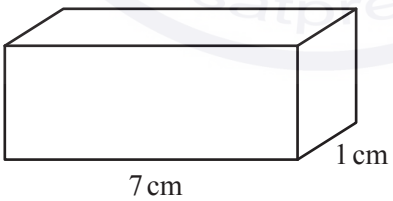


Complete the frequency table.

Time (t minutes)	$0 < t \leqslant 5$	$5 < t \leqslant 15$	$15 < t \leqslant 30$	$30 < t \leqslant 50$	$50 < t \leqslant 70$
Number of people	6		27		10

[2]

14



NOT TO SCALE

The diagram shows a solid cuboid with base area 7 cm^2.
The volume of this cuboid is 21 cm^3.

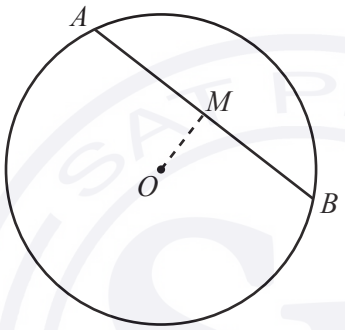
Work out the total surface area.

..... cm^2 [3]

15 Find the volume of a cylinder of radius 5 cm and height 8 cm.
Give the units of your answer.

.... [3]

16



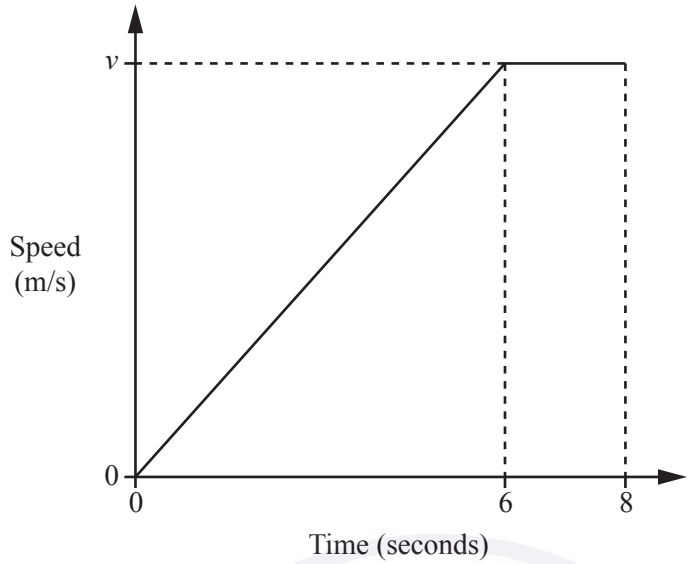
NOT TO SCALE

The diagram shows a circle, centre O.
AB is a chord of length 12 cm.
M is the mid-point of AB and $OM = 4.5$ cm.

Calculate the radius of the circle.

..... cm [3]

17 The diagram shows information about the first 8 seconds of a car journey.



NOT TO SCALE

The car travels with constant acceleration reaching a speed of v m/s after 6 seconds.
The car then travels at a constant speed of v m/s for a further 2 seconds.
The car travels a total distance of 150 metres.

Work out the value of v.

v = ... [3]

18 A ball falls d metres in t seconds.
d is directly proportional to the square of t.
The ball falls 44.1 m in 3 seconds.

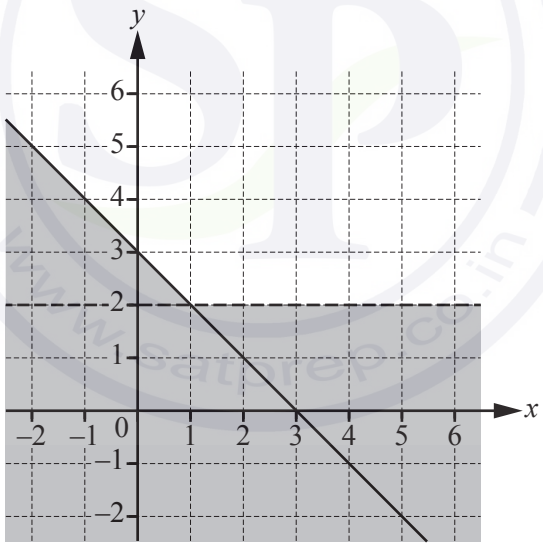
(a) Find a formula for d in terms of t.

$d =$ ..... [2]

(b) Calculate the distance the ball falls in 2 seconds.

..... m [1]

19



Find the two inequalities that define the region on the grid that is **not** shaded.

.....

..... [3]

20 $\mathbf{A} = \begin{pmatrix} 1 & 1 \\ 9 & 9 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 0 & 1 \\ 9 & 8 \end{pmatrix}$ $\mathbf{C} = \begin{pmatrix} 1 & 1 \\ 3 & 3 \end{pmatrix}$ $\mathbf{I} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

(a) Here are four matrix calculations.

AI **IA** $\mathbf{C}^2$ $\mathbf{B} + \mathbf{I}$

Work out which matrix calculation does **not** give the answer $\begin{pmatrix} 1 & 1 \\ 9 & 9 \end{pmatrix}$.

..... [2]

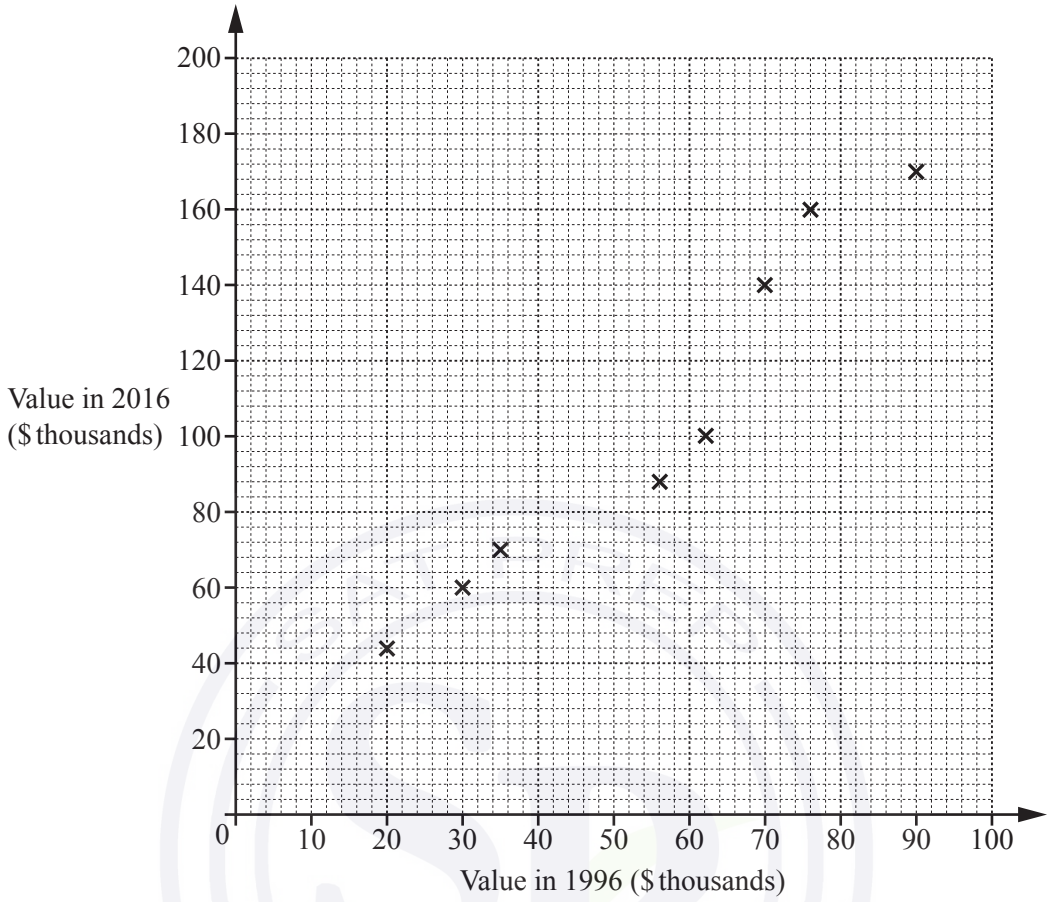
(b) Find $|\mathbf{B}|$.

..... [1]

(c) Explain why matrix **A** has no inverse.

..... [1]

21 The scatter diagram shows the value, in thousands of dollars, of eight houses in 1996 and the value of the same houses in 2016.



(a) One of these eight houses had a value of $70 000 in 1996.

Write down the value of this house in 2016.

$ ..... [1]

(b) The values of two more houses are shown in the table.

Value in 1996 ($ thousands)	40	80
Value in 2016 ($ thousands)	80	150

On the scatter diagram, plot these values. [1]

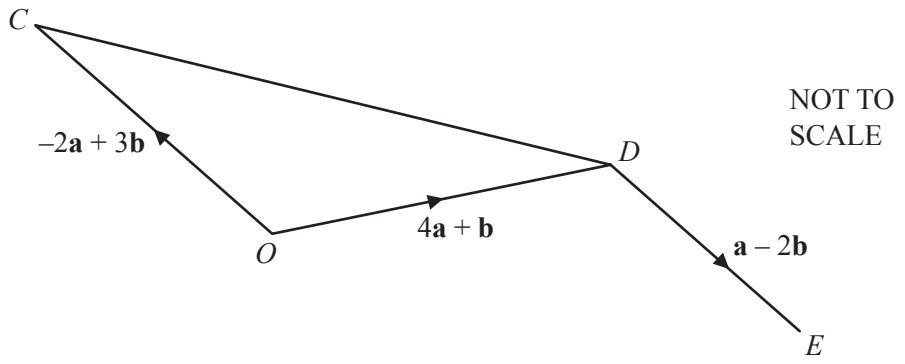
(c) On the scatter diagram, draw a line of best fit. [1]

(d) Another house had a value of $50 000 in 1996.

Find an estimate of the value of this house in 2016.

$ ..... [1]

22



In the diagram, O is the origin, $\overrightarrow{OC} = -2\mathbf{a} + 3\mathbf{b}$ and $\overrightarrow{OD} = 4\mathbf{a} + \mathbf{b}$.

(a) Find $\overrightarrow{CD}$, in terms of **a** and **b**, in its simplest form.

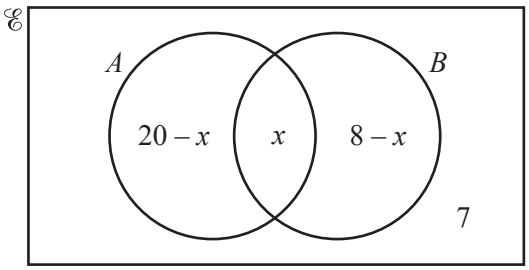
$\overrightarrow{CD} =$ ..... [2]

(b) $\overrightarrow{DE} = \mathbf{a} - 2\mathbf{b}$

Find the position vector of E, in terms of **a** and **b**, in its simplest form.

..... [2]

23 The Venn diagram shows information about the number of elements in sets A, B and $\mathscr{E}$.



(a) $n(A \cup B) = 23$

Find the value of x.

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

(b) An element is chosen at random from $\mathscr{E}$.

Find the probability that this element is in $(A \cup B)'$.

..... [2]

24 Box A and box B each contain blue and green pens only.
Raphael picks a pen at random from box A and Paulo picks a pen at random from box B.
The probability that Raphael picks a blue pen is $\frac{2}{3}$.
The probability that both Raphael and Paulo pick a blue pen is $\frac{8}{15}$.

(a) Find the probability that Paulo picks a blue pen.

..... [2]

(b) Find the probability that both Raphael and Paulo pick a green pen.

..... [3]

25 P is the point (16, 9) and Q is the point (22, 24).

(a) Find the equation of the line perpendicular to PQ that passes through the point (5, 1).
Give your answer in the form $y = mx + c$.

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

(b) N is the point on PQ such that $PN = 2NQ$.

Find the co-ordinates of N.

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

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

0985436845

MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2018**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

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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 70.

1 One day in Chamonix the temperature at noon was 6 °C.
At midnight the temperature was 11 °C lower.

Write down the temperature at midnight.

..... °C [1]

2 Factorise.

$w + w^3$

..... [1]

3 Liz takes 65 seconds to run 400 m.

Calculate her average speed.

..... m/s [1]

4 Complete the list of factors of 36.

1, 2, ... , 36 [2]

5 Increase \$22 by 15%.

\$..... [2]

6 **(a)** Write 209 802 correct to the nearest thousand.

..... [1]

(b) Write 4123 correct to 3 significant figures.

..... [1]

7 The probability that Kim wins a game is 0.72 .
In one year Kim will play 225 games.

Work out an estimate of the number of games Kim will win.

..... [2]

8 **(a)** Write 4.82×10^{-3} as an ordinary number.

..... [1]

(b) Write 52 million in standard form.

..... [1]

9 Solve.

$$\frac{1-p}{3} = 4$$

$p =$ ..... [2]

10 Factorise completely.

$$2a + 4b - ax - 2bx$$

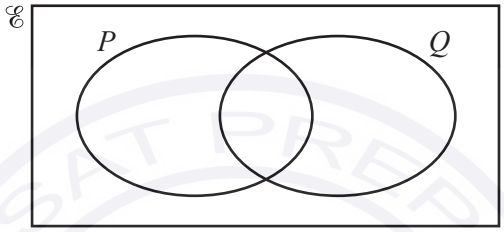
..... [2]

11 $A = (2\pi + y)x^2$

Rearrange the formula to make x the subject.

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

12



$n(\mathscr{E}) = 20$, $n(P) = 10$, $n(Q) = 13$ and $n(P \cup Q)' = 5$.

Work out $n(P \cap Q)$.
You may use the Venn diagram to help you.

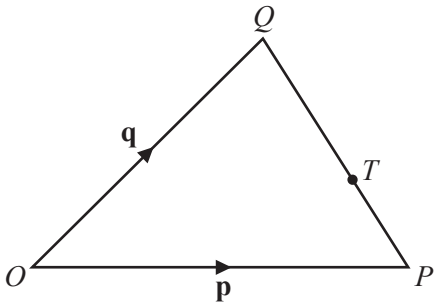
$n(P \cap Q) =$ ..... [2]

13 Simplify.

$$\frac{3+x}{9-x^2}$$

..... [2]

14



NOT TO SCALE

O is the origin, $\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OQ} = \mathbf{q}$.
$QT : TP = 2 : 1$

Find the position vector of T.
Give your answer in terms of **p** and **q**, in its simplest form.

..... [2]

15 **Without using a calculator**, work out $\frac{2}{3} \div 1\frac{1}{5}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [3]

16 **(a)** The length of the side of a square is 12 cm, correct to the nearest centimetre.

Calculate the upper bound for the perimeter of the square.

..... cm [2]

(b) Jo measures the length of a rope and records her measurement correct to the nearest ten centimetres.
The upper bound for her measurement is 12.35 m.

Write down the measurement she records.

..... m [1]

17 **(a)** Find the value of $\left(\frac{1}{81}\right)^{-\frac{3}{4}}$.

..... [1]

(b) Simplify. $\sqrt[3]{27t^{27}}$

..... [2]

18 Expand the brackets and simplify.

$$(2p+3)(3p-2)$$

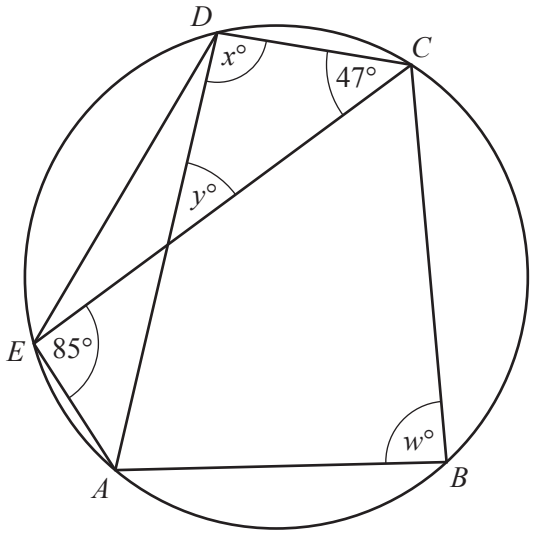
..... [3]

19 y is directly proportional to $(x-1)^2$.
When $x = 3$, $y = 24$.

Find y when $x = 6$.

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

20



NOT TO SCALE

The points A, B, C, D and E lie on the circumference of the circle.
Angle $DCE = 47°$ and angle $CEA = 85°$.

Find the values of w, x and y.

$w =$ .....

$x =$ .....

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

21 Write as a single fraction in its simplest form.

$$\frac{1}{y-1} - \frac{1}{y}$$

..... [3]

22 Find an expression for the nth term of each sequence.

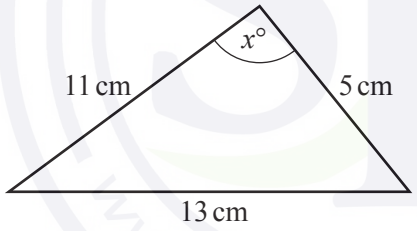
(a) 11, 7, 3, −1, …

..... [2]

(b) 3, 6, 12, 24, …

..... [2]

23

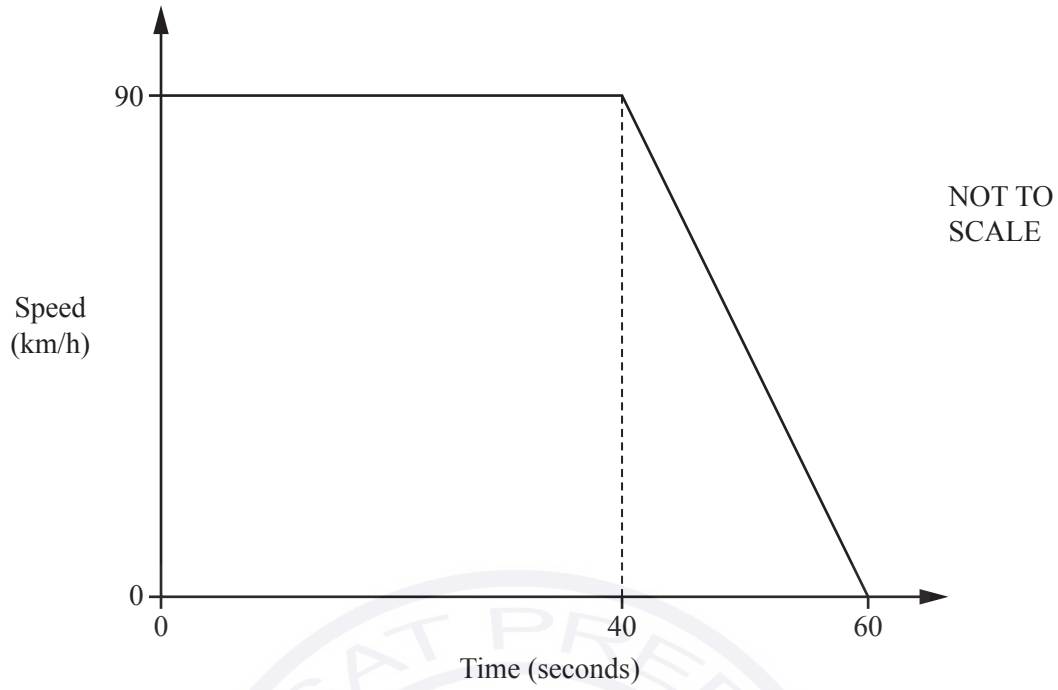


NOT TO SCALE

Calculate the value of x.

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

24



The diagram shows the speed–time graph for 60 seconds of a car journey.

(a) Change 90 km/h to m/s.

..... m/s [2]

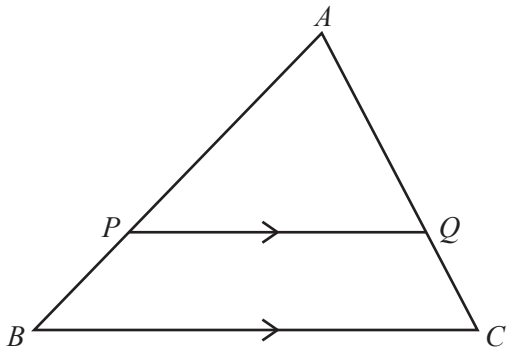
(b) Find the deceleration of the car in m/s^2.

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

(c) Find the distance travelled, in metres, in the 60 seconds.

..... m [2]

25 (a)



NOT TO SCALE

In the diagram, PQ is parallel to BC.
APB and AQC are straight lines.
$PQ = 8$ cm, $BC = 10$ cm and $AB = 9$ cm.

Calculate PB.

$PB =$ ..... cm [2]

(b)

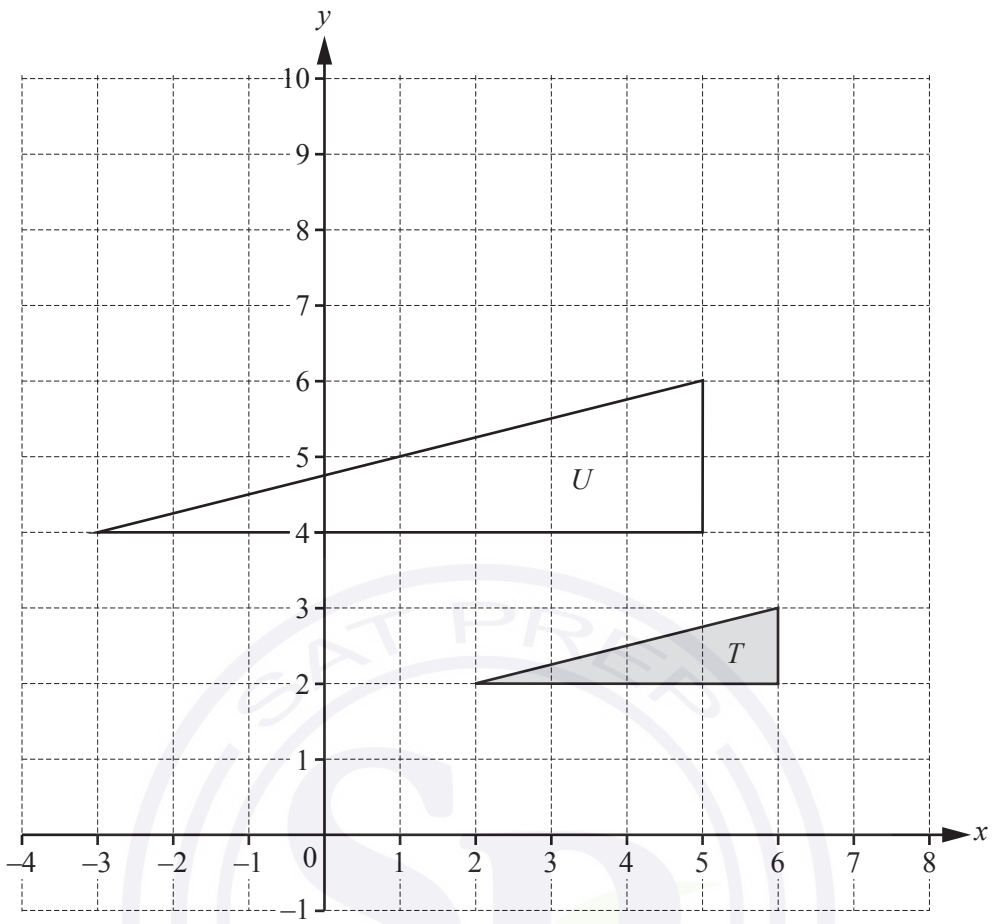
NOT TO SCALE

The diagram shows two glasses which are mathematically similar.
The larger glass has a capacity of 0.5 litres and the smaller glass has a capacity of 0.25 litres.
The height of the larger glass is 13 cm.

Calculate the height of the smaller glass.

..... cm [3]

26



(a) Describe fully the **single** transformation that maps triangle *T* onto triangle *U*.

.....

..... [3]

(b) On the grid, draw the image of triangle *T* after a rotation through 90° clockwise about the point (7, 3). [3]

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CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

0067995524

MATHEMATICS **0580/22**

Paper 2 (Extended) **February/March 2018**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

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The total of the marks for this paper is 70.

This document consists of **12** printed pages.

CAMBRIDGE International Examinations

1 "We eat more ice cream as the temperature rises."

What type of correlation is this?

..... [1]

2 Write 0.000 052 3 in standard form.

..... [1]

3 Calculate $\sqrt{17.8} - 1.3^{2.5}$.

..... [1]

4 Write the recurring decimal $0.\dot{8}$ as a fraction.

..... [1]

5

The diagram shows a regular pentagon and a kite.

Complete the following statements.

(a) The regular pentagon has ..... lines of symmetry. [1]

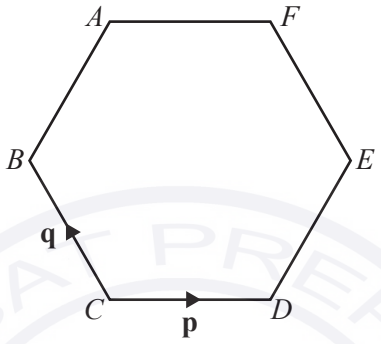
(b) The kite has rotational symmetry of order ..... . [1]

6 Factorise completely.

$$15k^2m - 20m^4$$

..... [2]

7



The diagram shows a regular hexagon $ABCDEF$.
$\overrightarrow{CD} = \mathbf{p}$ and $\overrightarrow{CB} = \mathbf{q}$.

Find $\overrightarrow{CA}$, in terms of **p** and **q**, giving your answer in its simplest form.

$\overrightarrow{CA}$ = ... [2]

8 Newton has a population of 23 000.
The population decreases exponentially at a rate of 1.4% per year.

Calculate the population of Newton after 5 years.

..... [2]

9 $2^p = \frac{1}{8^4}$

Find the value of p.

$p =$ ..... [2]

10 y is inversely proportional to x.
When $x = 9$, $y = 8$.

Find y when $x = 6$.

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

11 Dev makes 600 cakes.
18% of the 600 cakes go to a hotel and $\frac{2}{3}$ of the 600 cakes go to a supermarket.

Calculate how many cakes he has left.

..... [3]

12 **Without using your calculator**, work out $\frac{7}{8}+\frac{1}{6}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

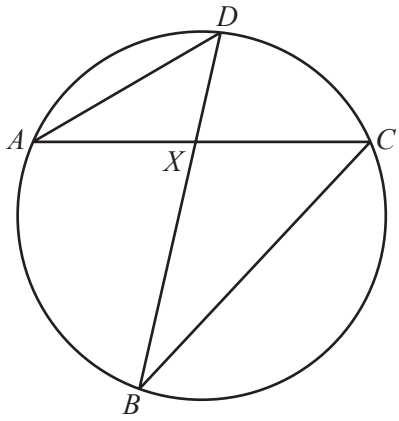
13 Solve the simultaneous equations.
You must show all your working.

$$2x+\frac{1}{2}y=13$$
$$3x+2y=17$$

$x =$ .....

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

14



NOT TO SCALE

A, B, C and D are points on the circumference of the circle.
AC and BD intersect at X.

(a) Complete the statement.

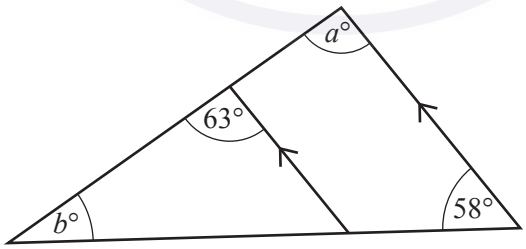
Triangle ADX is ..... to triangle BCX. [1]

(b) The area of triangle ADX is $36\,cm^2$ and the area of triangle BCX is $65.61\,cm^2$.
$AX = 8.6\,cm$ and $DX = 7.2\,cm$.

Find BX.

$BX =$ ..... cm [3]

15



NOT TO SCALE

Complete the statements.

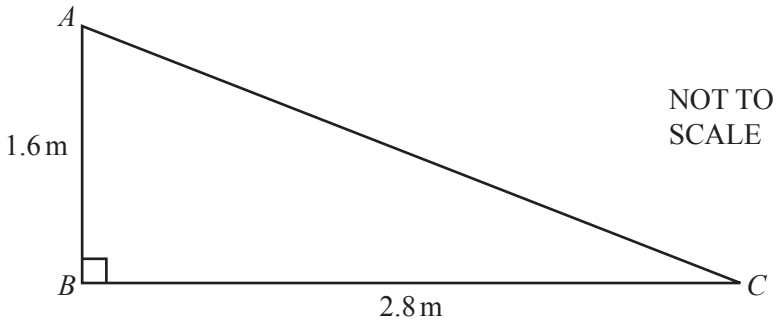
$a =$ ..... because .....

.....

$b =$ ..... because .....

..... [4]

16



(a) Find the area of triangle ABC.

..... m^2 [2]

(b) Calculate AC.

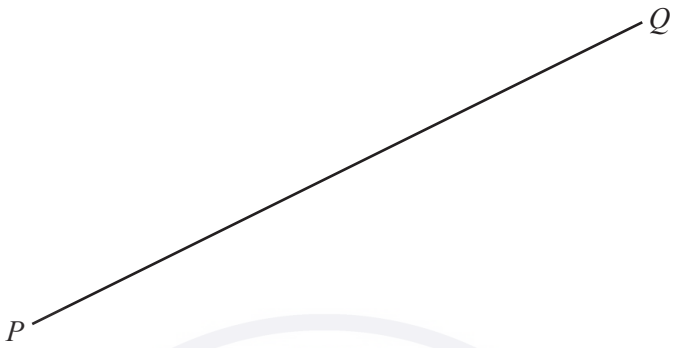
$AC =$ ..... m [2]

17 Solve the equation $2x^2 + 7x - 3 = 0$.
Show all your working and give your answers correct to 2 decimal places.

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

18 In this question, **use a straight edge and compasses only** and show all your construction arcs.

(a) Construct the perpendicular bisector of PQ.

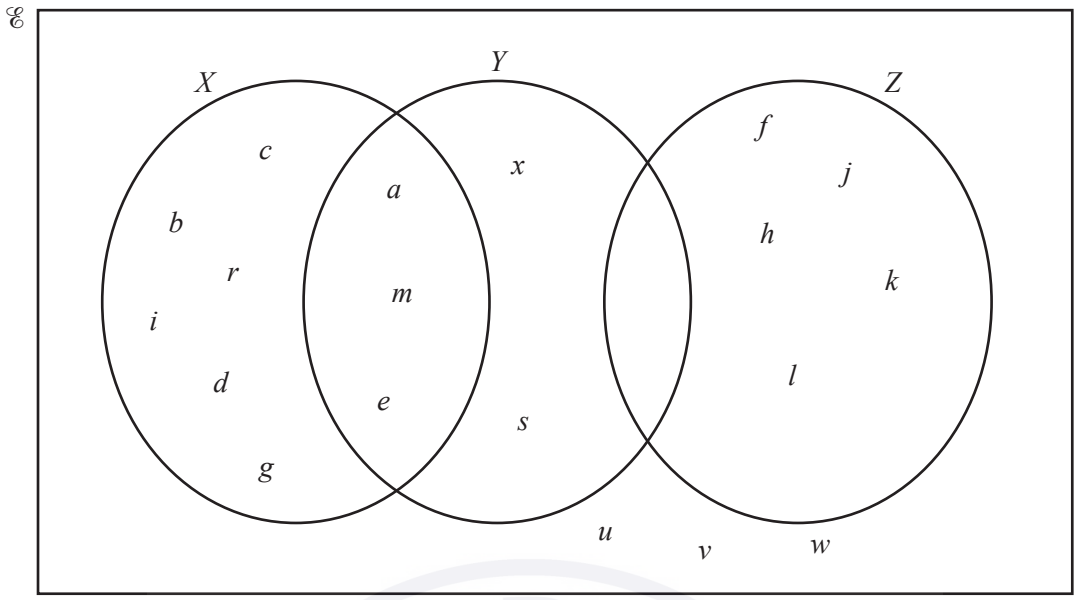


[2]

(b) Construct the bisector of angle ABC.

[2]

19



(a) Use set notation to complete the statements for the Venn diagram above.

(i) c ..... X [1]

(ii) ..... $= \{ a, m, e \}$ [1]

(iii) $Y \cap Z =$ ..... [1]

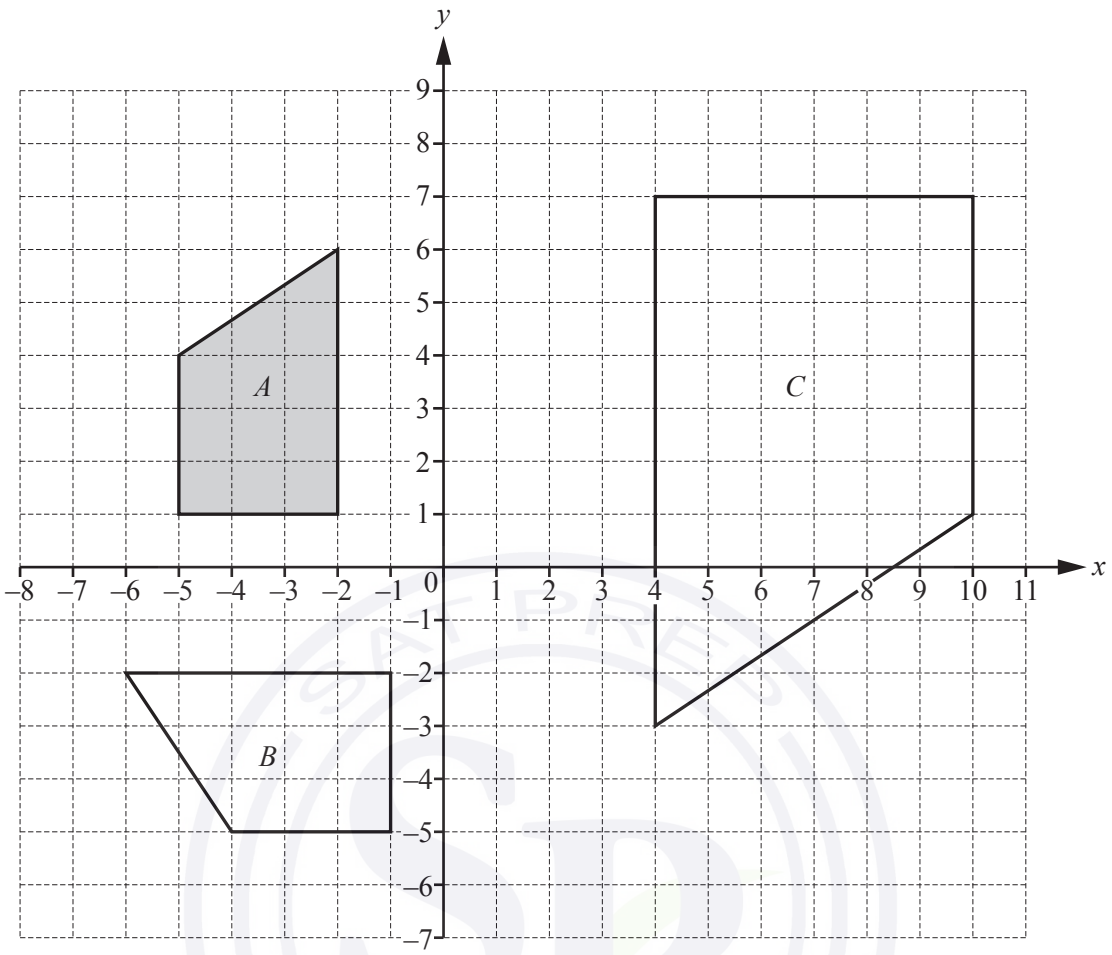
(b) List the elements of $(X \cup Y \cup Z)'$.

..... [1]

(c) Find $\mathrm{n}(X' \cap Z)$.

..... [1]

20



Describe fully the **single** transformation that maps

(a) shape *A* onto shape *B*,

.....

..... [3]

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

.....

..... [3]

21 $f(x) = 7 - x$ $g(x) = 4x + 2$ $h(x) = 15 - x^2$

(a) Find $ff(2)$.

..... [2]

(b) Find $gf(x)$ in its simplest form.

..... [2]

(c) Find $h(2x)$ in its simplest form.

..... [2]

Question 22 is printed on the next page.

22 Samira and Sonia each have a bag containing 20 sweets.
In each bag, there are 5 red, 6 green and 9 yellow sweets.

(a) Samira chooses one sweet at random from her bag.

Write down the probability that she chooses a yellow sweet.

..... [1]

(b) Sonia chooses two sweets at random, without replacement, from her bag.

(i) Show that the probability that she chooses two green sweets is $\frac{3}{38}$.

[2]

(ii) Calculate the probability that the sweets she chooses are **not** both the same colour.

..... [4]

Cambridge IGCSE

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CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

6068535689

MATHEMATICS **0580/21**

Paper 2 (Extended) **October/November 2017**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

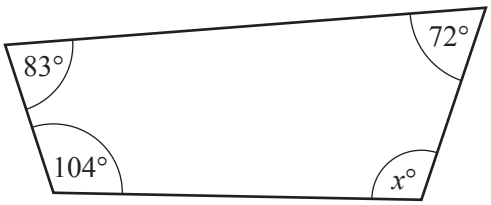
READ THESE INSTRUCTIONS FIRST

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 70.

1



NOT TO SCALE

The diagram shows a quadrilateral.

Find the value of x.

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

2 Work out.

$$2^{-4} \times 2^{5}$$

..... [1]

3 **(a)** Use a calculator to work out $\dfrac{5^{0.4} - \sqrt{3}}{0.13 - 0.015}$.

Write down all the digits in your calculator display.

..... [1]

(b) Write your answer to **part (a)** correct to 2 significant figures.

..... [1]

4 Amber's mean mark on five tests is 80.
Her marks on four of these tests are 68, 81, 74 and 89.

Work out her mark on the fifth test.

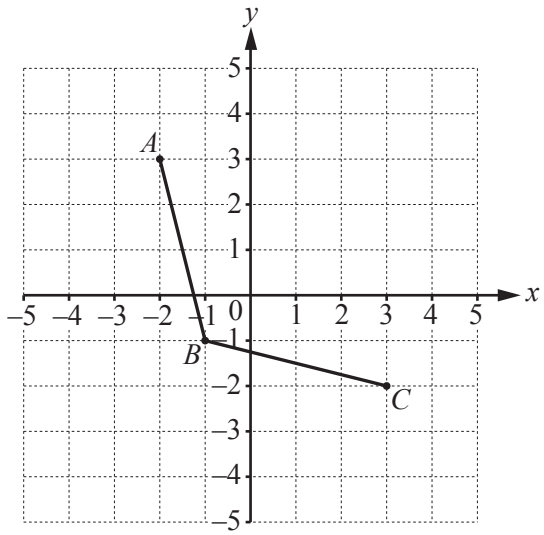
..... [2]

5 Factorise completely.

$$12x^2 + 15xy - 9x$$

..... [2]

6



The diagram shows two sides of a rhombus *ABCD*.

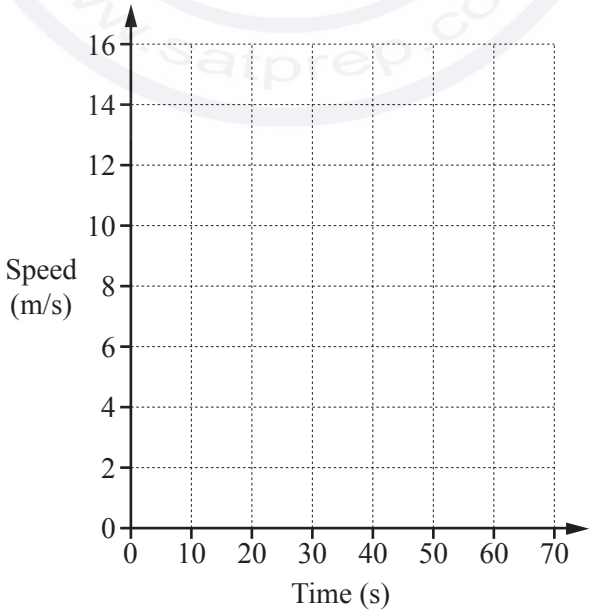
(a) Write down the co-ordinates of *A*.

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

(b) Complete the rhombus *ABCD* on the grid. [1]

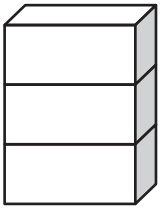
7 Petra begins a journey in her car.
She accelerates from rest at a constant rate of 0.4 m/s^2 for 30 seconds.
She then travels at a constant speed for 40 seconds.

On the grid, draw the speed-time graph for the first 70 seconds of Petra's journey.



[2]

8



NOT TO SCALE

The diagram shows three identical cuboids in a tower.
The height of one cuboid is 6.5 cm, correct to the nearest millimetre.

Work out the upper bound of the height of the tower.

..... cm [2]

9 The value of a motorbike is $12 400.
Each year, the value of the motorbike decreases exponentially by 15%.

Calculate the value of the motorbike after 3 years.

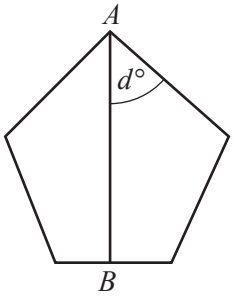
$..... [2]

10 **Without using a calculator**, work out $1\frac{2}{3} - \frac{11}{15}$.
Write down all the steps of your working and give your answer as a fraction in its lowest terms.

..... [3]

11 The diagram shows a regular pentagon.
AB is a line of symmetry.

Work out the value of *d*.



NOT TO SCALE

d = ... [3]

12 $\sqrt{5}$ -7 343 -11 0.4 2.5 $\frac{1}{3}$

From this list of numbers, write down

(a) a cube number,

..... [1]

(b) the smallest number,

..... [1]

(c) a natural number.

..... [1]

13 Simplify.

(a) $(m^5)^2$

..... [1]

(b) $4x^3y \times 5x^2y$

..... [2]

14 **(a)** D is the point $(2, -5)$ and $\overrightarrow{DE} = \begin{pmatrix} 7 \\ 1 \end{pmatrix}$.

Find the co-ordinates of the point E.

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

(b) $\mathbf{v} = \begin{pmatrix} t \\ 12 \end{pmatrix}$ and $|\mathbf{v}| = 13$.

Work out the value of t, where t is negative.

$t =$ ..... [2]

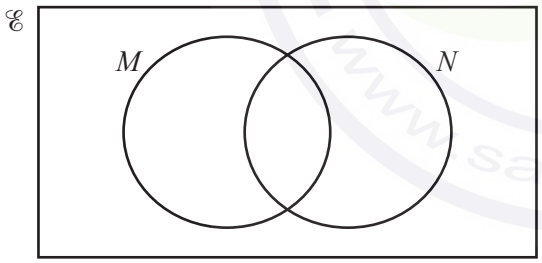
15 **(a)** $Q = \{1, 2, 3, 4, 5, 6\}$

Write down a set P where $P \subset Q$.

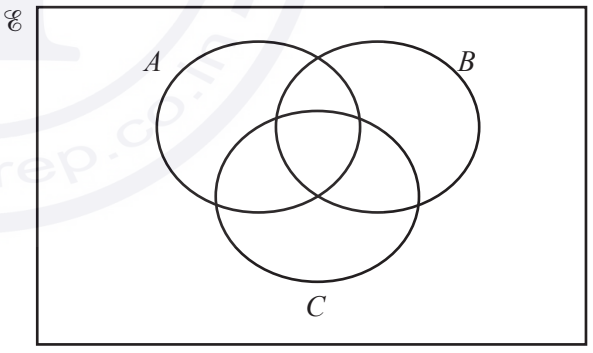
$P =$ ..... [1]

(b) Shade these regions in the Venn diagrams.

$M \cup N'$

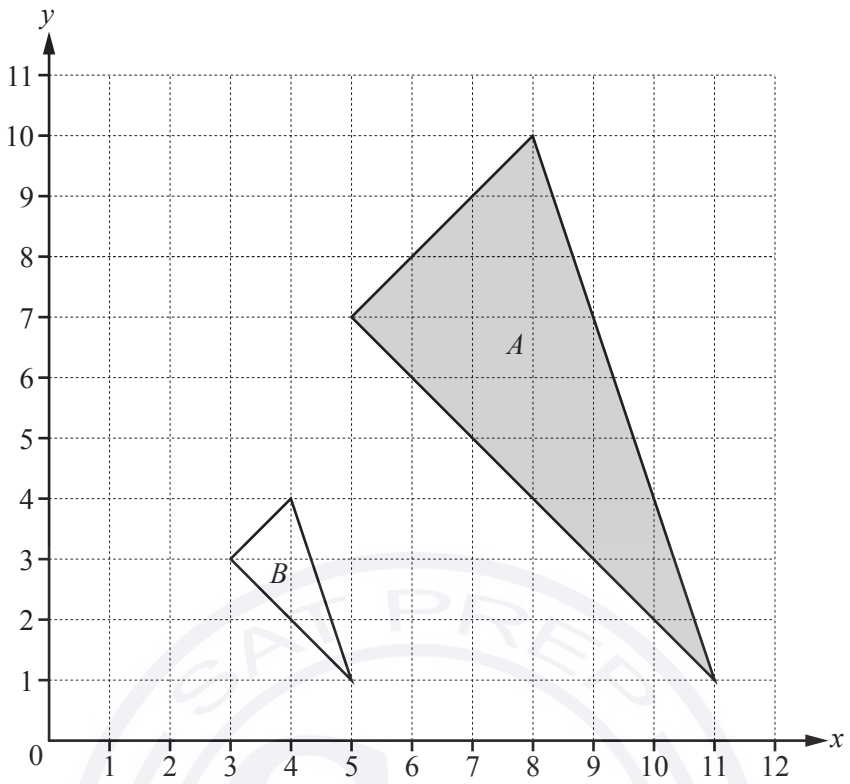


$(A \cup B) \cap C'$



[2]

16



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

.....

..... [3]

17 y is inversely proportional to $(x+1)^2$.
$y = 50$ when $x = 0.2$.

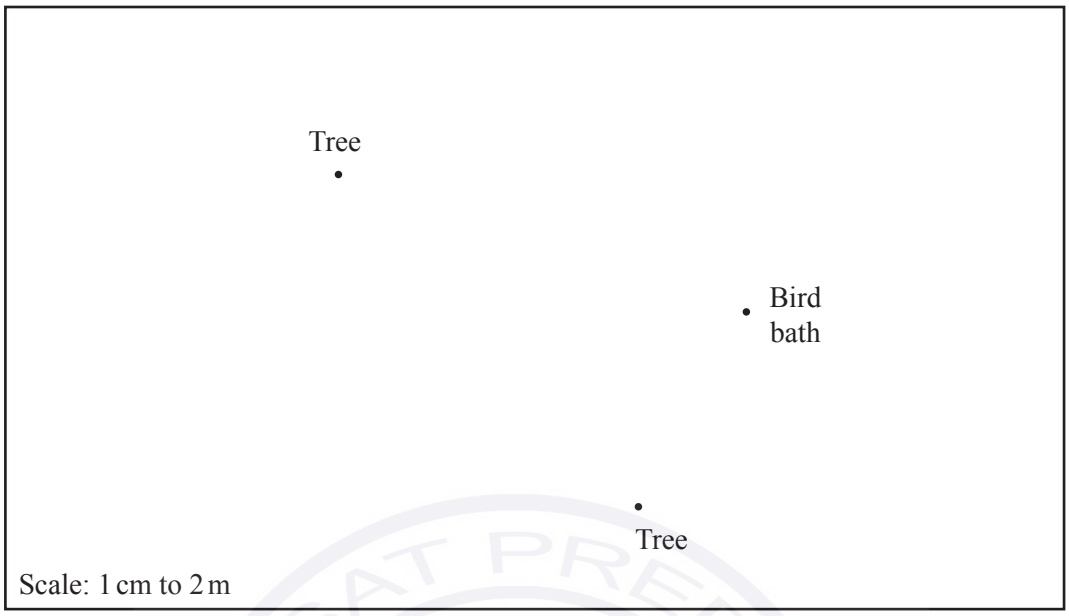
(a) Write y in terms of x.

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

(b) Find the value of y when $x = 0.5$.

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

18 The diagram shows a scale drawing of Tariq's garden.
The scale is 1 centimetre represents 2 metres.



Tariq puts a statue in the garden.
The statue is equidistant from the two trees and 10 m from the bird bath.

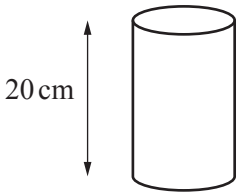
Find, by construction, the point where Tariq puts the statue.
Label the point *S*. [4]

19 Write as a single fraction in its simplest form.

$$\frac{5}{x-3}+\frac{3}{x+7}+\frac{1}{2}$$

..... [4]

20 (a)



NOT TO SCALE

A cylinder has height 20 cm.
The area of the circular cross section is 74 cm^2.

Work out the volume of this cylinder.

..... cm^3 [1]

(b) Cylinder *A* is mathematically similar to cylinder *B*.

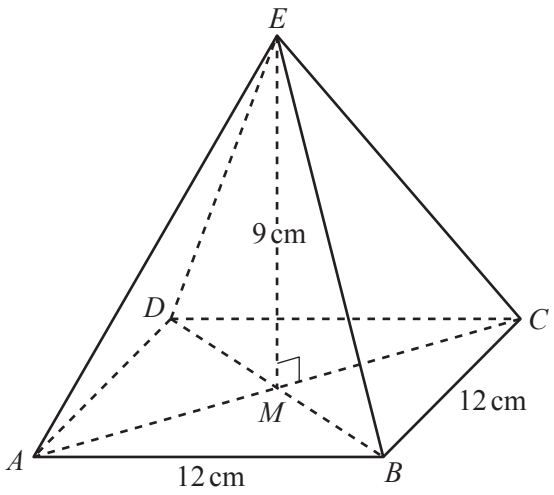
NOT TO SCALE

The height of cylinder *A* is 10 cm and its surface area is 440 cm^2.
The surface area of cylinder *B* is 3960 cm^2.

Calculate the height of cylinder *B*.

..... cm [3]

21



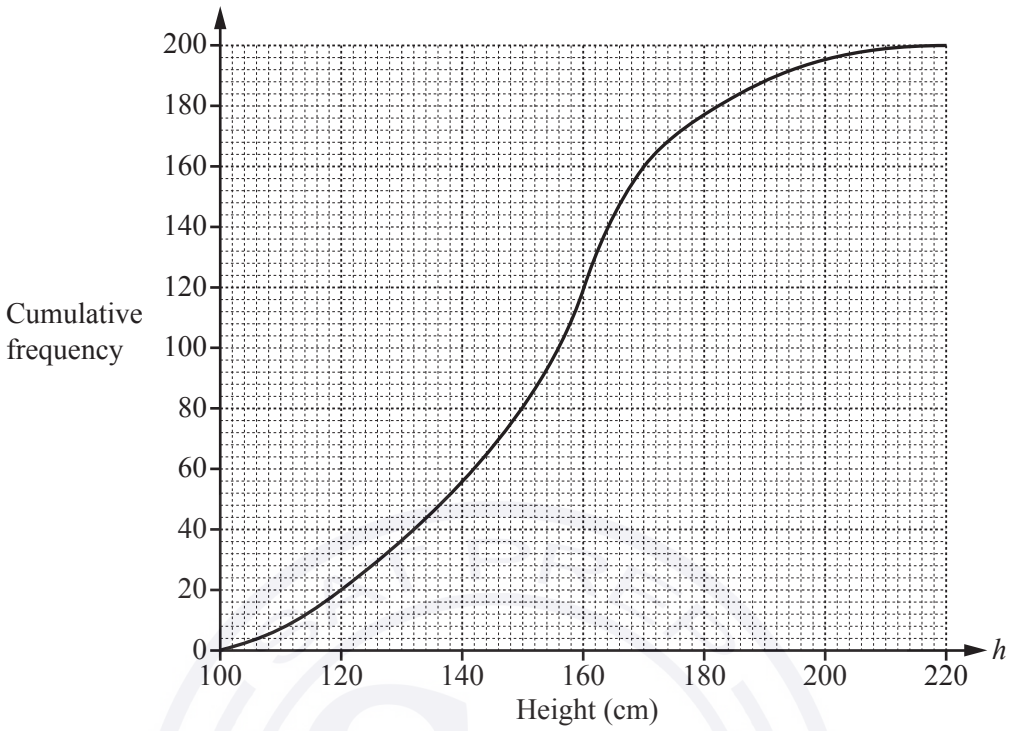
NOT TO SCALE

The diagram shows a square-based pyramid $ABCDE$.
The diagonals of the square meet at M.
E is vertically above M.
$AB = BC = 12$ cm and $EM = 9$ cm.

Calculate the angle between the edge EC and the base, $ABCD$, of the pyramid.

..... [4]

22 Simon records the heights, h cm, of 200 sunflowers in his garden.
The cumulative frequency diagram shows this information.



(a) Find the number of these sunflowers that have a height of more than 160 cm.

..... [2]

(b) Sue records the heights, h cm, of 200 sunflowers in her garden.
The cumulative frequency table shows this information.

Height (h cm)	Cumulative frequency
$h \leqslant 100$	0
$h \leqslant 110$	20
$h \leqslant 120$	48
$h \leqslant 130$	100
$h \leqslant 140$	140
$h \leqslant 150$	172
$h \leqslant 160$	188
$h \leqslant 170$	200

On the grid above, draw another cumulative frequency diagram to show this information. [3]

(c) Work out the difference between the median heights of Simon's sunflowers and Sue's sunflowers.

..... cm [2]

Question 23 is printed on the next page.

23 In one week, Neha spends x hours cooking and y hours cleaning.
The time she spends cleaning is at least equal to the time she spends cooking.
This can be written as $y \geqslant x$.

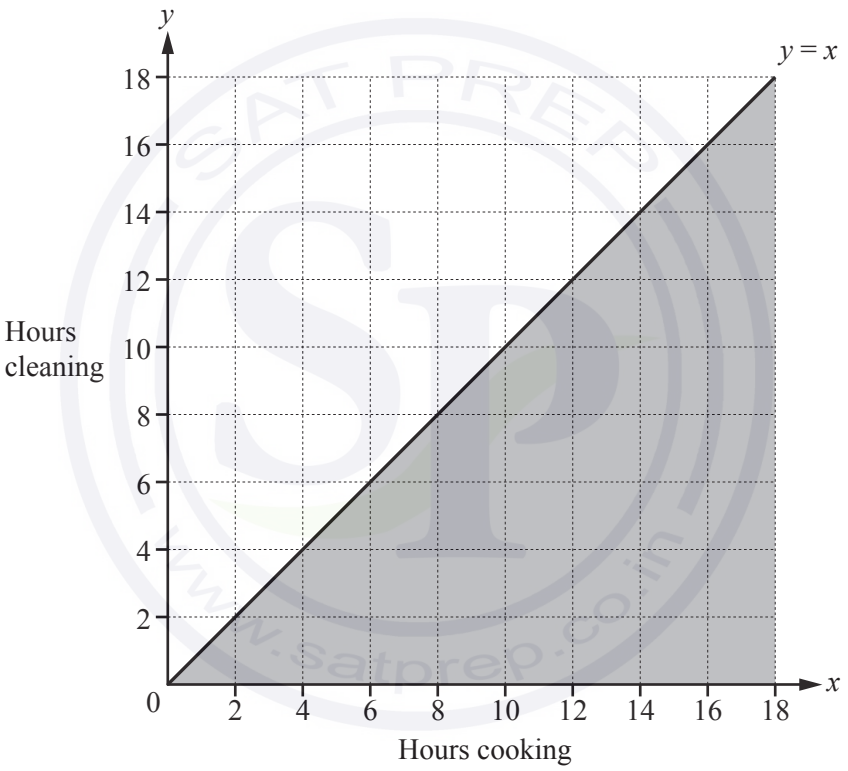
She spends no more than 16 hours in total cooking and cleaning.
She spends at least 4 hours cooking.

(a) Write down two more inequalities in x and/or y to show this information.

.....

..... [2]

(b) Complete the diagram to show the three inequalities.
Shade the **unwanted** regions.



[3]

(c) Neha receives \$10 for each hour she spends cooking and \$8 for each hour she spends cleaning.

Work out the largest amount she could receive.

\$..... [2]

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

MATHEMATICS **0580/22**

Paper 2 (Extended) **October/November 2017**

1 hour 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.
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Answer **all** questions.
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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 70.

This document consists of **11** printed pages and **1** blank page.

CAMBRIDGE International Examinations

1 One day, at noon, in Maseru, the temperature was 17 °C.
At midnight the temperature was 20 °C lower.

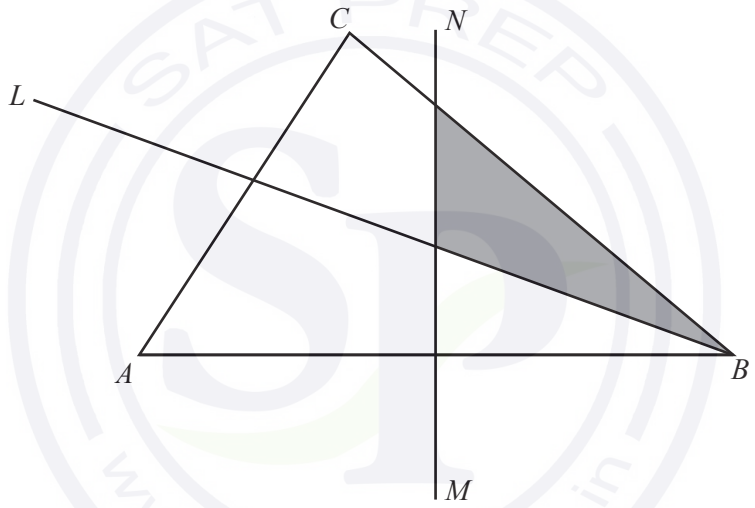
Work out the temperature at midnight.

..... °C [1]

2 Write 5.17×10^{-3} as an ordinary number.

..... [1]

3



In the diagram, *BL* is the bisector of angle *ABC* and *MN* is the perpendicular bisector of *AB*.

Complete the statement.

The shaded region contains the points, inside triangle *ABC*, that are

- nearer to *B* than to *A*

and

- nearer to ..... than to ..... [1]

4 **(a)** 1 and 12 are factors of 12.

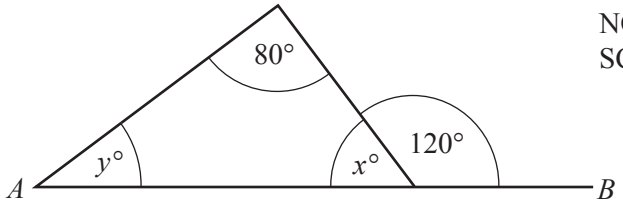
Write down all the other factors of 12.

..... [1]

(b) Write down the multiples of 9 between 20 and 40.

..... [1]

5



NOT TO SCALE

In the diagram, AB is a straight line.

Find the value of x and the value of y.

$x =$ .....

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

6 Write 55 g as a percentage of 2.2 kg.

.....% [2]

7 The area of a triangle is 528 cm^2.
The length of its base is 33 cm.

Calculate the perpendicular height of the triangle.

..... cm [2]

8 Amar cycles at a speed of 18 km/h.
It takes him 55 minutes to cycle between two villages.

Calculate the distance between the two villages.

..... km [2]

9 Work out, giving your answer in standard form.

$$1.2 \times 10^{40} + 1.2 \times 10^{41}$$

..... [2]

10 The sides of a triangle are 5.2 cm, 6.3 cm and 9.4 cm, each correct to the nearest millimetre.

Calculate the lower bound of the perimeter of the triangle.

..... cm [2]

11 Write the recurring decimal $0.\dot{4}\dot{8}$ as a fraction.
Show all your working.

..... [2]

12 Expand the brackets and simplify.

$$(5-n)(3+n)$$

..... [2]

13 **(a)** Write $\frac{11}{3}$ as a mixed number.

..... [1]

(b) **Without using a calculator**, work out $\frac{1}{4}+\frac{5}{12}$.
Show all the steps of your working and give your answer as a fraction in its lowest terms.

..... [2]

14 Find the integers which satisfy the inequality.

$$-5 < 2n-1 \leqslant 5$$

..... [3]

15 Write as a single fraction in its simplest form.

$$\frac{x+1}{x} - \frac{y-1}{y}$$

..... [3]

16 Here are the first four terms of a sequence.

23 17 11 5

(a) Find the next term.

..... [1]

(b) Find the nth term.

..... [2]

17

NOT TO SCALE

The diagram shows part of a regular polygon.
The exterior angle is $x°$.
The interior angle is $29x°$.

Work out the number of sides of this polygon.

..... [3]

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

$$y = \frac{x}{2}$$
$$2x - y = 1$$

$x =$ .....

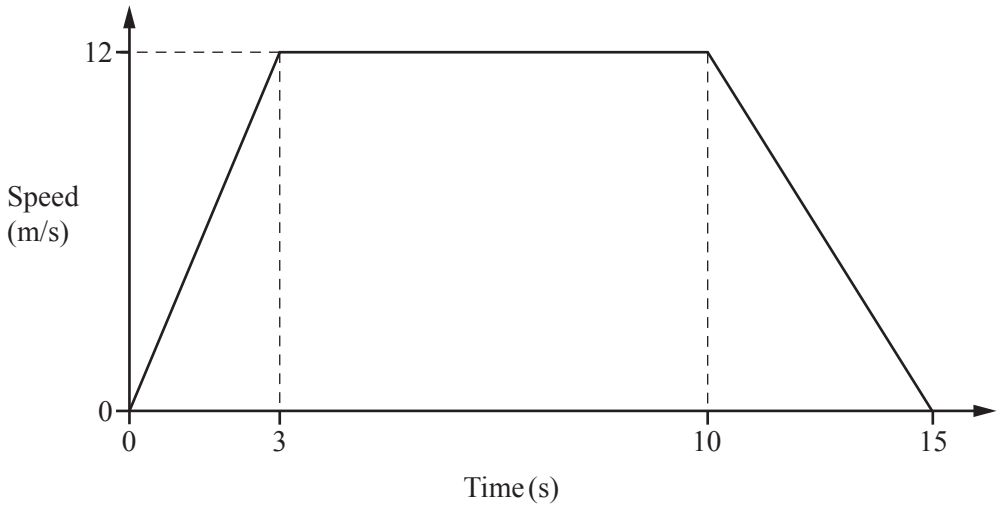
$y =$ ..... [3]

19 Make x the subject of the formula.

$$y = \sqrt{x^2 + 1}$$

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

20



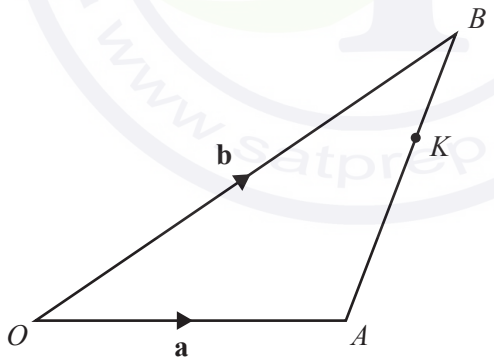
NOT TO SCALE

The diagram shows a speed-time graph.

Calculate the total distance travelled.

..... m [3]

21



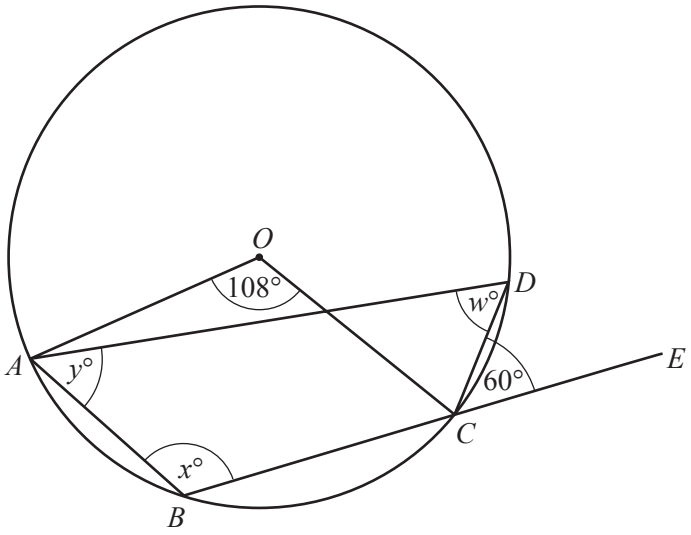
NOT TO SCALE

O is the origin and K is the point on AB so that $AK : KB = 2 : 1$.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

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

..... [3]

22



NOT TO SCALE

A, *B*, *C* and *D* are points on the circle, centre *O*.
BCE is a straight line.
Angle *AOC* = 108° and angle *DCE* = 60°.

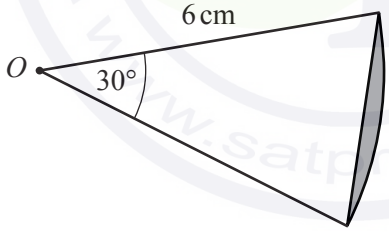
Calculate the values of *w*, *x* and *y*.

w = ...

x = ...

y = ... [3]

23



NOT TO SCALE

The diagram shows a sector of a circle, centre *O* and radius 6 cm.
The sector angle is 30°.
The area of the shaded segment is $(k\pi - c)$ cm^2, where *k* and *c* are integers.

Find the value of *k* and the value of *c*.

k = ...

c = ... [3]

24 Solve the equations.

(a) $7-3n=11n+2$

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

(b) $\frac{p-3}{5}=3$

$p =$ ..... [2]

25 Factorise completely.

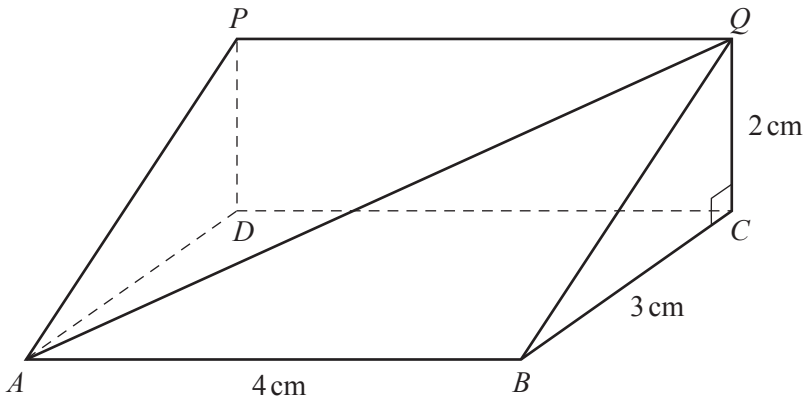
(a) $x^2-x-132$

..... [2]

(b) x^3-4x

..... [2]

26



NOT TO SCALE

The diagram shows a prism of length 4 cm.
The cross section is a right-angled triangle.
$BC = 3$ cm and $CQ = 2$ cm.

Calculate the angle between the line AQ and the base, $ABCD$, of the prism.

..... [4]

27 Simplify.

(a) $81^{\frac{3}{4}}$

..... [1]

(b) $x^{\frac{2}{3}} \div x^{-\frac{4}{3}}$

..... [1]

(c) $\left(\frac{8}{y^6}\right)^{-\frac{1}{3}}$

..... [2]

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

0243113261

MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2017**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

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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 70.

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1 Simplify.

$(x^2)^5$

..... [1]

2 The thickness of one sheet of paper is 8×10^{-3} cm.

Work out the thickness of 250 sheets of paper.

..... cm [1]

3 Write 23.4571 correct to

(a) 4 significant figures,

..... [1]

(b) the nearest 10.

..... [1]

4 The table shows the temperatures in five places at 10 am one day in January.

Place	Temperature (°C)
Helsinki	−7
Chicago	−10
London	3
Moscow	−4
Bangkok	26

(a) Which place was the coldest?

..... [1]

(b) At 2 pm the temperature in Helsinki had increased by 4 °C.

Write down the temperature in Helsinki at 2 pm.

..... °C [1]

5 Factorise completely.

$$12n^2 - 4mn$$

..... [2]

6 **(a)** $2^r = \frac{1}{16}$

Find the value of r.

$r =$ ..... [1]

(b) $3^t = \sqrt[5]{3}$

Find the value of t.

$t =$ ..... [1]

7 **Without using a calculator**, work out $1\frac{2}{3} + \frac{5}{7}$.

Write down all the steps of your working and give your answer as a mixed number in its simplest form.

..... [3]

8 Simon has two boxes of cards.
In one box, each card has one shape drawn on it that is either a triangle or a square.
In the other box, each card is coloured either red or blue.

Simon picks a card from each box at random.
The probability of picking a triangle card is t.
The probability of picking a red card is r.

Complete the table for the cards that Simon picks, writing each probability in terms of r and t.

Event	Probability
Triangle and red	
Square and red	$(1 - t)r$
Triangle and blue	
Square and blue	

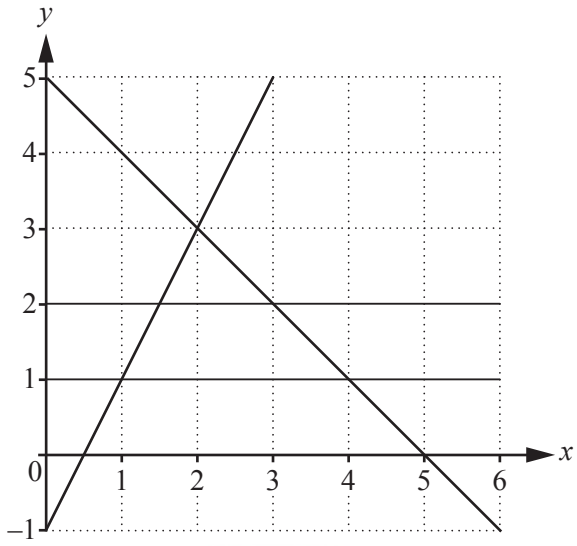
[3]

9 h is directly proportional to the square root of p.
$h = 5.4$ when $p = 1.44$.

Find h when $p = 2.89$.

$h =$ ..... [3]

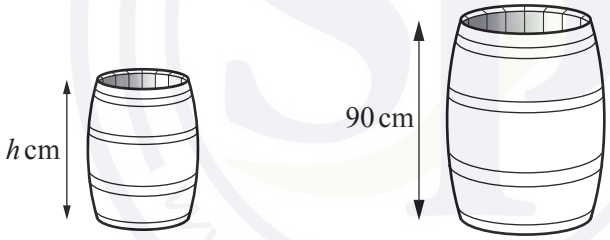
10



By shading the **unwanted** regions of the grid, find and label the region R that satisfies the following four inequalities.

$y \leqslant 2$ $y \geqslant 1$ $y \leqslant 2x - 1$ $y \leqslant 5 - x$ [3]

11 The two barrels in the diagram are mathematically similar.



NOT TO SCALE

The smaller barrel has a height of h cm and a capacity of 100 litres.
The larger barrel has a height of 90 cm and a capacity of 160 litres.

Work out the value of h.

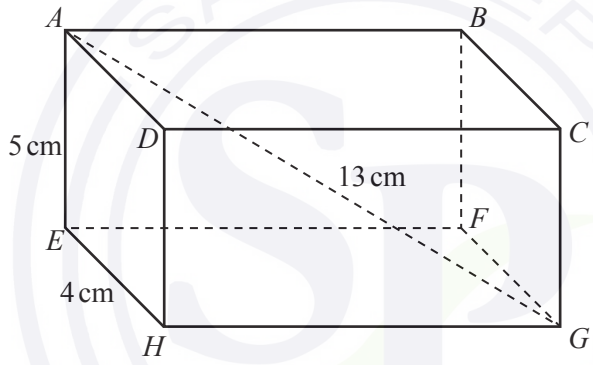
$h =$ ..... [3]

12 A line has gradient 5.
M and *N* are two points on this line.
M is the point $(x, 8)$ and *N* is the point $(k, 23)$.

Find an expression for x in terms of k.

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

13



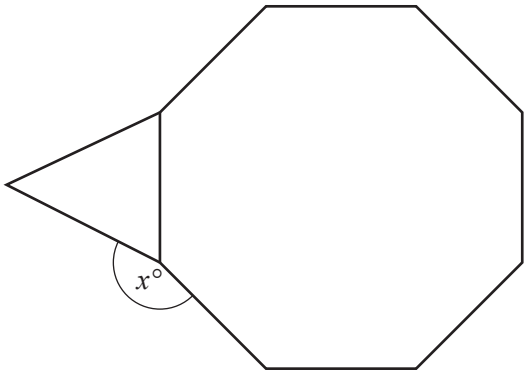
NOT TO SCALE

The diagram shows a cuboid *ABCDEFGH*.
$AE = 5$ cm, $EH = 4$ cm and $AG = 13$ cm.

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

..... [3]

14 The diagram shows a regular octagon joined to an equilateral triangle.

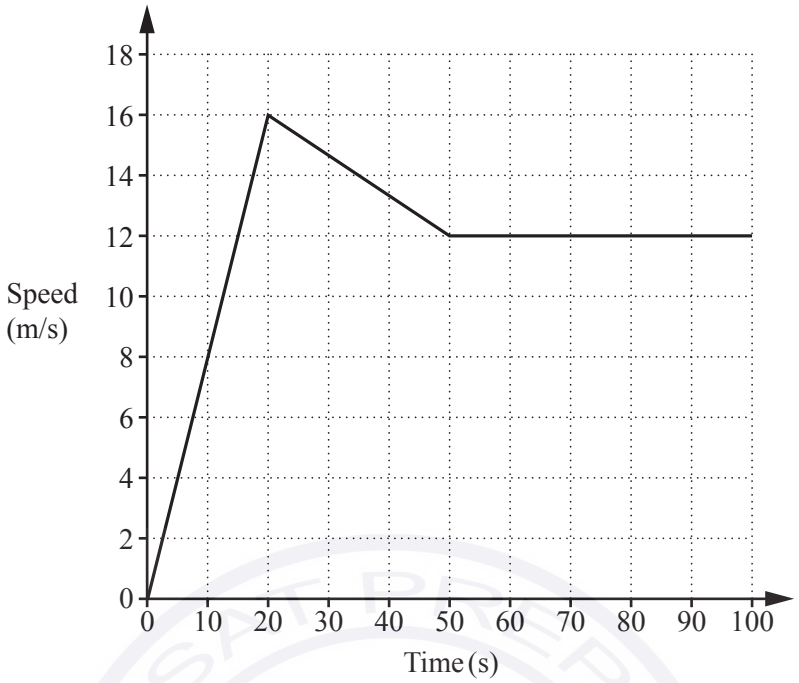


NOT TO SCALE

Work out the value of x.

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

15 The diagram shows information about the first 100 seconds of a car journey.



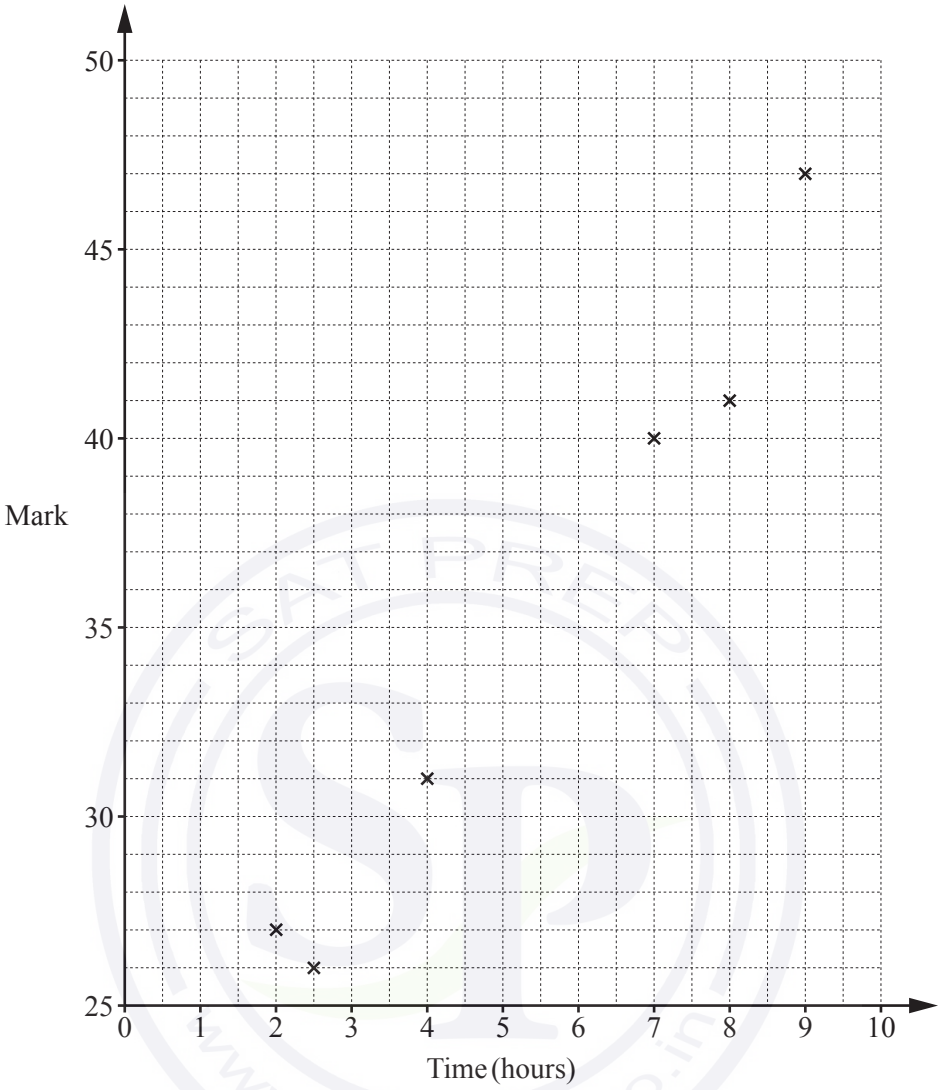
(a) Calculate the acceleration during the first 20 seconds of the journey.

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

(b) Work out the total distance travelled by the car in the 100 seconds.

.....m [3]

16 Six students revise for a test.
The scatter diagram shows the time, in hours, each student spent revising and their mark in the test.



(a) The data for two more students is shown in the table.

Time (hours)	4.5	6.5
Mark	33	35

Plot these two points on the scatter diagram. [1]

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

..... [1]

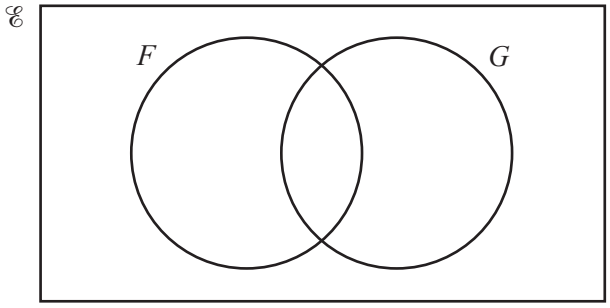
(c) Draw a line of best fit on the scatter diagram. [1]

(d) Another student spent 5.5 hours revising.

Estimate a mark for this student.

..... [1]

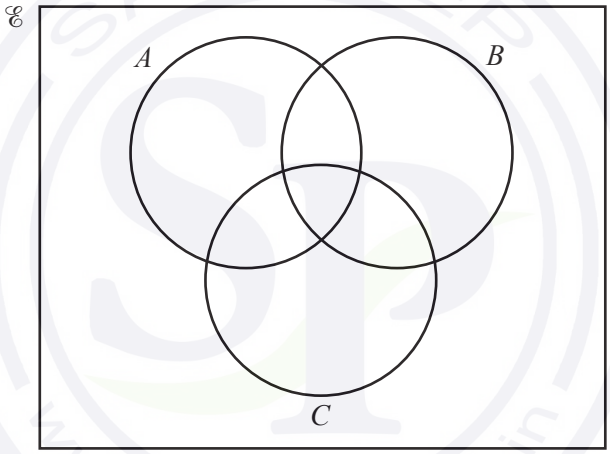
17 **(a)** In this Venn diagram, shade the region $F \cup G'$.



[1]

(b) $\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$
$A = \{x: x \text{ is an odd number}\}$
$B = \{x: x \text{ is a square number}\}$
$C = \{x: x \text{ is a multiple of 3}\}$

(i) Write all the elements of $\mathscr{E}$ in the Venn diagram below.



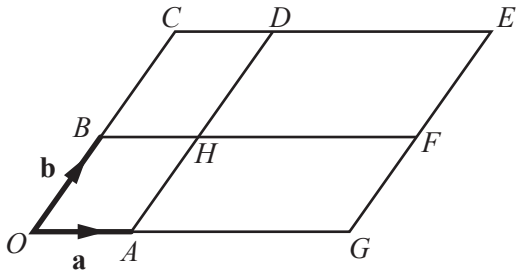
[2]

(ii) Another number is included in the set $\mathscr{E}$.
This number is in the region $A' \cap B \cap C$.

Write down a possible value for this number.

..... [1]

18 The diagram shows a parallelogram *OCEG*.



NOT TO SCALE

O is the origin, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
BHF and *AHD* are straight lines parallel to the sides of the parallelogram.
$\overrightarrow{OG} = 3\overrightarrow{OA}$ and $\overrightarrow{OC} = 2\overrightarrow{OB}$.

(a) Write the vector $\overrightarrow{HE}$ in terms of **a** and **b**.

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

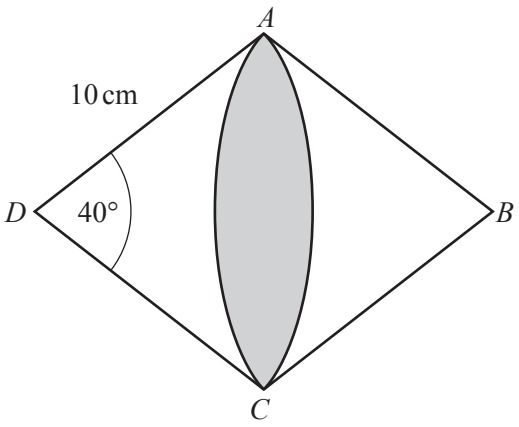
(b) Complete this statement.

a + 2**b** is the position vector of point ..... [1]

(c) Write down two vectors that can be written as 3**a** − **b**.

..... and ..... [2]

19 *ABCD* is a rhombus with side length 10 cm.



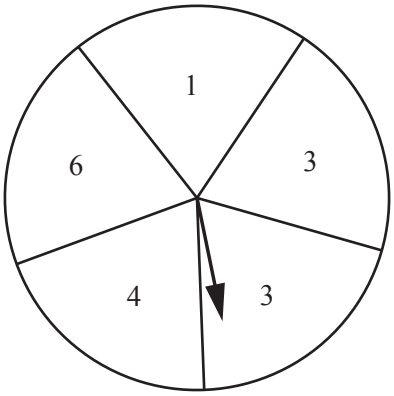
NOT TO SCALE

Angle $ADC = 40°$.
DAC is a sector of a circle with centre *D*.
BAC is a sector of a circle with centre *B*.

Calculate the shaded area.

..... cm^2 [4]

20 The diagram shows a fair spinner.



Anna spins it twice and adds the scores.

(a) Complete the table for the total scores.

		Score on first spin				
		1	3	3	4	6
Score on second spin	1	2	4	4	5	7
	3	4	6	6	7	9
	3	4	6	6	7	9
	4					
	6					

[1]

(b) Write down the most likely total score.

..... [1]

(c) Find the probability that Anna scores

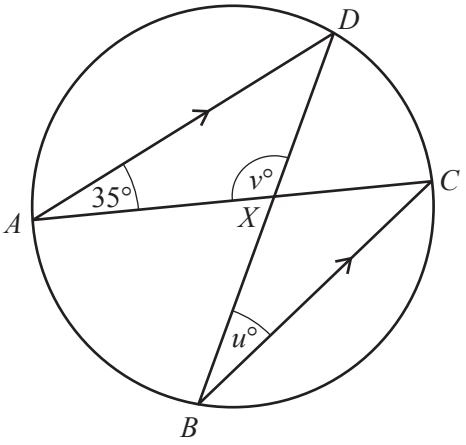
(i) a total less than 6,

..... [2]

(ii) a total of 3.

..... [1]

21 (a)



NOT TO SCALE

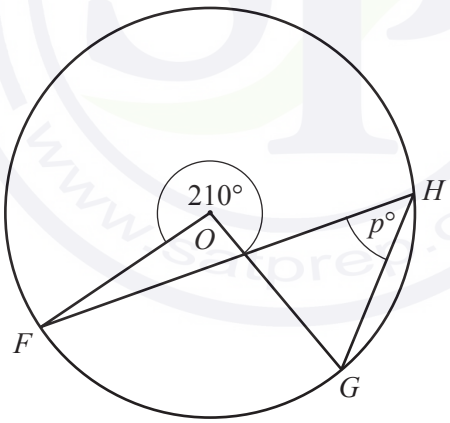
A, B, C and D are points on the circle.
AD is parallel to BC.
The chords AC and BD intersect at X.

Find the value of u and the value of v.

$u =$ .....

$v =$ ..... [3]

(b)



NOT TO SCALE

F, G and H are points on the circle, centre O.

Find the value of p.

$p =$ ..... [2]

22 Write as a single fraction in its simplest form.

(a) $\dfrac{x^2-3x}{x^2-9}$

..... [3]

(b) $\dfrac{3}{x-4}+\dfrac{2}{2x+5}$

..... [3]

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Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2343051529

MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2017**

1 hour 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 70.

1 Write 0.071 64 correct to 2 significant figures.

..... [1]

2 The probability that Stephanie wins her next tennis match is 0.85 .

Find the probability that Stephanie does not win her next tennis match.

..... [1]

3 Change 6200 cm^2 into m^2.

..... m^2 [1]

4 Calculate $\sqrt{120} + 3.8^2 - 25$.

..... [1]

5 Work out 85 cents as a percentage of \$2.03 .

..... % [1]

6 Factorise.

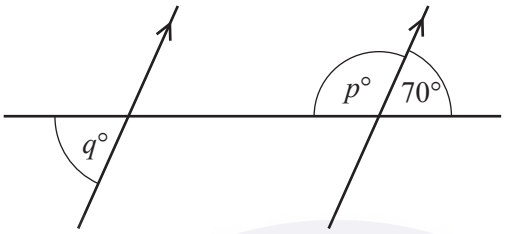
$14x - 21y$

..... [1]

7 Find the value of $5a - 3b$ when $a = 7$ and $b = -2$.

..... [2]

8



NOT TO SCALE

The diagram shows a straight line intersecting two parallel lines.

Find the value of p and the value of q.

$p =$ .....

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

9 **Without using a calculator**, work out $\frac{5}{6} - \frac{1}{2}$.

Show all the steps of your working and give your answer as a fraction in its simplest form.

..... [2]

10 Solve.

$$2-x=5x+1$$

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

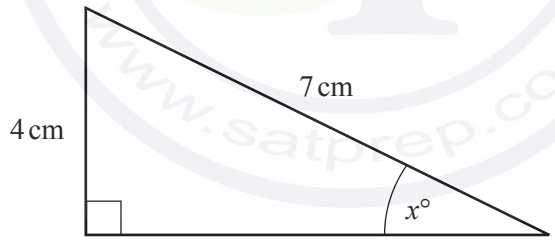
11 **(a)** Write 0.0605 in standard form.

..... [1]

(b) Calculate $0.1\times5.1\times10^{4}$, giving your answer in standard form.

..... [1]

12



NOT TO SCALE

Calculate the value of x.

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

13 Solve the inequality.

$$3n - 11 > 5n - 18$$

..... [2]

14 Work out.

(a) $125^{\frac{2}{3}}$

..... [1]

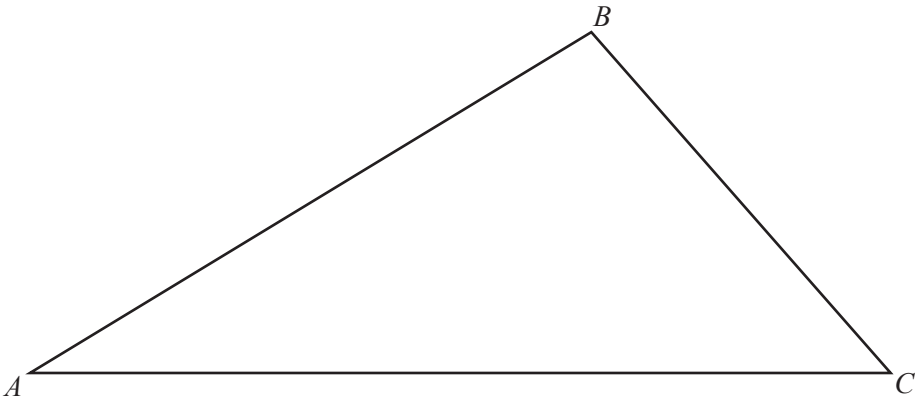
(b) $\left(\frac{1}{3}\right)^{-2}$

..... [1]

15 Make q the subject of the formula $p = 2q^2$.

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

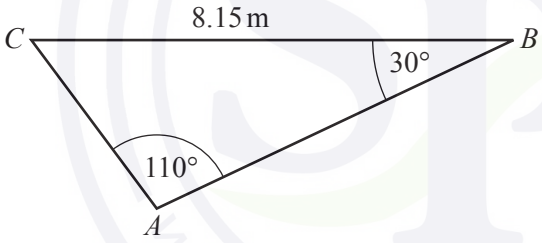
16



(a) **Using a straight edge and compasses only**, construct the bisector of angle *BAC*. [2]

(b) Shade the region inside the triangle that is nearer to *AC* than to *AB*. [1]

17



NOT TO SCALE

Calculate *AC*.

AC = ... m [3]

18 A rectangle has length 62 mm and width 47 mm, both correct to the nearest millimetre.
The area of this rectangle is A mm^2.

Complete the statement about the value of A.

..... $\leqslant A <$ ..... [3]

19 In a triangle PQR, $PQ = 8$ cm and $QR = 7$ cm.
The area of this triangle is 17 cm^2.

Calculate the two possible values of angle PQR.

Angle PQR = ... or ..... [3]

20 Write as a single fraction in its simplest form.

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

..... [3]

21 y is inversely proportional to $\sqrt{1+x}$.
When $x = 8$, $y = 2$.

Find y when $x = 15$.

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

22 Factorise completely.

(a) $9t^2 - u^2$

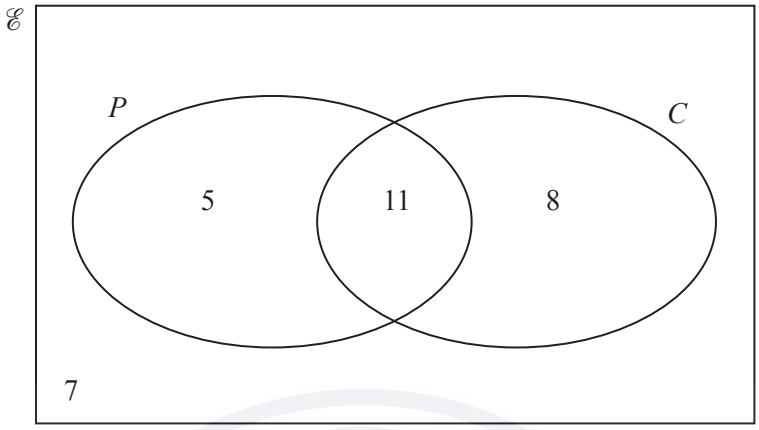
..... [2]

(b) $2c - 4d - pc + 2pd$

..... [2]

23 **(a)** $\mathscr{E}$ = {students in a class}
P = {students who study physics}
C = {students who study chemistry}

The Venn diagram shows numbers of students.



(i) Find the number of students who study physics or chemistry.

..... [1]

(ii) Find $n(P \cap C')$.

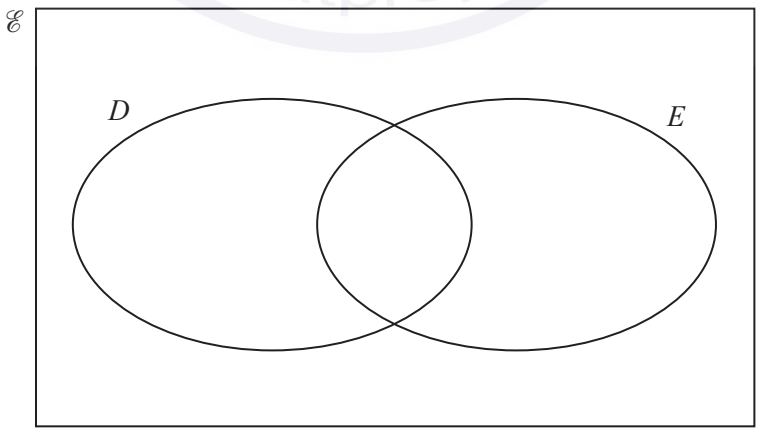
..... [1]

(iii) A student who does not study chemistry is chosen at random.

Find the probability that this student does not study physics.

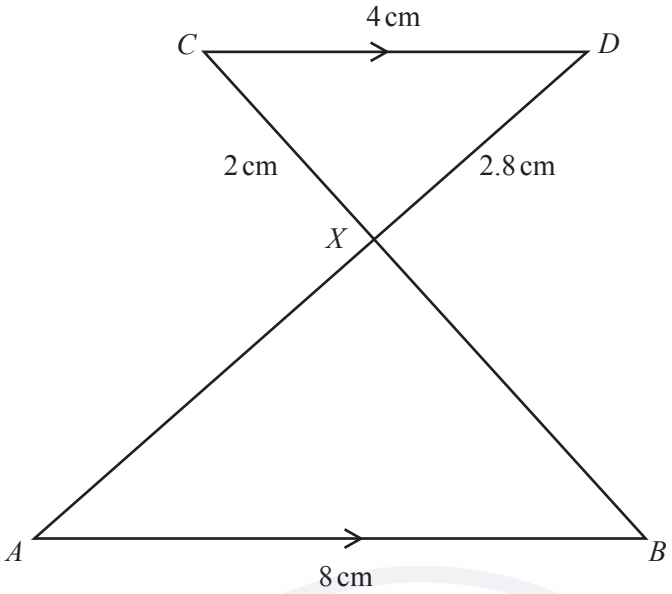
..... [1]

(b) On the Venn diagram below, shade the region $D \cup E'$.



[1]

24



NOT TO SCALE

In the diagram, AB and CD are parallel.
AD and BC intersect at X.
$AB = 8$ cm, $CD = 4$ cm, $CX = 2$ cm and $DX = 2.8$ cm.

(a) Complete this mathematical statement.

Triangle ABX is ..... to triangle DCX. [1]

(b) Calculate AX.

$AX =$ ..... cm [2]

(c) The area of triangle ABX is y cm^2.

Find the area of triangle DCX in terms of y.

..... cm^2 [1]

25 **(a)** Simplify. $(16x^{16})^{\frac{3}{4}}$

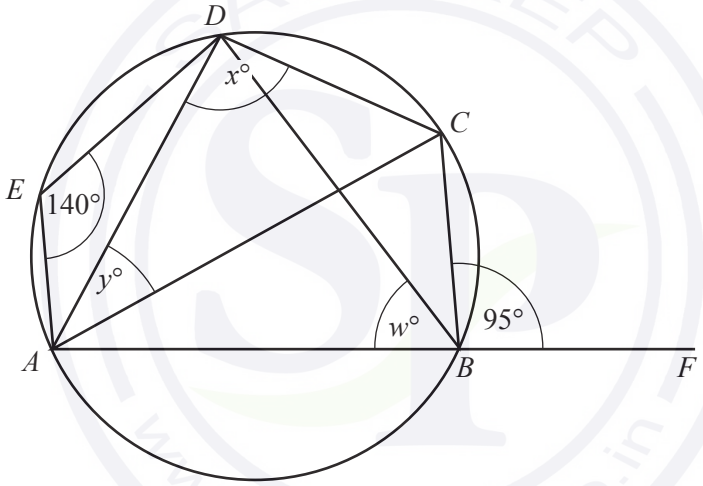
..... [2]

(b) $2p^{\frac{3}{2}} = 54$

Find the value of p.

$p =$ ..... [2]

26



NOT TO SCALE

A, B, C, D and E lie on the circle.
AB is extended to F.
Angle $AED = 140°$ and angle $CBF = 95°$.

Find the values of w, x and y.

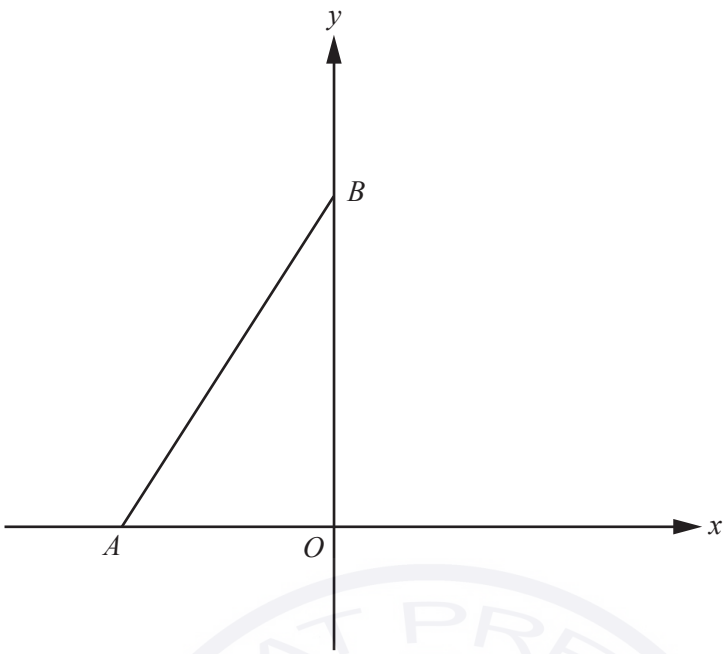
$w =$ .....

$x =$ .....

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

Question 27 is printed on the next page.

27



NOT TO SCALE

A is the point $(-2, 0)$ and B is the point $(0, 4)$.

(a) Find the equation of the straight line joining A and B.

..... [3]

(b) Find the equation of the perpendicular bisector of AB.

..... [4]

Cambridge IGCSE

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

3969340058

MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2017**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

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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 70.

This document consists of **11** printed pages and **1** blank page.

CAMBRIDGE International Examinations

1 Calculate $\sqrt{\frac{1}{2}(1-\cos 48°)}$.

.....[1]

2 Factorise completely.

$$4x^2 - 8xy$$

.....[2]

3 Find the lowest common multiple (LCM) of 20 and 24.

.....[2]

4 Make a the subject of the formula.

$$x = y + \sqrt{a}$$

$a =$ .....[2]

5 Calculate the volume of a **hemisphere** with radius 3.2 cm.

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

.....cm^3 [2]

6 The probability that Pedro scores a goal in any match is $\frac{2}{5}$.

Calculate the probability that Pedro scores a goal in each of the next two matches.

..... [2]

7 y is inversely proportional to x^2.
When $x = 2$, $y = 8$.

Find y in terms of x.

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

8 Simplify.

$$\left(\frac{8}{a^{12}}\right)^{\frac{1}{3}}$$

..... [2]

9 **(a)** $\overrightarrow{GH} = \begin{pmatrix} 6 \\ -4 \end{pmatrix}$

Find

(i) $5\overrightarrow{GH}$,

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

(ii) $\overrightarrow{HG}$.

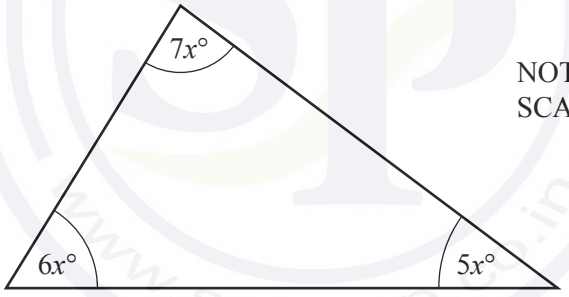
$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(b) $\begin{pmatrix} 6 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ y \end{pmatrix} = \begin{pmatrix} 8 \\ 3 \end{pmatrix}$

Find the value of y.

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

10 The three angles in a triangle are $5x°$, $6x°$ and $7x°$.



NOT TO SCALE

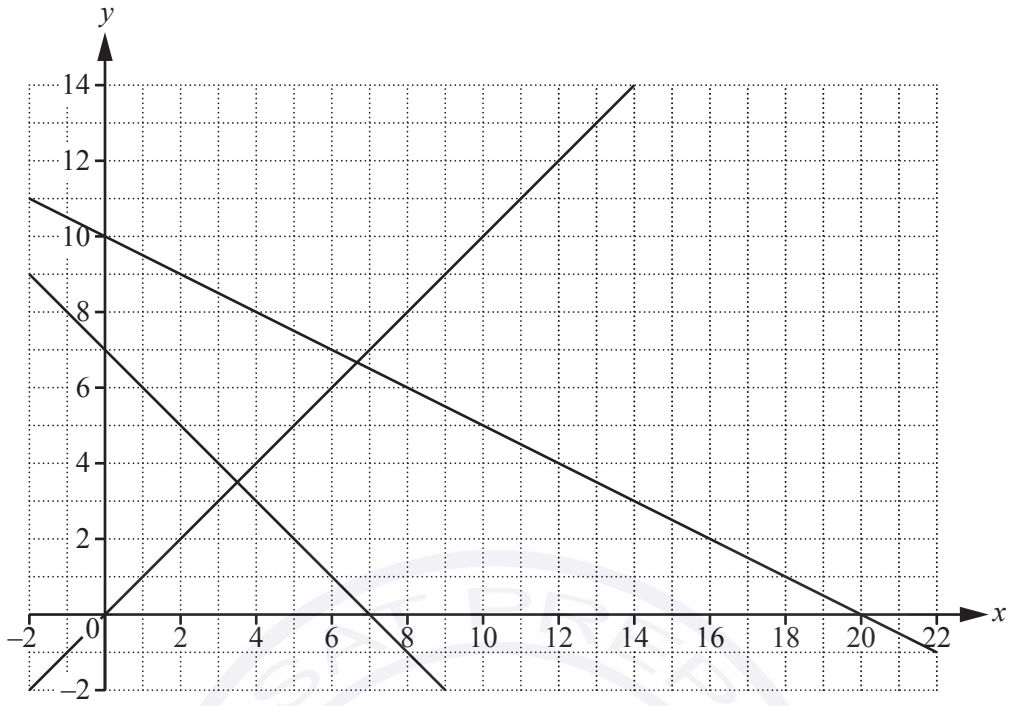
(a) Find the value of x.

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

(b) Work out the size of the largest angle in the triangle.

..... [1]

11



By shading the unwanted regions of the grid above, find and label the region R that satisfies the following four inequalities.

$x \geqslant 0$ $x + y \geqslant 7$ $y \geqslant x$ $x + 2y \leqslant 20$

[3]

12 $f(x) = 3 + 4x$ $g(x) = 6x + 7$

Find, in its simplest form,

(a) $f(3x)$,

.....[1]

(b) $fg(x)$.

.....[2]

13 Two bottles and their labels are mathematically similar.
The smaller bottle contains 0.512 litres of water and has a label with area 96 cm^2.
The larger bottle contains 1 litre of water.

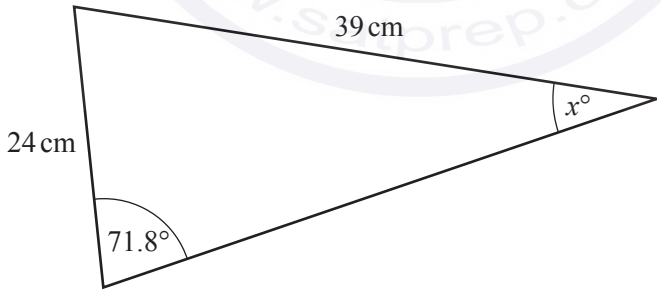
Calculate the area of the larger label.

.....cm^2 [3]

14 Write the recurring decimal $0.\dot{6}\dot{3}$ as a fraction in its lowest terms.
You must show all your working.

..... [3]

15



NOT TO SCALE

Find the value of x.

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

16 **(a)** Solve the inequality.

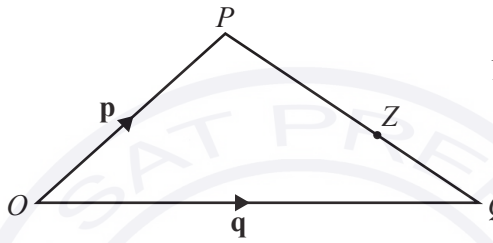
$$x + 13 \geqslant 3x + 7$$

.....[2]

(b) List the positive integers that satisfy the inequality in **part (a)**.

.....[1]

17



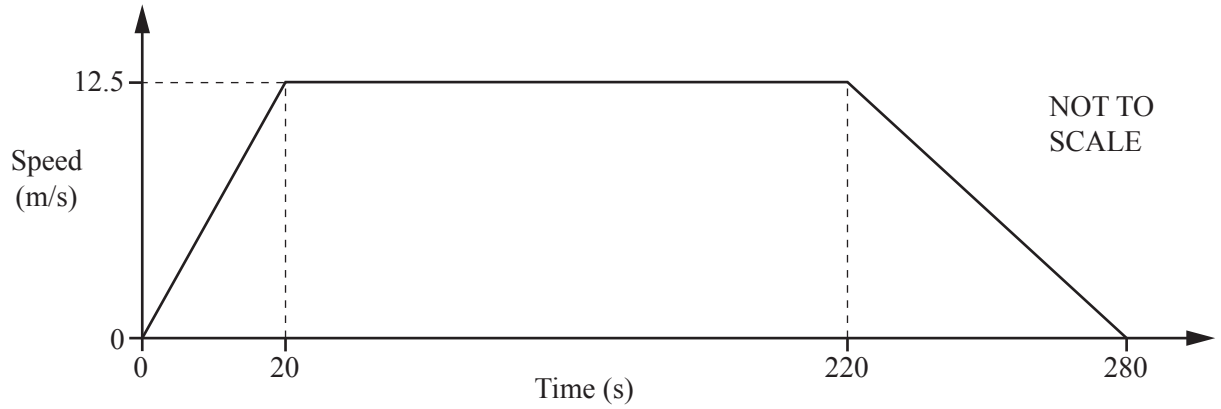
NOT TO SCALE

O is the origin, $\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OQ} = \mathbf{q}$.
Z is a point on PQ such that $PZ : ZQ = 5 : 2$.

Work out, in terms of **p** and **q**, the position vector of Z.
Give your answer in its simplest form.

.....[3]

18 The diagram shows a speed-time graph for the journey of a car.



Calculate the total distance travelled.

.....m [3]

19 **Without using your calculator**, work out $\frac{11}{12} - \left(\frac{3}{4} - \frac{2}{3}\right)$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [4]

20 Simplify.

(a) $6w^0$

..... [1]

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

..... [1]

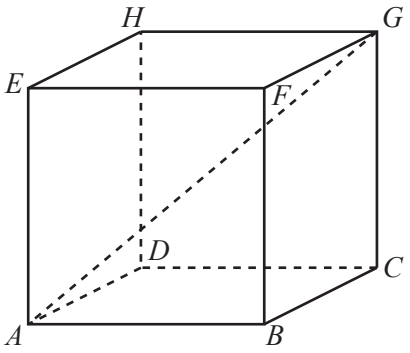
(c) $3y^6 \times 5y^{-2}$

..... [2]

21 Solve the equation $5x^2 + 10x + 2 = 0$.
You must show all your working and give your answers correct to 2 decimal places.

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

22 The diagram shows a cube *ABCDEFGH* of side length 26 cm.



NOT TO SCALE

Calculate the angle between *AG* and the base of the cube.

.....[4]

23 **(a)** Simplify.

$$\frac{4(x-6)^2}{(x-6)}$$

.....[1]

(b) Expand the brackets and simplify.

$$(x+4)^2+5(3x+2)$$

.....[3]

24 Marcel invests \$2500 for 3 years at a rate of 1.6% per year simple interest.
Jacques invests \$2000 for 3 years at a rate of x% per year compound interest.
At the end of the 3 years Marcel and Jacques receive the same amount of interest.

Calculate the value of x correct to 3 significant figures.

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

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

8545343212

MATHEMATICS **0580/22**

Paper 2 (Extended) **February/March 2017**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

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For π, use either your calculator value or 3.142.

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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 70.

This document consists of **12** printed pages.

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1 Expand the brackets and simplify.

$$4(5w+3)-2(w-1)$$

..... [2]

2 The line AB is one side of an equilateral triangle ABC.

Using a straight edge and compasses only, construct triangle ABC.

[2]

3 **Without using your calculator** and by rounding each number correct to 1 significant figure, estimate the value of

$$\frac{10.3\times 19.5}{88.9-43.2}.$$

You must show all your working.

..... [2]

4 The population of the world grows exponentially at a rate of 1.1% per year.

Find the number of years it takes for the population to grow from 7 billion to 7.31 billion.
Give your answer correct to the nearest whole number.

.....years [2]

5 $s = ut + 16t^2$

Find the value of s when $u = 2$ and $t = 3$.

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

6 Write the recurring decimal $0.1\dot{7}$ as a fraction.
Show all your working.

..... [2]

7 The length of a rectangle is 9.3 cm, correct to 1 decimal place.
Its width is 7.7 cm, correct to 1 decimal place.

Write down the lower bound and the upper bound for the area of the rectangle.

Lower bound = ... cm^2

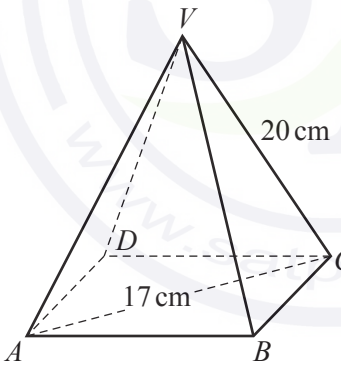
Upper bound = ... cm^2 [3]

8 **Without using your calculator**, work out $3\frac{1}{3} \div 2\frac{1}{2}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

9 The diagram shows a pyramid with a square base $ABCD$.
All the sloping edges of the pyramid are 20 cm long and $AC = 17$ cm.



NOT TO SCALE

Calculate the height of the pyramid.

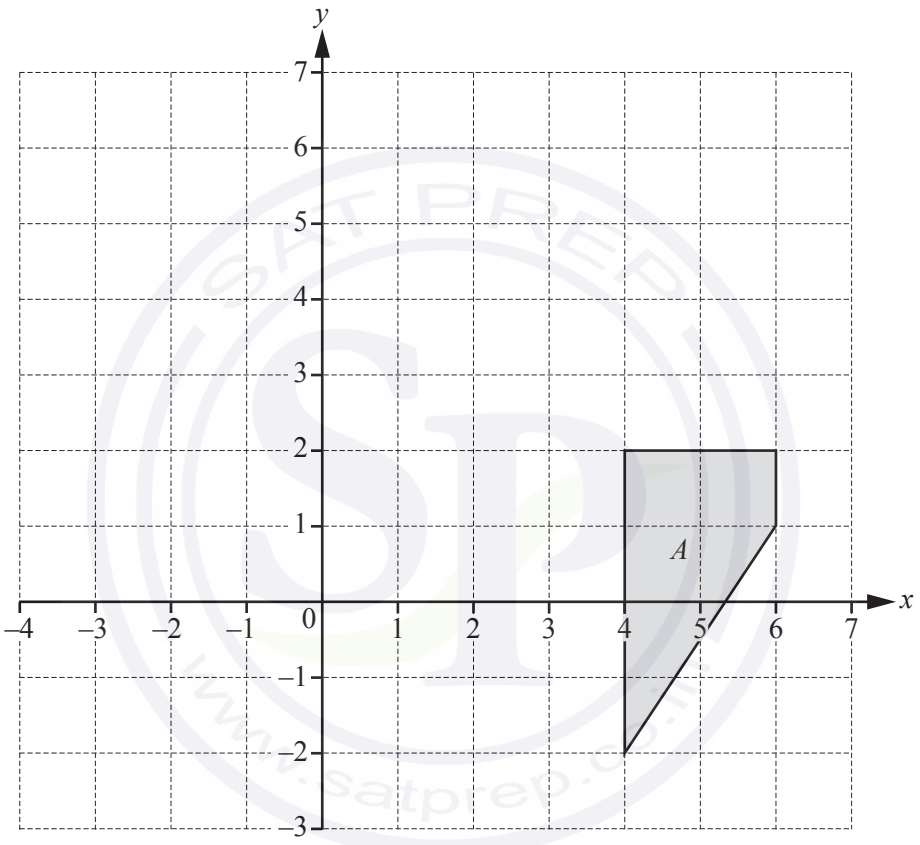
..... cm [3]

10 Indira buys a television in a sale for \$924.
This was a reduction of 12% on the original price.

Calculate the original price of the television.

\$..... [3]

11



T(X) is the image of the shape X after translation by the vector $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$.

M(Y) is the image of the shape Y after reflection in the line $x = 2$.

On the grid, draw MT(A), the image of shape A after the transformation MT. [3]

12 y is inversely proportional to x^2.
When $x = 5$, $y = 16$.

Find y when $x = 10$.

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

13 Factorise completely.

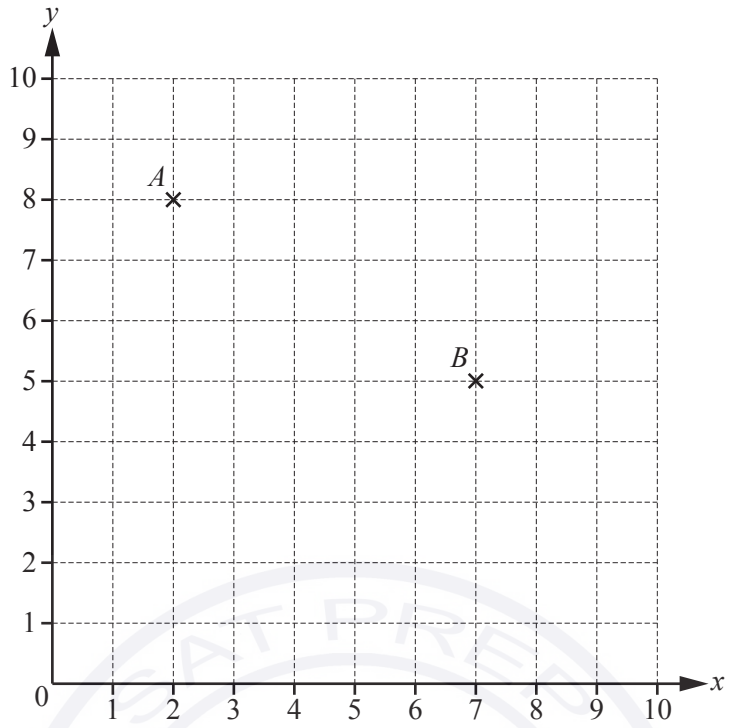
(a) $15c^2 - 5c$

..... [2]

(b) $2kp - km + 6p - 3m$

..... [2]

14



Points A and B are marked on the grid.

$\overrightarrow{BC} = \begin{pmatrix} -4 \\ 0 \end{pmatrix}$

(a) On the grid, plot the point C. [1]

(b) Write $\overrightarrow{AC}$ as a column vector.

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

(c) $\overrightarrow{DE}$ is a vector that is perpendicular to $\overrightarrow{BC}$.
The magnitude of $\overrightarrow{DE}$ is equal to the magnitude of $\overrightarrow{BC}$.

Write down a possible column vector for $\overrightarrow{DE}$.

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

15 Work out.

(a) $t^{24} \div t^4$

..... [1]

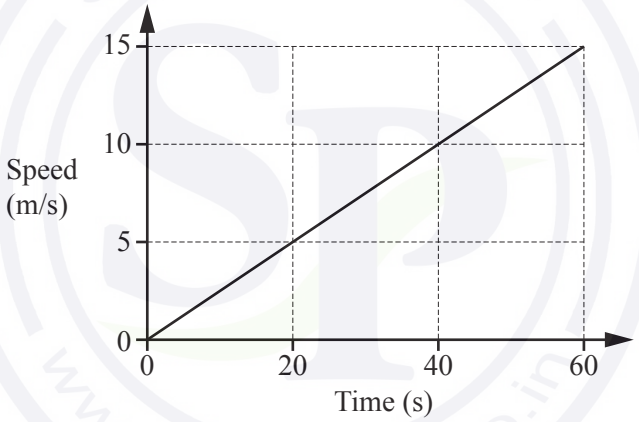
(b) $(x^5)^2$

..... [1]

(c) $(81m^8)^{\frac{3}{4}}$

..... [2]

16 The speed-time graph shows the first 60 seconds of a train journey.



(a) Find the acceleration of the train.

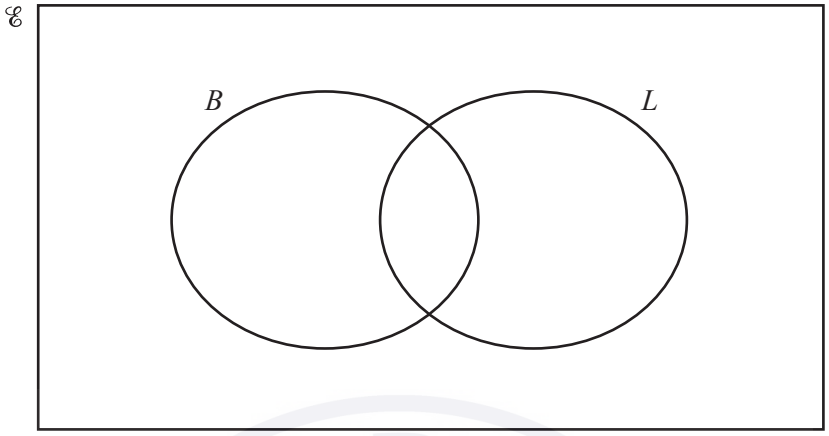
..... m/s^2 [1]

(b) Calculate the distance the train has travelled in this time.
Give your answer in kilometres.

..... km [3]

17 **(a)** A total of 20 trucks were tested at a checkpoint.

- 6 trucks failed the test for brakes (B)
- 7 trucks failed the test for lights (L)
- 9 trucks passed the tests for both brakes and lights.

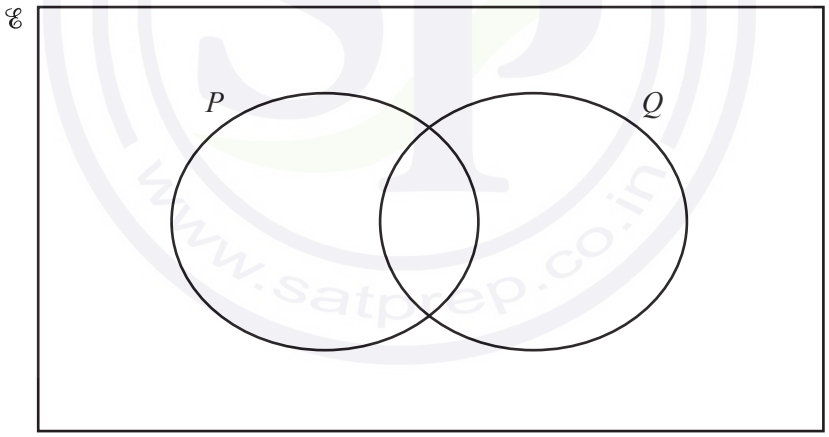


(i) Complete the Venn diagram. [2]

(ii) Find $\mathrm{n}(B' \cap L')$.

..... [1]

(b) In the Venn diagram below, shade the region $(P \cup Q) \cap Q'$.



[1]

18 $\mathbf{M} = \begin{pmatrix} 5 & 3 \\ 1 & -2 \end{pmatrix}$ $\mathbf{N} = \begin{pmatrix} 3 & -6 \\ 4 & 2 \end{pmatrix}$

Calculate

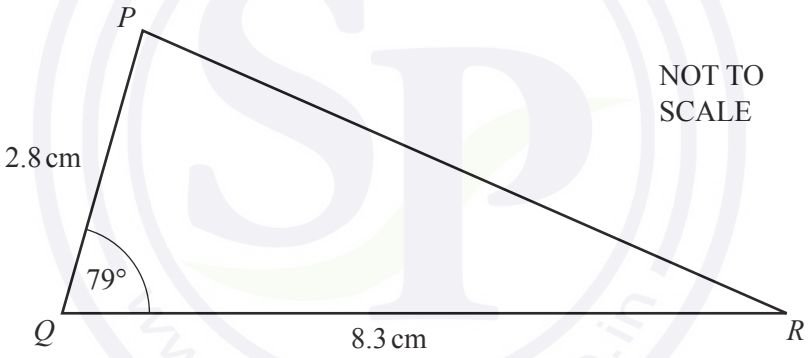
(a) **MN**,

( ) [2]

(b) $\mathbf{M}^{-1}$.

( ) [2]

19



(a) Calculate the area of triangle *PQR*.

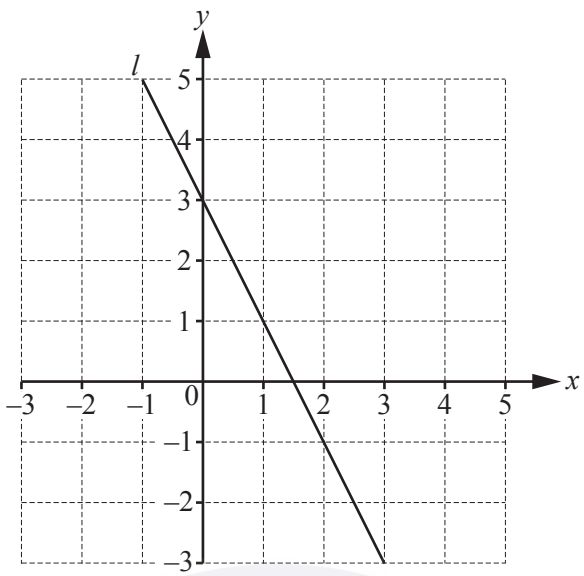
.....cm^2 [2]

(b) Triangle *PQR* is enlarged by scale factor 4.5 .

Calculate the area of the enlarged triangle.

.....cm^2 [2]

20



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

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

(b) A line perpendicular to the line l passes through the point $(3, -1)$.

Find the equation of this line.

..... [3]

Question 21 is printed on the next page.

21 $f(x) = \frac{x}{4} - 3$ $g(x) = 6x - 7$ $h(x) = 2^x$

(a) Work out the value of x when $f(x) = -0.5$.

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

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

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

(c) Work out the value of x when $h(x) = f(13)$.

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

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CANDIDATE NAME	
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4117177791

MATHEMATICS **0580/21**

Paper 2 (Extended) **October/November 2016**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

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The total of the marks for this paper is 70.

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1 Write down the temperature which is 5 °C below –2 °C.

..... °C [1]

2 Write 0.040 190 7 correct to

(a) 3 significant figures,

.....[1]

(b) 3 decimal places.

.....[1]

3 The price of a toy is 12 euros (€) in Germany and 14 Swiss francs in Switzerland.
1 Swiss franc = €0.905

Calculate the difference between these two prices.
Give your answer in euros.

€ .....[2]

4 Work out $\frac{2}{3} - \frac{1}{4}$, giving your answer as a fraction in its lowest terms.

Do not use a calculator and show all the steps of your working.

.....[2]

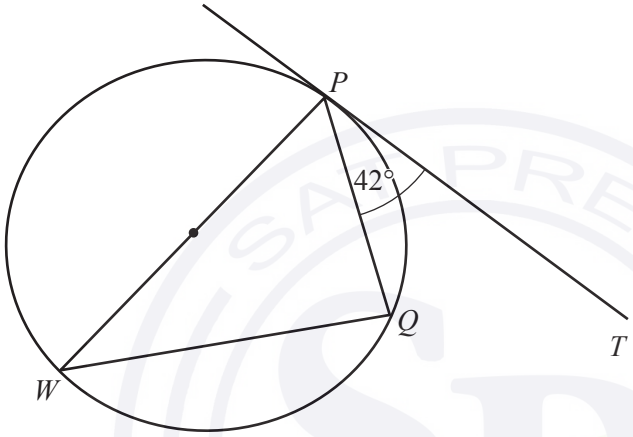
5 **(a)** Write 5^{-3} as a fraction.

..... [1]

(b) Write 0.004 56 in standard form.

..... [1]

6



NOT TO SCALE

In the diagram, PT is a tangent to the circle at P.
PW is a diameter and angle $TPQ = 42°$.

Find angle PWQ.

Angle PWQ = ... [2]

7 Simplify. $\dfrac{x^3y + 2xy^3}{x^2y^2}$

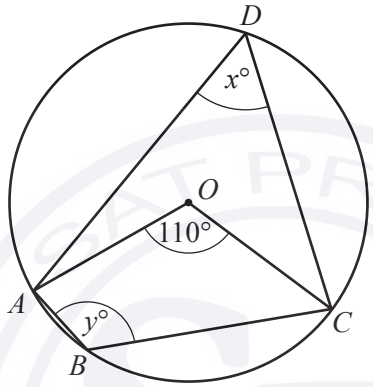
..... [2]

8 Write as a single fraction.

$$1 - \frac{2}{p} - \frac{3}{t}$$

..... [2]

9



NOT TO SCALE

A, B, C and D lie on the circle, centre O.

Find the value of x and the value of y.

x = ...

y = ... [2]

10 Simplify.

$$(36x^{16})^{\frac{1}{2}}$$

..... [2]

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

$$2x + 3y = 13$$
$$x + 2y = 9$$

$x =$ .....

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

12 **(a)** Write \$0.70 as a fraction of \$5.60, giving your answer in its lowest terms.

..... [1]

(b) Write the recurring decimal $0.\dot{1}\dot{8}$ as a fraction in its lowest terms.
[$0.\dot{1}\dot{8}$ means 0.181818…]

..... [2]

13 Factorise completely.

(a) $4p^2 - 9$

..... [1]

(b) $2ax - 4bx - ay + 2by$

..... [2]

14 y is directly proportional to the square root of $(x + 2)$.
When $x = 7$, $y = 2$.

Find y when $x = 98$.

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

15 Work out.

(a) $2\begin{pmatrix} 3 \\ 5 \end{pmatrix} - \begin{pmatrix} 1 \\ 2 \end{pmatrix}$

..... [1]

(b) $\begin{pmatrix} 1 & 2 \end{pmatrix}\begin{pmatrix} 2 \\ 3 \end{pmatrix}$

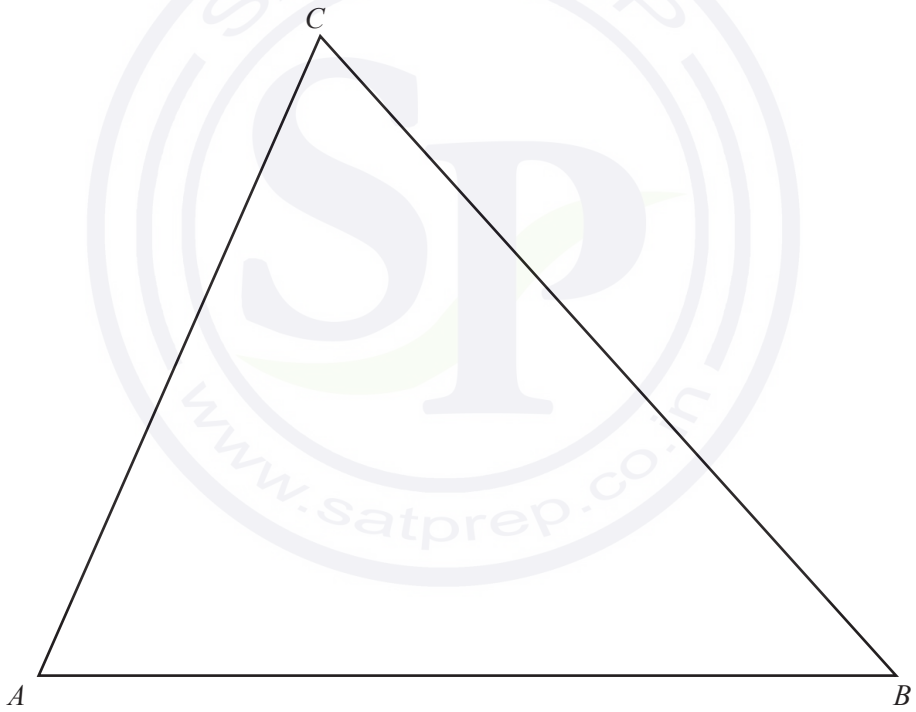
..... [2]

16 Two cups are mathematically similar.
The larger cup has capacity 0.5 litres and height 8 cm.
The smaller cup has capacity 0.25 litres.

Find the height of the smaller cup.

..... cm [3]

17



(a) Construct the locus of points, inside the triangle, that are 5 cm from B. [1]

(b) Construct the locus of points, inside the triangle, that are equidistant from AB and BC. [2]

(c) Shade the region, inside the triangle, containing points that are

- more than 5 cm from B

and

- nearer to AB than to BC. [1]

[Turn over

18 $y = p^2 + qr$

(a) Find y when $p = -5$, $q = 3$ and $r = -7$.

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

(b) Write p in terms of q, r and y.

$p =$ ..... [2]

19 Find the nth term of each sequence.

(a) 7, 13, 19, 25, 31, …

..... [2]

(b) 9, 16, 25, 36, 49, …

..... [2]

20 A train travels for m minutes at a speed of x metres per second.

(a) Find the distance travelled, in **kilometres**, in terms of m and x.
Give your answer in its simplest form.

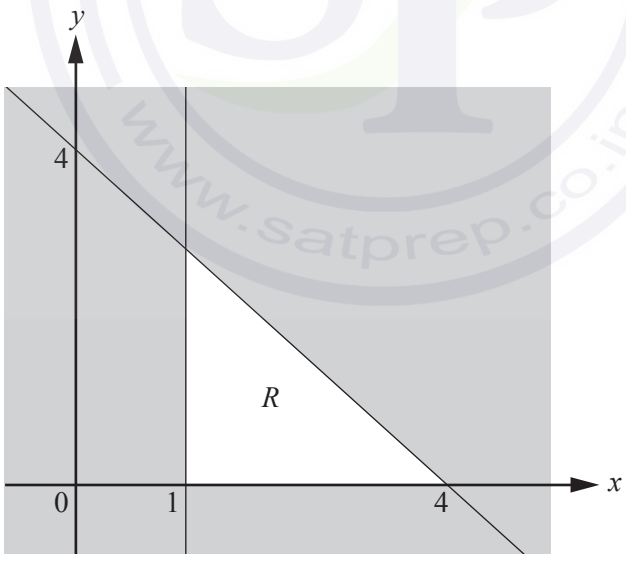
..... km [2]

(b) When $m = 5$, the train travels 10.5 km.

Find the value of x.

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

21



NOT TO SCALE

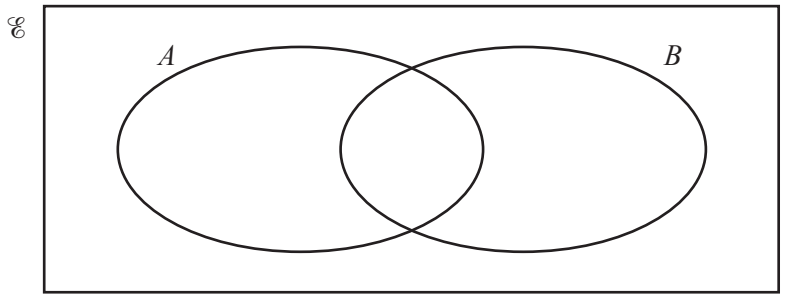
Write down the three inequalities that define the unshaded region, R.

.....

.....

..... [4]

22 **(a)** $n(\mathscr{E}) = 10,\ n(A) = 7,\ n(B) = 6,\ n(A \cup B)' = 1.$



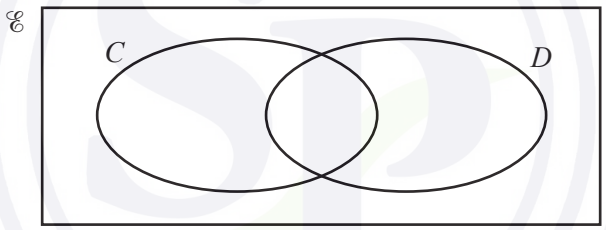
(i) Complete the Venn diagram by writing the number of elements in each subset. [2]

(ii) An element of $\mathscr{E}$ is chosen at random.

Find the probability that this element is an element of $A' \cap B$.

..... [1]

(b) On the Venn diagram below, shade the region $C' \cap D'$.



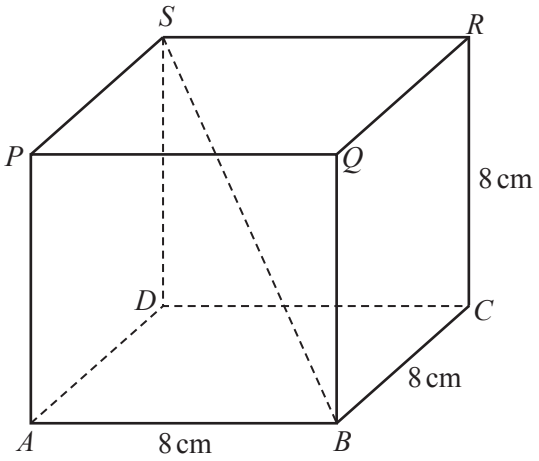
[1]

23 Solve the equation $2x^2 + 3x - 3 = 0$.
Show all your working and give your answers correct to 2 decimal places.

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

Question 24 is printed on the next page.

24



NOT TO SCALE

The diagram shows a cube of side length 8 cm.

(a) Calculate the length of the diagonal *BS*.

BS = ... cm [3]

(b) Calculate angle *SBD*.

Angle *SBD* = ... [2]

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MATHEMATICS **0580/22**

Paper 2 (Extended) **October/November 2016**

1 hour 30 minutes

Candidates answer on the Question Paper.

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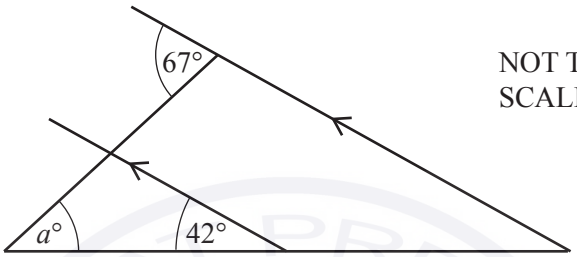
1 **(a)** Write 14 835 correct to the nearest thousand.

..... [1]

(b) Write your answer to **part (a)** in standard form.

..... [1]

2



NOT TO SCALE

Find the value of a.

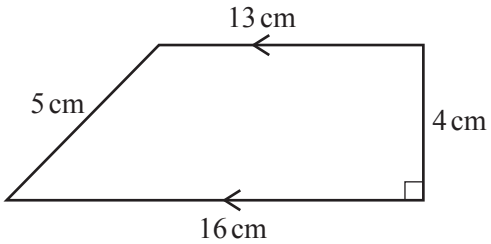
$a =$ ..... [2]

3 Solve the equation.

$6(k - 8) = 78$

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

4



NOT TO SCALE

Calculate the area of this trapezium.

..... cm^2 [2]

5 Simplify.

$$36y^5 \div 4y^2$$

..... [2]

6 The sides of a square are 8 cm, correct to the nearest centimetre.

Calculate the upper bound for the area of the square.

..... cm^2 [2]

7 Find the positive integers that satisfy the inequality $t+2 > 3t-6$.

..... [3]

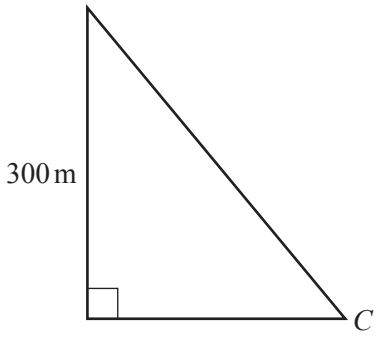
8 Solve the simultaneous equations.
You must show all your working.

$$\tfrac{1}{2}x + y = 8$$
$$x - 2y = 2$$

$x =$ .....

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

9 From the top of a building, 300 metres high, the angle of depression of a car, C, is 52°.



NOT TO SCALE

Calculate the horizontal distance from the car to the base of the building.

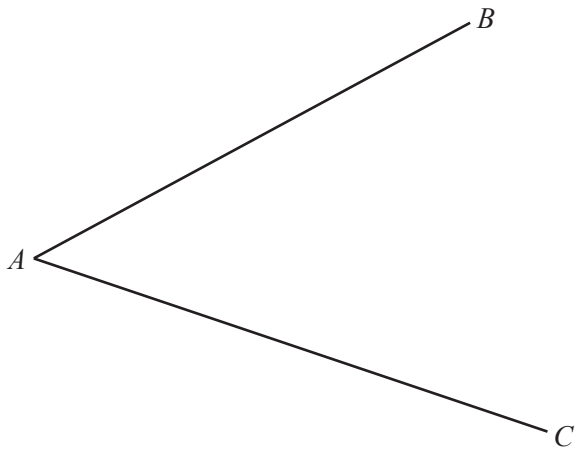
..... m [3]

10 The length of a backpack of capacity 30 litres is 53 cm.

Calculate the length of a mathematically similar backpack of capacity 20 litres.

..... cm [3]

11



(a) **Using compasses and a straight edge only**, construct the bisector of angle *BAC*. [2]

(b) Complete the statement.

The bisector of angle *BAC* is the locus of points that are .....

..... [1]

12 Ralf and Susie share \$57 in the ratio 2 : 1.

(a) Calculate the amount Ralf receives.

\$ ..... [2]

(b) Ralf gives \$2 to Susie.

Calculate the new ratio Ralf's money : Susie's money.
Give your answer in its simplest form.

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

13 Factorise.

(a) $m^3 + m$

..... [1]

(b) $25 - y^2$

..... [1]

(c) $x^2 + 3x - 28$

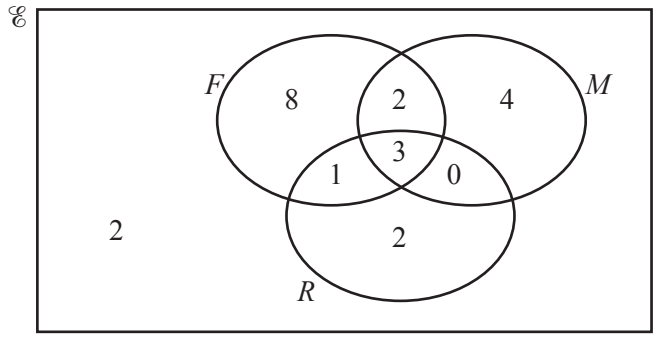
..... [2]

14 **Without using your calculator**, work out $\frac{3}{4} + \frac{2}{3} - \frac{1}{8}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [4]

15



The Venn diagram shows the number of people who like films (F), music (M) and reading (R).

(a) Find

(i) $\mathrm{n}(M)$,

..... [1]

(ii) $\mathrm{n}(R \cup M)$.

..... [1]

(b) A person is chosen at random from the people who like films.

Write down the probability that this person also likes music.

..... [1]

(c) On the Venn diagram, shade $M' \cap (F \cup R)$. [1]

16 $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ $\overrightarrow{BA} = \begin{pmatrix} -5 \\ 6 \end{pmatrix}$

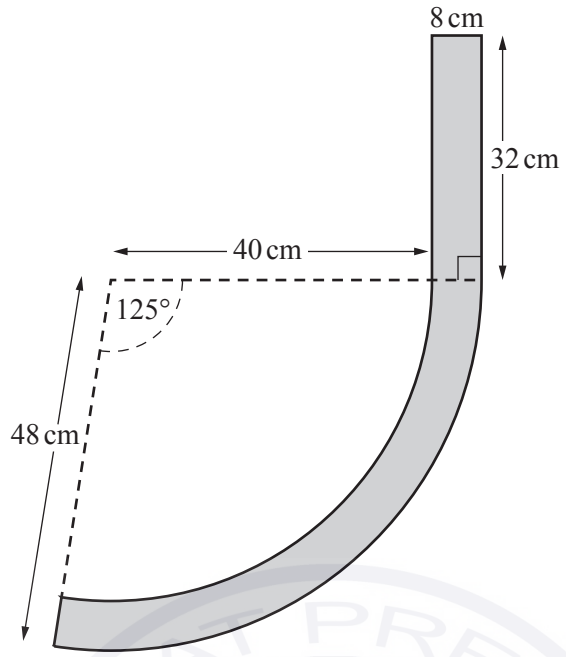
(a) Find $\overrightarrow{CA}$.

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

(b) Work out $|\overrightarrow{BA}|$.

..... [2]

17



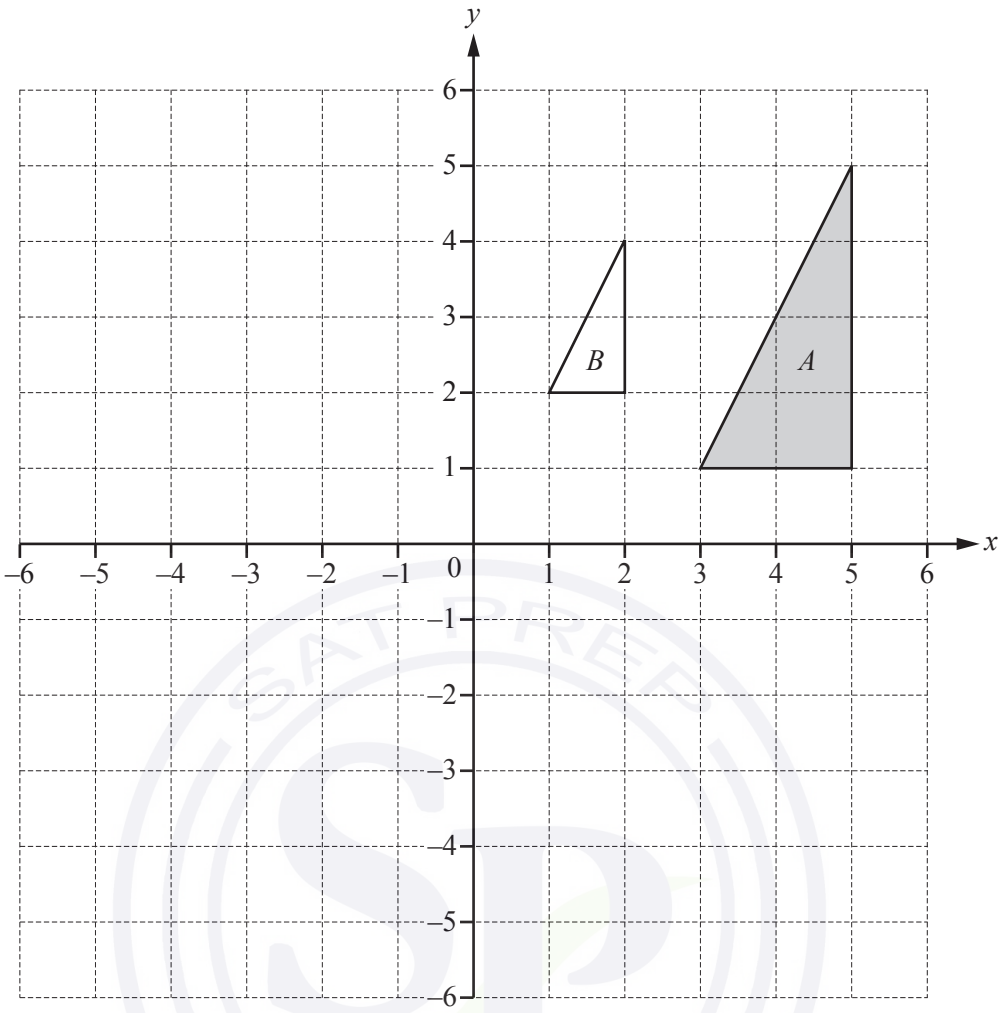
NOT TO SCALE

The diagram shows the cross section of part of a park bench.
It is made from a rectangle of length 32 cm and width 8 cm and a curved section.
The curved section is made from two concentric arcs with sector angle 125°.
The inner arc has radius 40 cm and the outer arc has radius 48 cm.

Calculate the area of the cross section correct to the nearest square centimetre.

..... cm^2 [5]

18



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

.....

..... [3]

(b) Draw the image of triangle A after the transformation represented by $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$. [3]

19 **(a)** Find the inverse of $\begin{pmatrix} 2 & -3 \\ 5 & -4 \end{pmatrix}$.

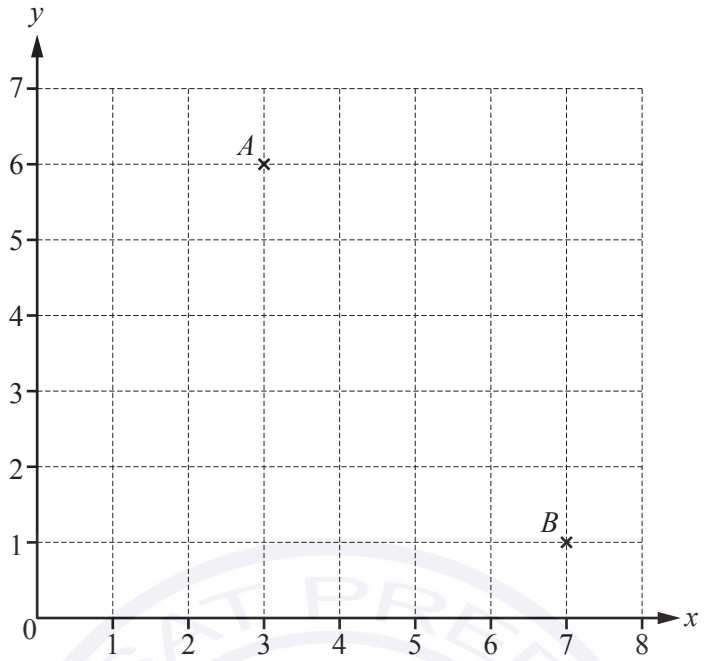
$\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(b) The matrix $\begin{pmatrix} w & -9 \\ 4 & w-12 \end{pmatrix}$ does not have an inverse.

Calculate the value of w.

$w =$ ..... [4]

20



Point A has co-ordinates (3, 6).

(a) Write down the co-ordinates of point B.

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

(b) Find the gradient of the line AB.

..... [2]

(c) Find the equation of the line that

- is perpendicular to the line AB

and

- passes through the point (0, 2).

..... [3]

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Cambridge IGCSE

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

2402917633

MATHEMATICS **0580/23**

Paper 2 (Extended) **October/November 2016**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

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Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
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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 70.

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 $V = 4p^2$

Find V when $p = 3$.

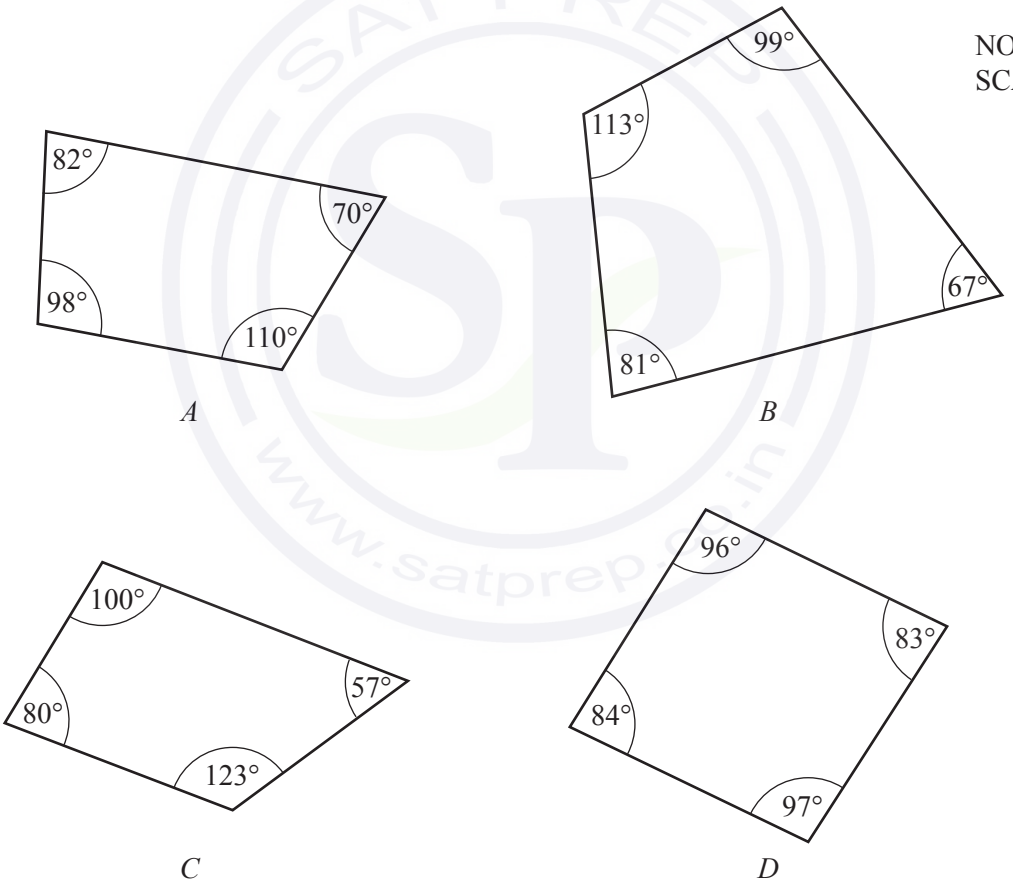
$V =$ .....[1]

2 Simplify.

$n^2 \times n^5$

.....[1]

3



The diagram shows four quadrilaterals A, B, C and D.

Which one of these could be a cyclic quadrilateral?

.....[1]

4 Write in standard form.

(a) 2 470 000

..... [1]

(b) 0.0079

..... [1]

5 **Without using a calculator**, work out $\frac{3}{5} + \frac{1}{6}$.

Write down all the steps of your working and give your answer as a fraction in its simplest form.

..... [2]

6 James is an animal doctor.
The table shows some information about the cats he saw in one week.

Day	Monday	Tuesday	Wednesday	Thursday	Friday
Number of cats seen	2	4	1	3	2
Mean mass of a cat (kg)	1.9	0.9	2.1	1.8	2

One of the cats James saw had a mass of 4 kg.

On which day did he see this cat?

..... [2]

7 Write these in order of size, smallest first.

0.6^3 0.22 $\sqrt{0.09}$ 0.4^2

..... < ..... < ..... < .....[2]
smallest

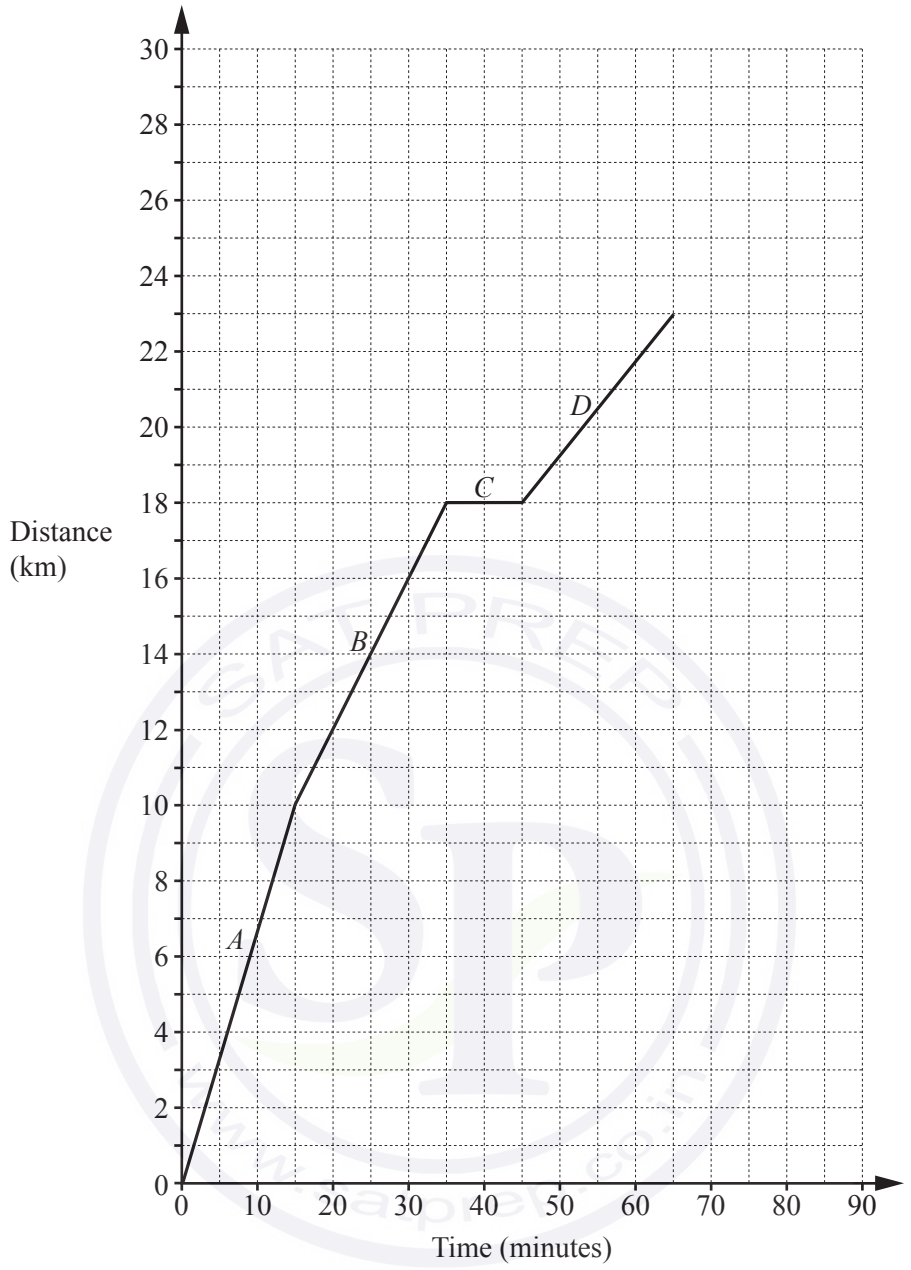
8 The length of a car is 4.2 m, correct to 1 decimal place.

Write down the upper bound and the lower bound of the length of this car.

Upper bound = ... m

Lower bound = ... m [2]

9



The diagram shows the distance-time graph for the first 65 minutes of a bicycle journey.

(a) There are four different parts to the journey labelled *A*, *B*, *C* and *D*.

Write down the part of the journey with the fastest speed.

..... [1]

(b) After the first 65 minutes the bicycle travels at a constant speed of 20 km/h for 15 minutes.

Draw this part of the journey on the diagram. [1]

10 Calculate.

(a) $2^3 - \sqrt{10+4^2}$

..... [1]

(b) $\dfrac{2\sqrt{3} \times \tan 70°}{3}$

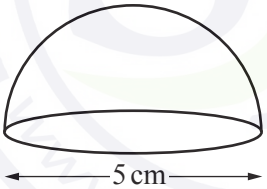
..... [1]

11 Ahmed paid \$34 000 for a car.
His car decreased in value by 40% at the end of the first year.
The value at the end of the second year was 10% less than the value at the end of the first year.

Calculate the value of Ahmed's car after 2 years.

\$ ..... [2]

12



NOT TO SCALE

The diagram shows a hemisphere with diameter 5 cm.

Calculate the volume of this hemisphere.

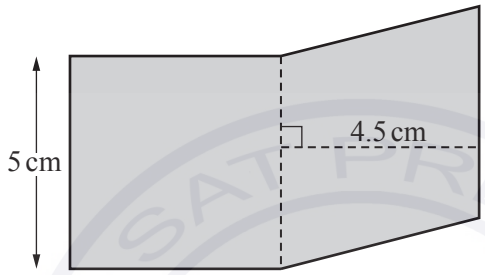
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm^3 [2]

13 Write the recurring decimal $0.\dot{2}$ as a fraction.
[$0.\dot{2}$ means 0.222…]

..... [2]

14 The shaded shape is made by joining a square and a rhombus.



NOT TO SCALE

Work out

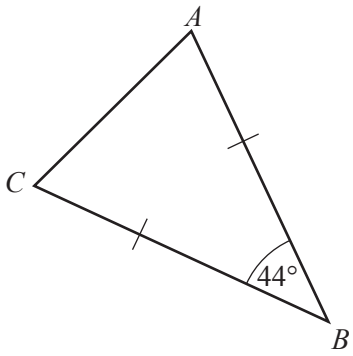
(a) the perimeter of the shaded shape,

..... cm [1]

(b) the area of the shaded shape.

..... cm^2 [2]

15 (a)



NOT TO SCALE

Triangle ABC is an isosceles triangle with $AB = CB$.
Angle $ABC = 44°$.

Find angle ACB.

Angle ACB = ... [1]

(b) A regular polygon has an exterior angle of 40°.

Work out the number of sides of this polygon.

..... [2]

16 d is inversely proportional to $(w + 1)^2$.
$d = 3.2$ when $w = 4$.

Find d when $w = 7$.

d = ... [3]

17 A is the point (8, 3) and B is the point (12, 1).

Find the equation of the line, perpendicular to the line AB, which passes through the point (0, 0).

..... [3]

18 $\mathrm{f}(x) = x^2$ $\mathrm{g}(x) = \dfrac{x-3}{2}$

Find

(a) $\mathrm{f}(-5)$,

..... [1]

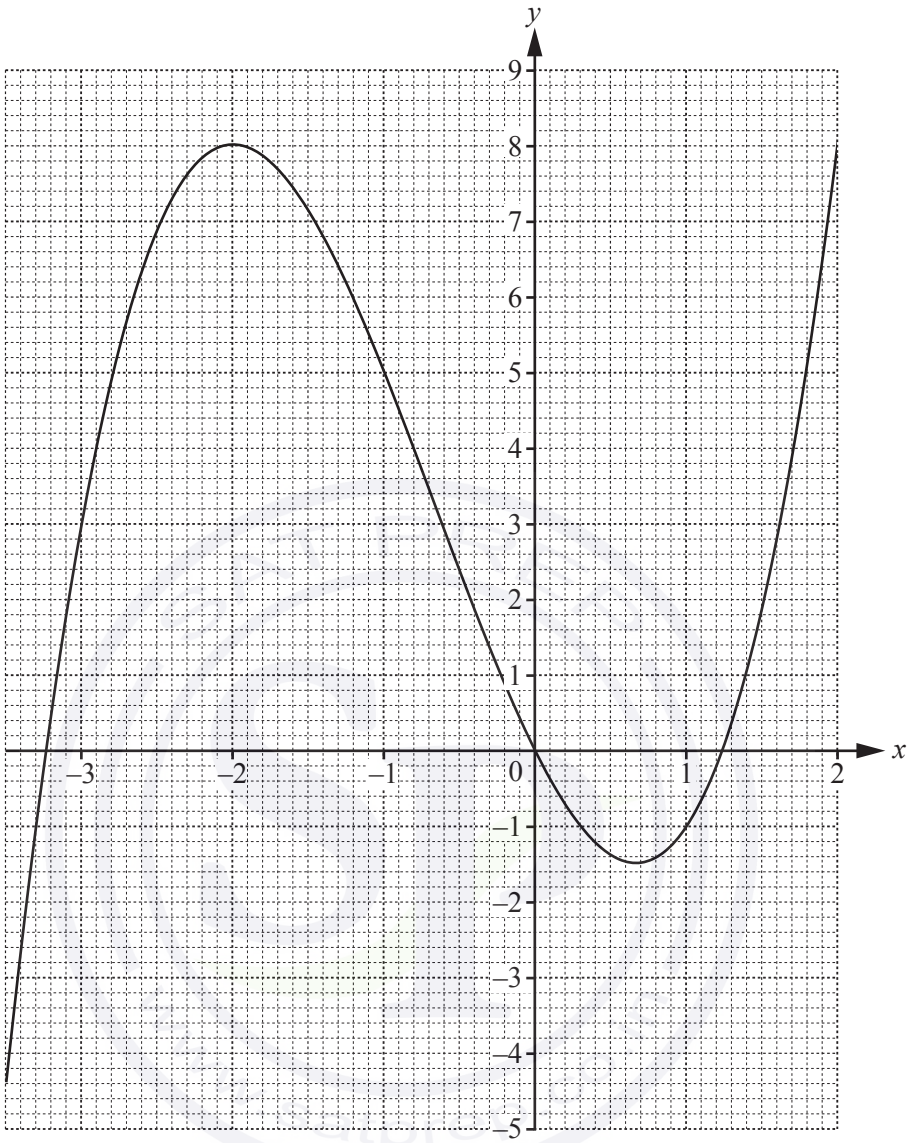
(b) $\mathrm{gf}(x)$,

..... [1]

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

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

19 The curve $y = x^3 + 2x^2 - 4x$ is shown on the grid.



(a) By drawing a suitable tangent, find an estimate of the gradient of the curve when $x = 1$.

..... [3]

(b) A point D lies on the curve.
The x co-ordinate of D is negative.
The gradient of the tangent at D is 0.

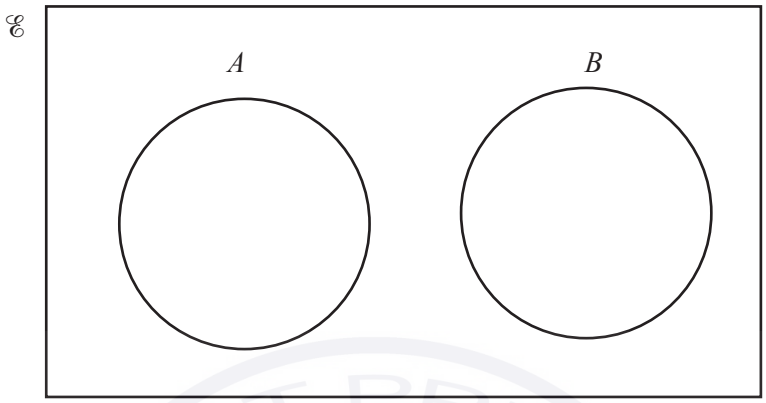
Write down the co-ordinates of D.

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

20 **(a)** $\mathscr{E} = \left\{7,\ 9.3,\ \pi,\ \frac{5}{9},\ 2\sqrt{8}\right\}$

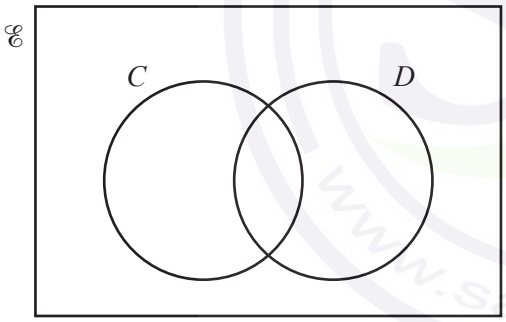
A = {integers}
B = {irrational numbers}

Write all the elements of $\mathscr{E}$ in their correct place on the Venn diagram.

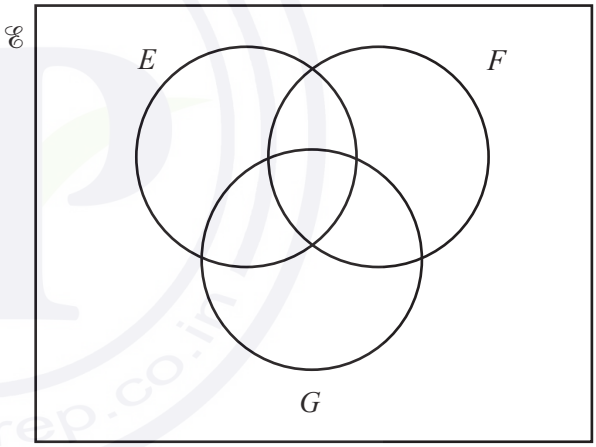


[2]

(b) Shade the region in each of the Venn diagrams below.



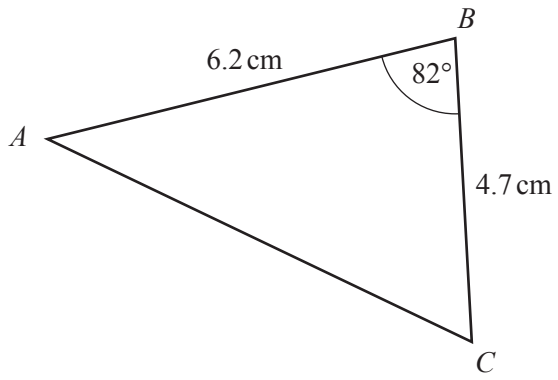
$C' \cup D$



$E \cap F' \cap G$

[2]

21 (a)

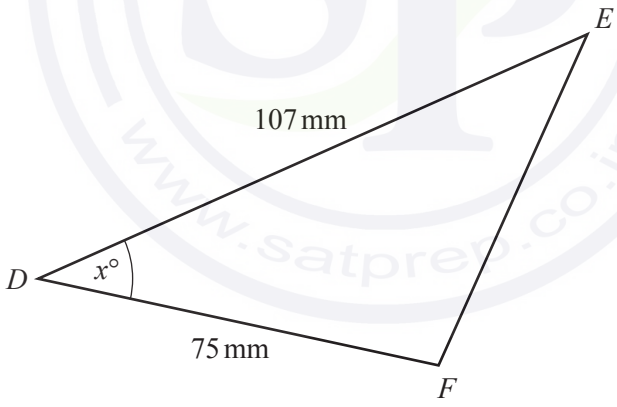


NOT TO SCALE

Calculate the area of triangle *ABC*.

..... cm^2 [2]

(b)



NOT TO SCALE

The area of triangle *DEF* is 2050 mm^2.

Work out the value of x.

x = ... [2]

22 The table shows some information about the mass, m grams, of 200 bananas.

Mass (m grams)	$90 < m \leqslant 110$	$110 < m \leqslant 120$	$120 < m \leqslant 125$	$125 < m \leqslant 140$
Frequency	40	70	60	30
Height of column in histogram (cm)			6	

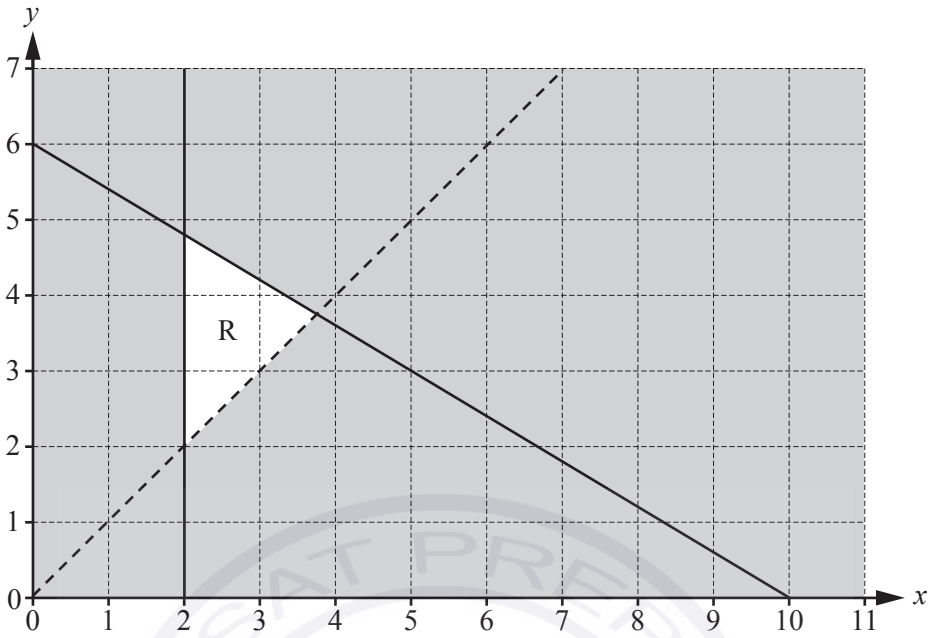
Complete the table.

[4]

23 Simplify. $\dfrac{42np - 7n}{12pt - 2t + 18mp - 3m}$

..... [4]

24



Find the three inequalities that define the unshaded region, R.

.....

.....

..... [5]

25 $\mathbf{A} = \begin{pmatrix} 4 & 2 \\ 2 & 1 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 7 & -3 \\ 4 & 5 \end{pmatrix}$ $\mathbf{C} = \begin{pmatrix} -2 & 3 & 1 \\ 4 & 5 & -1 \end{pmatrix}$ $\mathbf{D} = \begin{pmatrix} -9 \\ 0 \end{pmatrix}$

(a) Which of these four matrix calculations is **not** possible?

A + B **3C** **CB** **AD**

..... [1]

(b) Calculate **AB**.

( ) [2]

(c) Work out $\mathbf{B}^{-1}$, the inverse of **B**.

( ) [2]

(d) Explain why matrix **A** does not have an inverse.

..... [1]

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

0387967299

MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2016**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

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The total of the marks for this paper is 70.

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This document consists of **12** printed pages.

CAMBRIDGE International Examinations

1 A train leaves Zurich at 22 40 and arrives in Vienna at 07 32 the next day.

Work out the time taken.

..... h ..... min [1]

2 From a sample of 80 batteries, 3 are faulty.

Work out the percentage of faulty batteries.

..... % [1]

3 Write 1.27×10^{-3} as an ordinary number.

.....[1]

4 Calculate $(2.1 - 0.078)^{17}$, giving your answer correct to 4 significant figures.

.....[2]

5 Omar changes 2000 Saudi Arabian riyals (SAR) into euros (€) when the exchange rate is €1 = 5.087 SAR.

Work out how much Omar receives, giving your answer correct to the nearest euro.

€ .....[2]

6 Find the lowest common multiple (LCM) of 36 and 48.

..... [2]

7 $y = mx + c$

Find the value of y when $m = -2$, $x = -7$ and $c = -3$.

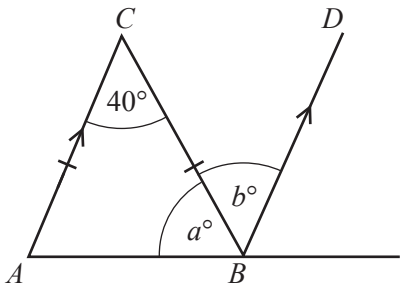
$y =$ ..... [2]

8 $y = \frac{qx}{p}$

Write x in terms of p, q and y.

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

9



NOT TO SCALE

Triangle ABC is isosceles and AC is parallel to BD.

Find the value of a and the value of b.

a = ...

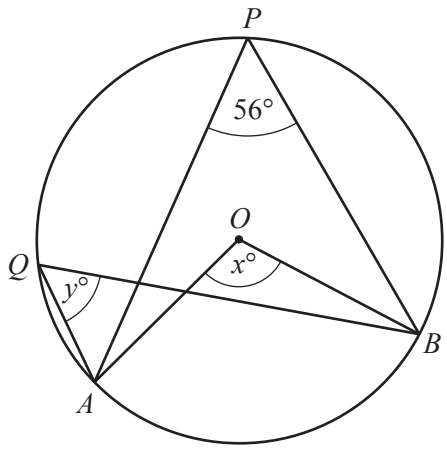
b = ... [2]

10 The sides of an equilateral triangle are 9.4 cm, correct to the nearest millimetre.

Work out the upper bound of the perimeter of this triangle.

..... cm [2]

11



NOT TO SCALE

A, B, P and Q lie on the circle, centre O.
Angle $APB = 56°$.

Find the value of

(a) x,

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

(b) y.

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

12 Simplify $(16p^{16})^{\frac{1}{4}}$.

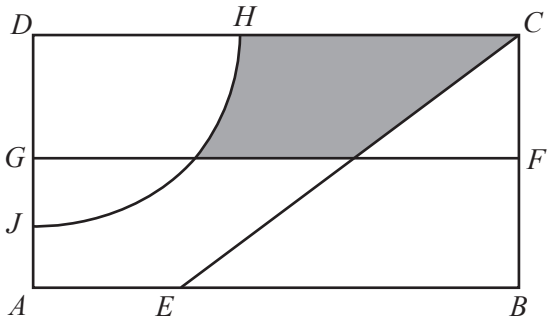
..... [2]

13 Solve the inequality.

$$n + 7 < 5n - 8$$

..... [2]

14



NOT TO SCALE

The diagram shows a rectangular garden divided into different areas.
FG is the perpendicular bisector of *BC*.
The arc *HJ* has centre *D* and radius 20 m.
CE is the bisector of angle *DCB*.

Write down two more statements using loci to describe the shaded region inside the garden.

The shaded region is

- nearer to *C* than to *B*
- .....
- ..... [2]

15 7, 5, 3, 1, – 1, …

(a) Find the next term in this sequence.

..... [1]

(b) Find the *n*th term of the sequence.

..... [2]

16 **Without using a calculator**, work out $\frac{6}{7} \div 1\frac{2}{3}$.

Show all your working and give your answer as a fraction in its lowest terms.

..... [3]

17 Five angles of a hexagon are each 115°.

Calculate the size of the sixth angle.

..... [3]

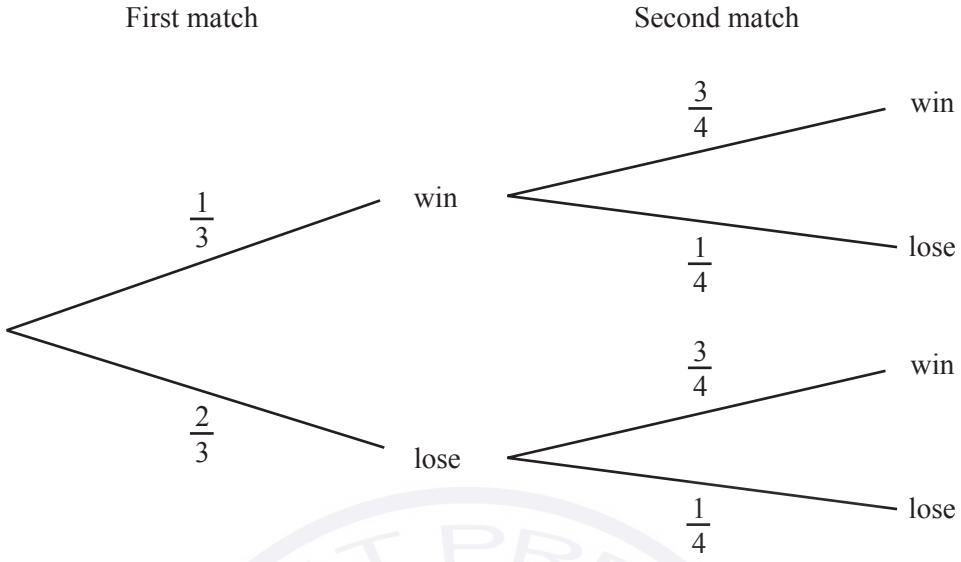
18 A car of length 4.3 m is travelling at 105 km/h.
It passes over a bridge of length 36 m.

Calculate the time, in seconds, it takes to pass over the bridge **completely**.

..... s [3]

[Turn over

19 The probability of a cricket team winning or losing in their first two matches is shown in the tree diagram.

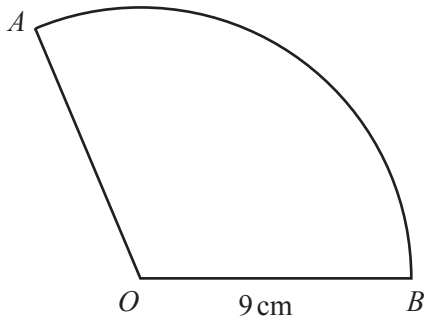


Find the probability that the cricket team wins at least one match.

..... [3]

20 AB is an arc of a circle, centre O, radius 9 cm.
The length of the arc AB is 6π cm.
The area of the sector AOB is $k\pi$ cm^2.

Find the value of k.



NOT TO SCALE

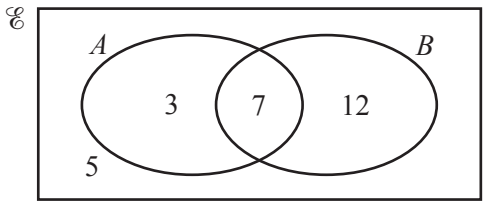
$k =$ ..... [3]

21 y is directly proportional to the positive square root of x.
When $x = 9$, $y = 12$.

Find y when $x = \frac{1}{4}$.

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

22



The Venn diagram shows the numbers of elements in each region.

(a) Find $n(A \cap B')$.

..... [1]

(b) An element is chosen at random.

Find the probability that this element is in set B.

..... [1]

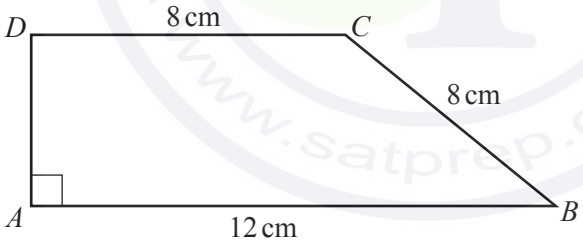
(c) An element is chosen at random from set A.

Find the probability that this element is also a member of set B.

..... [1]

(d) On the Venn diagram, shade the region $(A \cup B)'$. [1]

23



NOT TO SCALE

Calculate the area of this trapezium.

..... cm^2 [4]

24 Factorise completely.

(a) $2a + 4 + ap + 2p$

..... [2]

(b) $162 - 8t^2$

..... [2]

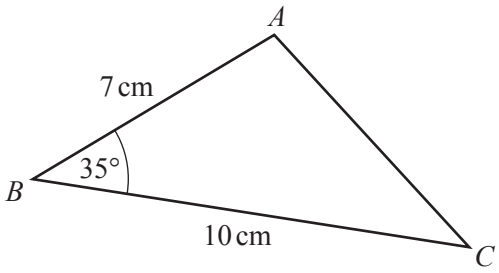
25 A is the point (4, 1) and B is the point (10, 15).

Find the equation of the perpendicular bisector of the line AB.

..... [6]

Question 26 is printed on the next page.

26



NOT TO SCALE

(a) Calculate the area of triangle ABC.

..... cm^2 [2]

(b) Calculate the length of AC.

AC = ... cm [4]

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

6212890302

MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2016**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

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1 Write 0.000 057 4 in standard form.

..... [1]

2 Calculate.

$$\frac{3.07 + 2^4}{5.03 - 1.79}$$

..... [1]

3 Write 3.5897 correct to 4 significant figures.

..... [1]

4 A quadrilateral has rotational symmetry of order 2 and no lines of symmetry.

Write down the mathematical name of this quadrilateral.

..... [1]

5 8 9 10 11 12 13 14 15 16

From the list of numbers, write down

(a) the square numbers,

..... [1]

(b) a prime factor of 99.

..... [1]

6 Simplify.

$$\left(\frac{1}{2}x^{\frac{2}{3}}\right)^3$$

..... [2]

7 A map is drawn to a scale of 1 : 1 000 000.
A forest on the map has an area of 4.6 cm^2.

Calculate the actual area of the forest in square kilometres.

..... km^2 [2]

8 Solve the inequality $\frac{x}{3} + 5 > 2$.

..... [2]

9 A regular polygon has an interior angle of 172°.

Find the number of sides of this polygon.

..... [3]

10 Make p the subject of the formula.

$$rp + 5 = 3p + 8r$$

p = ... [3]

11 Shahruk plays four games of golf.
His four scores have a mean of 75, a mode of 78 and a median of 77.

Work out his four scores.

.... [3]

12 Write the recurring decimal $0.3\dot{6}$ as a fraction.
Give your answer in its simplest form.
[$0.3\dot{6}$ means 0.3666…]

..... [3]

13 The base of a triangle is 9 cm correct to the nearest cm.
The area of this triangle is 40 cm^2 correct to the nearest 5 cm^2.

Calculate the upper bound for the perpendicular height of this triangle.

..... cm [3]

14 **Without using a calculator**, work out $2\frac{5}{8} \times \frac{3}{7}$.
Show all your working and give your answer as a mixed number in its lowest terms.

..... [3]

15 $y = x^2 + 7x - 5$ can be written in the form $y = (x + a)^2 + b$.

Find the value of a and the value of b.

a = ...

b = ... [3]

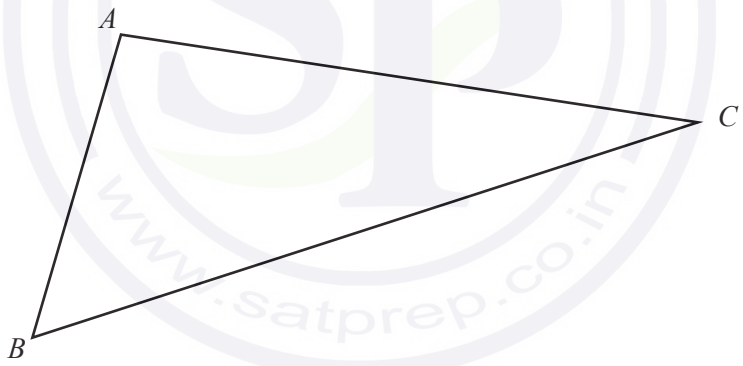
16 Solve the simultaneous equations.
Show all your working.

$$3x + 4y = 14$$
$$5x + 2y = 21$$

$x =$ .....

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

17 The diagram shows triangle ABC.



(a) **Using a straight edge and compasses only**, construct the bisector of angle ABC. [2]

(b) Draw the locus of points **inside** the triangle that are 3 cm from AC. [1]

18 Find the nth term of each of these sequences.

(a) 16, 19, 22, 25, 28, …

..... [2]

(b) 1, 3, 9, 27, 81, …

..... [2]

19 It is estimated that the world's population is growing at a rate of 1.14% per year.
On January 1st 2014 the population was 7.23 billion.

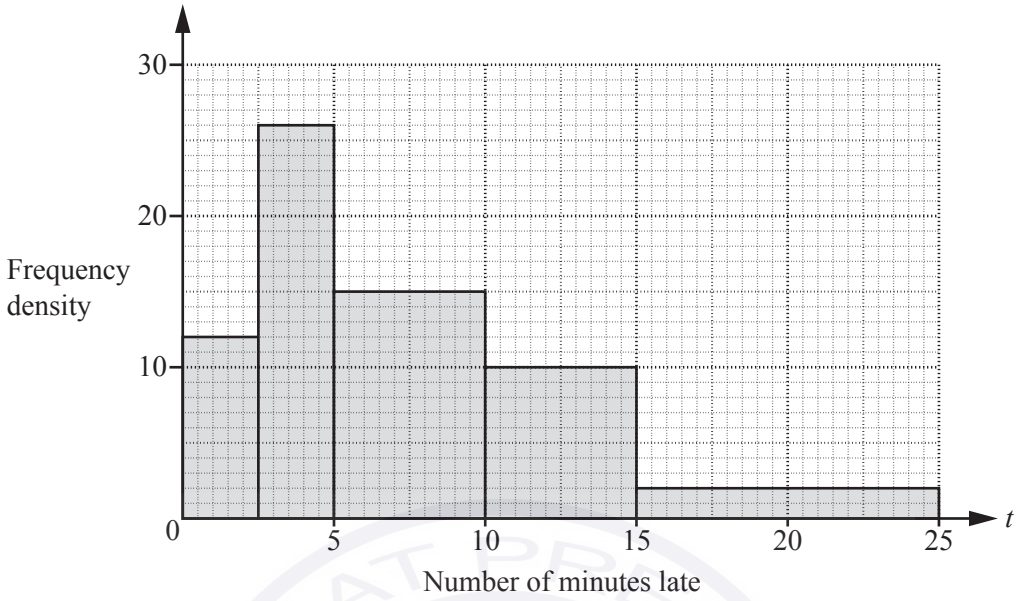
(a) Find the expected population on January 1st 2020.

.....billion [2]

(b) Find the year when the population is expected to reach 10 billion.

..... [2]

20 Deborah records the number of minutes late, t, for trains arriving at a station.
The histogram shows this information.



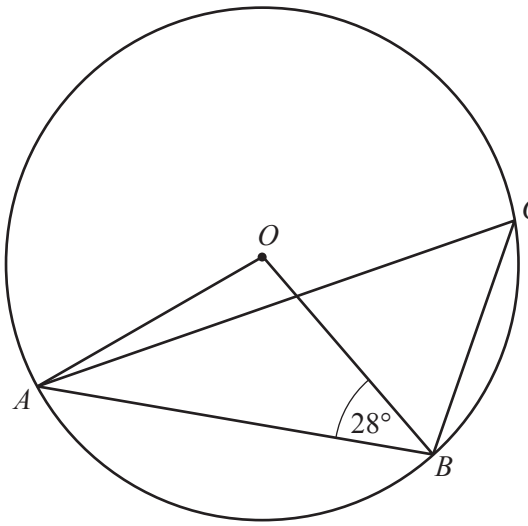
(a) Find the number of trains that Deborah recorded.

..... [2]

(b) Calculate the percentage of the trains recorded that arrived more than 10 minutes late.

.....% [2]

21



NOT TO SCALE

In the diagram, A, B and C lie on the circumference of a circle, centre O.

Work out the size of angle ACB.
Give a reason for each step of your working.

Angle ACB = ... [4]

22 $\mathbf{M} = \begin{pmatrix} 5 & 1 \\ -3 & -2 \end{pmatrix}$

(a) Work out $4\mathbf{M}$.

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

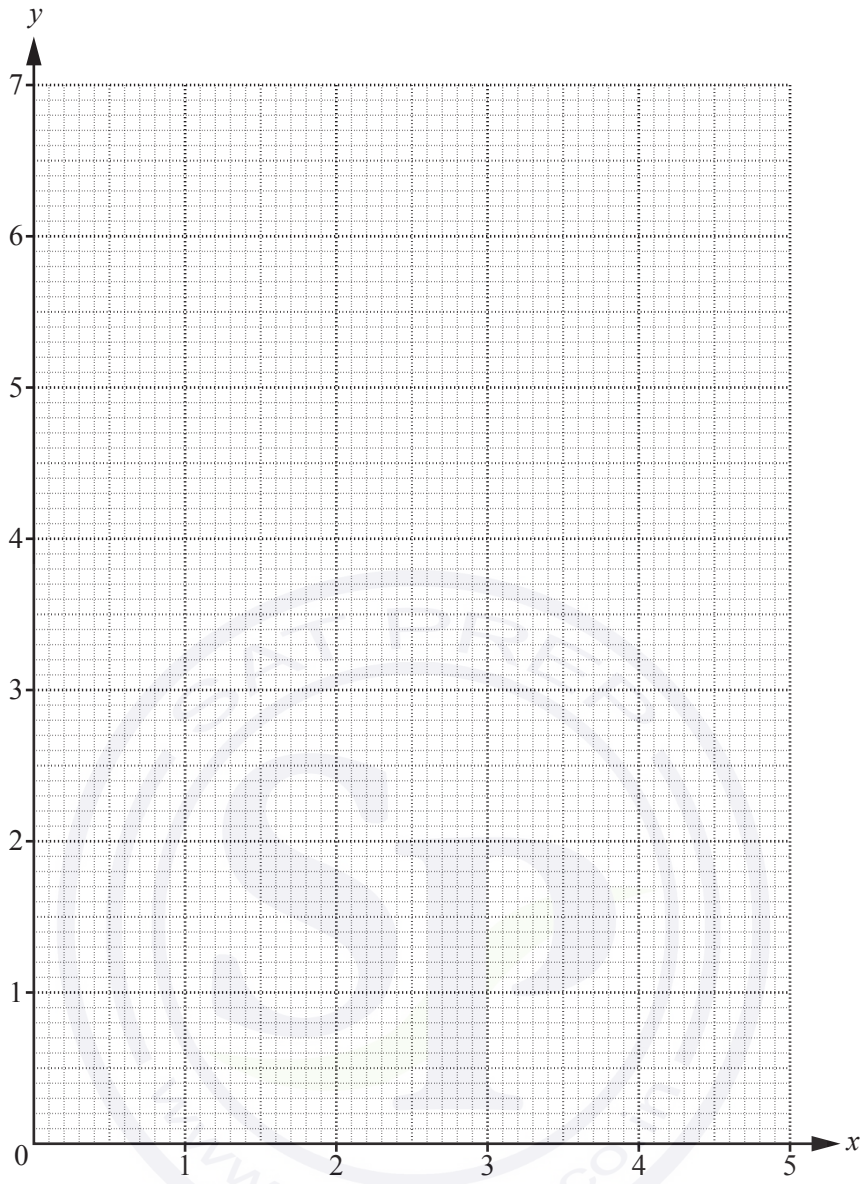
(b) Work out $\mathbf{M}^2$.

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

(c) Find $\mathbf{M}^{-1}$, the inverse of $\mathbf{M}$.

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

23



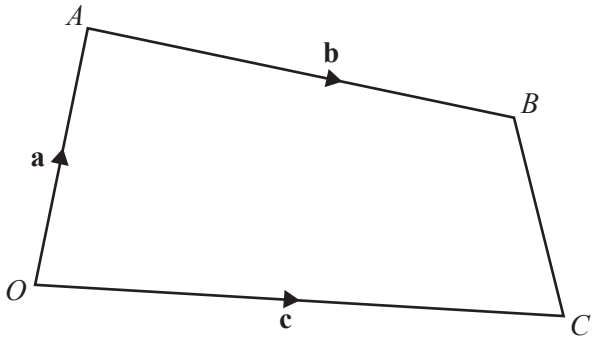
The region R satisfies these inequalities.

$y \leqslant 2x$ $\quad$ $3x + 4y \geqslant 12$ $\quad$ $x \leqslant 3$

On the grid, draw and label the region R that satisfies these inequalities.
Shade the **unwanted** regions.

[5]

24



NOT TO SCALE

In the diagram, O is the origin, $\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OC} = \mathbf{c}$ and $\overrightarrow{AB} = \mathbf{b}$.
P is on the line AB so that $AP : PB = 2 : 1$.
Q is the midpoint of BC.

Find, in terms of **a**, **b** and **c**, in its simplest form

(a) $\overrightarrow{CB}$,

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

(b) the position vector of Q,

..... [2]

(c) $\overrightarrow{PQ}$.

$\overrightarrow{PQ}$ = ... [2]

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Cambridge IGCSE

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

1018944705

MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2016**

1 hour 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 70.

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 **12** printed pages.

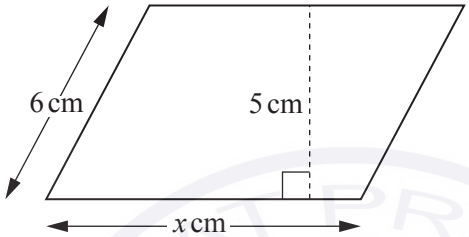
1 Find the cube root of 4913.

..... [1]

2 Write 71 496 correct to 2 significant figures.

..... [1]

3



NOT TO SCALE

The area of this parallelogram is 51.5 cm^2.

Work out the value of x.

x = ... [2]

4 Solve the equation.

$$6(y + 1) = 9$$

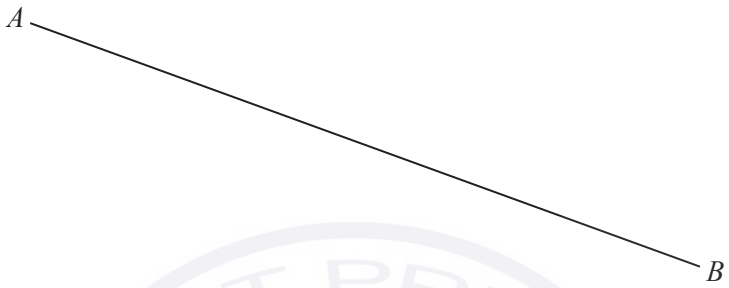
y = ... [2]

5 **Without using a calculator**, work out $\frac{1}{12} \times 1\frac{1}{5}$.

Show all your working and give your answer as a fraction in its lowest terms.

..... [2]

6 **Using a straight edge and compasses only**, construct the perpendicular bisector of the line AB.



[2]

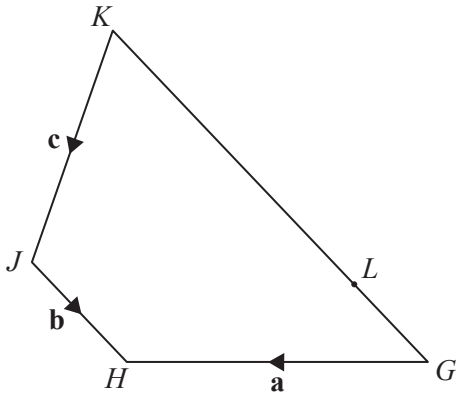
7 Simplify. $(32x^{10})^{\frac{3}{5}}$

..... [2]

8 Write the recurring decimal $0.3\dot{2}$ as a fraction.
[$0.3\dot{2}$ means 0.3222…]

..... [2]

9



NOT TO SCALE

GHJK is a quadrilateral.
$\overrightarrow{GH} = \mathbf{a}$, $\overrightarrow{JH} = \mathbf{b}$ and $\overrightarrow{KJ} = \mathbf{c}$.
L lies on *GK* so that $LK = 3GL$.

Find an expression, in terms of **a**, **b** and **c**, for $\overrightarrow{GL}$.

$\overrightarrow{GL}$ = ... [2]

10 Find the highest common factor (HCF) of 56 and 70.

..... [2]

11 Hattie has a box of coloured pens.
She takes a pen at random from the box.
The probability that she takes a red pen is 0.4 .

(a) Work out the probability that she does not take a red pen.

..... [1]

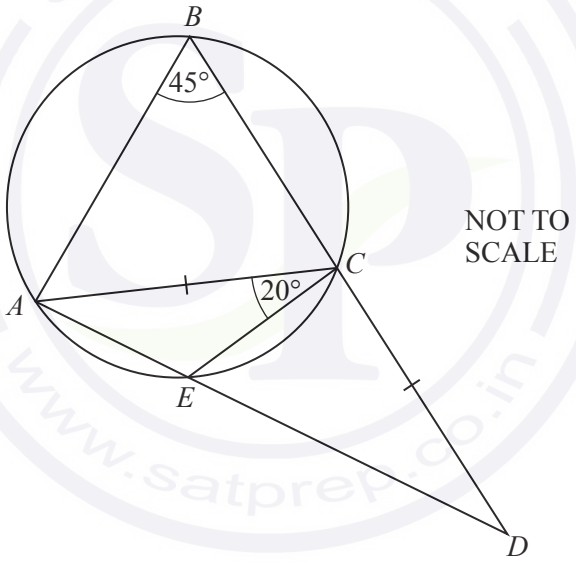
(b) The box contains only blue, red and green pens.
There are 15 blue pens and 15 green pens.

Complete the table.

Colour of pen	Blue	Red	Green
Number of pens	15		15
Probability		0.4	

[2]

12

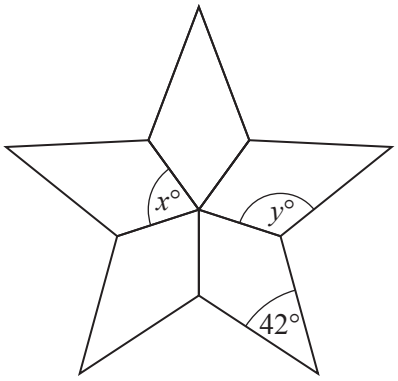


ABCE is a cyclic quadrilateral.
AED and *BCD* are straight lines.
AC = *CD*, angle *ABC* = 45° and angle *ACE* = 20°.

Work out angle *ECD*.

Angle *ECD* = ... [3]

13



NOT TO SCALE

The diagram is made from 5 congruent kites.

Work out the value of

(a) x,

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

(b) y.

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

14 **(a)** $\mathscr{E} = \{x: 2 \leqslant x \leqslant 16, x \text{ is an integer}\}$
$M = \{\text{even numbers}\}$
$P = \{\text{prime numbers}\}$

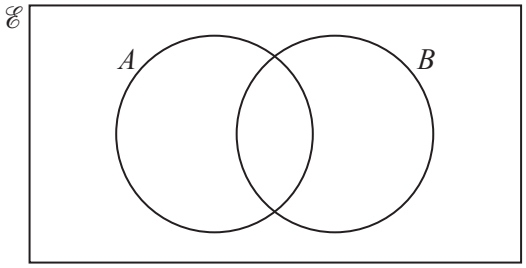
(i) Find n(M).

..... [1]

(ii) Write down the set $(P \cup M)'$.

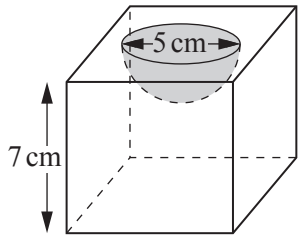
$(P \cup M)' = \{$..... $\}$ [1]

(b) On the Venn diagram, shade $A \cap B'$.



[1]

15 A solid consists of a metal cube with a hemisphere cut out of it.



NOT TO SCALE

The length of a side of the cube is 7 cm.
The diameter of the hemisphere is 5 cm.

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

.....cm^3 [3]

16 y is directly proportional to $(x + 2)^2$.
When $x = 8$, $y = 250$.

Find y when $x = 4$.

y = ... [3]

17 **(a)** $V = IR$

In an experiment I and R are both measured correct to 1 decimal place.

When $I = 4.0$ and $R = 2.7$, find the **lower** bound for V.

..... [2]

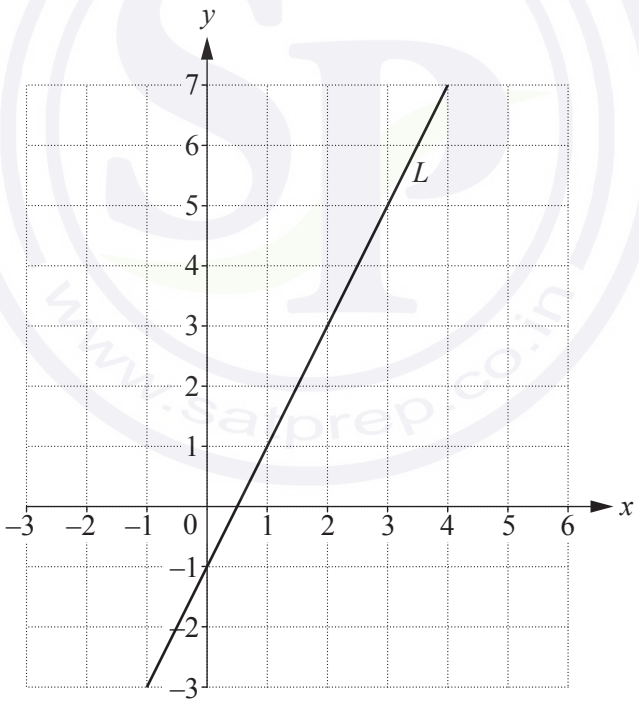
(b) $S = \frac{D}{T}$

In an experiment D and T are both measured correct to 2 significant figures.

When $D = 7.6$ and $T = 0.23$, find the **upper** bound for S.

..... [2]

18



(a) Work out the gradient of the line L.

..... [2]

(b) Write down the equation of the line parallel to the line L that passes through the point (0, 6).

..... [2]

19 At the start of an experiment there are 20 000 bacteria.
The number of bacteria increases at a rate of 30% per hour.

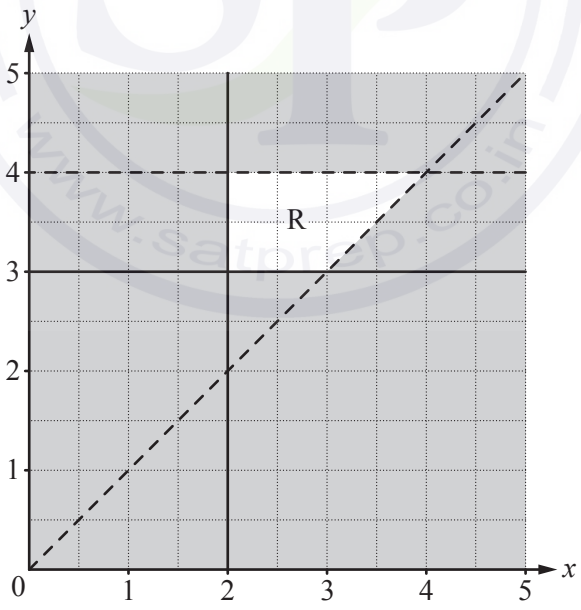
(a) Work out the number of bacteria after 4 hours.

..... [2]

(b) After how many **whole** hours, from the start of the experiment, will the number of bacteria be greater than one million?

..... hours [2]

20



Find four inequalities that define the region, R, on the grid.

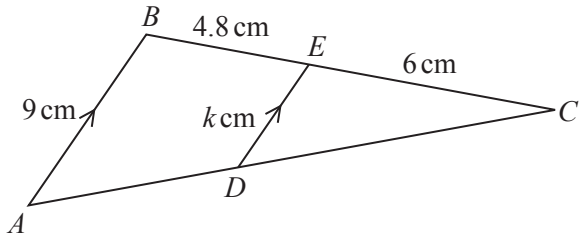
.....

.....

.....

..... [4]

21 (a)



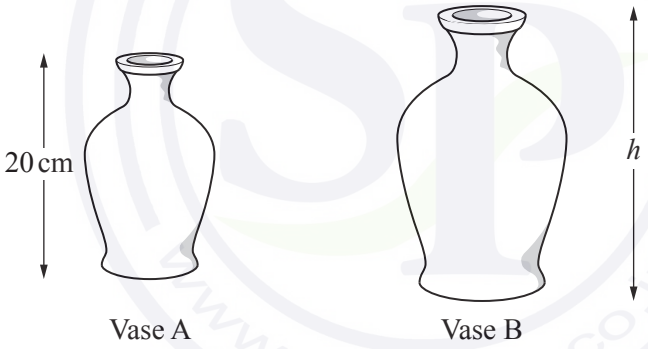
NOT TO SCALE

Triangles *CBA* and *CED* are similar.
AB is parallel to *DE*.
AB = 9 cm, *BE* = 4.8 cm, *EC* = 6 cm and *ED* = *k* cm.

Work out the value of *k*.

k = ... [2]

(b)



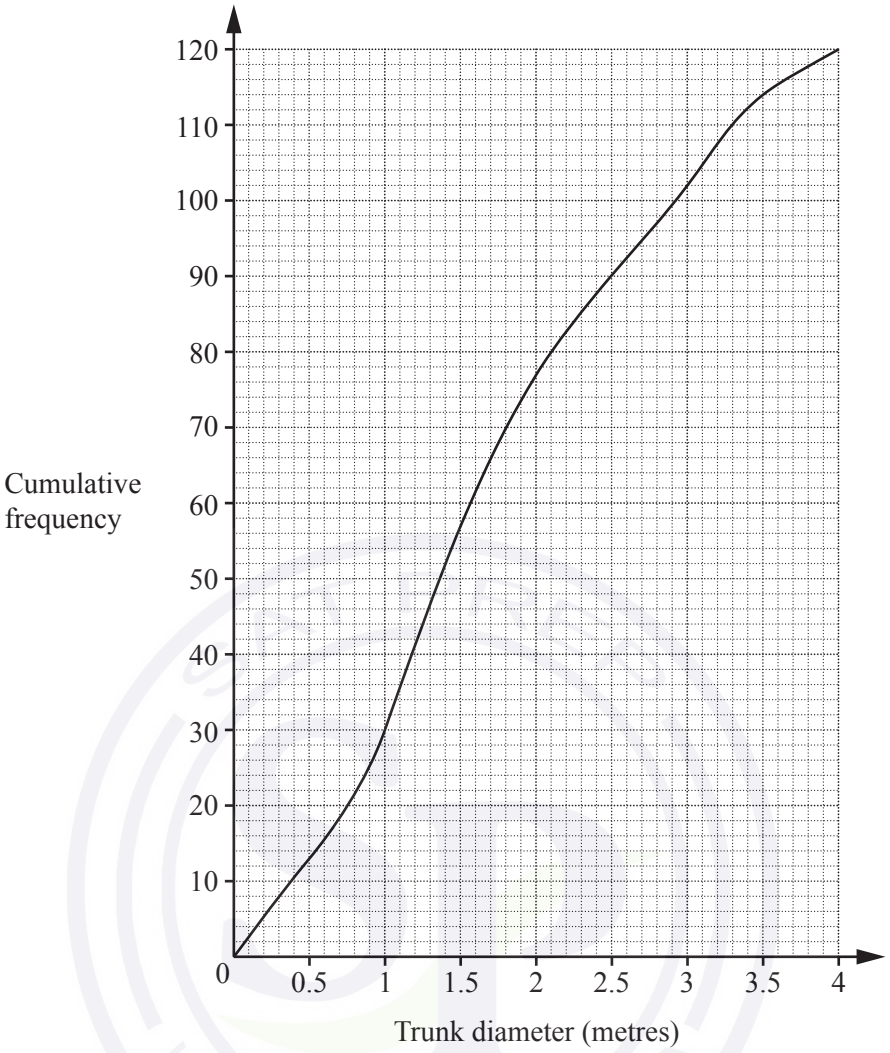
NOT TO SCALE

The diagram shows two mathematically similar vases.
Vase A has height 20 cm and volume 1500 cm^3.
Vase B has volume 2592 cm^3.

Calculate *h*, the height of vase B.

h = ... cm [3]

22 The cumulative frequency diagram shows information about the trunk diameter, in metres, of 120 trees.



Find

(a) the inter-quartile range,

..... m [2]

(b) the 95th percentile,

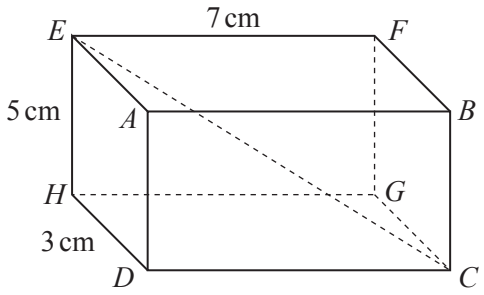
..... m [2]

(c) the number of trees with a trunk diameter greater than 3 metres.

..... [2]

Question 23 is printed on the next page.

23



NOT TO SCALE

The diagram shows a cuboid.
$HD = 3$ cm, $EH = 5$ cm and $EF = 7$ cm.

Calculate

(a) the length CE,

$CE =$ ..... cm [4]

(b) the angle between CE and the base $CDHG$.

..... [3]

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

MATHEMATICS **0580/22**

Paper 2 (Extended) **February/March 2016**

1 hour 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.
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If working is needed for any question it must be shown below that question.
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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 70.

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 **12** printed pages.

1 Solve $(x - 7)(x + 4) = 0$.

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

2 Factorise $2x - 4xy$.

..... [2]

3

NOT TO SCALE

Calculate angle BAC.

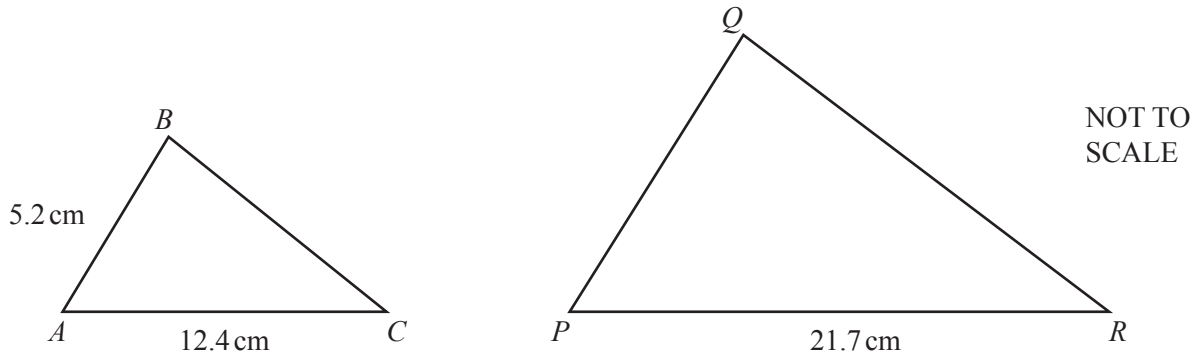
Angle $BAC =$ ..... [2]

4 Solve the inequality.

$$6n + 3 > 8n$$

..... [2]

5 Triangle ABC is similar to triangle PQR.



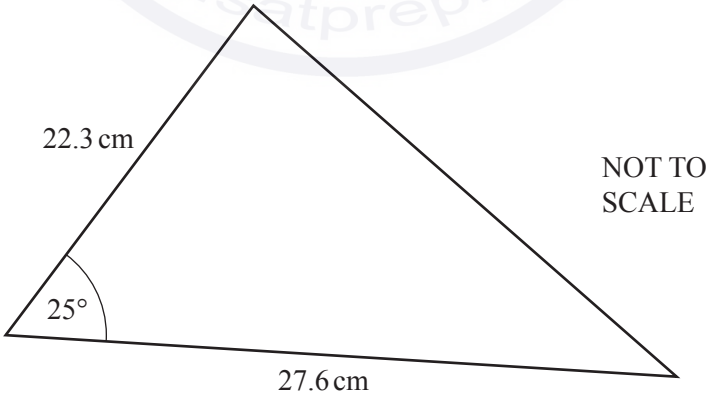
Find PQ.

$PQ =$ ..... cm [2]

6 Write the recurring decimal $0.\dot{4}$ as a fraction.
[$0.\dot{4}$ means 0.444…]

..... [2]

7



Calculate the area of this triangle.

..... cm^2 [2]

8 Find the inverse of the matrix $\begin{pmatrix} 3 & -2 \\ -8 & 7 \end{pmatrix}$.

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

9 **Without using your calculator**, work out $1\frac{7}{12} + \frac{13}{20}$.

You must show all your working and give your answer as a mixed number in its simplest form.

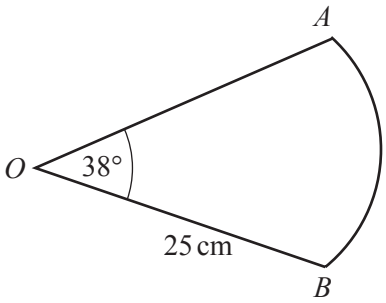
..... [3]

10 The scale on a map is 1 : 20 000.
The area of a lake on the map is 1.6 square centimetres.

Calculate the actual area of the lake.
Give your answer in square metres.

.....m^2 [3]

11



NOT TO SCALE

The diagram shows a sector of a circle, centre O, radius 25 cm.
The sector angle is 38°.

Calculate the length of the arc AB.
Give your answer correct to 4 significant figures.

AB = ... cm [3]

12 A metal pole is 500 cm long, correct to the nearest centimetre.
The pole is cut into rods each of length 5.8 cm, correct to the nearest millimetre.

Calculate the largest number of rods that the pole can be cut into.

..... [3]

13 **(a)** Write 2016 as the product of prime factors.

..... [3]

(b) Write 2016 in standard form.

..... [1]

14 Simplify.

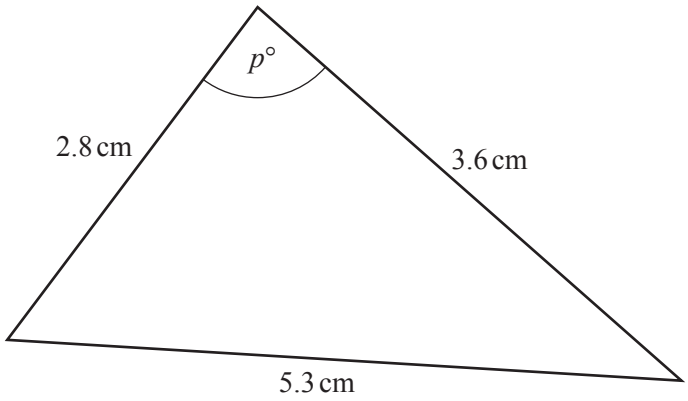
(a) $x^3y^4 \times x^5y^3$

..... [2]

(b) $(3p^2m^5)^3$

..... [2]

15



NOT TO SCALE

Find the value of p.

$p =$ ..... [4]

16 Raj measures the height, h cm, of 70 plants.
The table shows the information.

Height (h cm)	$10 < h \leqslant 20$	$20 < h \leqslant 40$	$40 < h \leqslant 50$	$50 < h \leqslant 60$	$60 < h \leqslant 90$
Frequency	7	15	27	13	8

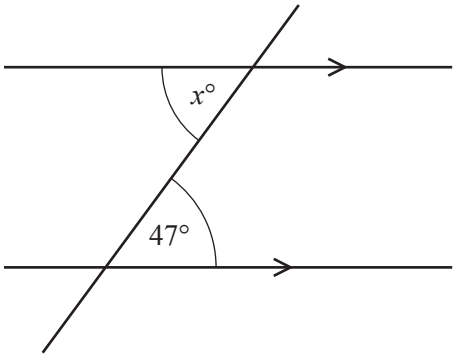
Calculate an estimate of the mean height of the plants.

..... cm [4]

17 Solve the equation $3x^2 - 11x + 4 = 0$.
Show all your working and give your answers correct to 2 decimal places.

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

18 (a)

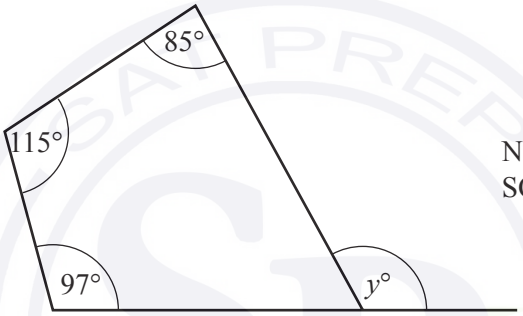


NOT TO SCALE

Find the value of x.

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

(b)

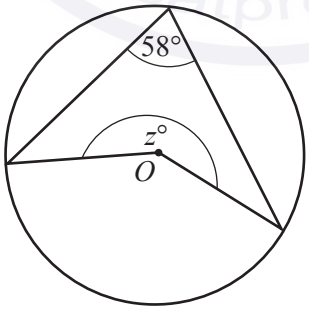


NOT TO SCALE

Find the value of y.

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

(c)



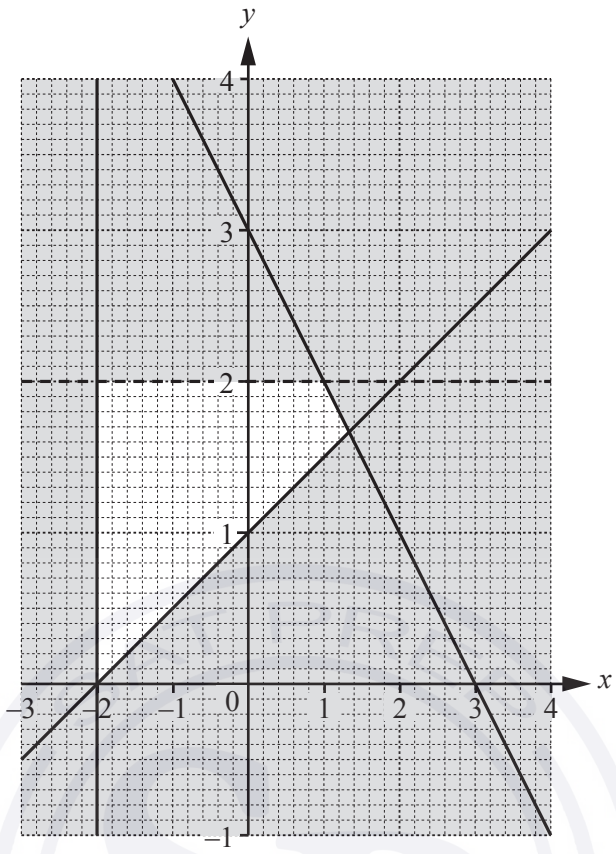
NOT TO SCALE

The diagram shows a circle, centre O.

Find the value of z.

$z =$ ..... [2]

19



Find the four inequalities that define the region that is **not** shaded.

.....

.....

.....

..... [5]

20 The nth term of a sequence is $an^2 + bn$.

(a) Write down an expression, in terms of a and b, for the 3rd term.

..... [1]

(b) The 3rd term of this sequence is 21 and the 6th term is 96.

Find the value of a and the value of b.
You must show all your working.

a = ...

b = ... [4]

Question 21 is printed on the next page.

21 Dan either walks or cycles to school.
The probability that he cycles to school is $\frac{1}{3}$.

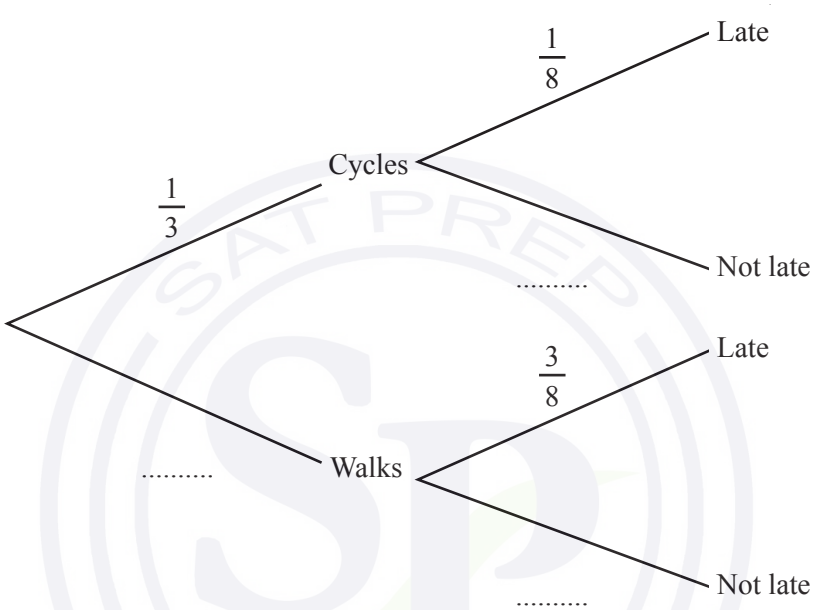
(a) Write down the probability that Dan walks to school.

..... [1]

(b) When Dan cycles to school the probability that he is late is $\frac{1}{8}$.

When Dan walks to school the probability that he is late is $\frac{3}{8}$.

Complete the tree diagram.



[2]

(c) Calculate the probability that

(i) Dan cycles to school and is late,

..... [2]

(ii) Dan is not late.

..... [3]

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CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

0950335531

MATHEMATICS **0580/21**

Paper 2 (Extended) **October/November 2015**

1 hour 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.
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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 70.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

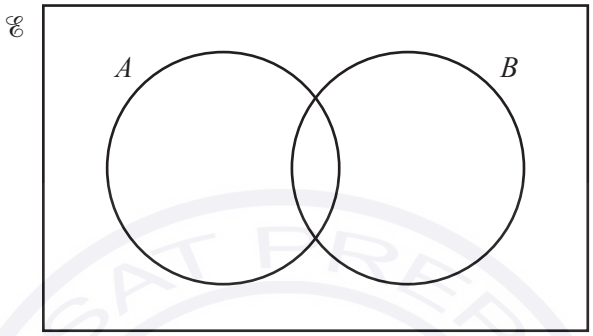
This document consists of **11** printed pages and **1** blank page.

1 At midnight the temperature in Newtown was –8 °C.
At noon the next day the temperature in Newtown was 9 °C.

Work out the rise in temperature from midnight to noon.

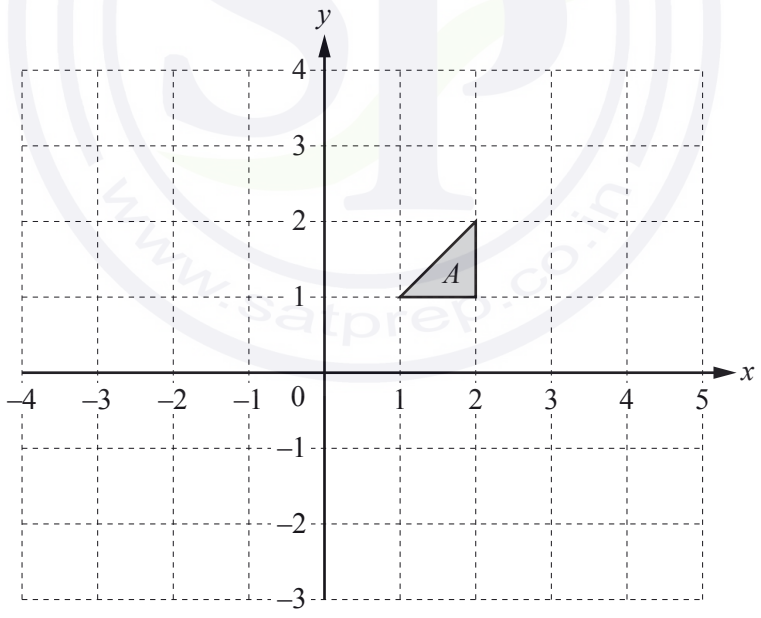
Answer ..... °C [1]

2



In the Venn diagram shade the region $A \cup B'$. [1]

3



Draw the image of shape A after a translation by the vector $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$. [2]

---

4 Pip and Ali share \$785 in the ratio Pip : Ali = 4 : 1.

Work out Pip's share.

Answer \$ ..... [2]

---

5 Jim scores the following marks in 8 tests.

7 8 8 y 6 9 10 5

His mean mark is 7.5 .

Calculate the value of y.

Answer y = ... [2]

---

6 By writing each number correct to 1 significant figure, estimate the value of $\dfrac{\sqrt{3.9} \times 29.3}{8.9 - 2.7}$.

Show all your working.

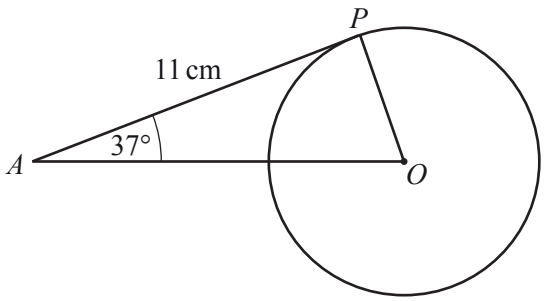
Answer ..... [2]

---

7 Work out the highest common factor (HCF) of 36 and 90.

Answer ..... [2]

8



NOT TO SCALE

In the diagram, AP is a tangent to the circle at P.
O is the centre of the circle, angle $PAO = 37°$ and $AP = 11$ cm.

(a) Write down the size of angle OPA.

Answer(a) Angle OPA = ... [1]

(b) Work out the radius of the circle.

Answer(b) ..... cm [2]

---

9 Factorise completely.

(a) $ax + ay + 3cx + 3cy$

Answer(a) ..... [2]

(b) $3a^2 - 12b^2$

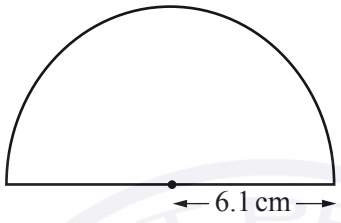
Answer(b) ..... [3]

---

10 Write the recurring decimal $0.1\dot{5}$ as a fraction.
[$0.1\dot{5}$ means 0.1555...]

Answer ..... [2]

11



NOT TO SCALE

A protractor is a semi-circle of radius 6.1 cm.

Calculate the **perimeter** of the protractor.

Answer ..... cm [3]

---

12 V is directly proportional to the cube of $(r + 1)$.
When $r = 1$, $V = 24$.

Work out the value of V when $r = 2$.

Answer $V =$ ..... [3]

---

13 Make x the subject of the formula.

$$y = ax^2 + b$$

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

---

14 A car travels at 56 km/h.

Find the time it takes to travel 300 metres.
Give your answer in seconds correct to the nearest second.

Answer ..... s [4]

---

15 Simplify. $\dfrac{x^2 - 16}{x^2 - 3x - 4}$

Answer ..... [4]

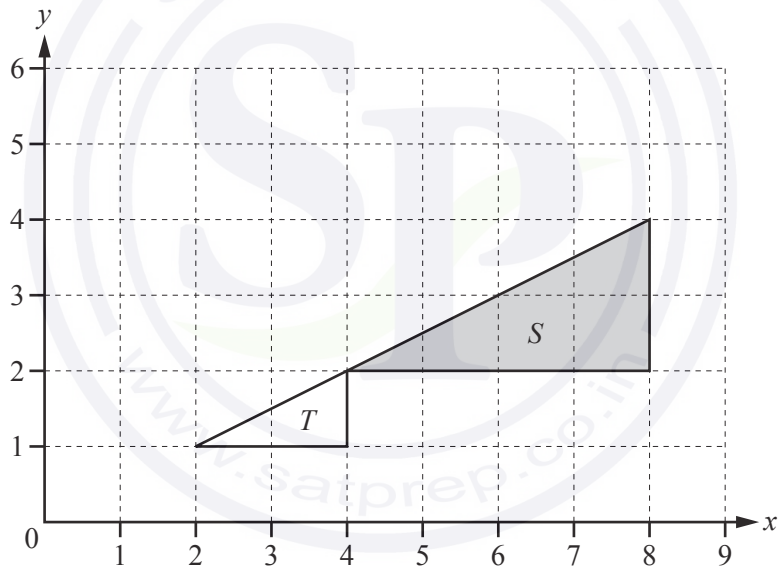
---

16 Hazel invests \$1800 for 7 years at a rate of 1.5% per year compound interest.

Calculate how much interest she will receive after the 7 years.
Give your answer correct to the nearest dollar.

Answer \$ ..... [4]

17



(a) Describe fully the **single** transformation that maps triangle *S* onto triangle *T*.

Answer(a) .....

..... [3]

(b) Find the matrix which represents the transformation that maps triangle *S* onto triangle *T*.

Answer(b) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

---

18 **(a)** Work out $\begin{pmatrix} 1 & -2 \\ 3 & 4 \end{pmatrix} \begin{pmatrix} -5 & -3 \\ 2 & 1 \end{pmatrix}$.

Answer(a) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

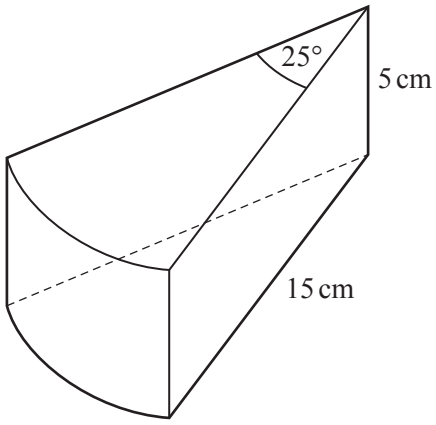
(b) Find the inverse of $\begin{pmatrix} 1 & -2 \\ 3 & 4 \end{pmatrix}$.

Answer(b) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(c) Explain why it is not possible to work out $\begin{pmatrix} 1 & -2 \\ 3 & 4 \end{pmatrix} + \begin{pmatrix} 3 \\ 2 \end{pmatrix}$.

Answer(c) ..... [1]

19



NOT TO SCALE

The diagram shows a wooden prism of height 5 cm.
The cross section of the prism is a sector of a circle with sector angle 25°.
The radius of the sector is 15 cm.

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

Answer ..... cm^2 [5]

20 The table shows the probability that a person has blue, brown or green eyes.

Eye colour	Blue	Brown	Green
Probability	0.4	0.5	0.1

Use the table to work out the probability that two people, chosen at random,

(a) have blue eyes,

Answer(a) ..... [2]

(b) have different coloured eyes.

Answer(b) ..... [4]

21 $f(x) = x^3$ $g(x) = 3x - 5$ $h(x) = 2x + 1$

Work out

(a) ff(2),

Answer(a) ..... [2]

(b) gh(x) and simplify your answer,

Answer(b) ..... [2]

(c) $h^{-1}(x)$, the inverse of h(x).

Answer(c) $h^{-1}(x)$ = ... [2]

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MATHEMATICS **0580/22**

Paper 2 (Extended) **October/November 2015**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

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The total of the marks for this paper is 70.

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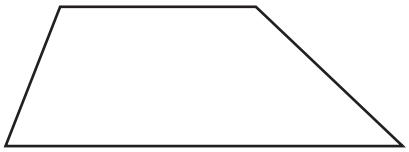
1 Write down the difference in temperature between 8°C and −9°C.

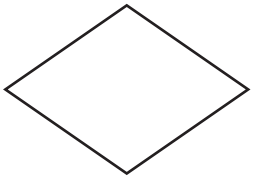
Answer ..... °C [1]

2

Parallelogram



Trapezium



Rhombus

Write down which one of these shapes has

- rotational symmetry of order 2

and

- no line symmetry.

Answer ..... [1]

---

3 Carlos changed $950 into euros (€) when the exchange rate was €1 = $1.368.

Calculate how many euros Carlos received.

Answer € ..... [2]

---

4 $\overrightarrow{AB} = \begin{pmatrix} -3 \\ 5 \end{pmatrix}$

Find $|\overrightarrow{AB}|$.

Answer ..... [2]

---

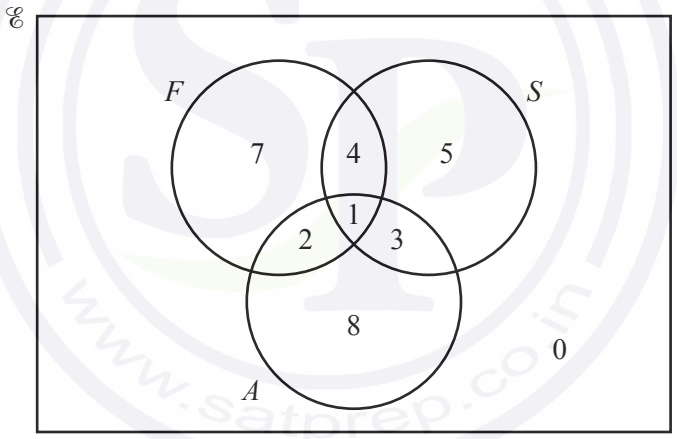
5 Calculate the volume of a hemisphere with radius 5 cm.

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

Answer ..... cm^3 [2]

---

6 The Venn diagram shows the number of students who study French (F), Spanish (S) and Arabic (A).



(a) Find $n(A \cup (F \cap S))$.

Answer(a) ..... [1]

(b) On the Venn diagram, shade the region $F' \cap S$. [1]

7

$$\mathbf{M} = \begin{pmatrix} 3 & -4 \\ -2 & 4 \end{pmatrix} \qquad \mathbf{N} = \begin{pmatrix} 5 & 0 \\ 1 & 2 \end{pmatrix}$$

Calculate **MN**.

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

---

8 Robert buys a car for $8000.
At the end of each year the value of the car has decreased by 10% of its value at the beginning of that year.

Calculate the value of the car at the end of 7 years.

Answer $ ..... [2]

---

9 The scale on a map is 1 : 50 000.
The area of a field on the map is 1.2 square centimetres.

Calculate the actual area of the field in square kilometres.

Answer ..... km^2 [2]

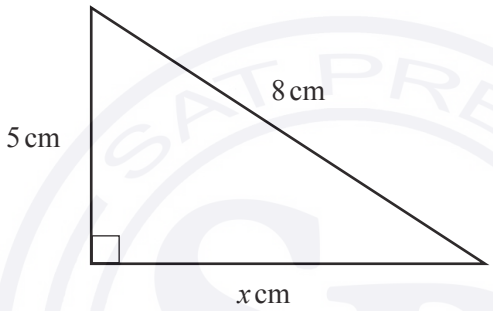
---

10 Jason receives some money for his birthday.
He spends $\frac{11}{15}$ of the money and has \$14.40 left.

Calculate how much money he received for his birthday.

Answer \$ ..... [3]

11



NOT TO SCALE

Calculate the value of x.

Answer x = ... [3]

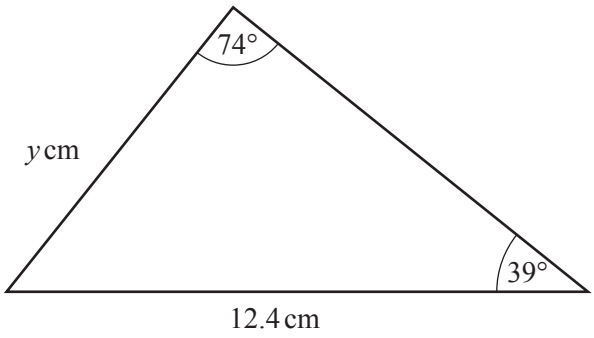
---

12 Without using your calculator, work out $2\frac{1}{4} - \frac{11}{12}$.

You must show all your working and give your answer as a fraction in its lowest terms.

Answer ..... [3]

13



NOT TO SCALE

Calculate the value of y.

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

---

14 Jasjeet and her brother collect stamps.
When Jasjeet gives her brother 1% of her stamps, she has 2475 stamps left.

Calculate how many stamps Jasjeet had originally.

Answer ..... [3]

---

15 Factorise

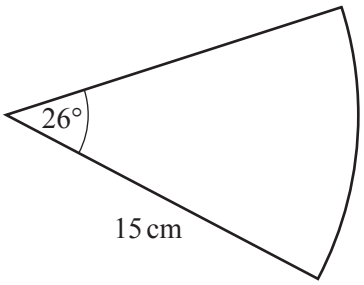
(a) $9w^2 - 100$,

Answer(a) ..... [1]

(b) $mp + np - 6mq - 6nq$.

Answer(b) ..... [2]

16



NOT TO SCALE

The diagram shows a sector of a circle with radius 15 cm.

Calculate the perimeter of this sector.

Answer ..... cm [3]

---

17 y is directly proportional to the square of $(x - 1)$.
$y = 63$ when $x = 4$.

Find the value of y when $x = 6$.

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

---

18 A rectangle has length 5.8 cm and width 2.4 cm, both correct to 1 decimal place.

Calculate the lower bound and the upper bound of the perimeter of this rectangle.

Answer Lower bound ..... cm

Upper bound ..... cm [3]

---

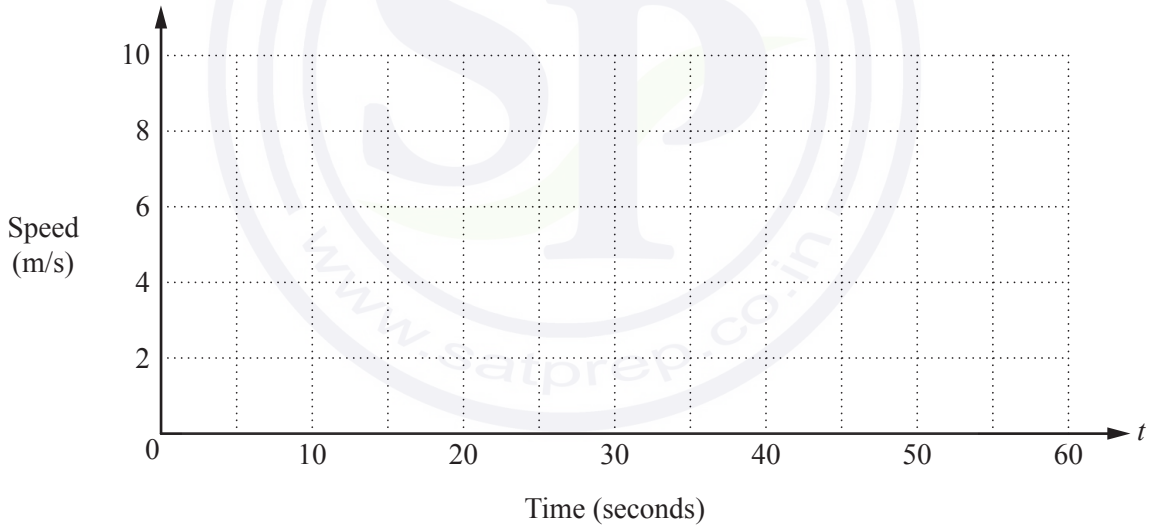
19 Solve the equation $5x^2 - 6x - 3 = 0$.
Show all your working and give your answers correct to 2 decimal places.

Answer x = ... or x = ... [4]

---

20 A car passes through a checkpoint at time $t = 0$ seconds, travelling at 8 m/s.
It travels at this speed for 10 seconds.
The car then decelerates at a constant rate until it stops when $t = 55$ seconds.

(a) On the grid, draw the speed-time graph.



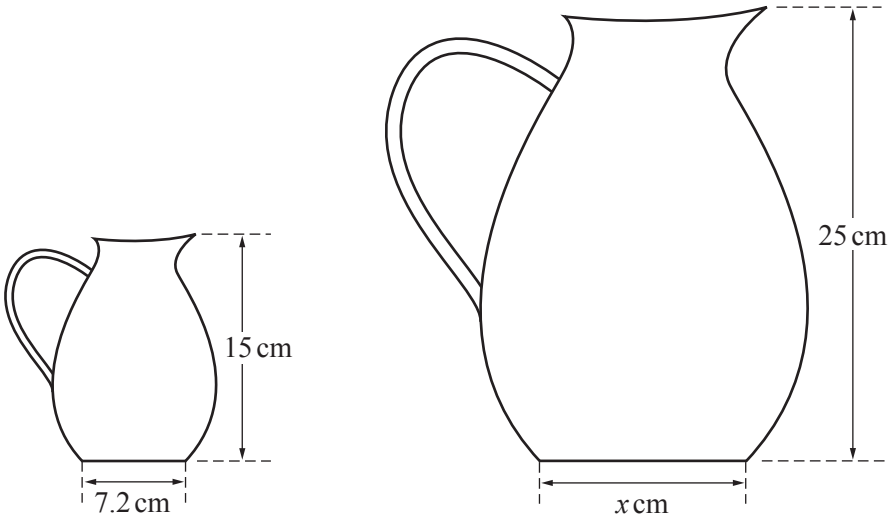
[2]

(b) Calculate the total distance travelled by the car after passing through the checkpoint.

Answer(b) ..... m [3]

---

21 (a)



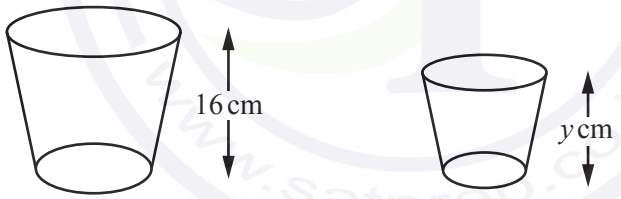
NOT TO SCALE

The diagram shows two jugs that are mathematically similar.

Find the value of x.

Answer(a) x = ... [2]

(b)



NOT TO SCALE

The diagram shows two glasses that are mathematically similar.
The height of the larger glass is 16 cm and its volume is 375 cm^3.
The height of the smaller glass is y cm and its volume is 192 cm^3.

Find the value of y.

Answer(b) y = ... [3]

22 The table shows information about the numbers of pets owned by 24 students.

Number of pets	0	1	2	3	4	5	6
Frequency	1	2	3	5	7	3	3

(a) Calculate the mean number of pets.

Answer(a) ..... [3]

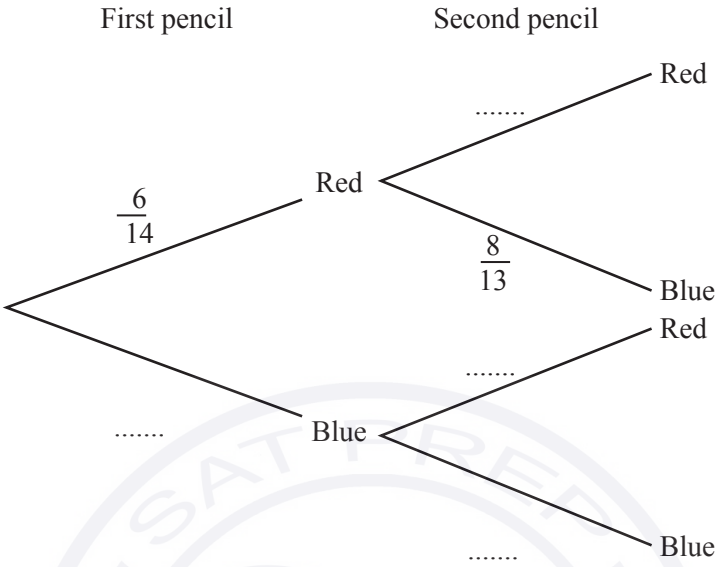
(b) Jennifer joins the group of 24 students.
When the information for Jennifer is added to the table, the new mean is 3.44 .

Calculate the number of pets that Jennifer has.

Answer(b) ..... [3]

23 A box contains 6 red pencils and 8 blue pencils.
A pencil is chosen at random and not replaced.
A second pencil is then chosen at random.

(a) Complete the tree diagram.



[2]

(b) Calculate the probability that

(i) both pencils are red,

Answer(b)(i) ..... [2]

(ii) at least one of the pencils is red.

Answer(*b*)(ii) ..... [3]

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CANDIDATE NUMBER	

2135367334

MATHEMATICS **0580/23**

Paper 2 (Extended) **October/November 2015**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
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This document consists of **12** printed pages.

1 Write 168.9 correct to 2 significant figures.

Answer ..... [1]

---

2 Calculate $\frac{2.07 - 1.89}{5.71 - 3.92}$.

Answer ..... [1]

---

3 Write 1.7×10^{-4} as an ordinary number.

Answer ..... [1]

---

4 The probability that it will rain on any day is $\frac{1}{5}$.

Calculate an estimate of the number of days it will rain in a month with 30 days.

Answer ..... [1]

---

5 11 12 13 14 15 16

From the list of numbers, write down

(a) the factors of 60,

Answer(a) ..... [1]

(b) the prime numbers.

Answer(b) ..... [1]

---

6 Simplify.

$1 - 2u + u + 4$

Answer ..... [2]

---

7 Factorise completely.

$2x - 4x^2$

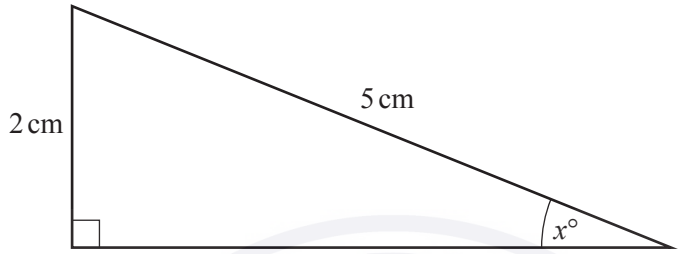
Answer ..... [2]

---

8 Find the sum of the interior angles of a 25-sided polygon.

Answer ..... [2]

9



NOT TO SCALE

Calculate the value of x.

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

---

10 Find the value of

(a) $(\sqrt{5})^8$,

Answer(a) ..... [1]

(b) $\left(\frac{1}{27}\right)^{-\frac{2}{3}}$.

Answer(b) ..... [1]

[Turn over

11 Write the following as single fractions.

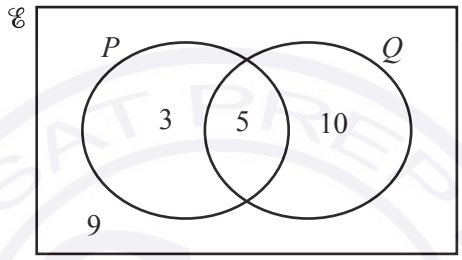
(a) $x + \frac{x}{2}$

Answer(a) ..... [1]

(b) $x + \frac{2}{x}$

Answer(b) ..... [1]

12



The Venn diagram shows the number of elements in each set.

(a) Find $\mathrm{n}(P' \cap Q)$.

Answer(a) ..... [1]

(b) Complete the statement $\mathrm{n}(\ldots\ldots\ldots\ldots\ldots) = 17$. [1]

---

13 $\mathbf{M} = \begin{pmatrix} 7 & u \\ 2 & 3 \end{pmatrix}$ and $|\mathbf{M}| = 1$.

Find the value of u.

Answer $u =$ ..... [2]

---

14 Two containers are mathematically similar.
Their volumes are $54\,\text{cm}^3$ and $128\,\text{cm}^3$.
The height of the smaller container is 4.5 cm.

Calculate the height of the larger container.

Answer ..... cm [3]

---

15 Work out $\frac{2}{3} + \frac{1}{6} - \frac{1}{4}$, giving your answer as a fraction in its lowest terms.

Do not use a calculator and show all the steps of your working.

Answer ..... [3]

---

16 Make a the subject of the formula $s = ut + \frac{1}{2}at^2$.

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

[Turn over

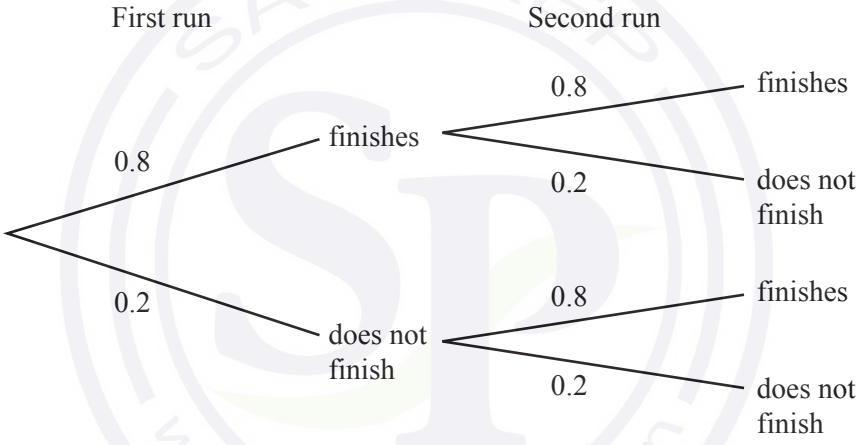
17 Simplify.

$$\left(\frac{x^{64}}{16y^{16}}\right)^{\frac{1}{4}}$$

Answer ..... [3]

---

18 Samira takes part in two charity runs.
The probability that she finishes each run is 0.8 .



Find the probability that Samira finishes at least one run.

Answer ..... [3]

---

19 y is inversely proportional to $(x + 2)^2$.
When $x = 1$, $y = 2$.

Find y in terms of x.

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

---

20 The volume of a cuboid is 878 cm^3, correct to the nearest cubic centimetre.
The length of the base of the cuboid is 7 cm, correct to the nearest centimetre.
The width of the base of the cuboid is 6 cm, correct to the nearest centimetre.

Calculate the lower bound for the height of the cuboid.

Answer ..... cm [3]

[Turn over

21 Solve the equation $3x^2 + 4x - 5 = 0$.
Show all your working and give your answers correct to 2 decimal places.

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

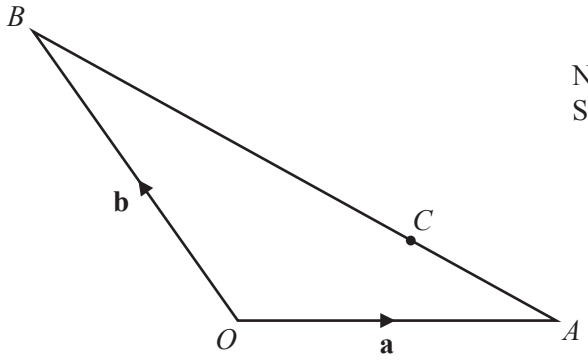
---

22 Simplify.

$$\frac{4 + 10w}{8 - 50w^2}$$

Answer ..... [4]

23



NOT TO SCALE

In the diagram, O is the origin, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
C is on the line AB so that $AC : CB = 1 : 2$.

Find, in terms of **a** and **b**, in its simplest form,

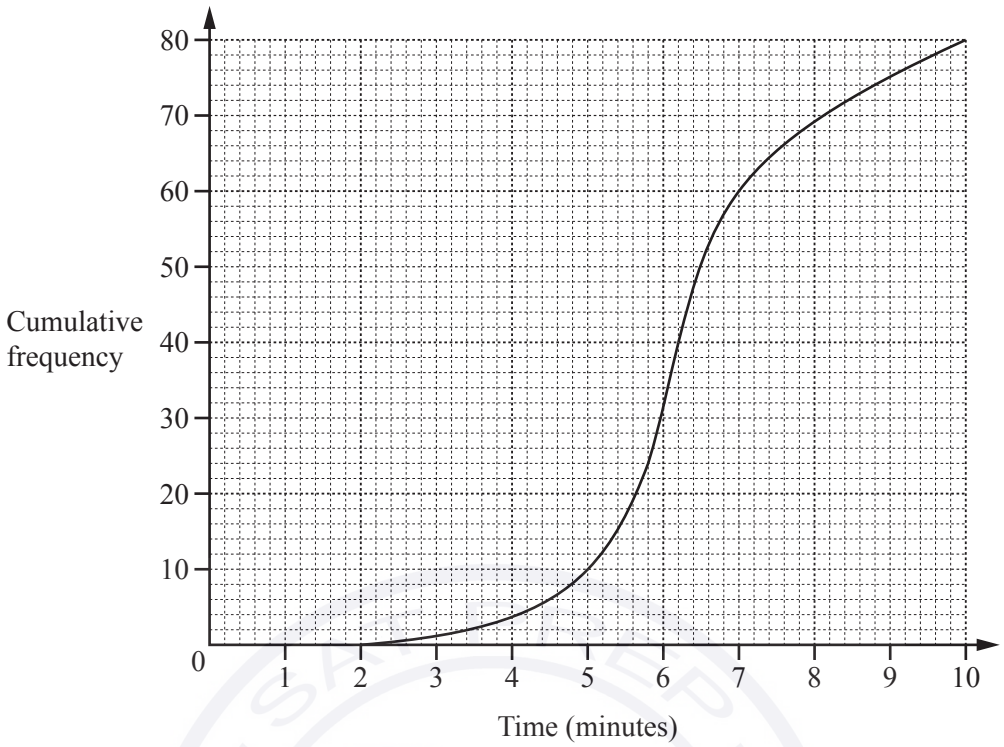
(a) $\overrightarrow{AC}$,

Answer(a) $\overrightarrow{AC}$ = ... [2]

(b) the position vector of C.

Answer(b) ..... [2]

24



The cumulative frequency diagram shows information about the times, in minutes, taken by 80 students to complete a short test.

Find

(a) the median,

Answer(a) ..... min [1]

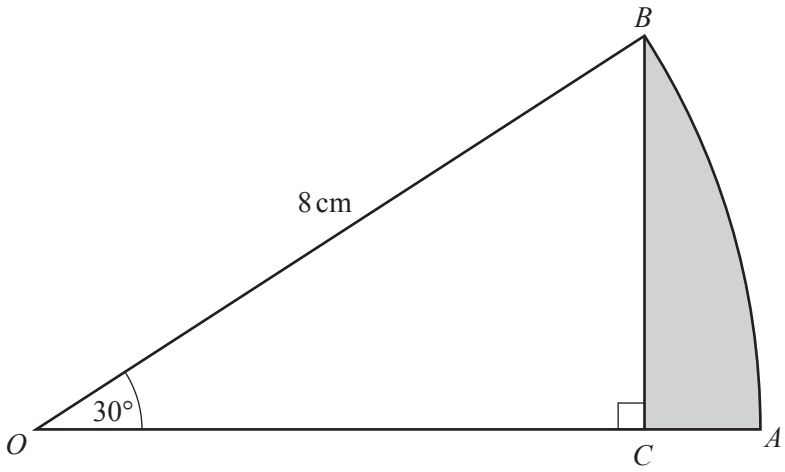
(b) the 30th percentile,

Answer(b) ..... min [2]

(c) the number of students taking more than 5 minutes.

Answer(c) ..... [2]

25



NOT TO SCALE

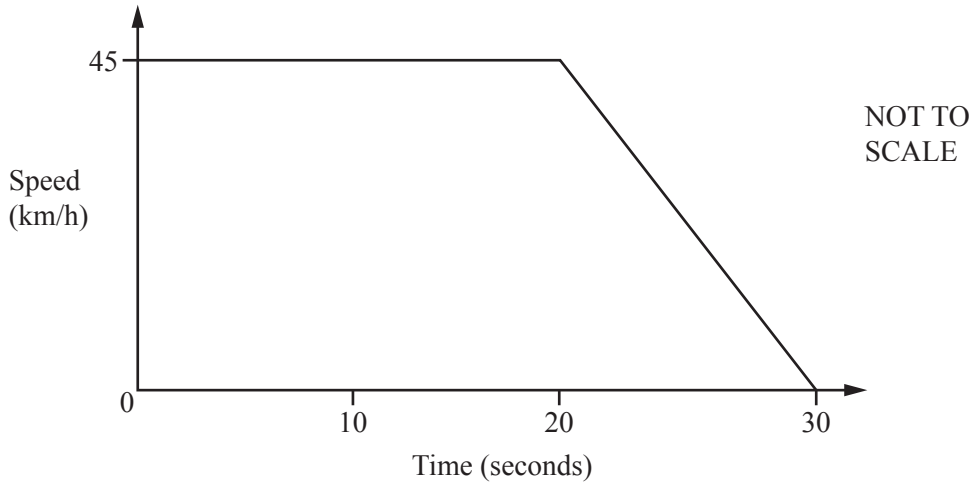
OAB is the sector of a circle, centre *O*, with radius 8 cm and sector angle 30°.
BC is perpendicular to *OA*.

Calculate the area of the region shaded on the diagram.

Answer ..... cm^2 [5]

Question 26 is printed on the next page.

26



The diagram shows the speed-time graph of a car.
The car travels at 45 km/h for 20 seconds.
The car then decelerates for 10 seconds until it stops.

(a) Change 45 km/h into m/s.

Answer(a) ..... m/s [2]

(b) Find the deceleration of the car, giving your answer in m/s^2.

Answer(b) ..... m/s^2 [1]

(c) Find the distance travelled by the car during the 30 seconds, giving your answer in metres.

Answer(c) ..... m [3]

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MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2015**

1 hour 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.
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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 70.

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 **12** printed pages.

1 At noon the temperature was 4 °C.
At midnight the temperature was –5.5 °C.

Work out the difference in temperature between noon and midnight.

Answer ..... °C [1]

---

2 Use your calculator to work out $\sqrt{10 + 0.6 \times (8.3^2 + 5)}$.

Answer ..... [1]

---

3 Write 270 000 in standard form.

Answer ..... [1]

---

4 Expand and simplify.

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

Answer ..... [2]

---

5 Paul and Sammy take part in a race.
The probability that Paul wins the race is $\frac{9}{35}$.
The probability that Sammy wins the race is 26%.

Who is more likely to win the race?
Give a reason for your answer.

Answer ..... because ..... [2]

---

6 Rice is sold in 75 gram packs and 120 gram packs.
The masses of both packs are given correct to the nearest gram.

Calculate the lower bound for the difference in mass between the two packs.

Answer ..... g [2]

---

7 Simplify.

$6uw^{-3} \times 4uw^{6}$

Answer ..... [2]

---

8 The point A has co-ordinates $(-4, 6)$ and the point B has co-ordinates $(7, -2)$.

Calculate the length of the line AB.

Answer AB = ... units [3]

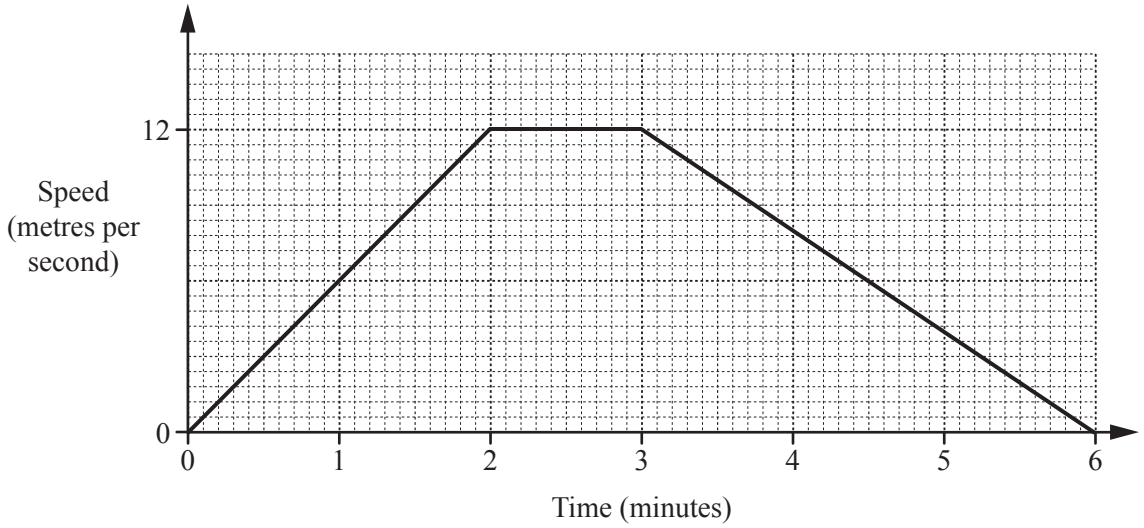
---

9 **Without using a calculator**, work out $1\frac{4}{5} \div \frac{3}{7}$.

Show all your working and give your answer as a fraction in its lowest terms.

Answer ..... [3]

10



A tram leaves a station and accelerates for 2 **minutes** until it reaches a speed of 12 metres per second.
It continues at this speed for 1 minute.
It then decelerates for 3 minutes until it stops at the next station.
The diagram shows the speed-time graph for this journey.

Calculate the distance, in metres, between the two stations.

Answer ..... m [3]

---

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

(a) 4, 8, 12, 16, 20, ...

Answer(a) ..... [1]

(b) 11, 20, 35, 56, 83, ...

Answer(b) ..... [2]

---

12 p is inversely proportional to the square of $(q + 4)$.
$p = 2$ when $q = 2$.

Find the value of p when $q = -2$.

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

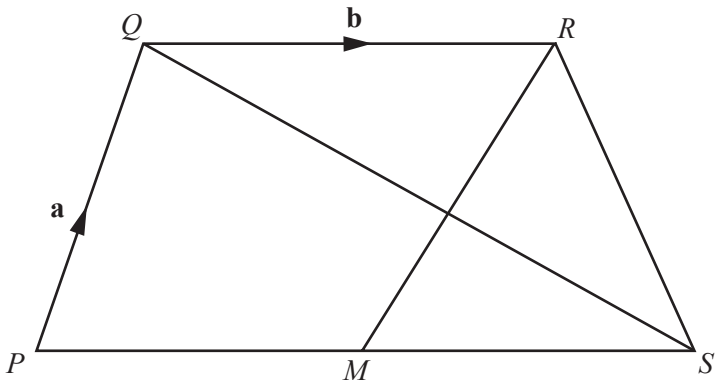
---

13 A car travels a distance of 1280 **metres** at an average speed of 64 kilometres per hour.

Calculate the time it takes for the car to travel this distance.
Give your answer in **seconds**.

Answer ..... s [3]

14



NOT TO SCALE

PQRS is a quadrilateral and *M* is the midpoint of *PS*.
$\overrightarrow{PQ} = \mathbf{a}$, $\overrightarrow{QR} = \mathbf{b}$ and $\overrightarrow{SQ} = \mathbf{a} - 2\mathbf{b}$.

(a) Show that $\overrightarrow{PS} = 2\mathbf{b}$.

Answer(a)

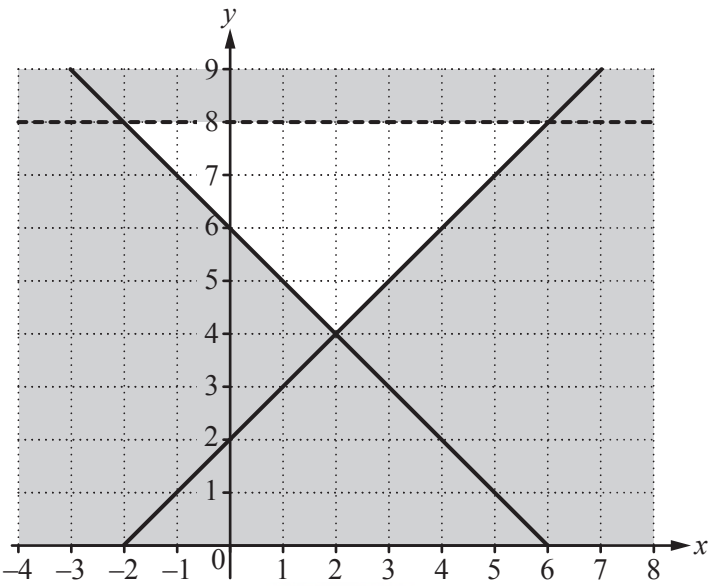
[1]

(b) Write down the mathematical name for the quadrilateral *PQRM*, giving reasons for your answer.

Answer(b) ..... because .....

..... [2]

15



Write down the 3 inequalities which define the unshaded region.

Answer .....

.....

..... [4]

---

16 Georg invests $5000 for 14 years at a rate of 2% per year compound interest.

Calculate the interest he receives.
Give your answer correct to the nearest dollar.

Answer $ ..... [4]

---

17 **(a)** Write 30 as a product of its prime factors.

Answer(a) ..... [2]

(b) Find the lowest common multiple (LCM) of 30 and 45.

Answer(b) ..... [2]

---

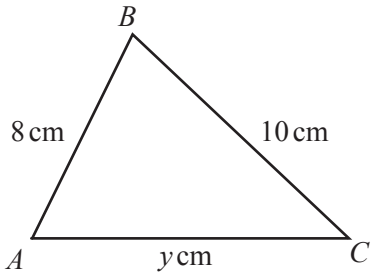
18 Solve the simultaneous equations.
You must show all your working.

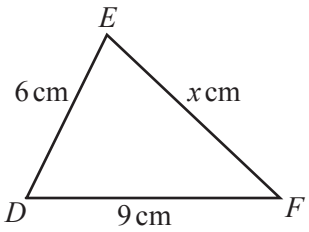
$5x + 2y = -2$
$3x - 5y = 17.4$

Answer x = ...

y = ... [4]

19





NOT TO SCALE

Triangle ABC is similar to triangle DEF.

Calculate the value of

(a) x,

Answer(a) $x =$ ..... [2]

(b) y.

Answer(b) $y =$ ..... [2]

---

20 Factorise completely.

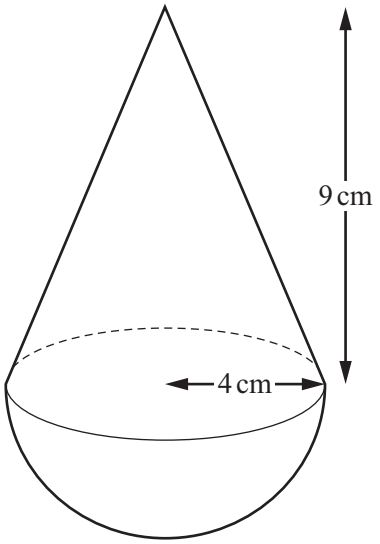
(a) $yp + yt + 2xp + 2xt$

Answer(a) ..... [2]

(b) $7(h + k)^2 - 21(h + k)$

Answer(b) ..... [2]

21



NOT TO SCALE

The diagram shows a toy.
The shape of the toy is a cone, with radius 4 cm and height 9 cm, on top of a hemisphere with radius 4 cm.

Calculate the volume of the toy.
Give your answer correct to the nearest cubic centimetre.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

Answer ..... cm^3 [4]

22 **(a)** Calculate $\begin{pmatrix} 3 & 7 \\ -1 & 4 \end{pmatrix}\begin{pmatrix} -2 & 1 \\ 4 & 2 \end{pmatrix}$.

Answer(a) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(b) Calculate the inverse of $\begin{pmatrix} 5 & 3 \\ 6 & 4 \end{pmatrix}$.

Answer(b) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

Question 23 is printed on the next page.

23 $f(x) = 5 - 3x$

(a) Find f(6).

Answer(a) ..... [1]

(b) Find $f(x + 2)$.

Answer(b) ..... [1]

(c) Find $ff(x)$, in its simplest form.

Answer(c) ..... [2]

(d) Find $f^{-1}(x)$, the inverse of $f(x)$.

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

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MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2015**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

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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 70.

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 Write 53 400 000 in standard form.

Answer ..... [1]

---

2 A doctor starts work at 20 40 and finishes work at 06 10 the next day.

How long is the doctor at work?
Give your answer in hours and minutes.

Answer ..... h ..... min [1]

---

3 $81^x = 3$

Find the value of x.

Answer x = ... [1]

---

4 7 9 20 3 9

(a) A number is removed from this list and the median and range do not change.

Write down this number.

Answer(a) ..... [1]

(b) An extra number is included in the original list and the mode does not change.

Write down a possible value for this number.

Answer(b) ..... [1]

---

5 A biased 4-sided dice is rolled.
The possible scores are 1, 2, 3 or 4.
The probability of rolling a 1, 3 or 4 is shown in the table.

Score	1	2	3	4
Probability	0.15		0.3	0.35

Complete the table. [2]

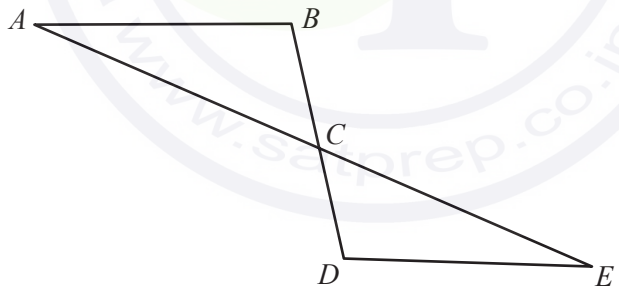
---

6 Solve.

$$5(w + 4 \times 10^3) = 6 \times 10^4$$

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

7



NOT TO SCALE

The diagram shows two straight lines, *AE* and *BD*, intersecting at *C*.
Angle *ABC* = angle *EDC*.
Triangles *ABC* and *EDC* are congruent.

Write down **two** properties of line segments *AB* and *DE*.

Answer AB and *DE* are .....

and ..... [2]

---

8 5, 11, 21, 35, 53, ...

Find the *n*th term of this sequence.

Answer ..... [2]

---

9 Write the recurring decimal $0.2\dot{5}$ as a fraction.
[$0.2\dot{5}$ means 0.2555...]

Answer ..... [2]

---

10 One year ago Ahmed's height was 114 cm.
Today his height is 120 cm.
Both measurements are correct to the nearest centimetre.

Work out the upper bound for the increase in Ahmed's height.

Answer ..... cm [2]

---

11 $\mathbf{M} = \begin{pmatrix} 3 & 1 \\ -11 & -2 \end{pmatrix}$

Find $\mathbf{M}^{-1}$, the inverse of $\mathbf{M}$.

Answer $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

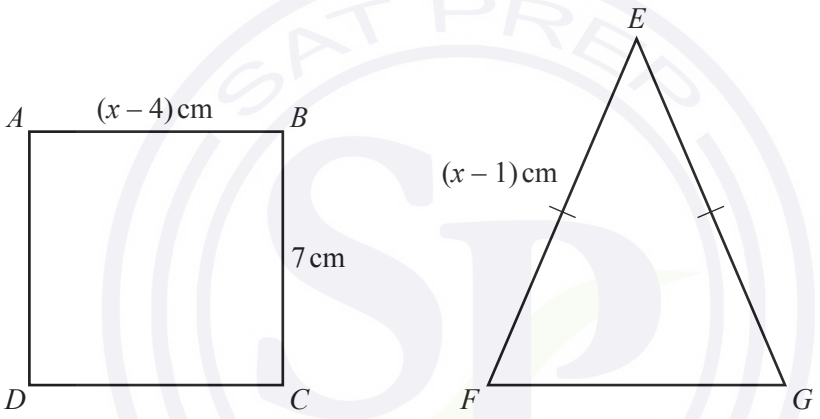
---

12 Without using a calculator, work out $\frac{4}{5} \div 2\frac{2}{3}$.

Write down all the steps of your working and give your answer as a fraction in its simplest form.

Answer ..... [3]

13



(a) *ABCD* is a square.

Find the value of x.

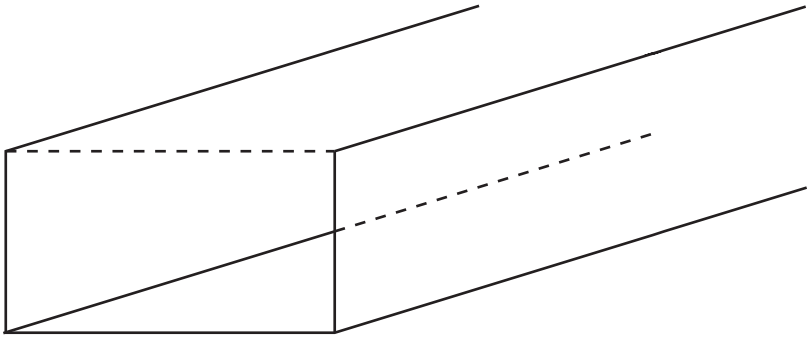
Answer(a) x = ... [1]

(b) Square *ABCD* and isosceles triangle *EFG* have the same perimeter.

Work out the length of *FG*.

Answer(b) FG = ... cm [2]

14



The diagram shows a channel for water.
The channel lies on horizontal ground.
This channel has a constant rectangular cross section with area 0.95 m^2.
The channel is full and the water flows through the channel at a rate of 4 metres/**minute**.

Calculate the number of cubic metres of water that flow along the channel in 3 **hours**.

Answer ..... m^3 [3]

---

15 Write as a single fraction in its simplest form.

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

Answer ..... [3]

---

16 **(a)** Find the value of

(i) $\left(\frac{1}{4}\right)^{0.5}$,

Answer(a)(i) ..... [1]

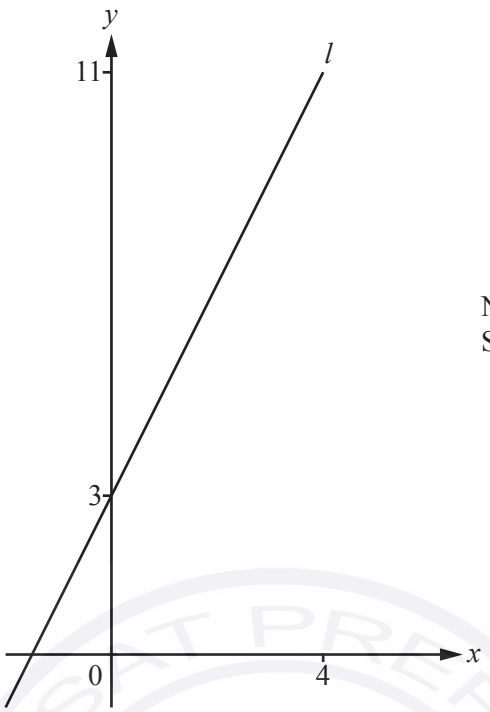
(ii) $(-8)^{\frac{2}{3}}$.

Answer(a)(ii) ..... [1]

(b) Use a calculator to find the decimal value of $\frac{\sqrt{29 - 3 \times 32^{0.4}}}{3}$.

Answer(b) ..... [1]

17



NOT TO SCALE

The diagram shows the straight line, l, which passes through the points (0, 3) and (4, 11).

(a) Find the equation of line l in the form $y = mx + c$.

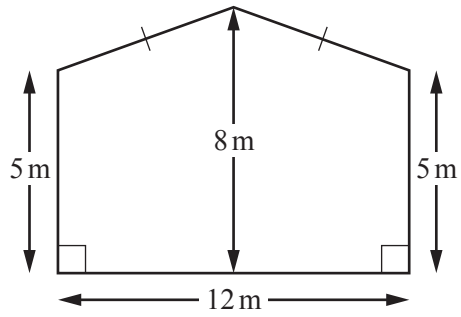
Answer(a) $y =$ ..... [3]

(b) Line p is perpendicular to line l.

Write down the gradient of line p.

Answer(b) ..... [1]

18



NOT TO SCALE

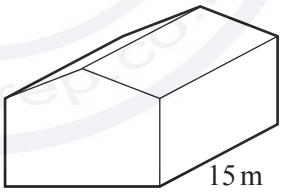
The diagram shows the front face of a barn.
The width of the barn is 12 m.
The height of the barn is 8 m.
The sides of the barn are both of height 5 m.

(a) Work out the area of the front face of the barn.

Answer(a) ..... m^2 [3]

(b) The length of the barn is 15 m.

Work out the volume of the barn.



NOT TO SCALE

Answer(b) ..... m^3 [1]

19 The diagram shows the positions of three points A, B and C.

(a) Draw the locus of points which are 4 cm from C. [1]

(b) **Using a straight edge and compasses only**, construct the locus of points which are equidistant from A and B. [2]

(c) Shade the region which is

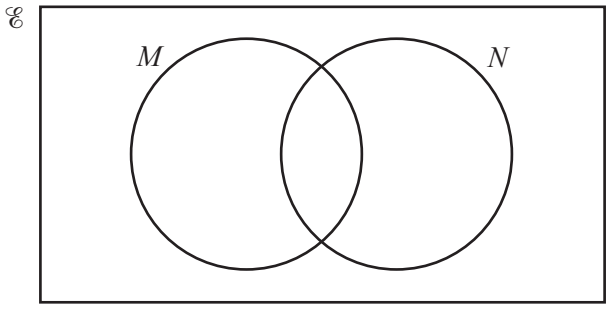
- less than 4 cm from C

and

- nearer to B than to A. [1]

20 **(a)** You may use this Venn diagram to help you answer **part (a)**.

$\mathscr{E} = \{x : 1 \leqslant x \leqslant 12, x \text{ is an integer}\}$
$M = \{\text{odd numbers}\}$
$N = \{\text{multiples of 3}\}$



(i) Find n(N).

Answer(a)(i) ..... [1]

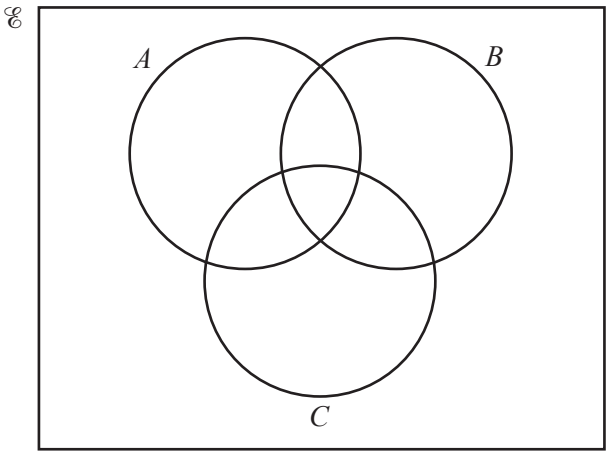
(ii) Write down the set $M \cap N$.

Answer(a)(ii) $M \cap N = \{$ ..... $\}$ [1]

(iii) Write down a set P where $P \subset M$.

Answer(a)(iii) $P = \{$ ..... $\}$ [1]

(b) Shade $(A \cup C) \cap B'$ in the Venn diagram below.



[1]

21 $f(x) = x^2 + 4x - 6$

(a) $f(x)$ can be written in the form $(x + m)^2 + n$.

Find the value of m and the value of n.

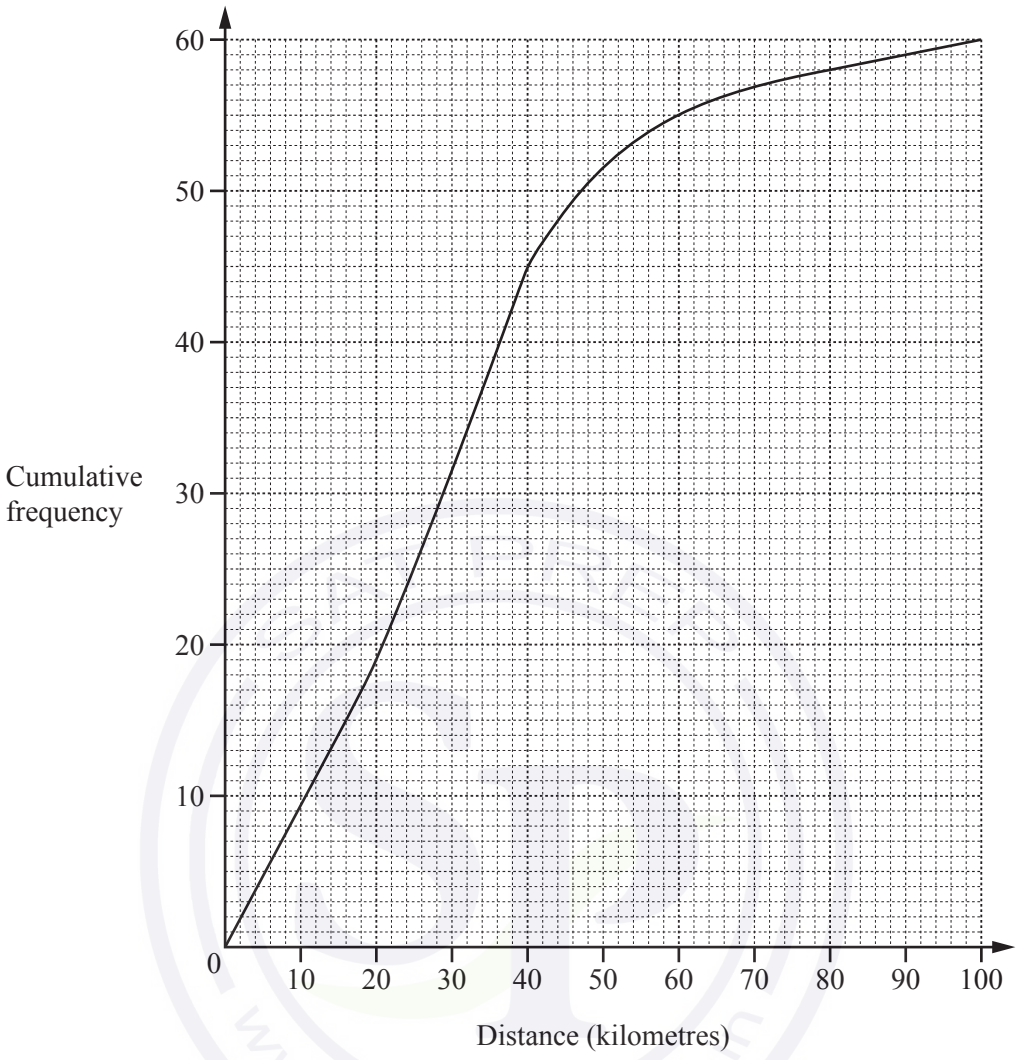
Answer(a) m = ...

n = ... [2]

(b) Use your answer to **part (a)** to find the positive solution to $x^2 + 4x - 6 = 0$.

Answer(b) x = ... [2]

22 The cumulative frequency diagram shows information about the distances travelled, in kilometres, by 60 people.



Find

(a) the 80th percentile,

Answer(a) ..... km [2]

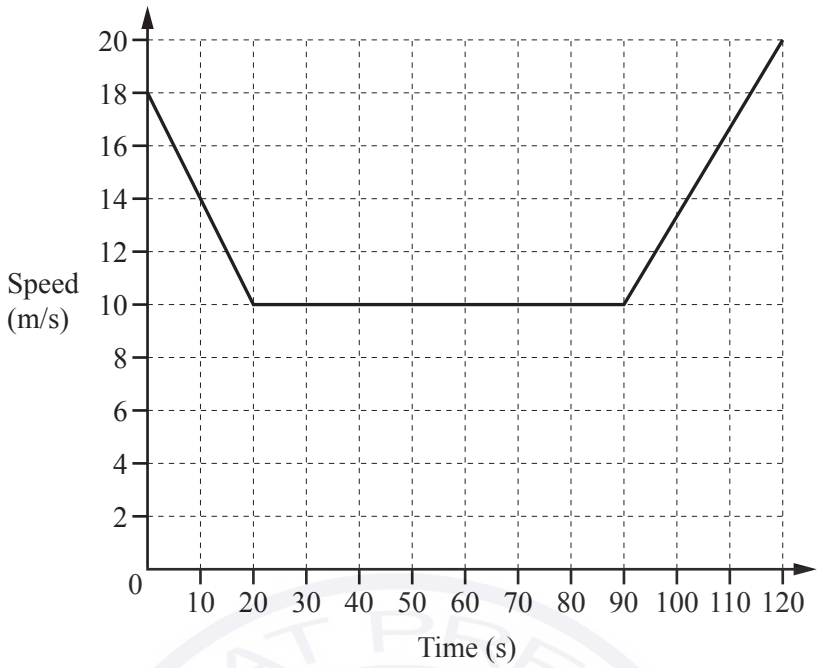
(b) the inter-quartile range,

Answer(b) ..... km [2]

(c) the number of people who travelled more than 60 km.

Answer(c) ..... [2]

23



The diagram shows the speed-time graph for 120 seconds of a car journey.

(a) Calculate the deceleration of the car during the first 20 seconds.

Answer(a) ..... m/s^2 [1]

(b) Calculate the total distance travelled by the car during the 120 seconds.

Answer(b) ..... m [3]

(c) Calculate the average speed for this 120 second journey.

Answer(c) ..... m/s [1]

24 $f(x) = 3x + 5$ $g(x) = x^2$

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

Answer(a) ..... [1]

(b) Find $f^{-1}(x)$, the inverse function.

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

(c) Find $ff(x)$.
Give your answer in its simplest form.

Answer(c) ..... [2]

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MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2015**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

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This document consists of **12** printed pages.

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1 Ahmed and Babar share 240 g of sweets in the ratio 7 : 3.

Calculate the amount Ahmed receives.

Answer ..... g [2]

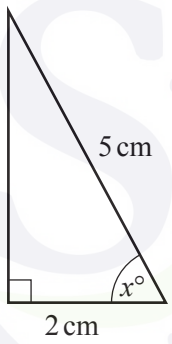
---

2 Factorise completely.

$9x^2 - 6x$

Answer ..... [2]

3



NOT TO SCALE

Calculate the value of x.

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

---

4 An equilateral triangle has sides of length 6.2 cm, correct to the nearest millimetre.

Complete the statement about the perimeter, P cm, of the triangle.

Answer ..... $\leqslant P <$ ..... [2]

---

5 Factorise $2x^2 - 5x - 3$.

Answer ..... [2]

---

6 Find the 2×2 matrix that represents a rotation through 90° clockwise about (0, 0).

Answer $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

---

7 James buys a drink for 2 euros (€).

Work out the cost of the drink in pounds (£) when £1 = €1.252 .
Give your answer correct to 2 decimal places.

Answer £ ..... [3]

---

8 **Without using a calculator**, work out $1\frac{7}{8} \div \frac{5}{9}$.

Show all your working and give your answer as a fraction in its lowest terms.

Answer ..... [3]

---

9 Solve the equation.

$$3(x + 4) = 2(4x - 1)$$

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

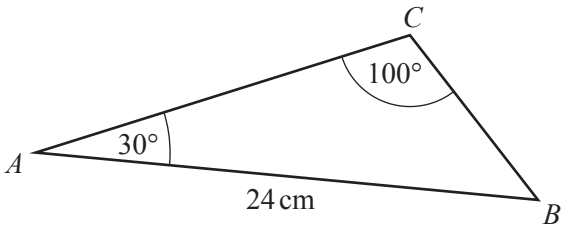
---

10 In a sale, the cost of a coat is reduced from \$85 to \$67.50 .

Calculate the percentage reduction in the cost of the coat.

Answer ..... % [3]

11

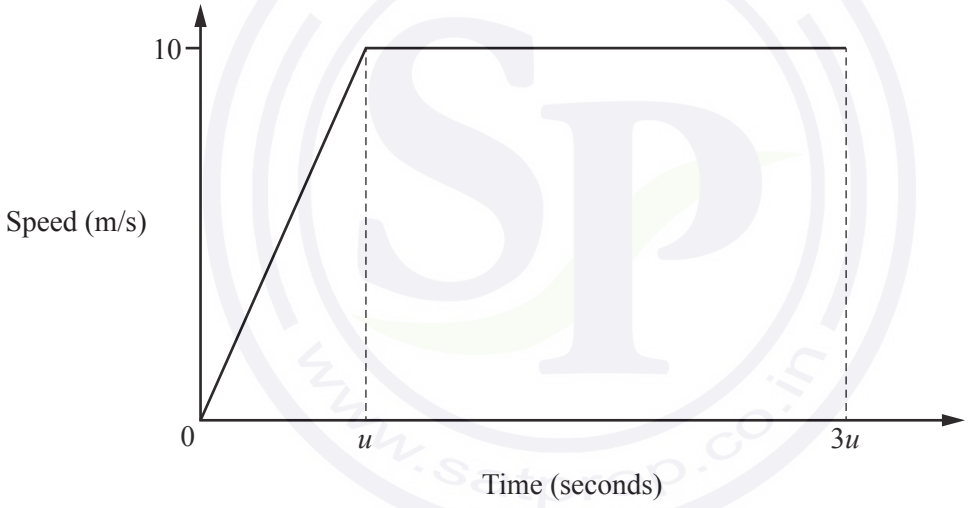


NOT TO SCALE

Use the sine rule to calculate BC.

Answer BC = ... cm [3]

12



NOT TO SCALE

A car starts from rest and accelerates for u seconds until it reaches a speed of 10 m/s.
The car then travels at 10 m/s for $2u$ seconds.
The diagram shows the speed-time graph for this journey.

The distance travelled by the car in the first $3u$ seconds is 125 m.

(a) Find the value of u.

Answer(a) u = ... [3]

(b) Find the acceleration in the first u seconds.

Answer(b) ..... m/s^2 [1]

---

13 Simplify.

(a) $12x^{12} \div 3x^3$

Answer(a) ..... [2]

(b) $(256y^{256})^{\frac{1}{8}}$

Answer(b) ..... [2]

---

14 Solve the equation.

$$2x^2 + x - 2 = 0$$

Show your working and give your answers correct to 2 decimal places.

Answer x = ... or x = ... [4]

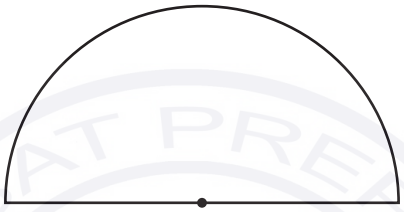
---

15 The circumference of a circle is 30 cm.

(a) Calculate the radius of the circle.

Answer(a) ..... cm [2]

(b)

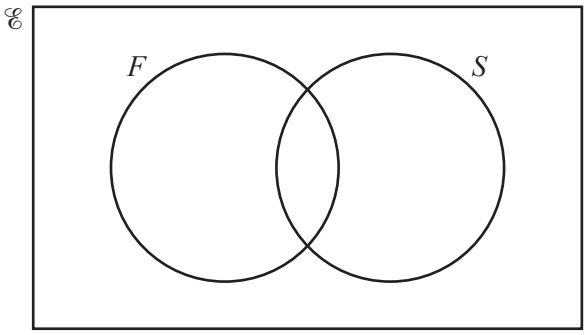


The length of the arc of the semi-circle is 15 cm.

Calculate the area of the semi-circle.

Answer(b) ..... cm^2 [2]

16 **(a)** In this part, you may use this Venn diagram to help you answer the questions.



In a class of 30 students, 25 study French (F), 18 study Spanish (S).
One student does not study French or Spanish.

(i) Find the number of students who study French and Spanish.

Answer(a)(i) ..... [2]

(ii) One of the 30 students is chosen at random.

Find the probability that this student studies French but not Spanish.

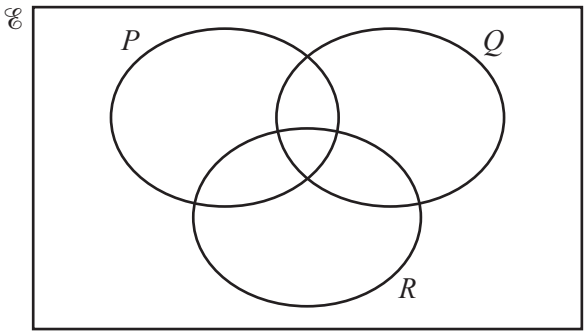
Answer(a)(ii) ..... [1]

(iii) A student who does not study Spanish is chosen at random.

Find the probability that this student studies French.

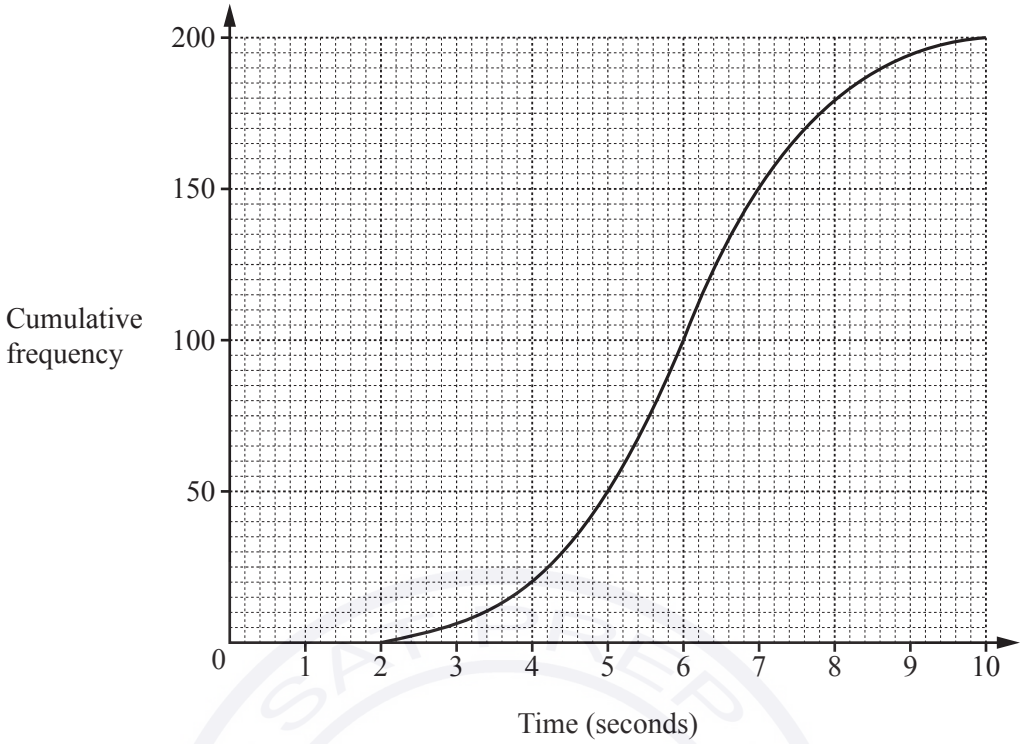
Answer(a)(iii) ..... [1]

(b)



On this Venn diagram, shade the region $R \cap (P \cup Q)'$. [1]

17



200 students take a reaction time test.
The cumulative frequency diagram shows the results.

Find

(a) the median,

Answer(a) ..... s [1]

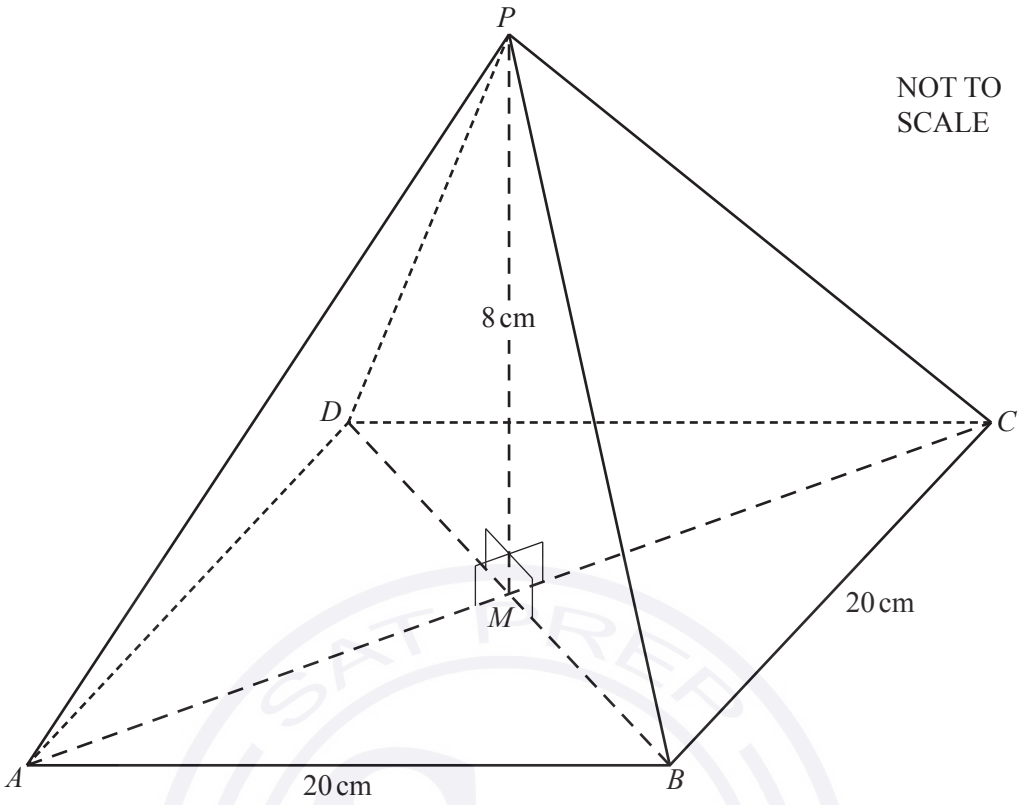
(b) the inter-quartile range,

Answer(b) ..... s [2]

(c) the number of students with a reaction time of more than 4 seconds.

Answer(c) ..... [2]

18

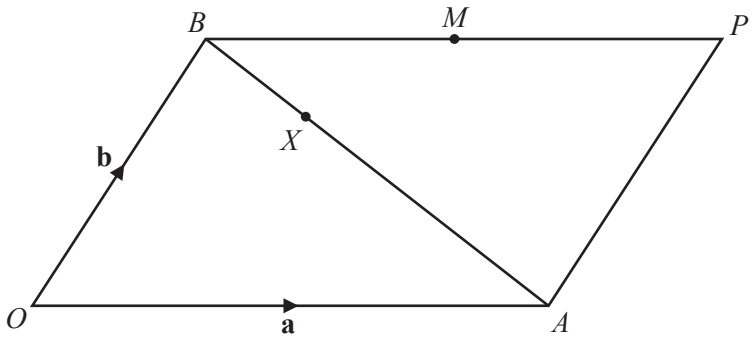


The diagram shows a solid pyramid on a square horizontal base $ABCD$.
The diagonals AC and BD intersect at M.
P is vertically above M.
$AB = 20$ cm and $PM = 8$ cm.

Calculate the total surface area of the pyramid.

Answer ..... cm^2 [5]

19



NOT TO SCALE

OAPB is a parallelogram.
O is the origin, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
M is the midpoint of *BP*.

(a) Find, in terms of **a** and **b**, giving your answer in its simplest form,

(i) $\overrightarrow{BA}$,

Answer(a)(i) $\overrightarrow{BA}$ = ... [1]

(ii) the position vector of *M*.

Answer(a)(ii) ..... [1]

(b) *X* is on *BA* so that $BX : XA = 1 : 2$.

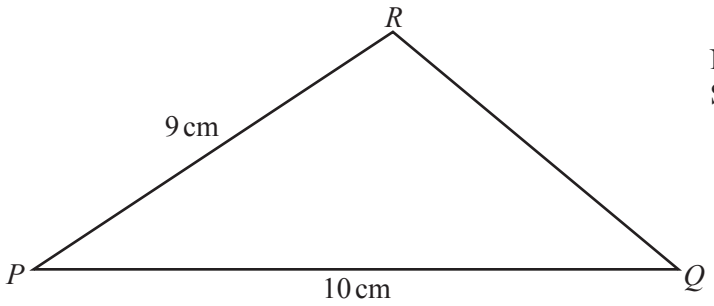
Show that *X* lies on *OM*.

Answer(b)

[4]

Question 20 is printed on the next page.

20



NOT TO SCALE

The area of triangle PQR is $38.5\,\text{cm}^2$.

Calculate the length QR.

Answer QR = ... cm [6]

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5844369115

MATHEMATICS **0580/22**

Paper 2 (Extended) **February/March 2015**

1 hour 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 70.

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 **12** printed pages.

1 The number of hot drinks sold in a café decreases as the weather becomes warmer.

What type of correlation does this statement show?

Answer ..... [1]

---

2 Find the lowest common multiple (LCM) of 24 and 32.

Answer ..... [2]

---

3 The base of a rectangular tank is 1.2 metres by 0.9 metres.
The water in the tank is 53 **centimetres** deep.

Calculate the number of litres of water in the tank.

Answer ..... litres [2]

---

4 Factorise $14p^2 + 21pq$.

Answer ..... [2]

---

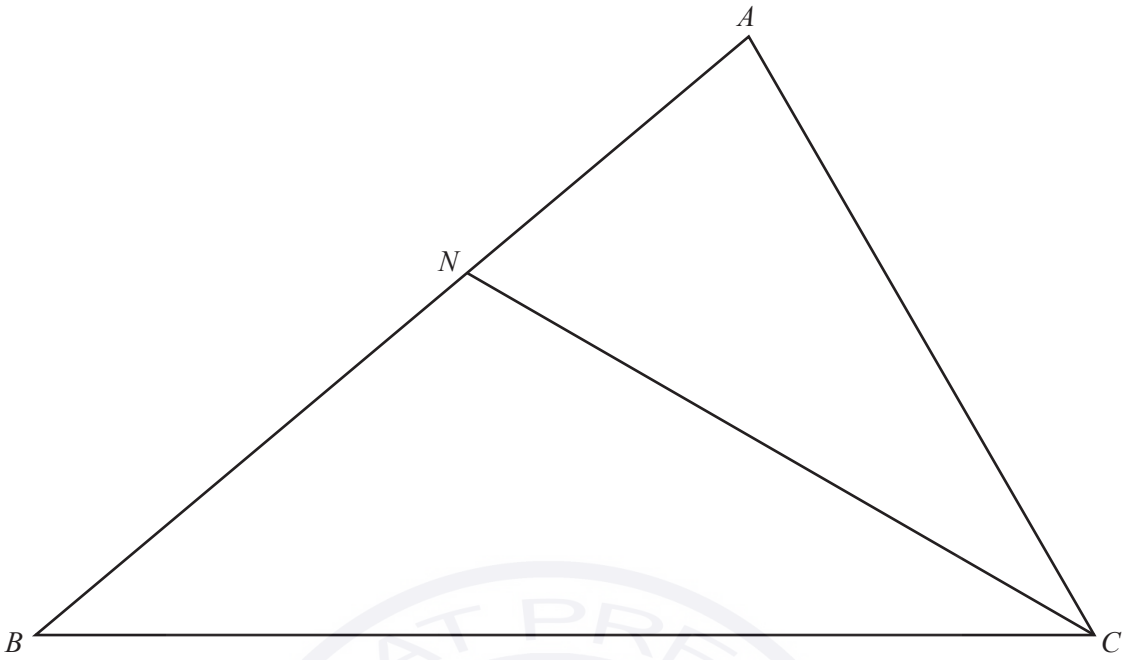
5 These are the first five terms of a sequence.

13 8 3 –2 –7

Find the nth term of this sequence.

Answer ..... [2]

6



In triangle ABC, CN is the bisector of angle ACB.

(a) **Using a ruler and compasses only**, construct the locus of points inside triangle ABC that are 5.7 cm from B. [1]

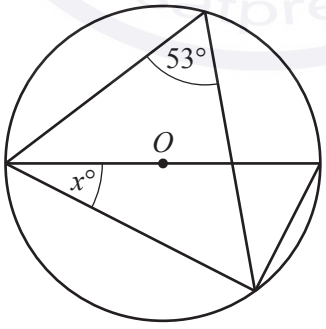
(b) Shade the region inside triangle ABC that is

- more than 5.7 cm from B

and

- nearer to BC than to AC. [1]

7



NOT TO SCALE

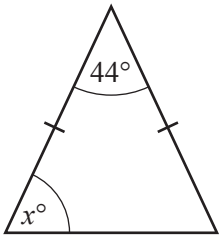
The diagram shows a circle, centre O.

Find the value of x.

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

---

8 (a)



NOT TO SCALE

The diagram shows an isosceles triangle.

Find the value of x.

Answer(a) x = ... [1]

(b) The exterior angle of a regular polygon is 24°.

Find the number of sides of this regular polygon.

Answer(b) ..... [2]

---

9 Ahmed, Batuk and Chand share \$1000 in the ratio 8 : 7 : 5.

Calculate the amount each receives.

Answer Ahmed \$ .....

Batuk \$ .....

Chand \$ ..... [3]

---

10 Pavan saves \$$x$ each month.
His two brothers **each** save \$4 more than Pavan each month.

Altogether the three boys save \$26 each month.

(a) Write down an equation in x.

Answer(a) ..... [1]

(b) Solve your equation to find the amount Pavan saves each month.

Answer(b) \$..... [2]

---

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

$$\tfrac{1}{2}x - 8y = 1$$
$$x + 2y = 6\tfrac{1}{2}$$

Answer x = ...

y = ... [3]

---

12 The population of Olton is decreasing at a rate of 3% per year.
In 2013, the population was 50 000.

Calculate the population after 4 years.
Give your answer correct to the nearest hundred.

Answer ..... [3]

---

13 x varies directly as the cube root of y.
$x = 6$ when $y = 8$.

Find the value of x when $y = 64$.

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

---

14 Find the equation of the line that

- is perpendicular to the line $y = 3x - 1$

and

- passes through the point (7, 4).

Answer ..... [3]

---

15 $\mathbf{A} = \begin{pmatrix} 8 & 3 \\ 4 & 2 \end{pmatrix}$

Find

(a) $\mathbf{A}^2$,

Answer(a) $\mathbf{A}^2 =$ $\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

(b) $\mathbf{A}^{-1}$.

Answer(b) $\mathbf{A}^{-1} =$ $\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

---

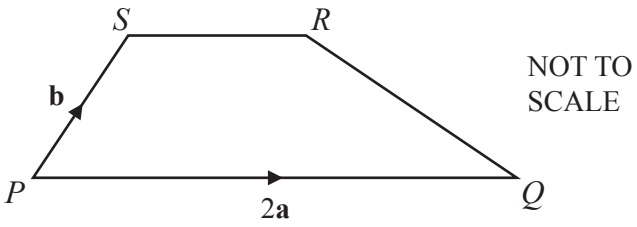
16 **Without using your calculator**, work out $2\frac{7}{9} \div \frac{5}{6}$.

Give your answer as a fraction in its lowest terms.
You must show each step of your working.

Answer ..... [4]

[Turn over

17 (a)

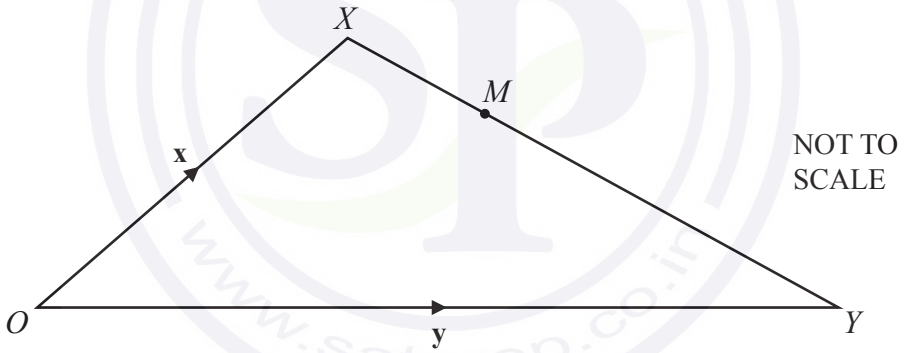


$PQRS$ is a trapezium with $PQ = 2SR$.
$\overrightarrow{PQ} = 2\mathbf{a}$ and $\overrightarrow{PS} = \mathbf{b}$.

Find $\overrightarrow{QR}$ in terms of **a** and **b** in its simplest form.

Answer(a) $\overrightarrow{QR}$ = ... [2]

(b)

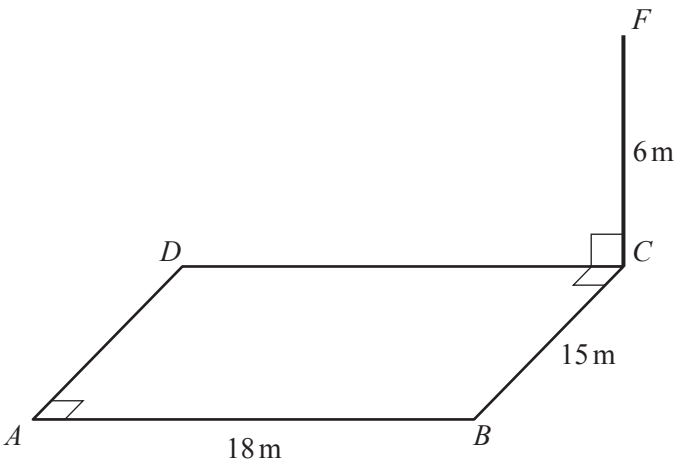


$\overrightarrow{OX} = \mathbf{x}$ and $\overrightarrow{OY} = \mathbf{y}$.
M is a point on XY such that $XM : MY = 3 : 5$.

Find $\overrightarrow{OM}$ in terms of **x** and **y** in its simplest form.

Answer(b) $\overrightarrow{OM}$ = ... [2]

18



NOT TO SCALE

The diagram shows a rectangular playground $ABCD$ on horizontal ground.
A vertical flagpole CF, 6 metres high, stands in corner C.
$AB = 18$ m and $BC = 15$ m.

Calculate the angle of elevation of F from A.

Answer ..... [4]

---

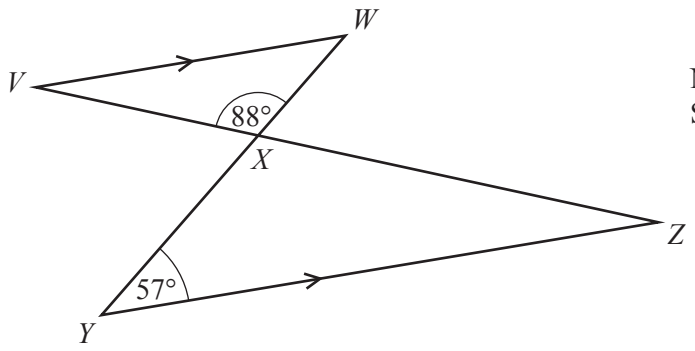
19 Fritz drives a distance of 381 km in 2 hours and 18 minutes.
He then drives 75 km at a constant speed of 30 km/h.

Calculate his average speed for the whole journey.

Answer ..... km/h [4]

[Turn over

20 (a)



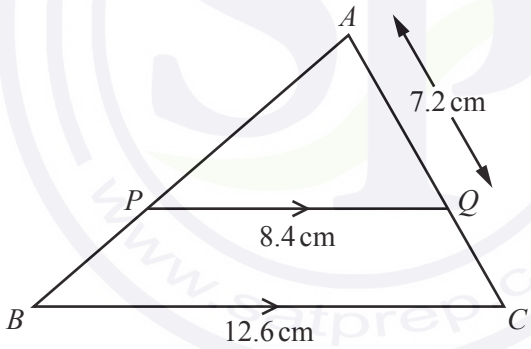
NOT TO SCALE

Two straight lines VZ and YW intersect at X.
VW is parallel to YZ, angle $XYZ = 57°$ and angle $VXW = 88°$.

Find angle WVX.

Answer(a) Angle WVX = ... [2]

(b)



NOT TO SCALE

ABC is a triangle and PQ is parallel to BC.
$BC = 12.6$ cm, $PQ = 8.4$ cm and $AQ = 7.2$ cm.

Find AC.

Answer(b) AC = ... cm [2]

21 **(a)** Simplify

(i) x^0,

Answer(a)(i) ..... [1]

(ii) $m^4 \times m^3$,

Answer(a)(ii) ..... [1]

(iii) $(8p^6)^{\frac{1}{3}}$.

Answer(a)(iii) ..... [2]

(b) $243^x = 3^2$

Find the value of x.

Answer(b) x = ... [2]

Question 22 is printed on the next page.

22 $f(x) = 5x - 3$ $g(x) = x^2$

(a) Find $fg(-2)$.

Answer(a) ..... [2]

(b) Find $gf(x)$, in terms of x, in its simplest form.

Answer(b) ..... [2]

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

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

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CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

3014020988

MATHEMATICS **0580/22**

Paper 2 (Extended) **October/November 2014**

1 hour 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.
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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 70.

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This document consists of **12** printed pages.

1 Insert **one pair** of brackets only to make the following statement correct.

$$6 + 5 \times 10 - 8 = 16$$

[1]

---

2 Calculate $\dfrac{8.24 + 2.56}{1.26 - 0.72}$.

Answer ..... [1]

3

Write down the order of rotational symmetry of this shape.

Answer ..... [1]

---

4 Shade the region required in each Venn diagram.

$(A \cup B)'$ $A' \cap B$

[2]

---

5 Make r the subject of this formula.

$$v = \sqrt[3]{p + r}$$

Answer r = ... [2]

---

6 The length, l metres, of a football pitch is 96 m, correct to the nearest metre.

Complete the statement about the length of this football pitch.

Answer ..... $\leqslant l <$ ..... [2]

---

7 For her holiday, Alyssa changed 2800 Malaysian Ringgits (MYR) to US dollars ($) when the exchange rate was 1 MYR = $0.325 .

At the end of her holiday she had $210 left.

(a) How many dollars did she spend?

Answer(a) $..... [2]

(b) She changed the $210 for 750 MYR.

What was the exchange rate in dollars for 1 MYR?

Answer(b) 1 MYR = $..... [1]

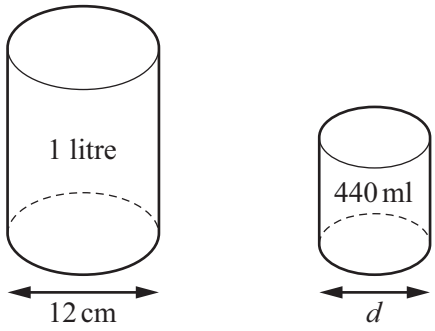
---

8 **Without using a calculator**, work out $1\frac{1}{6} \div \frac{7}{8}$.

Show all your working and give your answer as a fraction in its lowest terms.

Answer ..... [3]

9



NOT TO SCALE

Two cylindrical cans are mathematically similar.
The larger can has a capacity of 1 litre and the smaller can has a capacity of 440 ml.

Calculate the diameter, d, of the 440 ml can.

Answer d = ... cm [3]

---

10 The cost of a circular patio, \$$C$, varies as the square of the radius, r metres.
$C = 202.80$ when $r = 2.6$.

Calculate the cost of a circular patio with $r = 1.8$.

Answer \$..... [3]

---

11 $\mathbf{A} = \begin{pmatrix} 3 & -2 \\ 1 & 4 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 2 & 0 \\ -5 & 7 \end{pmatrix}$

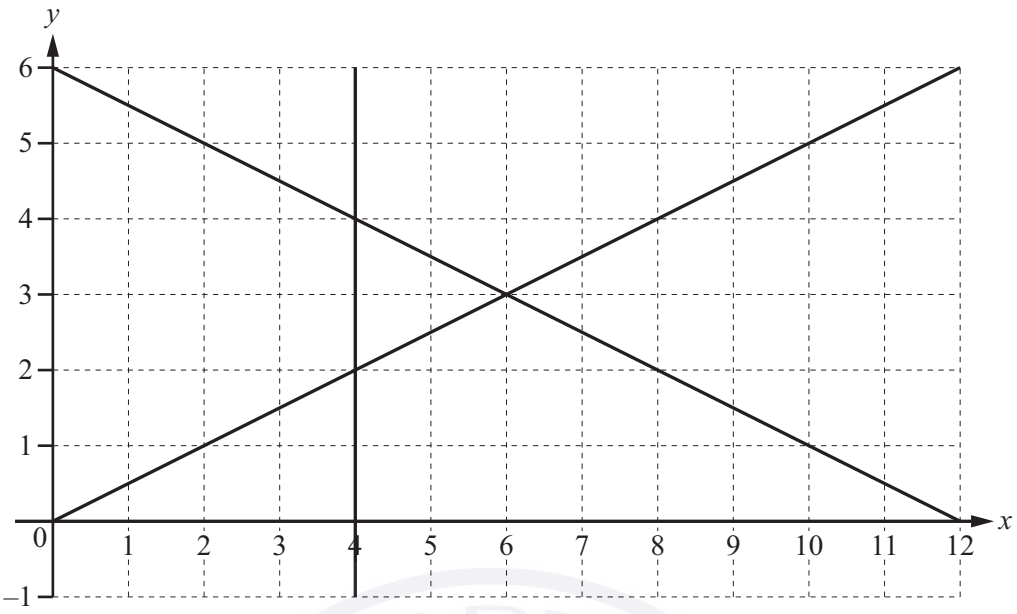
(a) Calculate **BA**.

Answer(a) **BA** = [2]

(b) Find the determinant of **A**.

Answer(b) ..... [1]

12

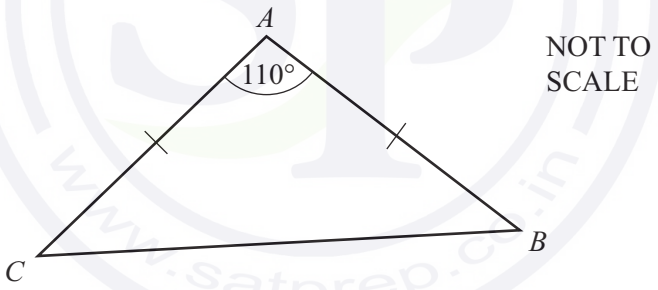


By shading the **unwanted** regions of the grid, find and label the region R which satisfies the following four inequalities.

$y \geqslant 0$ $\quad x \geqslant 4$ $\quad 2y \leqslant x$ $\quad 2y + x \leqslant 12$

[3]

13

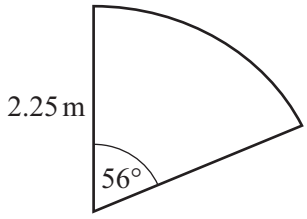


Triangle ABC is isosceles with $AB = AC$.
Angle $BAC = 110°$ and the area of the triangle is $85\,\text{cm}^2$.

Calculate AC.

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

14



NOT TO SCALE

The diagram shows a sand pit in a child's play area.
The shape of the sand pit is a sector of a circle of radius 2.25 m and sector angle 56°.

(a) Calculate the area of the sand pit.

Answer(a) ..... m^2 [2]

(b) The sand pit is filled with sand to a depth of 0.3 m.

Calculate the volume of sand in the sand pit.

Answer(b) ..... m^3 [1]

---

15 **(a)** Write 90 as a product of prime factors.

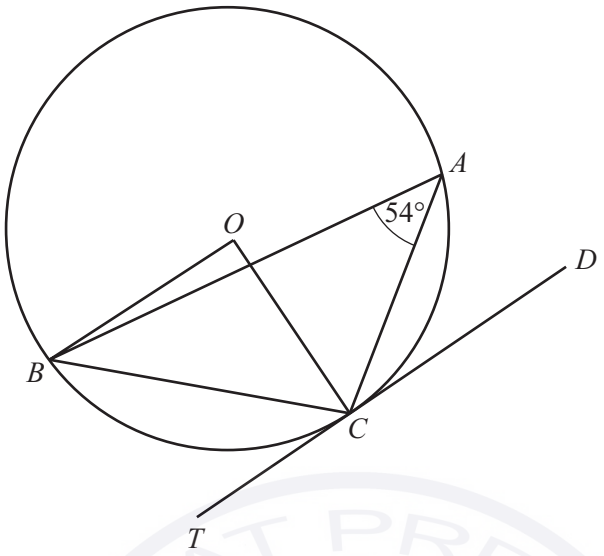
Answer(a) ..... [2]

(b) Find the lowest common multiple of 90 and 105.

Answer(b) ..... [2]

---

16 A, B and C are points on a circle, centre O.
TCD is a tangent to the circle.
Angle $BAC = 54°$.



NOT TO SCALE

(a) Find angle BOC, giving a reason for your answer.

Answer(a) Angle BOC = ... because .....

..... [2]

(b) When O is the origin, the position vector of point C is $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$.

(i) Work out the gradient of the radius OC.

Answer(b)(i) ..... [1]

(ii) D is the point $(7, k)$.

Find the value of k.

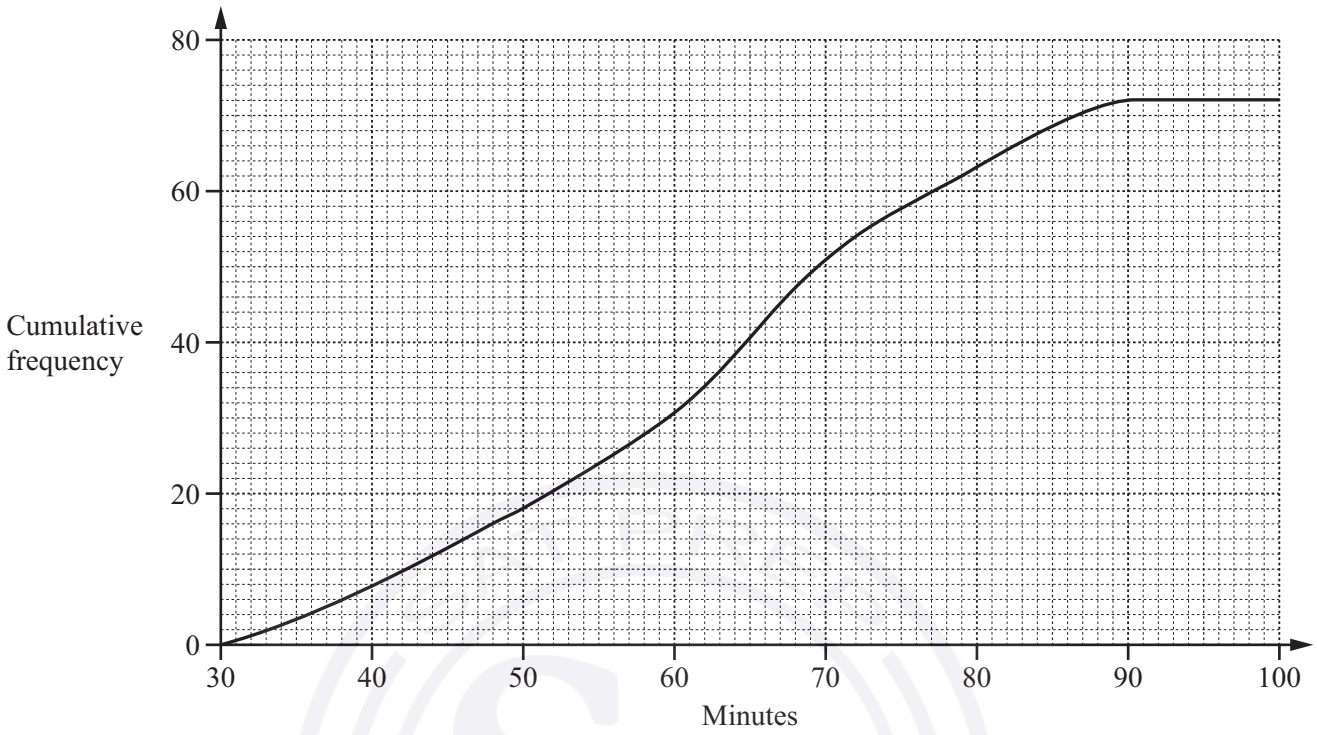
Answer(b)(ii) k = ... [1]

17 Alex invests $200 for 2 years at a rate of 2% per year simple interest.
Chris invests $200 for 2 years at a rate of 2% per year compound interest.

Calculate how much more interest Chris has than Alex.

Answer $..... [4]

18 72 students are given homework one evening.
They are told to spend no more than 100 minutes completing their homework.
The cumulative frequency diagram shows the number of minutes they spend.



(a) How many students spent more than 48 minutes completing their homework?

Answer(a) ..... [2]

(b) Find

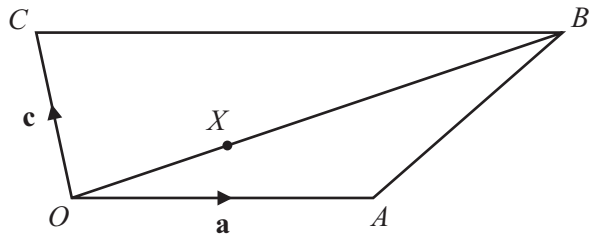
(i) the median,

Answer(b)(i) ..... [1]

(ii) the inter-quartile range.

Answer(b)(ii) ..... [2]

19



NOT TO SCALE

The diagram shows a quadrilateral $OABC$.
$\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OC} = \mathbf{c}$ and $\overrightarrow{CB} = 2\mathbf{a}$.
X is a point on OB such that $OX : XB = 1 : 2$.

(a) Find, in terms of **a** and **c**, in its simplest form

(i) $\overrightarrow{AC}$,

Answer(a)(i) $\overrightarrow{AC}$ = ... [1]

(ii) $\overrightarrow{AX}$.

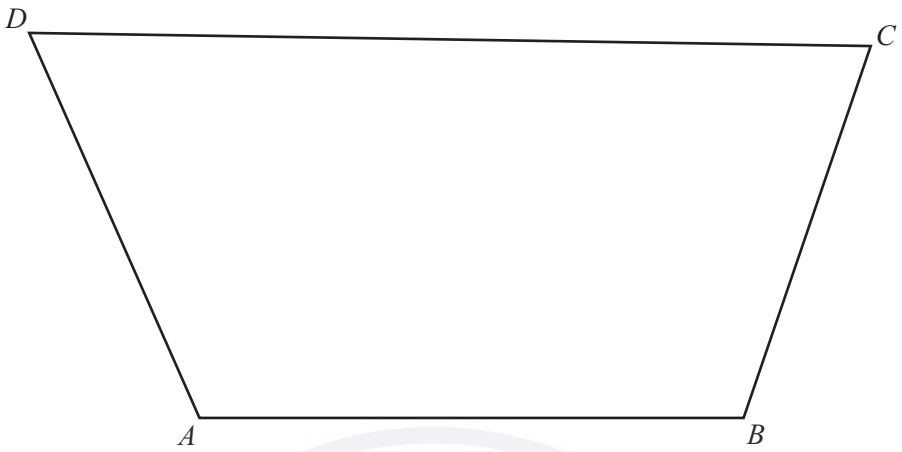
Answer(a)(ii) $\overrightarrow{AX}$ = ... [3]

(b) Explain why the vectors $\overrightarrow{AC}$ and $\overrightarrow{AX}$ show that C, X and A lie on a straight line.

Answer(b) .....

..... [2]

20 The diagram shows the plan, *ABCD*, of a park.
The scale is 1 centimetre represents 20 metres.



Scale: 1 cm to 20 m

(a) Find the actual distance *BC*.

Answer(a) ..... m [2]

(b) A fountain, *F*, is to be placed

- 160 m from *C*

and

- equidistant from *AB* and *AD*.

On the diagram, **using a ruler and compasses only**, construct and mark the position of *F*.
Leave in all your construction lines. [5]

Question 21 is printed on the next page.

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

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

Answer(a) ..... [3]

(b) Simplify.

$$\frac{4x^2 - 16x}{2x^2 + 6x - 56}$$

Answer(b) ..... [4]

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CENTRE NUMBER						CANDIDATE NUMBER				

2853616420

MATHEMATICS **0580/23**

Paper 2 (Extended) **October/November 2014**

1 hour 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 70.

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 **12** printed pages.

1 $1 = 8.2 rand

Change $350 into rands.

Answer ..... rand [2]

---

2 Write the following in order of size, smallest first.

$0.34 \qquad \sqrt{0.6} \qquad 0.6^2 \qquad 0.7^3$

Answer ..... < ..... < ..... < ..... [2]
smallest

---

3 Work out $4 \times 10^{-5} \times 6 \times 10^{12}$.
Give your answer in standard form.

Answer ..... [2]

---

4 The four sector angles in a pie chart are $2x°$, $3x°$, $4x°$ and 90°.

Find the value of x.

Answer x = ... [2]

---

5 A train takes 65 minutes to travel 52 km.

Calculate the average speed of the train in kilometres per hour.

Answer ..... km/h [2]

---

6 Solve the equation.

$$\frac{2x + 5}{3} = 8$$

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

---

7 Find the interior angle of a regular polygon with 18 sides.

Answer ..... [3]

---

8 Make x the subject of the formula.

$$y = 2 + \sqrt{x - 8}$$

Answer x = ... [3]

---

9 y varies inversely as $(x + 5)$.
$y = 6$ when $x = 3$.

Find y when $x = 7$.

Answer y = ... [3]

---

10 Maryah borrows \$12 000 to start a business.
The loan is for 3 years at a rate of 5% per year compound interest.
The loan has to be paid back at the end of the 3 years.

Calculate the total amount to be paid back.

Answer \$..... [3]

---

11 **(a)** Here are the first three terms of a sequence.

$U_1 = 1^3$ $U_2 = 1^3 + 2^3$ $U_3 = 1^3 + 2^3 + 3^3$

The nth term is given by $U_n = \frac{1}{4}n^2 (n + 1)^2$.

Work out the value of U_{39} .

Answer(a) U_{39} = ... [2]

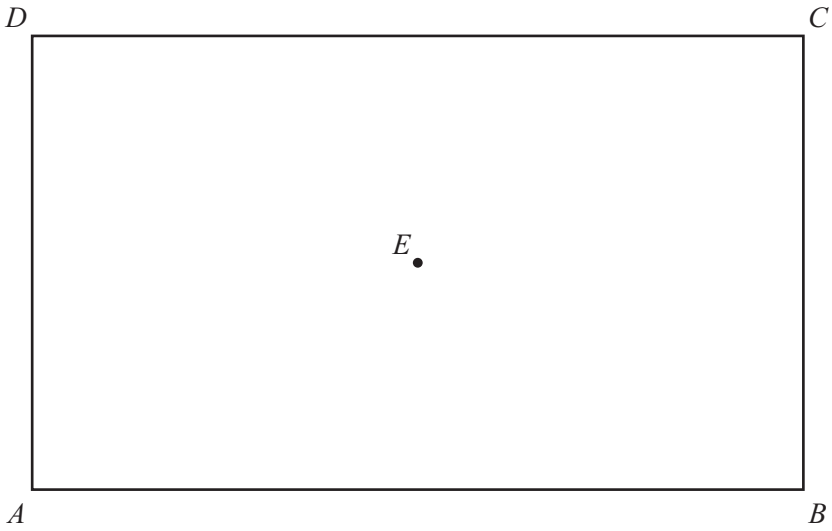
(b) Here are the first three terms of another sequence.

$V_1 = 2^3$ $V_2 = 2^3 + 4^3$ $V_3 = 2^3 + 4^3 + 6^3$

By comparing this sequence with the sequence in **part (a)**, find a formula for the nth term, V_n .

Answer(b) V_n = ... [1]

12



(a) Draw the locus of the points which are 3 cm from E. [1]

(b) **Using a straight edge and compasses only**, construct the bisector of angle DCB. [2]

(c) Shade the region which is

- less than 3 cm from E

and

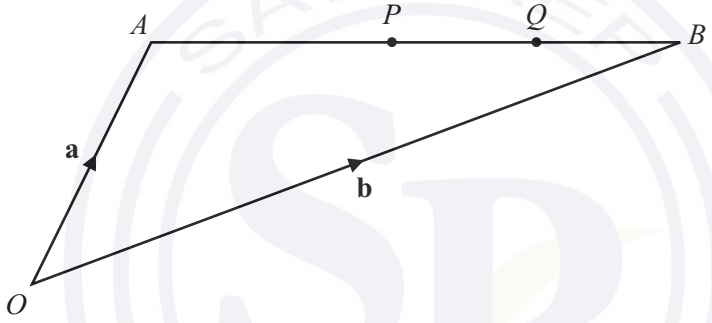
- nearer to CB than to CD. [1]

13 Write as a single fraction, in its simplest form.

$$\frac{3}{2x} + \frac{2x}{3} + 3 + 2x$$

Answer ..... [4]

14



NOT TO SCALE

The diagram shows two points, P and Q, on a straight line AB.
P is the midpoint of AB and Q is the midpoint of PB.
O is the origin, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

Write down, in terms of **a** and **b**, in its simplest form

(a) $\overrightarrow{AP}$,

Answer(a) $\overrightarrow{AP}$ = ... [2]

(b) the position vector of Q.

Answer(b) ..... [2]

---

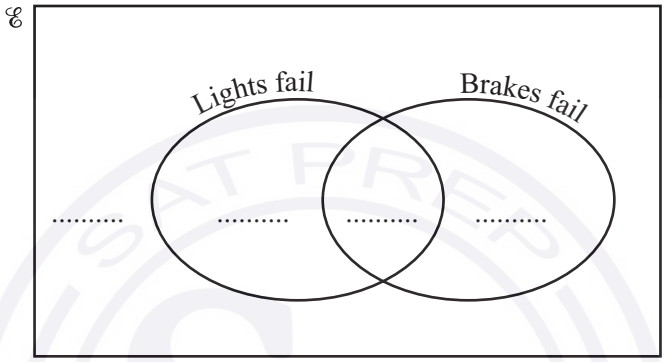
15 The lights and brakes of 30 bicycles are tested.
The table shows the results.

	Lights	Brakes
Fail test	3	9
Pass test	27	21

The lights and brakes both failed on one bicycle only.

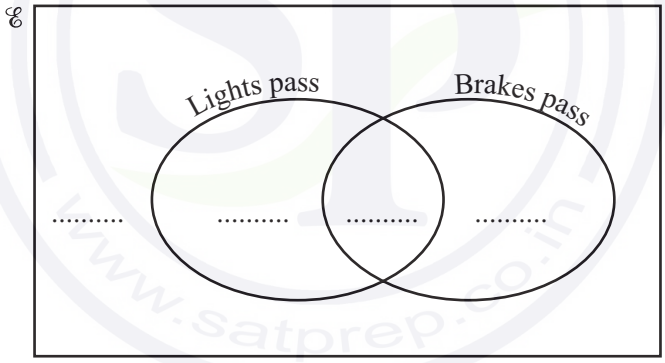
$\mathscr{E}$ = {30 bicycles}
Complete the Venn diagrams.

(a)



[2]

(b)



[2]

16 $f(x) = (x - 3)^2$ $g(x) = \frac{x-1}{4}$ $h(x) = x^3$

Find

(a) hf(1),

Answer(a) ..... [2]

(b) $g^{-1}(x)$,

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

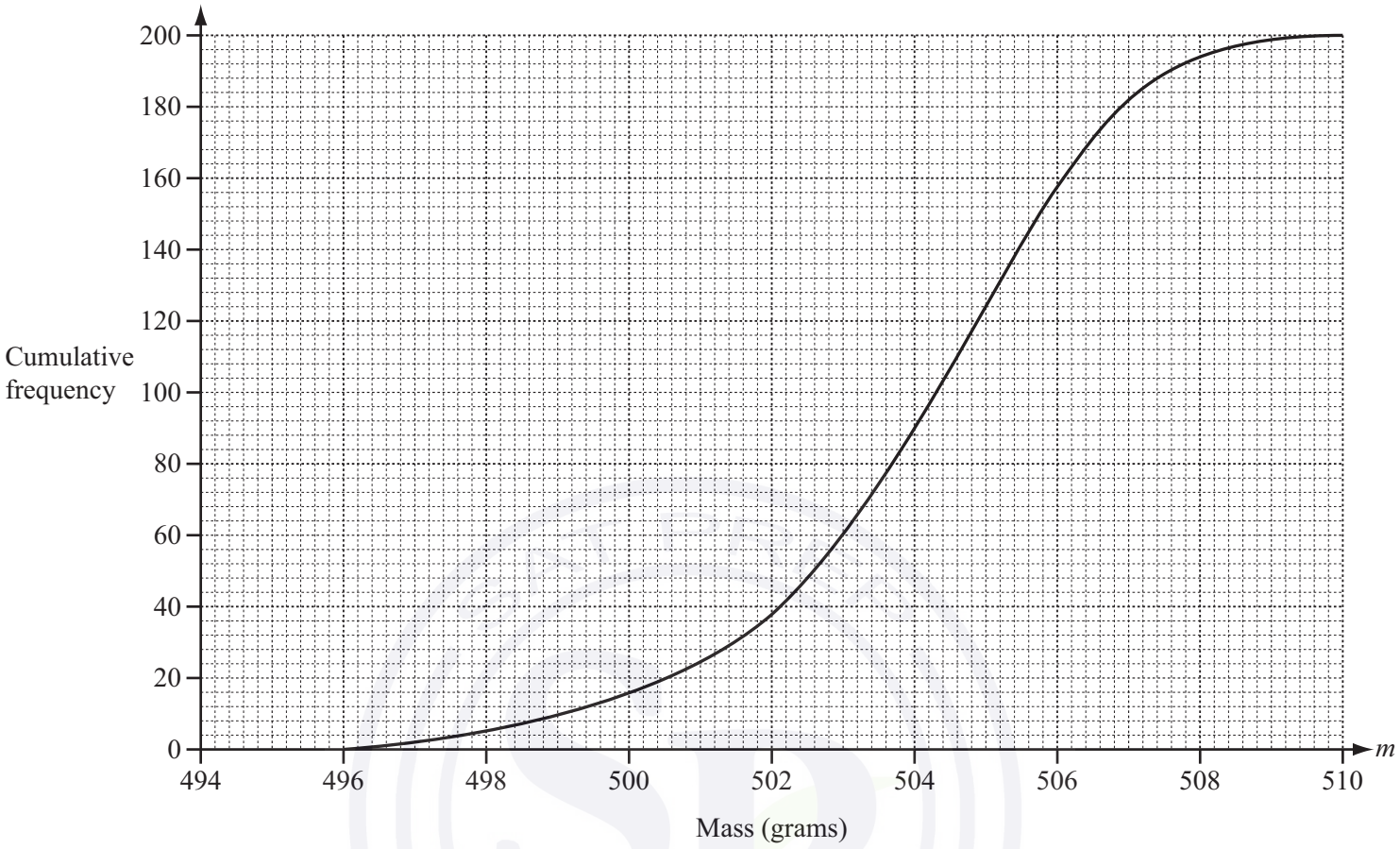
(c) gh(x),

Answer(c) gh(x) = ... [1]

(d) the solution to the equation $f(x) = 0$.

Answer(d) x = ... [1]

17 The mass, m grams, of cornflakes in each of 200 boxes is recorded.
The cumulative frequency diagram shows the results.



(a) Use the diagram to estimate the inter-quartile range.

Answer(a) ..... g [2]

(b) Find the probability that a box chosen at random has a mass of 500 grams or less.

Answer(b) ..... [2]

(c)

Mass (m grams)	$496 < m \leqslant 500$	$500 < m \leqslant 504$	$504 < m \leqslant 508$	$508 < m \leqslant 510$
Frequency	16	74	104	6

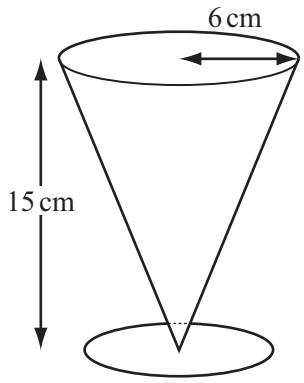
The data in this frequency table is to be shown in a histogram.

Complete the frequency density table below.

Mass (m grams)	$496 < m \leqslant 500$	$500 < m \leqslant 504$	$504 < m \leqslant 508$	$508 < m \leqslant 510$
Frequency density	4			

[2]

18



NOT TO SCALE

The diagram shows a glass, in the shape of a cone, for drinking milk.
The cone has a radius of 6 cm and height 15 cm.
A bottle of milk holds 2 litres.

(a) How many times can the glass be completely filled from the bottle?
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

Answer(a) ..... [4]

(b) Calculate the volume of milk left in the bottle.
Give your answer in cm^3.

Answer(b) ..... cm^3 [3]

Question 19 is printed on the next page.

[Turn over

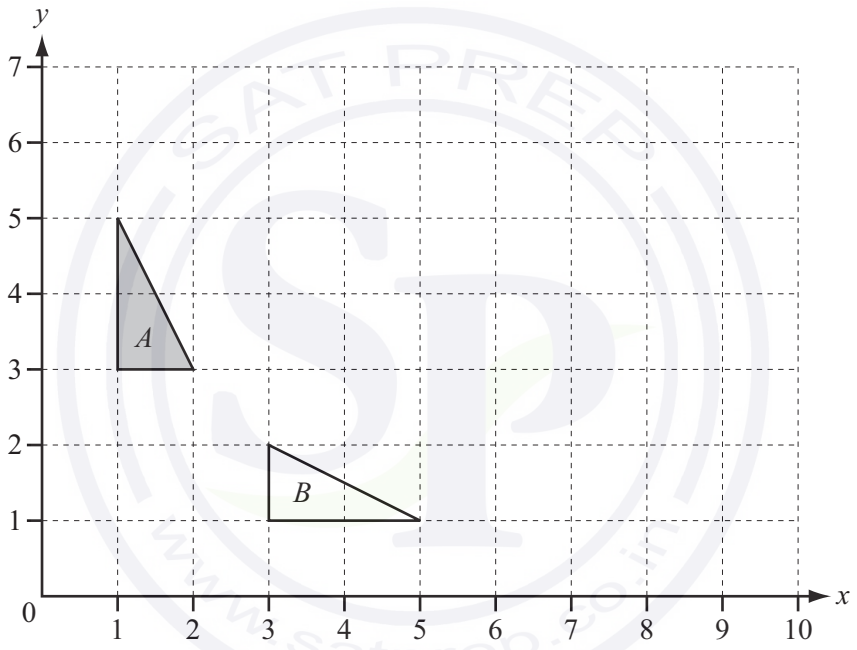
19 (a) $\mathbf{N} = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$

Describe fully the **single** transformation represented by **N**.

Answer(a) .....

..... [3]

(b) Find the matrix which represents the **single** transformation that maps triangle *A* onto triangle *B*.



Answer(b) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(c) On the grid, draw the image of triangle *A* under a stretch, factor 3, with the *y*-axis invariant. [2]

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MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2014**

1 hour 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.
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Answer **all** questions.
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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 70.

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 **12** printed pages.

1 Use your calculator to work out $\sqrt{\frac{3}{4}} + 2^{-1}$.

Give your answer correct to 2 decimal places.

Answer ..... [2]

---

2 $y = \frac{2}{x^2} + \frac{x^2}{2}$

Find the value of y when $x = 6$.
Give your answer as a mixed number in its simplest form.

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

---

3 Solve the equation. $\frac{n-8}{2} = 11$

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

---

4 $$p = \frac{4.8 \times 1.98276}{16.83}$$

(a) In the spaces provided, write each number in this calculation correct to 1 significant figure.

Answer(a)

$$\frac{\text{.....} \times \text{.....}}{\text{.....}}$$

[1]

(b) Use your answer to **part (a)** to estimate the value of p.

Answer(b) ..... [1]

---

5 Write the following in order of size, smallest first.

0.5^2 $\quad 0.5 \quad$ 0.5^3 $\quad \sqrt[3]{0.5}$

Answer ..... < ..... < ..... < ..... [2]

---

6 Carlo changed 800 euros (€) into dollars for his holiday when the exchange rate was €1 = $1.50 .
His holiday was then cancelled.
He changed all his dollars back into euros and he received €750.

Find the new exchange rate.

Answer €1 = $..... [3]

---

7 Make x the subject of the formula.

$$y = (x - 4)^2 + 6$$

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

---

8 Write as a single fraction in its simplest form.

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

Answer ..... [3]

---

9 A bus company in Dubai has the following operating times.

Day	Starting time	Finishing time
Saturday	06 00	24 00
Sunday	06 00	24 00
Monday	06 00	24 00
Tuesday	06 00	24 00
Wednesday	06 00	24 00
Thursday	06 00	24 00
Friday	13 00	24 00

(a) Calculate the total number of hours that the bus company operates in one week.

Answer(a) ..... h [3]

(b) Write the starting time on Friday in the 12-hour clock.

Answer(b) ..... [1]

[Turn over

10 Factorise completely.

(a) $ax + ay + bx + by$

Answer(a) ..... [2]

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

Answer(b) ..... [2]

---

11 A triangle has sides of length 2 cm, 8 cm and 9 cm.

Calculate the value of the largest angle in this triangle.

Answer ..... [4]

---

12 $p = 4 \times 10^5$ $q = 5 \times 10^4$

Find, giving your answer in standard form,

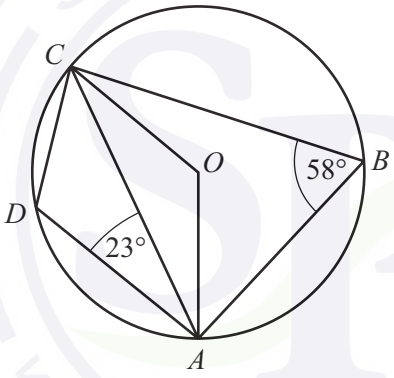
(a) pq,

Answer(a) ..... [2]

(b) $\frac{q}{p}$.

Answer(b) ..... [2]

13



NOT TO SCALE

A, B, C and D lie on a circle centre O.
Angle $ABC = 58°$ and angle $CAD = 23°$.

Calculate

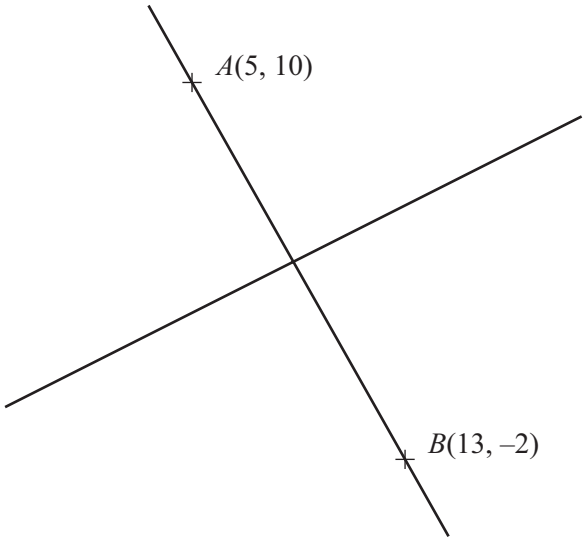
(a) angle OCA,

Answer(a) Angle OCA = ... [2]

(b) angle DCA.

Answer(b) Angle DCA = ... [2]

14



NOT TO SCALE

$A(5, 10)$ and $B(13, -2)$ are two points on the line AB.
The perpendicular bisector of the line AB has gradient $\frac{2}{3}$.

Find the equation of the perpendicular bisector of AB.

Answer ..... [4]

15 Solve the inequality for positive integer values of x.

$$\frac{21+x}{5} > x+1$$

Answer ..... [4]

---

16 **(a)** $(2^{24})^{\frac{1}{2}} = p^4$

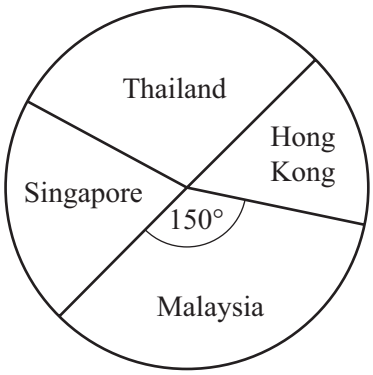
Find the value of p.

Answer(a) $p =$ ..... [2]

(b) Simplify $\dfrac{q^2+q^2}{q^{\frac{1}{4}} \times q^{\frac{1}{4}}}$.

Answer(b) ..... [3]

17



NOT TO SCALE

A travel brochure has 72 holidays in four different countries.
The pie chart shows this information.

(a) There are 24 holidays in Thailand.

Show that the sector angle for Thailand is 120°.

Answer(a)

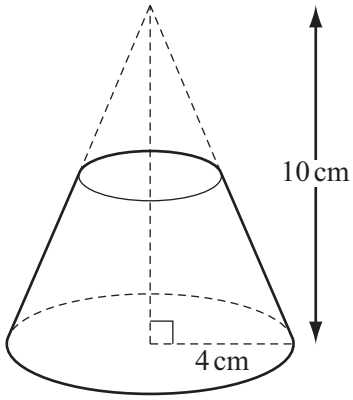
[2]

(b) The sector angle for Malaysia is 150°.
The sector angle for Singapore is twice the sector angle for Hong Kong.

Calculate the number of holidays in Hong Kong.

Answer(b) ..... [3]

18



NOT TO SCALE

A **solid** cone has base radius 4 cm and height 10 cm.
A mathematically similar cone is removed from the top as shown in the diagram.
The volume of the cone that is removed is $\frac{1}{8}$ of the volume of the original cone.

(a) Explain why the cone that is removed has radius 2 cm and height 5 cm.

Answer(a)

[2]

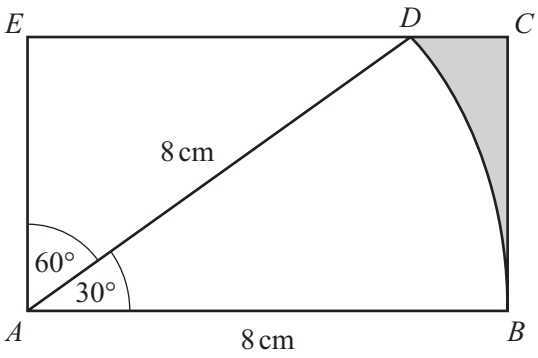
(b) Calculate the volume of the remaining solid.

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

Answer(b) ..... cm^3 [4]

Question 19 is printed on the next page.

19



NOT TO SCALE

The diagram shows a rectangle *ABCE*.
D lies on *EC*.
DAB is a sector of a circle radius 8 cm and sector angle 30°.

Calculate the area of the shaded region.

Answer ..... cm^2 [7]

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CENTRE NUMBER						CANDIDATE NUMBER				

9522292004

MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2014**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

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For π, use either your calculator value or 3.142.

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This document consists of **12** printed pages.

1 Calculate $\frac{\sqrt[3]{16}}{1.3^2}$.

Answer ..... [1]

---

2 **(a)** Write 569 000 correct to 2 significant figures.

Answer(a) ..... [1]

(b) Write 569 000 in standard form.

Answer(b) ..... [1]

---

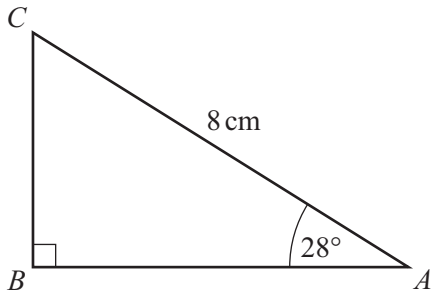
3 Solve the simultaneous equations.

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

Answer x = ...

y = ... [2]

4



NOT TO SCALE

Calculate the length of AB.

Answer AB = ... cm [2]

5

NOT TO SCALE

The equation of the line l in the diagram is $y = 5 - x$.

(a) The line cuts the y-axis at P.

Write down the co-ordinates of P.

Answer(a) (..... , ...) [1]

(b) Write down the gradient of the line l.

Answer(b) ..... [1]

---

6 The mass of 1 cm^3 of copper is 8.5 grams, correct to 1 decimal place.

Complete the statement about the total mass, T grams, of 12 cm^3 of copper.

Answer ..... $\leqslant T <$ ..... [2]

---

7 Write the following in order, smallest first.

$\sqrt{0.1}$ $\quad \frac{43}{201}$ $\quad 2\frac{1}{2}\%$ $\quad 0.2$

Answer ..... < ..... < ..... < ..... [2]

---

8 Without using your calculator, work out $\frac{5}{6} - \left(\frac{1}{2} \times 1\frac{1}{2}\right)$.

Write down all the steps of your working.

Answer ..... [3]

---

9 At the beginning of July, Kim had a mass of 63 kg.
At the end of July, his mass was 61 kg.

Calculate the percentage loss in Kim's mass.

Answer ..... % [3]

---

10 $V = \frac{1}{3}Ah$

(a) Find V when $A = 15$ and $h = 7$.

Answer(a) V = ... [1]

(b) Make h the subject of the formula.

Answer(b) h = ... [2]

---

11 Anita buys a computer for \$391 in a sale.
The sale price is 15% less than the original price.

Calculate the original price of the computer.

Answer \$ ..... [3]

---

12 Solve the equation.

$$\frac{3}{2x} + \frac{1}{x+1} = 0$$

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

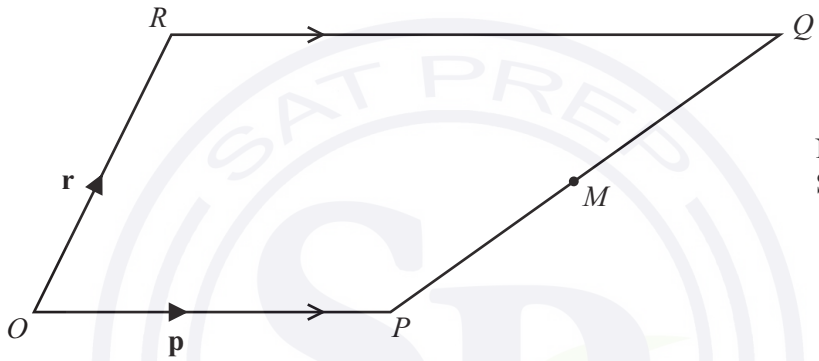
---

13 w varies inversely as the square root of x.
When $x = 4$, $w = 4$.

Find w when $x = 25$.

Answer $w =$ ..... [3]

14



NOT TO SCALE

$OPQR$ is a trapezium with RQ parallel to OP and $RQ = 2OP$.
O is the origin, $\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OR} = \mathbf{r}$.
M is the midpoint of PQ.

Find, in terms of **p** and **r**, in its simplest form

(a) $\overrightarrow{PQ}$,

Answer(a) $\overrightarrow{PQ} =$ ..... [1]

(b) $\overrightarrow{OM}$, the position vector of M.

Answer(b) $\overrightarrow{OM} =$ ..... [2]

[Turn over

15 $\mathbf{M} = \begin{pmatrix} 4 & 2 \\ 3 & 5 \end{pmatrix}$

Find

(a) $\mathbf{M}^2$,

Answer(a) [2]

(b) the determinant of **M**.

Answer(b) ..... [1]

---

16 Factorise completely.

(a) $4p^2q - 6pq^2$

Answer(a) ..... [2]

(b) $u + 4t + ux + 4tx$

Answer(b) ..... [2]

---

17 **(a)** Simplify $(3125t^{125})^{\frac{1}{5}}$.

Answer(a) ..... [2]

(b) Find the value of p when $3^p = \frac{1}{9}$.

Answer(b) $p =$ ..... [1]

(c) Find the value of w when $x^{72} \div x^w = x^8$.

Answer(c) $w =$ ..... [1]

18

NOT TO SCALE

The two containers are mathematically similar in shape.
The larger container has a volume of 3456 cm^3 and a surface area of 1024 cm^2.
The smaller container has a volume of 1458 cm^3.

Calculate the surface area of the smaller container.

Answer ..... cm^2 [4]

---

19 Simplify.

$$\frac{x^2 + 6x - 7}{3x + 21}$$

Answer ..... [4]

---

20 32 25 18 11 4

These are the first 5 terms of a sequence.

Find

(a) the 6th term,

Answer(a) ..... [1]

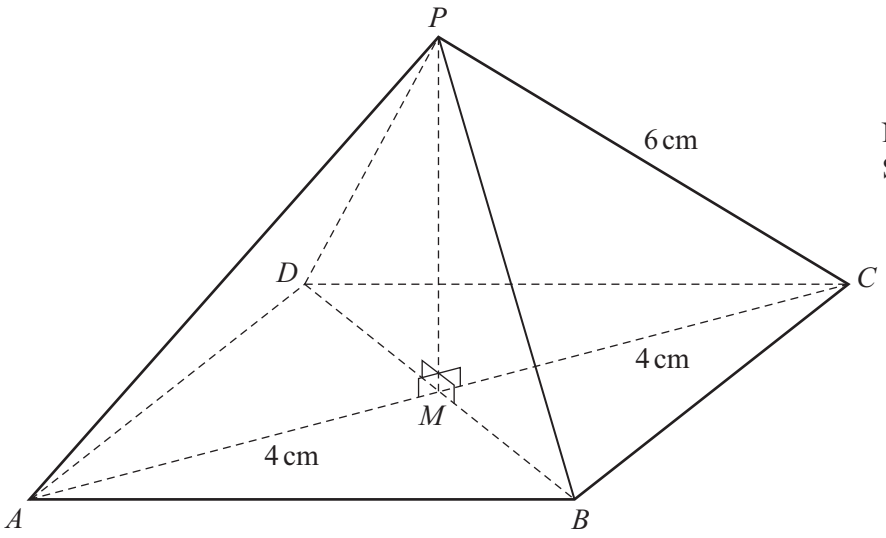
(b) the nth term,

Answer(b) ..... [2]

(c) which term is equal to –332.

Answer(c) ..... [2]

21



The diagram shows a pyramid on a square base $ABCD$ with diagonals, AC and BD, of length 8 cm.
AC and BD meet at M and the vertex, P, of the pyramid is vertically above M.
The sloping edges of the pyramid are of length 6 cm.

Calculate

(a) the perpendicular height, PM, of the pyramid,

Answer(a) PM = ... cm [3]

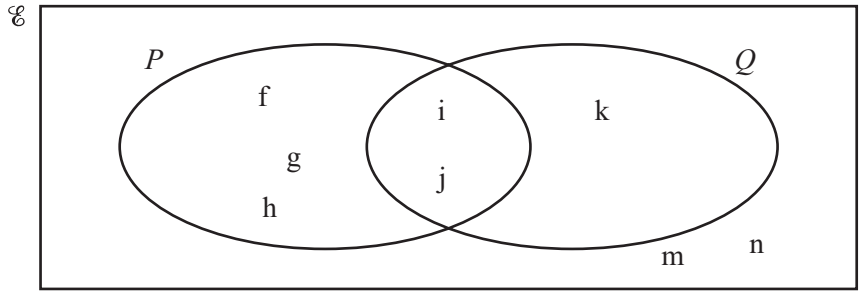
(b) the angle between a sloping edge and the base of the pyramid.

Answer(b) ..... [3]

Question 22 is printed on the next page.

[Turn over

22



(a) Use the information in the Venn diagram to complete the following.

(i) $P \cap Q$ = {.....} [1]

(ii) $P' \cup Q$ = {.....} [1]

(iii) $n(P \cup Q)'$ = ... [1]

(b) A letter is chosen at random from the set Q.

Find the probability that it is also in the set P.

Answer(b) ..... [1]

(c) On the Venn diagram shade the region $P' \cap Q$. [1]

(d) Use a set notation symbol to complete the statement.

{f, g, h} ..... P

[1]

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MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2014**

1 hour 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.
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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 70.

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 **12** printed pages.

1 In March 2011, the average temperature in Kiev was 3°C.
In March 2012, the average temperature in Kiev was 19°C lower than in March 2011.

Write down the average temperature in Kiev in March 2012.

Answer ..... °C [1]

---

2 Michelle sells ice cream.
The table shows how many of the different flavours she sells in one hour.

Flavour	Vanilla	Strawberry	Chocolate	Mango
Number sold	6	8	9	7

Michelle wants to show this information in a pie chart.

Calculate the sector angle for mango.

Answer ..... [2]

---

3 Chris changes \$1350 into euros (€) when €1 = \$1.313 .

Calculate how much he receives.

Answer €..... [2]

---

4 Factorise completely.

$15a^3 - 5ab$

Answer ..... [2]

---

5 **(a)** Use your calculator to find the value of $7.5^{-0.4} \div \sqrt{57}$.
Write down your full calculator display.

Answer(a) ..... [1]

(b) Write your answer to **part (a)** in standard form.

Answer(b) ..... [1]

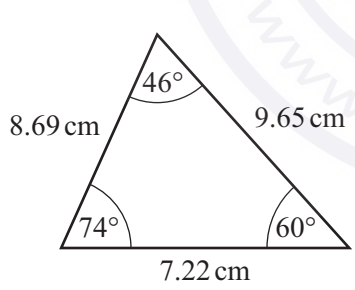
---

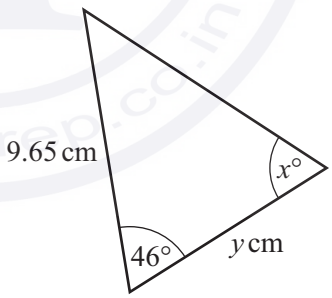
6 Simplify.

$3x^2y^3 \times x^4y$

Answer ..... [2]

7





NOT TO SCALE

These two triangles are congruent.
Write down the value of

(a) x,

Answer(a) $x =$ ..... [1]

(b) y.

Answer(b) $y =$ ..... [1]

---

8 Hans draws a plan of a field using a scale of 1 centimetre to represent 15 metres.
The actual area of the field is $10\,800\,m^2$.

Calculate the area of the field on the plan.

Answer ..... cm^2 [2]

---

9 Solve the inequality.

$$5t + 23 < 17 - 2t$$

Answer ..... [2]

---

10 Without using a calculator, work out $1\frac{1}{4} - \frac{7}{9}$.

Write down all the steps in your working.

Answer ..... [3]

---

11 y varies as the cube root of $(x + 3)$.
When $x = 5$, $y = 1$.

Find the value of y when $x = 340$.

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

---

12 **(a)** Factorise $3x^2 + 2x - 8$.

Answer(a) ..... [2]

(b) Solve the equation $3x^2 + 2x - 8 = 0$.

Answer(b) $x =$ ..... or $x =$ ..... [1]

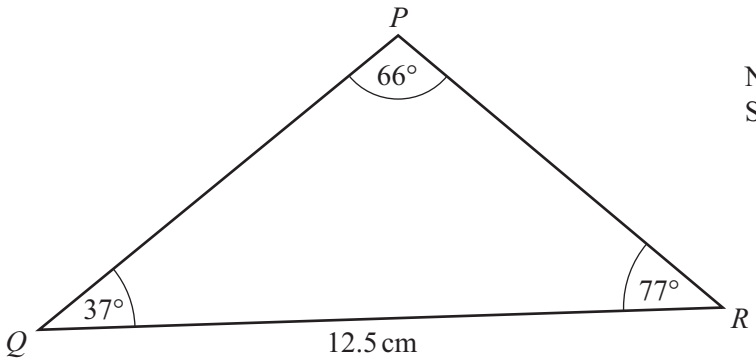
---

13 Find the equation of the line passing through the points with co-ordinates $(5, 9)$ and $(-3, 13)$.

Answer ..... [3]

[Turn over

14



NOT TO SCALE

Calculate *PR*.

Answer PR = ... cm [3]

---

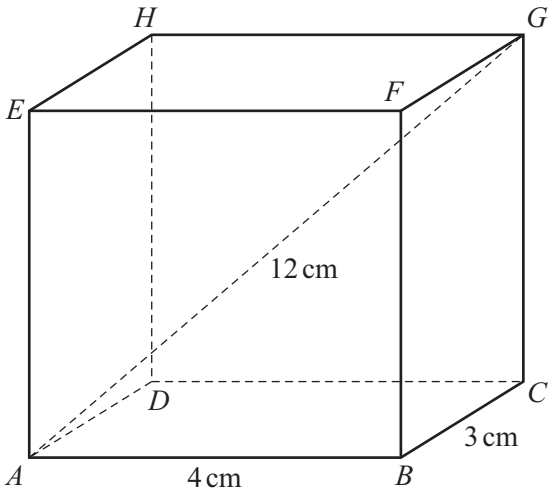
15 A rectangle has length 127.3 cm and width 86.5 cm, both correct to 1 decimal place.

Calculate the upper bound and the lower bound for the perimeter of the rectangle.

Answer Upper bound = ... cm

Lower bound = ... cm [3]

16



NOT TO SCALE

ABCDEFGH is a cuboid.
$AB = 4$ cm, $BC = 3$ cm and $AG = 12$ cm.

Calculate the angle that AG makes with the base $ABCD$.

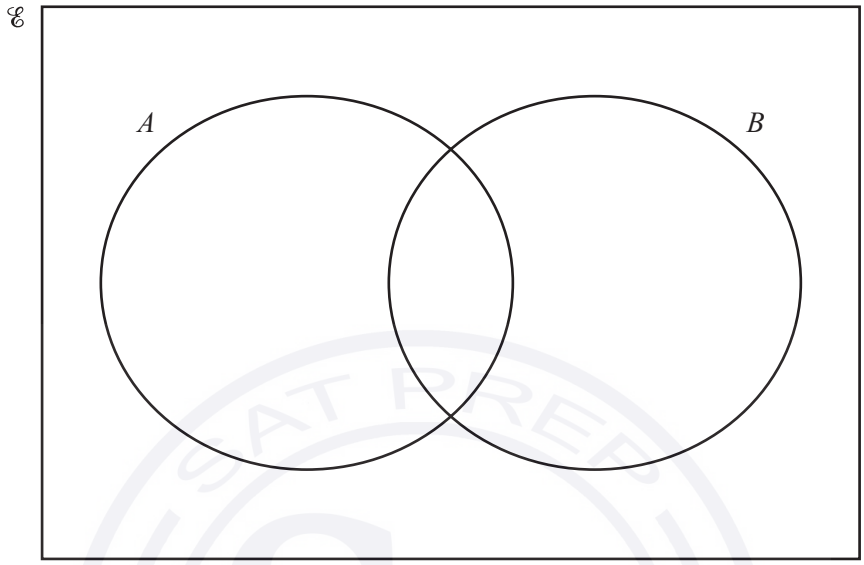
Answer ..... [4]

17 $\mathscr{E} = \{x : 1 \leqslant x \leqslant 10$, where x is an integer$\}$

$A = \{$square numbers$\}$

$B = \{1, 2, 3, 4, 5, 6\}$

(a) Write all the elements of $\mathscr{E}$ in their correct place in the Venn diagram.



[2]

(b) List the elements of $(A \cup B)'$.

Answer(b) ..... [1]

(c) Find $n(A \cap B')$.

Answer(c) ..... [1]

18 $\mathbf{A} = \begin{pmatrix} 5 & 2 \\ 4 & 3 \end{pmatrix}$

(a) Calculate $\mathbf{A}^2$.

Answer(a) [2]

(b) Calculate $\mathbf{A}^{-1}$, the inverse of $\mathbf{A}$.

Answer(b) [2]

---

19 Robbie pays \$10.80 when he buys 3 notebooks and 4 pencils.
Paniz pays \$14.50 when she buys 5 notebooks and 2 pencils.

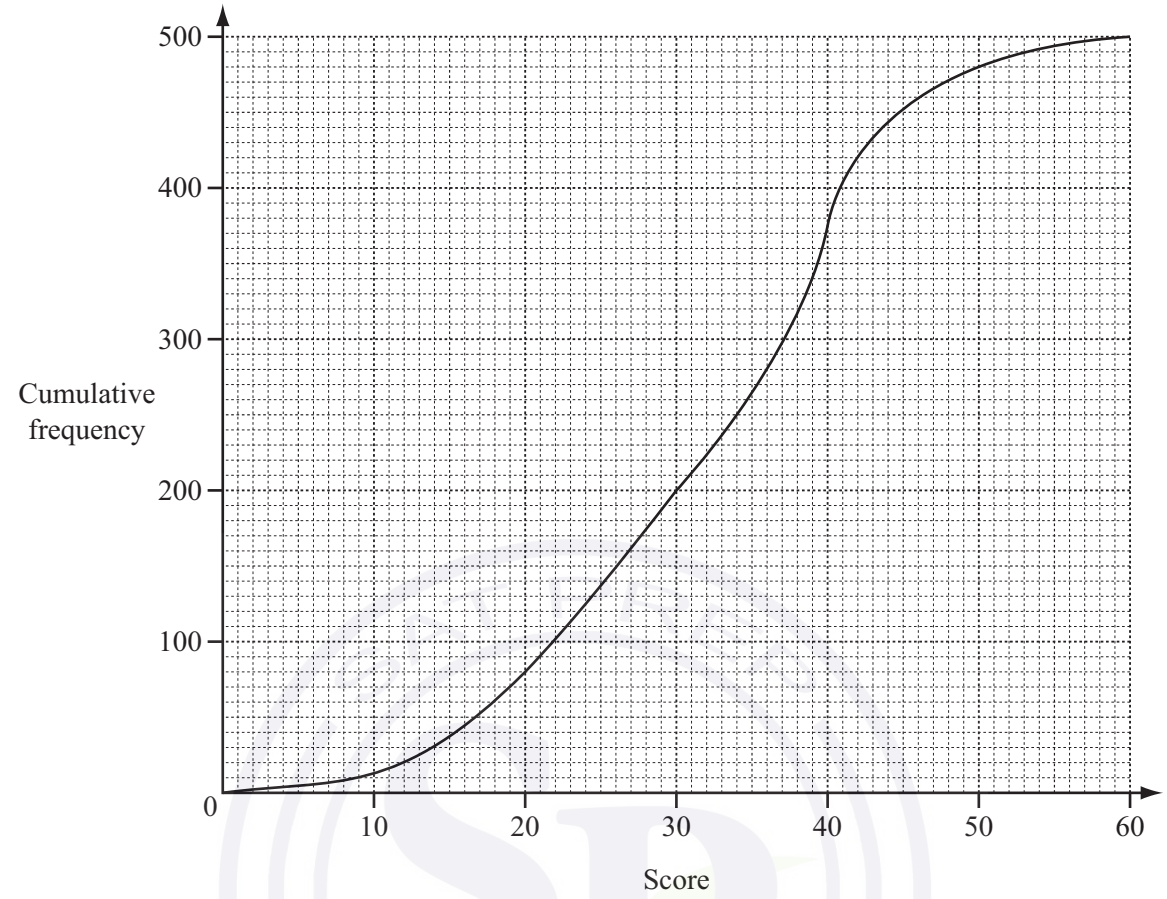
Write down simultaneous equations and use them to find the cost of a notebook and the cost of a pencil.

Answer Cost of a notebook = \$.....

Cost of a pencil = \$..... [5]

---

20 Jenna draws a cumulative frequency diagram to show information about the scores of 500 people in a quiz.



Use the diagram to find

(a) the median score,

Answer(a) ..... [1]

(b) the inter-quartile range,

Answer(b) ..... [2]

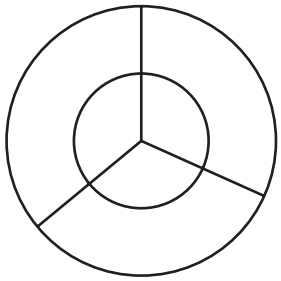
(c) the 40th percentile,

Answer(c) ..... [1]

(d) the number of people who scored 30 or less but more than 20.

Answer(d) ..... [1]

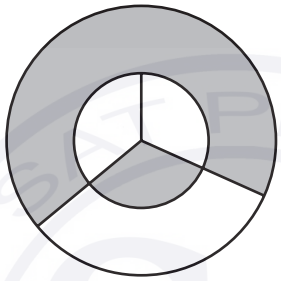
21



NOT TO SCALE

The diagram shows two concentric circles and three radii.
The diagram has rotational symmetry of order 3.

A club uses the diagram for its badge with some sections shaded.
The radius of the large circle is 6 cm and the radius of the small circle is 4 cm.



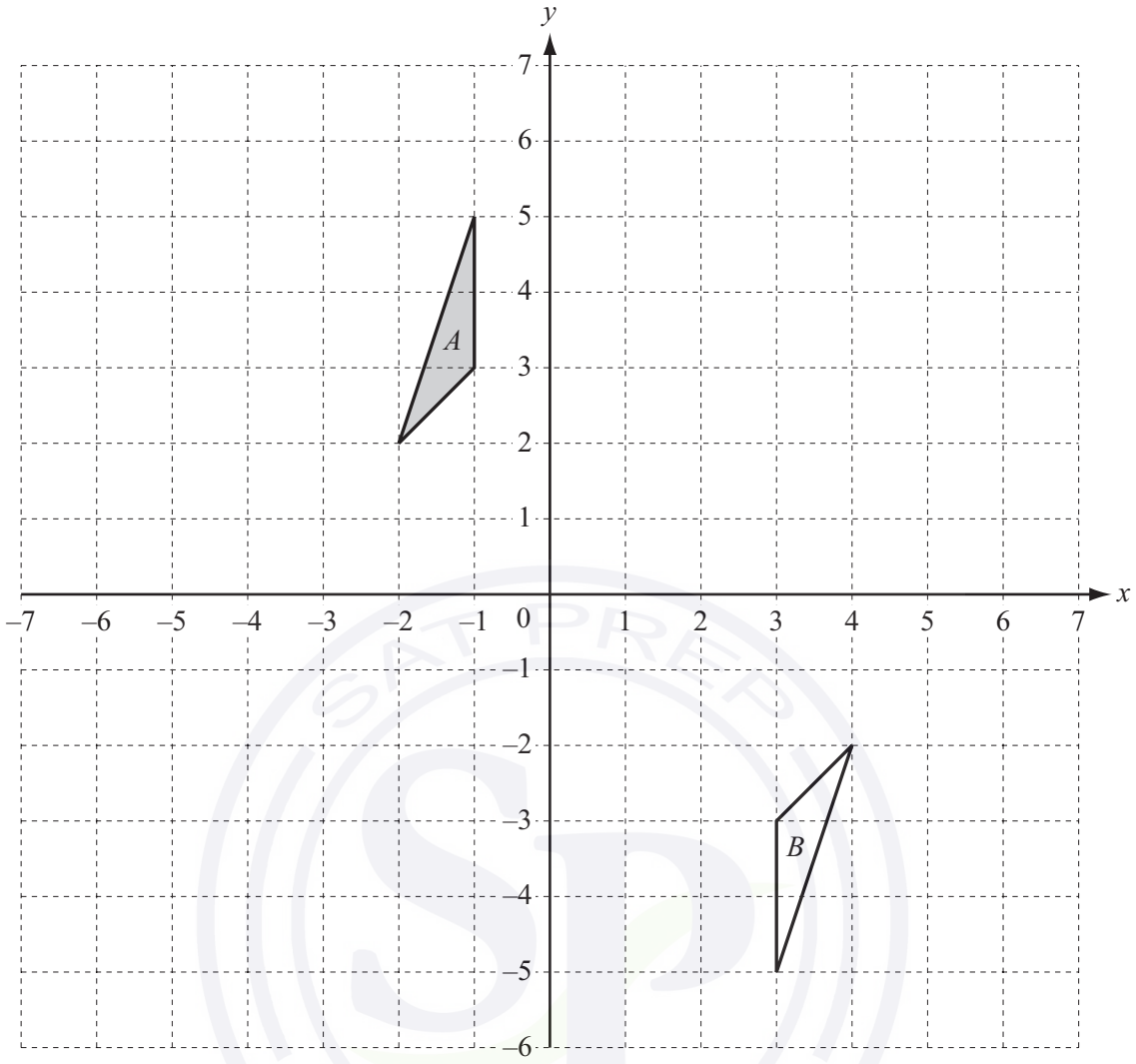
NOT TO SCALE

Calculate the total perimeter of the shaded area.

Answer ..... cm [5]

Question 22 is printed on the next page.

22



(a) Draw the image of triangle A after a translation by the vector $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$. [2]

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

Answer(b) .....

..... [3]

(c) Draw the image of triangle A after the transformation represented by the matrix $\begin{pmatrix} -2 & 0 \\ 0 & 1 \end{pmatrix}$. [3]

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MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2014**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

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1 Use your calculator to work out $\sqrt{\frac{3}{4}} + 2^{-1}$.

Give your answer correct to 2 decimal places.

Answer ..... [2]

---

2 $y = \frac{2}{x^2} + \frac{x^2}{2}$

Find the value of y when $x = 6$.
Give your answer as a mixed number in its simplest form.

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

---

3 Solve the equation. $\frac{n-8}{2} = 11$

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

---

4 $$p = \frac{4.8 \times 1.98276}{16.83}$$

(a) In the spaces provided, write each number in this calculation correct to 1 significant figure.

Answer(a)

$$\frac{\text{.....} \times \text{.....}}{\text{.....}}$$

[1]

(b) Use your answer to **part (a)** to estimate the value of p.

Answer(b) ..... [1]

---

5 Write the following in order of size, smallest first.

0.5^2 $\quad 0.5 \quad$ 0.5^3 $\quad \sqrt[3]{0.5}$

Answer ..... < ..... < ..... < ..... [2]

---

6 Carlo changed 800 euros (€) into dollars for his holiday when the exchange rate was €1 = $1.50 .
His holiday was then cancelled.
He changed all his dollars back into euros and he received €750.

Find the new exchange rate.

Answer €1 = $..... [3]

---

7 Make x the subject of the formula.

$$y = (x - 4)^2 + 6$$

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

---

8 Write as a single fraction in its simplest form.

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

Answer ..... [3]

---

9 A bus company in Dubai has the following operating times.

Day	Starting time	Finishing time
Saturday	06 00	24 00
Sunday	06 00	24 00
Monday	06 00	24 00
Tuesday	06 00	24 00
Wednesday	06 00	24 00
Thursday	06 00	24 00
Friday	13 00	24 00

(a) Calculate the total number of hours that the bus company operates in one week.

Answer(a) ..... h [3]

(b) Write the starting time on Friday in the 12-hour clock.

Answer(b) ..... [1]

[Turn over

10 Factorise completely.

(a) $ax + ay + bx + by$

Answer(a) ..... [2]

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

Answer(b) ..... [2]

---

11 A triangle has sides of length 2 cm, 8 cm and 9 cm.

Calculate the value of the largest angle in this triangle.

Answer ..... [4]

---

12 $p = 4 \times 10^5$ $q = 5 \times 10^4$

Find, giving your answer in standard form,

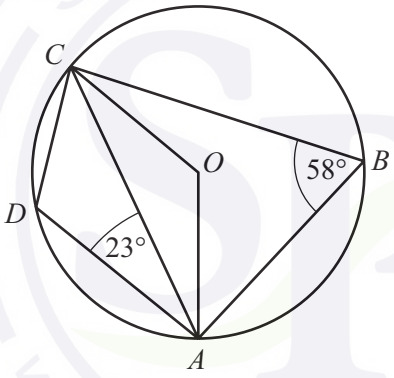
(a) pq,

Answer(a) ..... [2]

(b) $\frac{q}{p}$.

Answer(b) ..... [2]

13



NOT TO SCALE

A, B, C and D lie on a circle centre O.
Angle $ABC = 58°$ and angle $CAD = 23°$.

Calculate

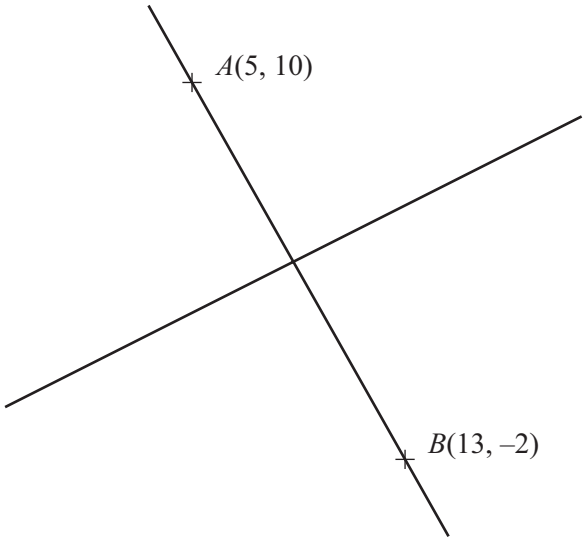
(a) angle OCA,

Answer(a) Angle OCA = ... [2]

(b) angle DCA.

Answer(b) Angle DCA = ... [2]

14



NOT TO SCALE

$A(5, 10)$ and $B(13, -2)$ are two points on the line AB.
The perpendicular bisector of the line AB has gradient $\frac{2}{3}$.

Find the equation of the perpendicular bisector of AB.

Answer ..... [4]

15 Solve the inequality for positive integer values of x.

$$\frac{21+x}{5} > x+1$$

Answer ..... [4]

---

16 **(a)** $(2^{24})^{\frac{1}{2}} = p^4$

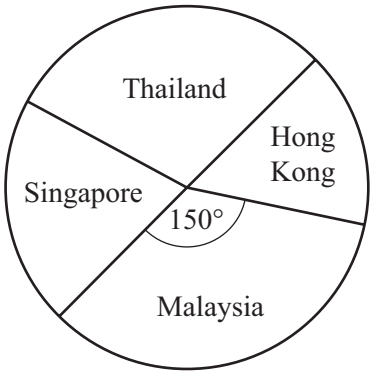
Find the value of p.

Answer(a) $p =$ ..... [2]

(b) Simplify $\dfrac{q^2+q^2}{q^{\frac{1}{4}} \times q^{\frac{1}{4}}}$.

Answer(b) ..... [3]

17



NOT TO SCALE

A travel brochure has 72 holidays in four different countries.
The pie chart shows this information.

(a) There are 24 holidays in Thailand.

Show that the sector angle for Thailand is 120°.

Answer(a)

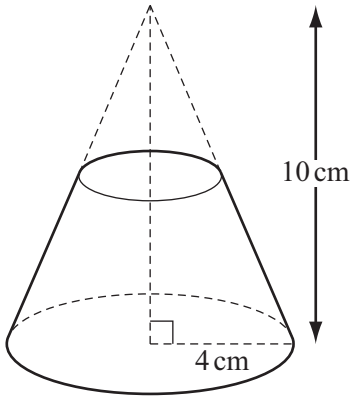
[2]

(b) The sector angle for Malaysia is 150°.
The sector angle for Singapore is twice the sector angle for Hong Kong.

Calculate the number of holidays in Hong Kong.

Answer(b) ..... [3]

18



NOT TO SCALE

A **solid** cone has base radius 4 cm and height 10 cm.
A mathematically similar cone is removed from the top as shown in the diagram.
The volume of the cone that is removed is $\frac{1}{8}$ of the volume of the original cone.

(a) Explain why the cone that is removed has radius 2 cm and height 5 cm.

Answer(a)

[2]

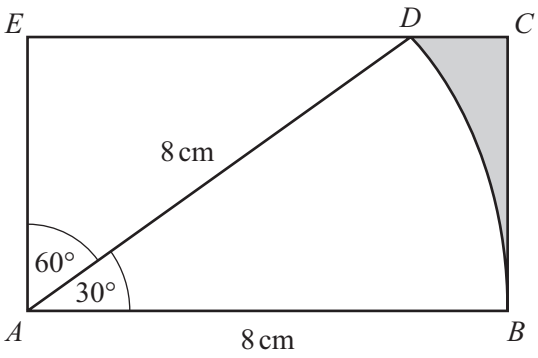
(b) Calculate the volume of the remaining solid.

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

Answer(b) ..... cm^3 [4]

Question 19 is printed on the next page.

19



NOT TO SCALE

The diagram shows a rectangle *ABCE*.
D lies on *EC*.
DAB is a sector of a circle radius 8 cm and sector angle 30°.

Calculate the area of the shaded region.

Answer ..... cm^2 [7]

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9522292004

MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2014**

1 hour 30 minutes

Candidates answer on the Question Paper.

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1 Calculate $\frac{\sqrt[3]{16}}{1.3^2}$.

Answer ..... [1]

---

2 **(a)** Write 569 000 correct to 2 significant figures.

Answer(a) ..... [1]

(b) Write 569 000 in standard form.

Answer(b) ..... [1]

---

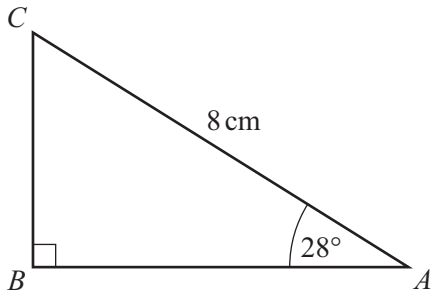
3 Solve the simultaneous equations.

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

Answer x = ...

y = ... [2]

4



NOT TO SCALE

Calculate the length of AB.

Answer AB = ... cm [2]

5

NOT TO SCALE

The equation of the line l in the diagram is $y = 5 - x$.

(a) The line cuts the y-axis at P.

Write down the co-ordinates of P.

Answer(a) (..... , ...) [1]

(b) Write down the gradient of the line l.

Answer(b) ..... [1]

---

6 The mass of 1 cm^3 of copper is 8.5 grams, correct to 1 decimal place.

Complete the statement about the total mass, T grams, of 12 cm^3 of copper.

Answer ..... $\leqslant T <$ ..... [2]

---

7 Write the following in order, smallest first.

$\sqrt{0.1}$ $\quad \frac{43}{201}$ $\quad 2\frac{1}{2}\%$ $\quad 0.2$

Answer ..... < ..... < ..... < ..... [2]

---

8 Without using your calculator, work out $\frac{5}{6} - \left(\frac{1}{2} \times 1\frac{1}{2}\right)$.

Write down all the steps of your working.

Answer ..... [3]

---

9 At the beginning of July, Kim had a mass of 63 kg.
At the end of July, his mass was 61 kg.

Calculate the percentage loss in Kim's mass.

Answer ..... % [3]

---

10 $V = \frac{1}{3}Ah$

(a) Find V when $A = 15$ and $h = 7$.

Answer(a) V = ... [1]

(b) Make h the subject of the formula.

Answer(b) h = ... [2]

---

11 Anita buys a computer for \$391 in a sale.
The sale price is 15% less than the original price.

Calculate the original price of the computer.

Answer \$ ..... [3]

---

12 Solve the equation.

$$\frac{3}{2x} + \frac{1}{x+1} = 0$$

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

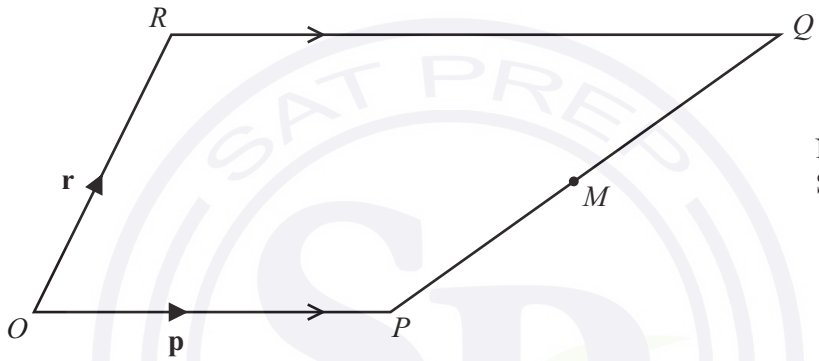
---

13 w varies inversely as the square root of x.
When $x = 4$, $w = 4$.

Find w when $x = 25$.

Answer $w =$ ..... [3]

14



NOT TO SCALE

$OPQR$ is a trapezium with RQ parallel to OP and $RQ = 2OP$.
O is the origin, $\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OR} = \mathbf{r}$.
M is the midpoint of PQ.

Find, in terms of **p** and **r**, in its simplest form

(a) $\overrightarrow{PQ}$,

Answer(a) $\overrightarrow{PQ} =$ ..... [1]

(b) $\overrightarrow{OM}$, the position vector of M.

Answer(b) $\overrightarrow{OM} =$ ..... [2]

[Turn over

15 $\mathbf{M} = \begin{pmatrix} 4 & 2 \\ 3 & 5 \end{pmatrix}$

Find

(a) $\mathbf{M}^2$,

Answer(a) [2]

(b) the determinant of **M**.

Answer(b) ..... [1]

---

16 Factorise completely.

(a) $4p^2q - 6pq^2$

Answer(a) ..... [2]

(b) $u + 4t + ux + 4tx$

Answer(b) ..... [2]

---

17 **(a)** Simplify $(3125t^{125})^{\frac{1}{5}}$.

Answer(a) ..... [2]

(b) Find the value of p when $3^p = \frac{1}{9}$.

Answer(b) $p =$ ..... [1]

(c) Find the value of w when $x^{72} \div x^w = x^8$.

Answer(c) $w =$ ..... [1]

18

NOT TO SCALE

The two containers are mathematically similar in shape.
The larger container has a volume of 3456 cm^3 and a surface area of 1024 cm^2.
The smaller container has a volume of 1458 cm^3.

Calculate the surface area of the smaller container.

Answer ..... cm^2 [4]

---

19 Simplify.

$$\frac{x^2 + 6x - 7}{3x + 21}$$

Answer ..... [4]

---

20 32 25 18 11 4

These are the first 5 terms of a sequence.

Find

(a) the 6th term,

Answer(a) ..... [1]

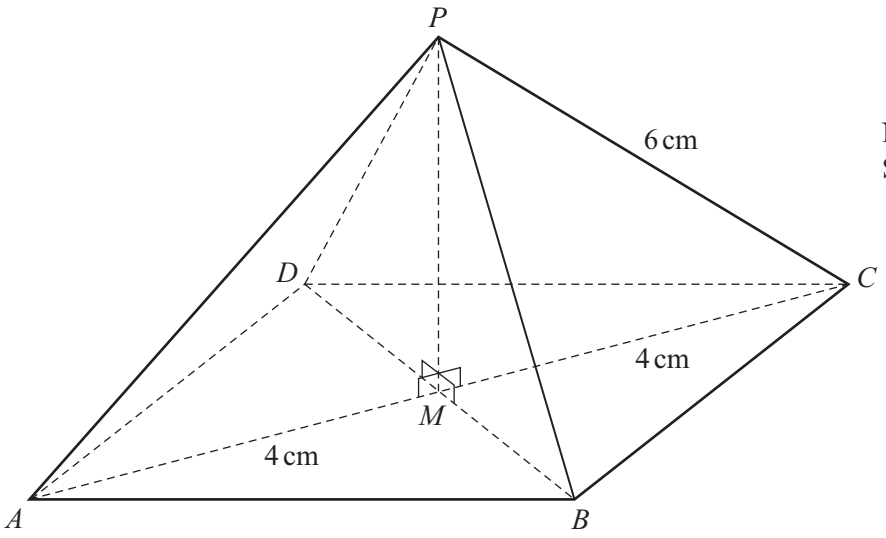
(b) the nth term,

Answer(b) ..... [2]

(c) which term is equal to –332.

Answer(c) ..... [2]

21



The diagram shows a pyramid on a square base $ABCD$ with diagonals, AC and BD, of length 8 cm.
AC and BD meet at M and the vertex, P, of the pyramid is vertically above M.
The sloping edges of the pyramid are of length 6 cm.

Calculate

(a) the perpendicular height, PM, of the pyramid,

Answer(a) PM = ... cm [3]

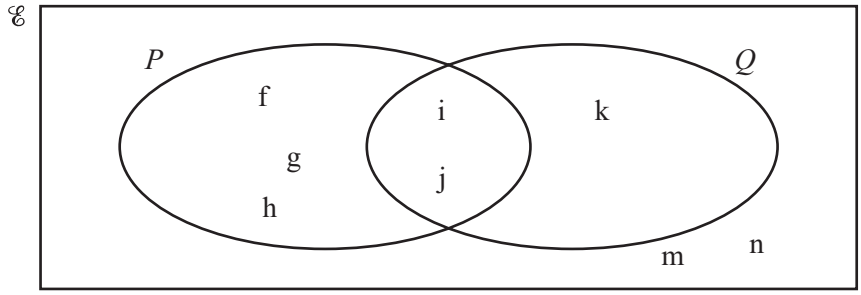
(b) the angle between a sloping edge and the base of the pyramid.

Answer(b) ..... [3]

Question 22 is printed on the next page.

[Turn over

22



(a) Use the information in the Venn diagram to complete the following.

(i) $P \cap Q$ = {.....} [1]

(ii) $P' \cup Q$ = {.....} [1]

(iii) $n(P \cup Q)'$ = ... [1]

(b) A letter is chosen at random from the set Q.

Find the probability that it is also in the set P.

Answer(b) ..... [1]

(c) On the Venn diagram shade the region $P' \cap Q$. [1]

(d) Use a set notation symbol to complete the statement.

{f, g, h} ..... P

[1]

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2014**

1 hour 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.
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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 70.

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 **12** printed pages.

1 In March 2011, the average temperature in Kiev was 3°C.
In March 2012, the average temperature in Kiev was 19°C lower than in March 2011.

Write down the average temperature in Kiev in March 2012.

Answer ..... °C [1]

---

2 Michelle sells ice cream.
The table shows how many of the different flavours she sells in one hour.

Flavour	Vanilla	Strawberry	Chocolate	Mango
Number sold	6	8	9	7

Michelle wants to show this information in a pie chart.

Calculate the sector angle for mango.

Answer ..... [2]

---

3 Chris changes \$1350 into euros (€) when €1 = \$1.313 .

Calculate how much he receives.

Answer €..... [2]

---

4 Factorise completely.

$15a^3 - 5ab$

Answer ..... [2]

---

5 **(a)** Use your calculator to find the value of $7.5^{-0.4} \div \sqrt{57}$.
Write down your full calculator display.

Answer(a) ..... [1]

(b) Write your answer to **part (a)** in standard form.

Answer(b) ..... [1]

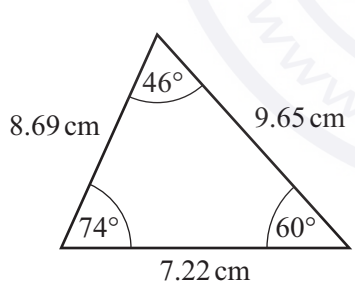
---

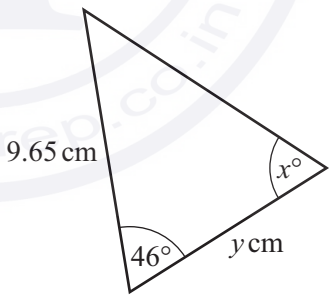
6 Simplify.

$3x^2y^3 \times x^4y$

Answer ..... [2]

7





NOT TO SCALE

These two triangles are congruent.
Write down the value of

(a) x,

Answer(a) $x =$ ..... [1]

(b) y.

Answer(b) $y =$ ..... [1]

---

8 Hans draws a plan of a field using a scale of 1 centimetre to represent 15 metres.
The actual area of the field is $10\,800\,m^2$.

Calculate the area of the field on the plan.

Answer ..... cm^2 [2]

---

9 Solve the inequality.

$$5t + 23 < 17 - 2t$$

Answer ..... [2]

---

10 Without using a calculator, work out $1\frac{1}{4} - \frac{7}{9}$.

Write down all the steps in your working.

Answer ..... [3]

---

11 y varies as the cube root of $(x + 3)$.
When $x = 5$, $y = 1$.

Find the value of y when $x = 340$.

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

---

12 **(a)** Factorise $3x^2 + 2x - 8$.

Answer(a) ..... [2]

(b) Solve the equation $3x^2 + 2x - 8 = 0$.

Answer(b) $x =$ ..... or $x =$ ..... [1]

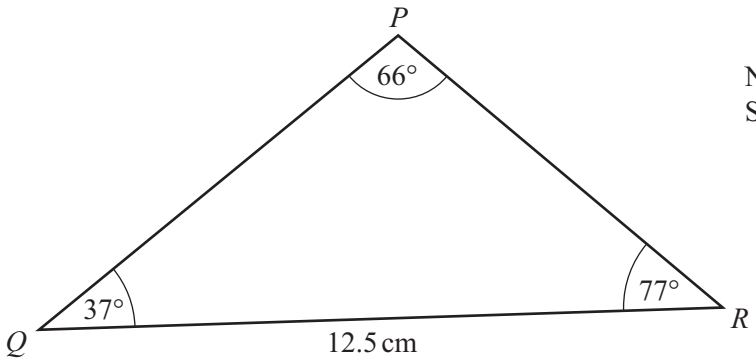
---

13 Find the equation of the line passing through the points with co-ordinates $(5, 9)$ and $(-3, 13)$.

Answer ..... [3]

[Turn over

14



NOT TO SCALE

Calculate *PR*.

Answer PR = ... cm [3]

---

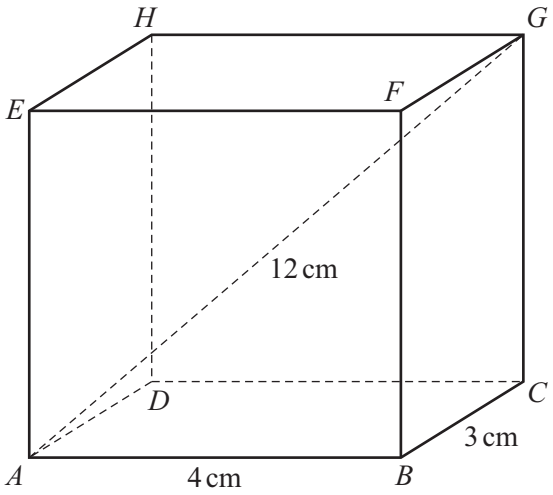
15 A rectangle has length 127.3 cm and width 86.5 cm, both correct to 1 decimal place.

Calculate the upper bound and the lower bound for the perimeter of the rectangle.

Answer Upper bound = ... cm

Lower bound = ... cm [3]

16



NOT TO SCALE

ABCDEFGH is a cuboid.
$AB = 4$ cm, $BC = 3$ cm and $AG = 12$ cm.

Calculate the angle that AG makes with the base $ABCD$.

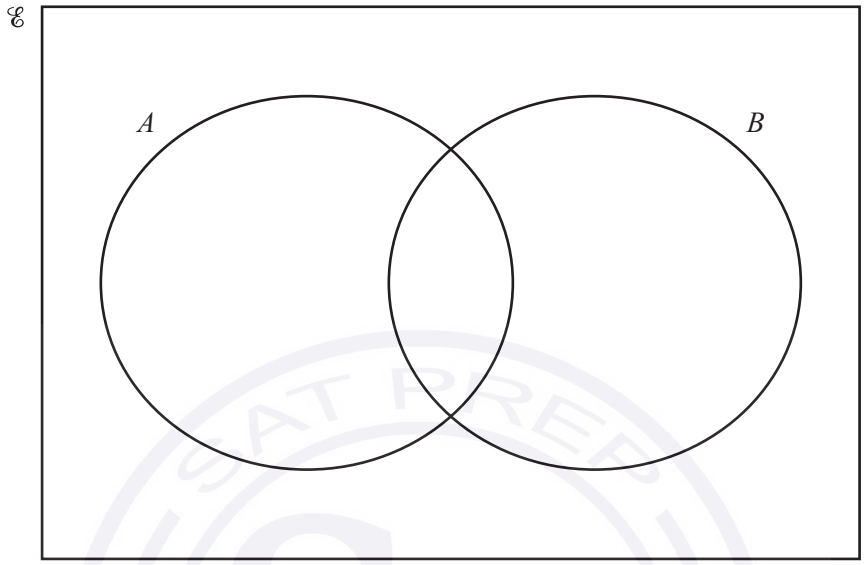
Answer ..... [4]

17 $\mathscr{E} = \{x : 1 \leqslant x \leqslant 10$, where x is an integer$\}$

$A = \{$square numbers$\}$

$B = \{1, 2, 3, 4, 5, 6\}$

(a) Write all the elements of $\mathscr{E}$ in their correct place in the Venn diagram.



[2]

(b) List the elements of $(A \cup B)'$.

Answer(b) ..... [1]

(c) Find $n(A \cap B')$.

Answer(c) ..... [1]

18 $\mathbf{A} = \begin{pmatrix} 5 & 2 \\ 4 & 3 \end{pmatrix}$

(a) Calculate $\mathbf{A}^2$.

Answer(a) [2]

(b) Calculate $\mathbf{A}^{-1}$, the inverse of $\mathbf{A}$.

Answer(b) [2]

---

19 Robbie pays \$10.80 when he buys 3 notebooks and 4 pencils.
Paniz pays \$14.50 when she buys 5 notebooks and 2 pencils.

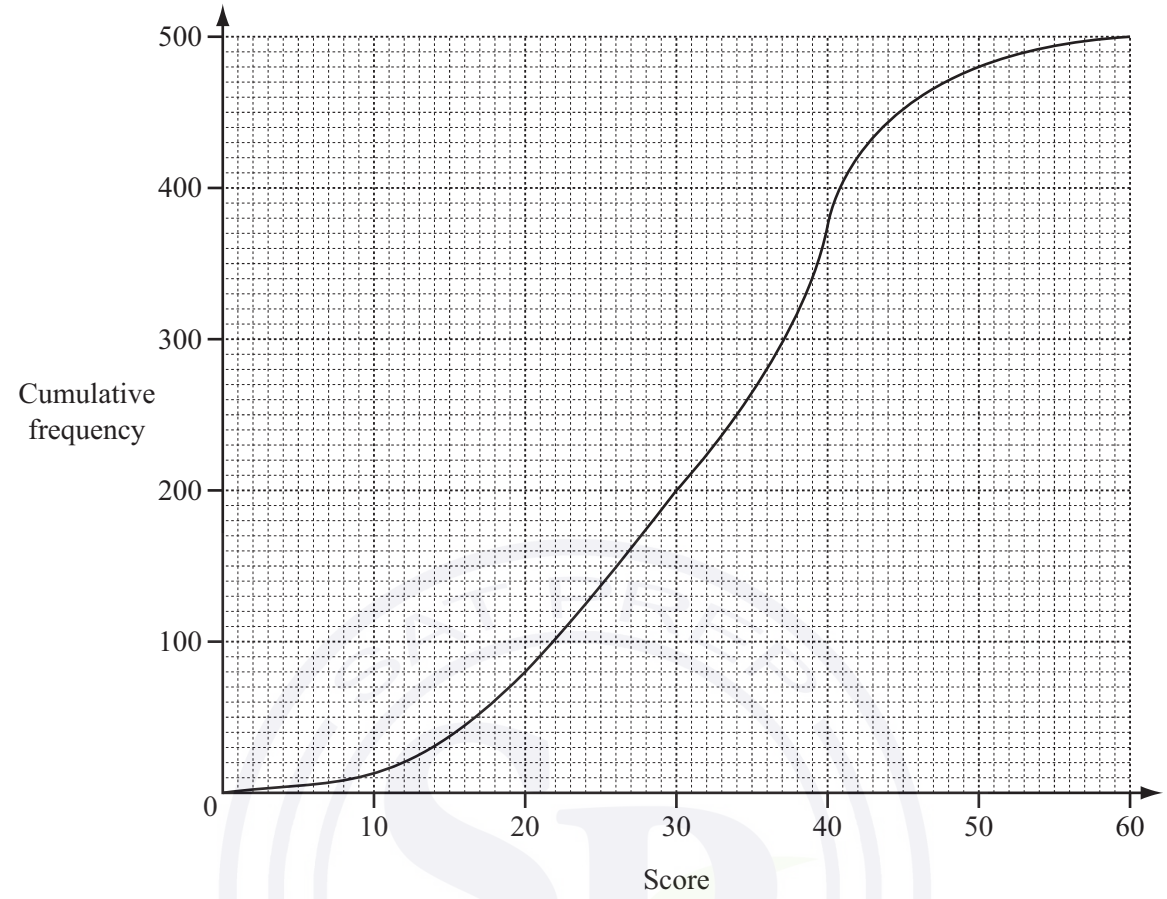
Write down simultaneous equations and use them to find the cost of a notebook and the cost of a pencil.

Answer Cost of a notebook = \$.....

Cost of a pencil = \$..... [5]

---

20 Jenna draws a cumulative frequency diagram to show information about the scores of 500 people in a quiz.



Use the diagram to find

(a) the median score,

Answer(a) ..... [1]

(b) the inter-quartile range,

Answer(b) ..... [2]

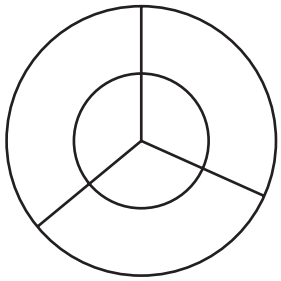
(c) the 40th percentile,

Answer(c) ..... [1]

(d) the number of people who scored 30 or less but more than 20.

Answer(d) ..... [1]

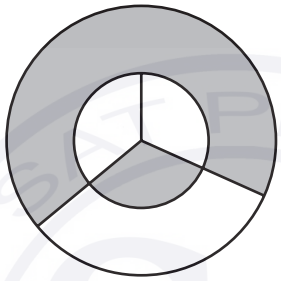
21



NOT TO SCALE

The diagram shows two concentric circles and three radii.
The diagram has rotational symmetry of order 3.

A club uses the diagram for its badge with some sections shaded.
The radius of the large circle is 6 cm and the radius of the small circle is 4 cm.



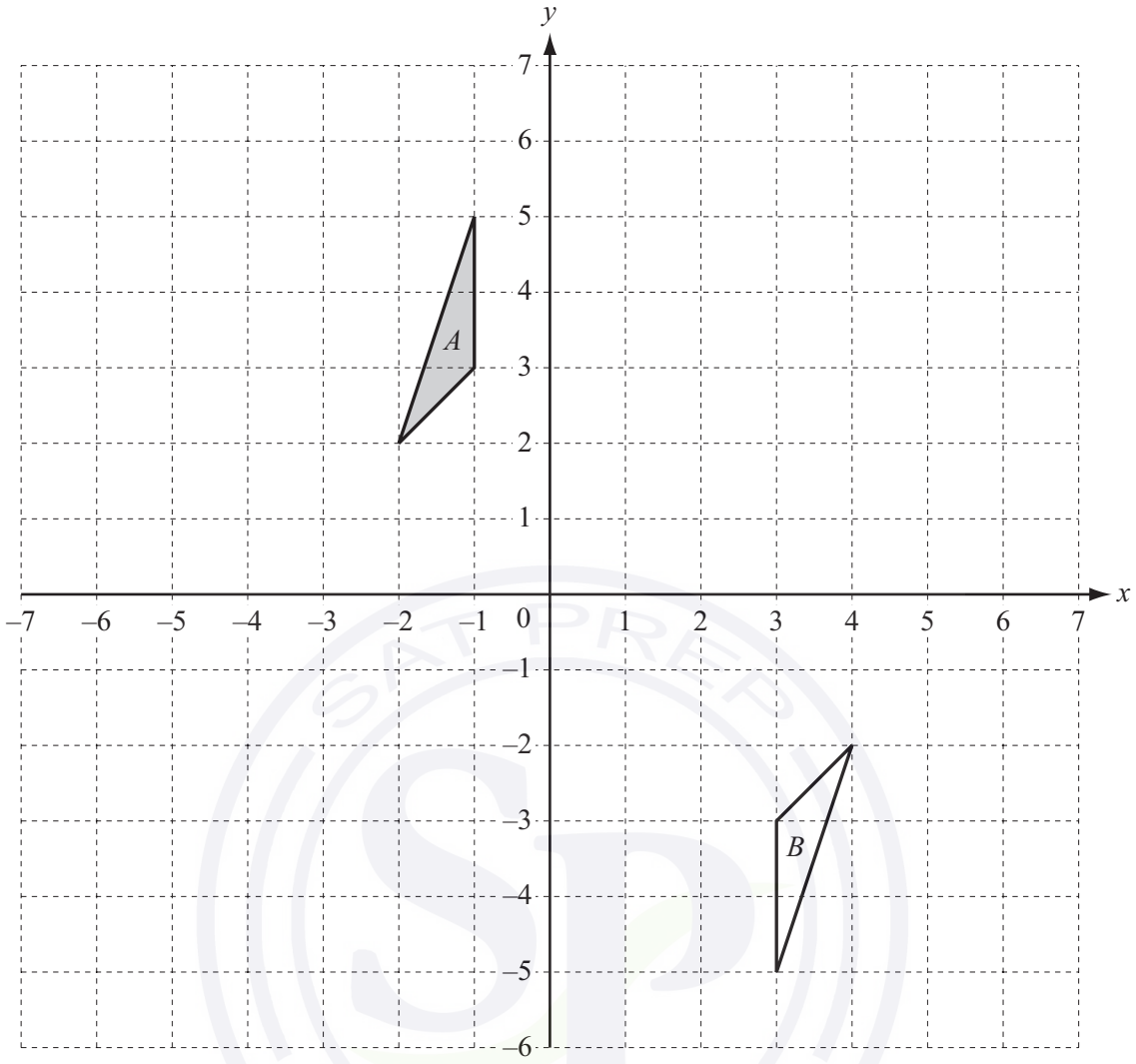
NOT TO SCALE

Calculate the total perimeter of the shaded area.

Answer ..... cm [5]

Question 22 is printed on the next page.

22



(a) Draw the image of triangle A after a translation by the vector $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$. [2]

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

Answer(b) .....

..... [3]

(c) Draw the image of triangle A after the transformation represented by the matrix $\begin{pmatrix} -2 & 0 \\ 0 & 1 \end{pmatrix}$. [3]

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

MATHEMATICS **0580/21**

Paper 2 (Extended) **October/November 2013**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

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The total of the marks for this paper is 70.

This document consists of **11** printed pages and **1** blank page.

For Examiner's Use

1 Work out 72 cents as a percentage of 83 cents.

Answer ..... % [1]

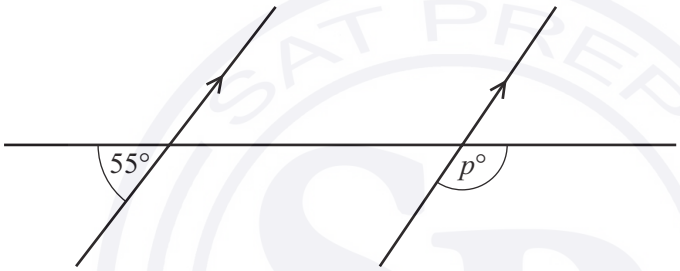
---

2 Calculate $\dfrac{5.27 - 0.93}{4.89 - 4.07}$.

Give your answer correct to 4 significant figures.

Answer ..... [2]

3



NOT TO SCALE

Find the value of p.

Answer p = ... [2]

---

4 Calculate 17.5% of 44 kg.

Answer ..... kg [2]

For Examiner's Use

5 Solve the equation.

$$5 - 2x = 3x - 19$$

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

6

S	P	A	C	E	S

One of the 6 letters is taken at random.

(a) Write down the probability that the letter is S.

Answer(a) ..... [1]

(b) The letter is replaced and again a letter is taken at random.
This is repeated 600 times.

How many times would you expect the letter to be S?

Answer(b) ..... [1]

---

7 The length, p cm, of a car is 440 cm, correct to the nearest 10 cm.

Complete the statement about p.

Answer ..... $\leqslant p <$ ..... [2]

For Examiner's Use

8 Emily invests \$$x$ at a rate of 3% per year simple interest.
After 5 years she has \$20.10 interest.

Find the value of x.

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

---

9 Find the nth term in each of the following sequences.

(a) $\frac{1}{3}, \quad \frac{2}{4}, \quad \frac{3}{5}, \quad \frac{4}{6}, \quad \frac{5}{7}, \quad \ldots\ldots$

Answer(a) ..... [1]

(b) 0, 3, 8, 15, 24, ...

Answer(b) ..... [2]

---

10 Make b the subject of the formula.

$$c = \sqrt{a^2 + b^2}$$

Answer $b =$ ..... [3]

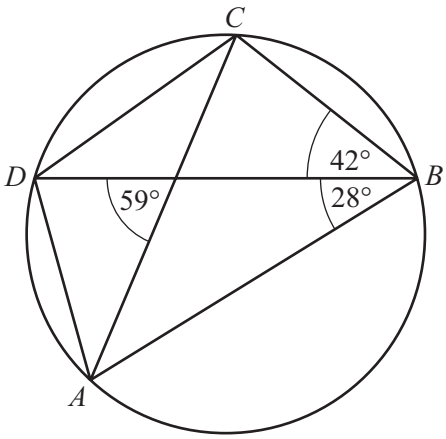
---

11 The volume of a child's model plane is 1200 cm^3.
The volume of the full size plane is 4050 m^3.

Find the scale of the model in the form $1 : n$.

Answer 1 : ..... [3]

12



NOT TO SCALE

A, *B*, *C* and *D* lie on the circle.

Find

(a) angle *ADC*,

Answer(a) Angle *ADC* = ... [1]

(b) angle *ADB*.

Answer(b) Angle *ADB* = ... [2]

---

13 **(a)** $3^x = \sqrt[4]{3^5}$

Find the value of x.

Answer(a) x = ... [1]

(b) Simplify $(32y^{15})^{\frac{2}{5}}$.

Answer(b) ..... [2]

[Turn over

14 Write as a single fraction in its simplest form.

$$3 - \frac{t+2}{t-1}$$

Answer ..... [3]

---

15 Do not use a calculator in this question and show all the steps of your working.

Give each answer as a fraction in its lowest terms.

Work out.

(a) $\frac{3}{4} - \frac{1}{12}$

Answer(a) ..... [2]

(b) $2\frac{1}{2} \times \frac{4}{25}$

Answer(b) ..... [2]

16

A is the point (–1, 1) and B is the point (8, 7).

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

Answer(a) $\overrightarrow{AB} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(b) Find $|\overrightarrow{AB}|$.

Answer(b) $|\overrightarrow{AB}| =$ ..... [2]

(c) $\overrightarrow{AC} = 2\overrightarrow{AB}$.

Write down the co-ordinates of C.

Answer(c) (..... , ...) [1]

---

17 Factorise completely.

(a) $a + b + at + bt$

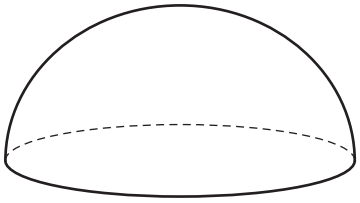
Answer(a) ..... [2]

(b) $x^2 - 2x - 24$

Answer(b) ..... [2]

---

18 The diagram shows a solid hemisphere.



The **total** surface area of this hemisphere is 243π.
The volume of the hemisphere is $k\pi$.

Find the value of k.

[The surface area, A, of a sphere with radius r is $A = 4\pi r^2$.]
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

Answer $k =$ ..... [4]

---

19 **(a)** Convert 144 km/h into metres per second.

Answer(a) ..... m/s [2]

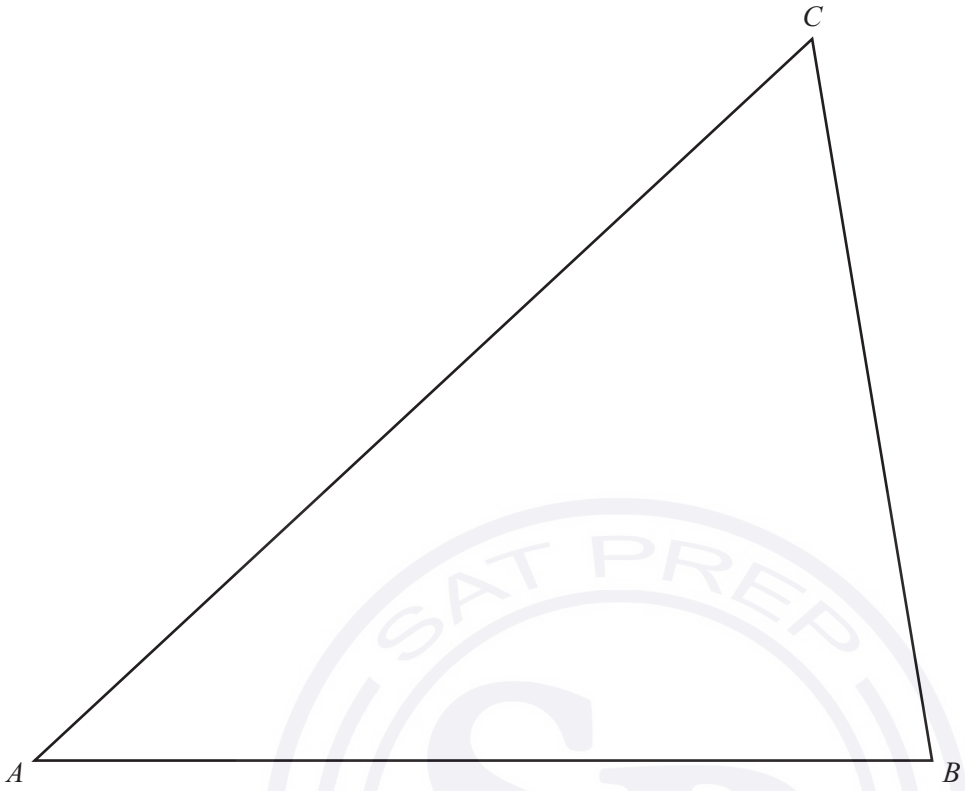
(b) A train of length 120 m is travelling at 144 km/h.
It passes under a bridge of width 20 m.

Find the time taken for the whole train to pass under the bridge.
Give your answer in seconds.

Answer(b) ..... s [2]

20

For Examiner's Use



(a) In this part, use a straight edge and compasses only and show your construction arcs.

Construct accurately

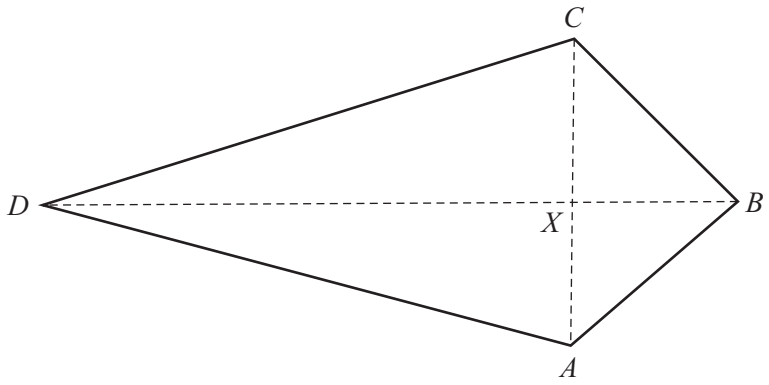
(i) the bisector of angle B, [2]

(ii) the locus of points equidistant from B and from C. [2]

(b) Shade the region inside triangle ABC containing the points which are

nearer to BC than to BA **and** nearer to C than to B. [1]

21



NOT TO SCALE

ABCD is a kite.
The diagonals *AC* and *BD* intersect at *X*.
AC = 12 cm, *BD* = 20 cm and *DX* : *XB* = 3 : 2 .

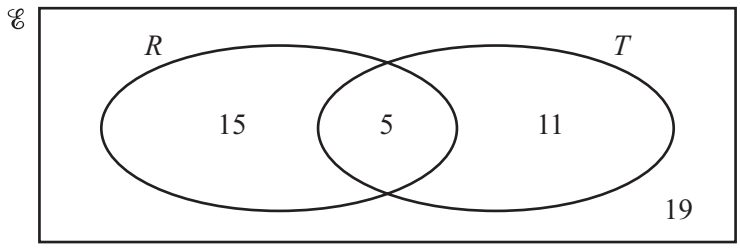
(a) Calculate angle *ABC*.

Answer(a) Angle *ABC* = ... [3]

(b) Calculate the area of the kite.

Answer(b) ..... cm^2 [2]

22



The Venn diagram shows the number of red cars and the number of two-door cars in a car park.
There is a total of 50 cars in the car park.
R = {red cars} and T = {two-door cars}.

(a) A car is chosen at random.

Write down the probability that

(i) it is red and it is a two-door car,

Answer(a)(i) ..... [1]

(ii) it is not red and it is a two-door car.

Answer(a)(ii) ..... [1]

(b) A two-door car is chosen at random.

Write down the probability that it is not red.

Answer(b) ..... [1]

(c) Two cars are chosen at random.

Find the probability that they are both red.

Answer(c) ..... [2]

(d) On the Venn diagram, shade the region $R \cup T'$. [1]

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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
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CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

8971796422

MATHEMATICS **0580/22**

Paper 2 (Extended) **October/November 2013**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

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For Examiner's Use

1 Write the following in order of size, smallest first.

$$19\% \qquad \frac{1}{5} \qquad \sqrt{0.038} \qquad \sin 11.4° \qquad 0.719^5$$

Answer ..... < ..... < ..... < ..... < ..... [2]

---

2 Use a calculator to work out the following.

(a) $3\,(-4 \times 6^2 - 5)$

Answer(a) ..... [1]

(b) $\sqrt{3} \times \tan 30° + \sqrt{2} \times \sin 45°$

Answer(b) ..... [1]

---

3 Find the circumference of a circle of radius 2.5 cm.

Answer ..... cm [2]

---

4 Bruce plays a game of golf.
His scores for each of the 18 holes are shown below.

2	3	4	5	4	6	2	3	4
4	5	3	4	3	5	4	4	4

The information is to be shown in a pie chart.

Calculate the sector angle for the score of 4.

Answer ..... [2]

For Examiner's Use

5 **(a)** Add **one** line to the diagram so that it has two lines of symmetry.

[1]

(b) Add **two** lines to the diagram so that it has rotational symmetry of order 2.

[1]

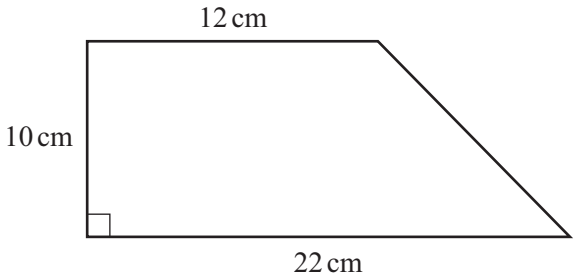
---

6 Rearrange the formula to make x the subject.

$$y = x^2 + 4$$

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

7



NOT TO SCALE

Find the area of the trapezium.

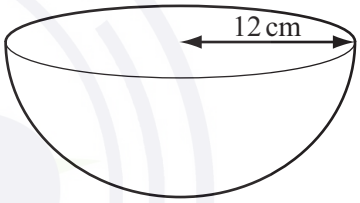
Answer ..... cm^2 [2]

---

8 A **hemisphere** has a radius of 12 cm.

Calculate its volume.

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



Answer ..... cm^3 [2]

---

9 The exterior angle of a regular polygon is 36°.

What is the name of this polygon?

Answer ..... [3]

---

10 The table shows how the dollar to euro conversion rate changed during one day.

Time	10 00	11 00	12 00	13 00	14 00	15 00	16 00
$1	€1.3311	€1.3362	€1.3207	€1.3199	€1.3200	€1.3352	€1.3401

Khalil changed $500 into euros (€).

How many more euros did Khalil receive if he changed his money at the highest rate compared to the lowest rate?

Answer € ..... [3]

---

11 The speed, v, of a wave is inversely proportional to the square root of the depth, d, of the water.
$v = 30$ when $d = 400$.

Find v when $d = 25$.

Answer $v =$ ..... [3]

---

12 A circle has a radius of 8.5 cm correct to the nearest 0.1 cm.
The lower bound for the area of the circle is $p\pi$ cm^2.
The upper bound for the area of the circle is $q\pi$ cm^2.

Find the value of p and the value of q.

Answer $p =$ .....

$q =$ ..... [3]

---

13 Pam wins the student of the year award in New Zealand.
She sends three photographs of the award ceremony by post to her relatives.

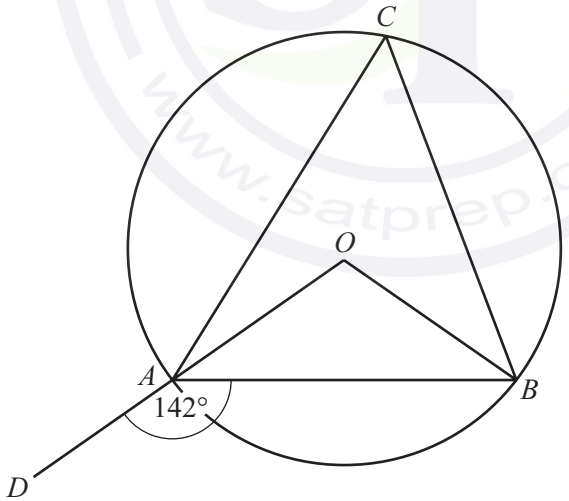
- one of size 13 cm by 23 cm to her uncle in Australia
- one of size 15 cm by 23 cm to her sister in China
- one of size 23 cm by 35 cm to her mother in the UK

Maximum lengths	Australia	Rest of the world
13 cm by 23.5 cm	\$1.90	\$2.50
15.5 cm by 23.5 cm	\$2.40	\$2.90
23 cm by 32.5 cm	\$2.80	\$3.40
26 cm by 38.5 cm	\$3.60	\$5.20

The cost of postage is shown in the table above.
Use this information to calculate the total cost.

Answer \$ ..... [3]

14



NOT TO SCALE

A, *B* and *C* are points on the circumference of a circle centre *O*.
OAD is a straight line and angle *DAB* = 142°.

Calculate the size of angle *ACB*.

Answer Angle *ACB* = ... [3]

For Examiner's Use

15 Find the co-ordinates of the point of intersection of the two lines.

$$2x - 7y = 2$$
$$4x + 5y = 42$$

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

---

16 Solve the inequality.

$$\frac{x}{2} + \frac{x-2}{3} < 5$$

Answer ..... [4]

17

$$\mathbf{M} = \begin{pmatrix} 2 & 1 \\ 4 & 6 \end{pmatrix} \qquad \mathbf{N} = \begin{pmatrix} 5 & 0 \\ 1 & 5 \end{pmatrix}$$

(a) Work out **MN**.

Answer(a) **MN** = [2]

(b) Find $\mathbf{M}^{-1}$.

Answer(b) $\mathbf{M}^{-1}$ = [2]

For Examiner's Use

18 $A(5, 23)$ and $B(-2, 2)$ are two points.

(a) Find the co-ordinates of the midpoint of the line AB.

Answer(a) (..... , ...) [2]

(b) Find the equation of the line AB.

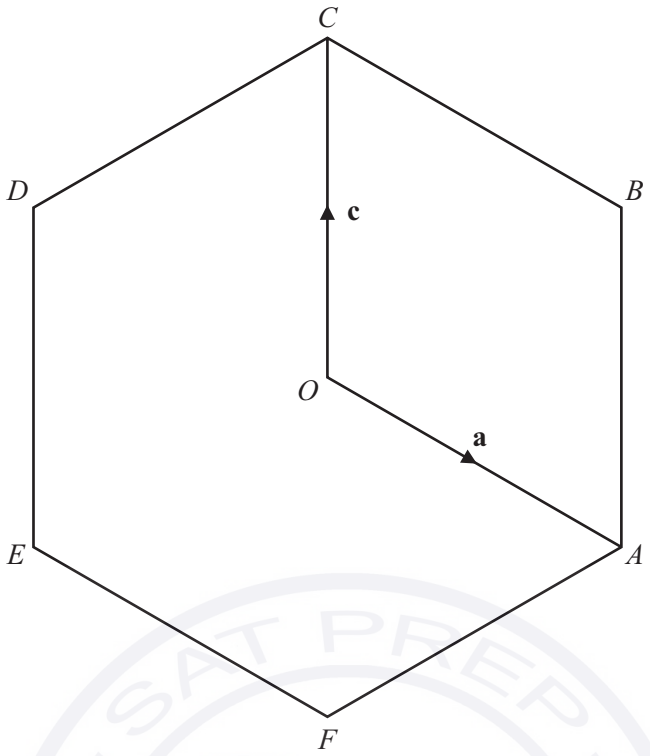
Answer(b) ..... [3]

(c) Show that the point (3, 17) lies on the line AB.

Answer(c)

[1]

19



O is the origin.
$ABCDEF$ is a regular hexagon and O is the midpoint of AD.

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$.

Find, in terms of **a** and **c**, in their simplest form

(a) $\overrightarrow{BE}$,

Answer(a) $\overrightarrow{BE}$ = ... [2]

(b) $\overrightarrow{DB}$,

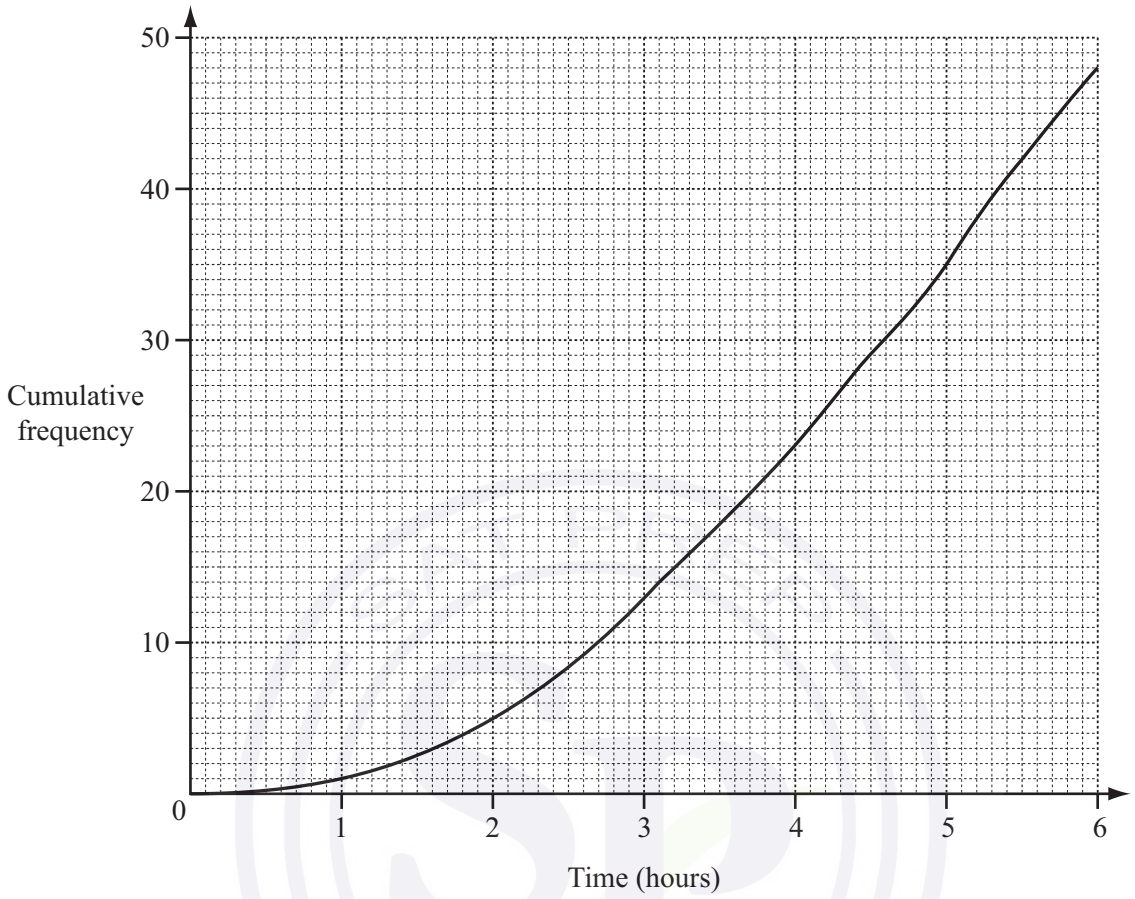
Answer(b) $\overrightarrow{DB}$ = ... [2]

(c) the position vector of E.

Answer(c) ..... [2]

For Examiner's Use

20 During one day 48 people visited a museum.
The length of time each person spent in the museum was recorded.
The results are shown on the cumulative frequency diagram.



Work out

(a) the median,

Answer(a) ..... h [1]

(b) the 20th percentile,

Answer(b) ..... h [2]

(c) the inter-quartile range,

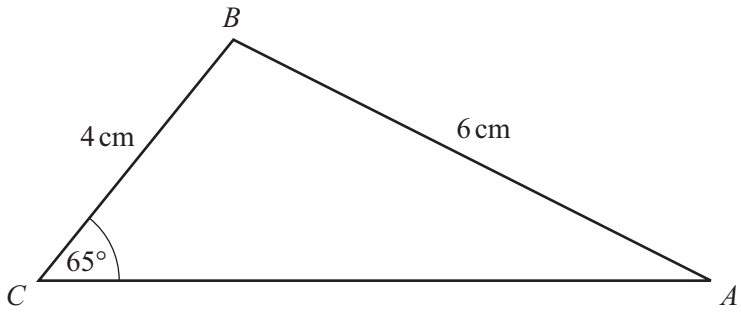
Answer(c) ..... h [2]

(d) the probability that a person chosen at random spends 2 hours or less in the museum.

Answer(d) ..... [2]

Question 21 is printed on the next page.

21



NOT TO SCALE

In triangle ABC, $AB = 6$ cm, $BC = 4$ cm and angle $BCA = 65°$.

Calculate

(a) angle CAB,

Answer(a) Angle CAB = ... [3]

(b) the area of triangle ABC.

Answer(b) ..... cm^2 [3]

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

MATHEMATICS **0580/23**

Paper 2 (Extended) **October/November 2013**

1 hour 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 70.

This document consists of **12** printed pages.

For Examiner's Use

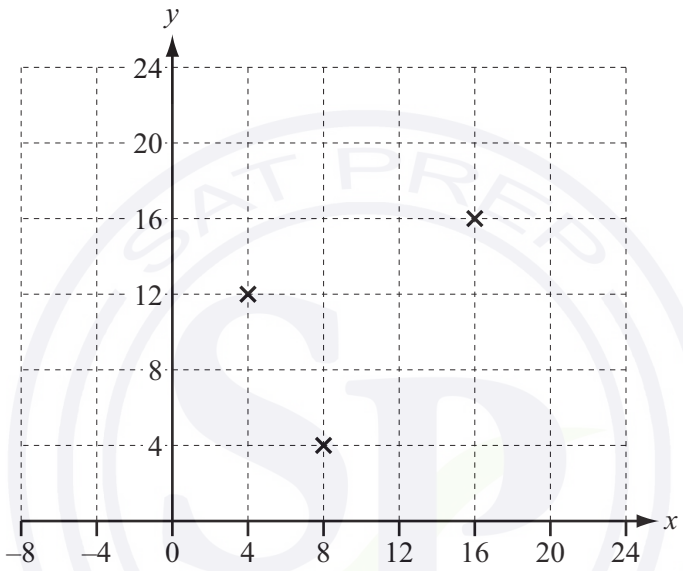
1 Christa had a music lesson every week for one year.
Each of the 52 lessons lasted for 45 minutes.

Calculate the total time that Christa spent in music lessons.
Give your time in hours.

Answer ..... h [2]

---

2 Three of the vertices of a parallelogram are at (4, 12), (8, 4) and (16, 16).



Write down the co-ordinates of two possible positions of the fourth vertex.

Answer (..... , ...) and (..... , ...) [2]

---

3 Solve the equation $1 + 2x = -15$.

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

---

4 Write the following in order of size, smallest first.

$\cos 100°$ $\tan 100°$ $\frac{1}{100}$ $100^{-0.1}$

Answer ..... < ..... < ..... < ..... [2]

For Examiner's Use

5 Write

(a) 60 square metres in square centimetres,

Answer(a) ..... cm^2 [1]

(b) 22 metres per second in kilometres per hour.

Answer(b) ..... km/h [2]

---

6 In 2012 the cost of a ticket to an arts festival was \$30.
This was 20% more than the ticket cost in 2011.

Calculate the cost of the ticket in 2011.

Answer \$ ..... [3]

---

7 The solutions of the equation $x^2 - 6x + d = 0$ are both integers.
d is a prime number.

Find d.

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

[Turn over

8 m varies directly as the cube of x.
$m = 200$ when $x = 2$.

Find m when $x = 0.4$.

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

---

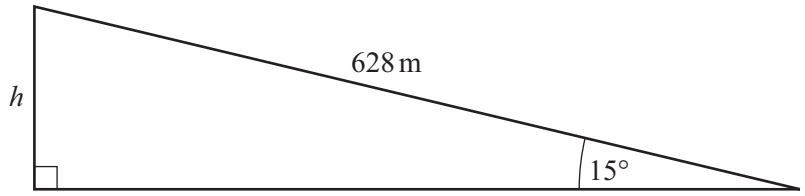
9 **(a)** Expand and simplify $(a + b)^2$.

Answer(a) ..... [2]

(b) Find the value of $a^2 + b^2$ when $a + b = 6$ and $ab = 7$.

Answer(b) ..... [1]

10



NOT TO SCALE

Calculate the length h.
Give your answer correct to 2 significant figures.

Answer h = ... m [3]

---

11 $\mathbf{A} = \begin{pmatrix} 3 & -1 \\ 4 & 2 \end{pmatrix}$ $\mathbf{I} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

Work out the following.

(a) AI

Answer(a) **AI** = [1]

(b) $\mathbf{A}^{-1}$

Answer(b) $\mathbf{A}^{-1}$ = [2]

---

12 Write the answer to the following calculations in standard form.

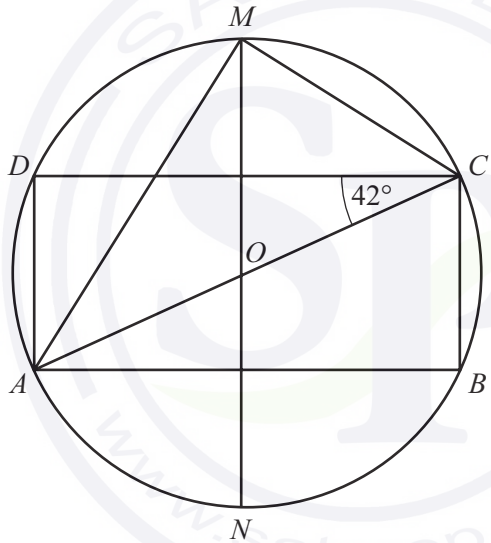
(a) $600 \div 8000$

Answer(a) ..... [2]

(b) $10^8 - 7 \times 10^6$

Answer(b) ..... [2]

13



NOT TO SCALE

The vertices of the rectangle $ABCD$ lie on a circle centre O.
MN is a line of symmetry of the rectangle.
AC is a diameter of the circle and angle $ACD = 42°$.

Calculate

(a) angle CAM,

Answer(a) Angle CAM = ... [2]

(b) angle DCM.

Answer(b) Angle DCM = ... [2]

For Examiner's Use

14 **(a)** Simplify $(64q^{-2})^{\frac{1}{2}}$.

Answer(a) ..... [2]

(b) $5^7 \div 5^9 = p^2$

Find p.

Answer(b) $p =$ ..... [2]

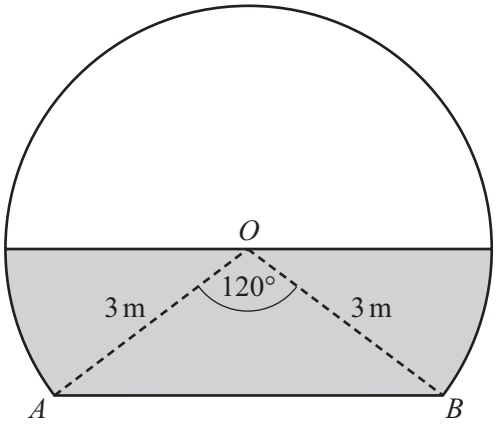
15

For Examiner's Use

(a) Construct the locus of all the points which are 3 cm from vertex A **and** outside the rectangle. [2]

(b) Construct, **using a straight edge and compasses only**, one of the lines of symmetry of the rectangle. [2]

16 The diagram shows the entrance to a tunnel.
The circular arc has a radius of 3 m and centre O.
AB is horizontal and angle $AOB = 120°$.



NOT TO SCALE

During a storm the tunnel filled with water, to the level shown by the shaded area in the diagram.

(a) Calculate the shaded area.

Answer(a) ..... m^2 [4]

(b) The tunnel is 50 m long.

Calculate the volume of water in the tunnel.

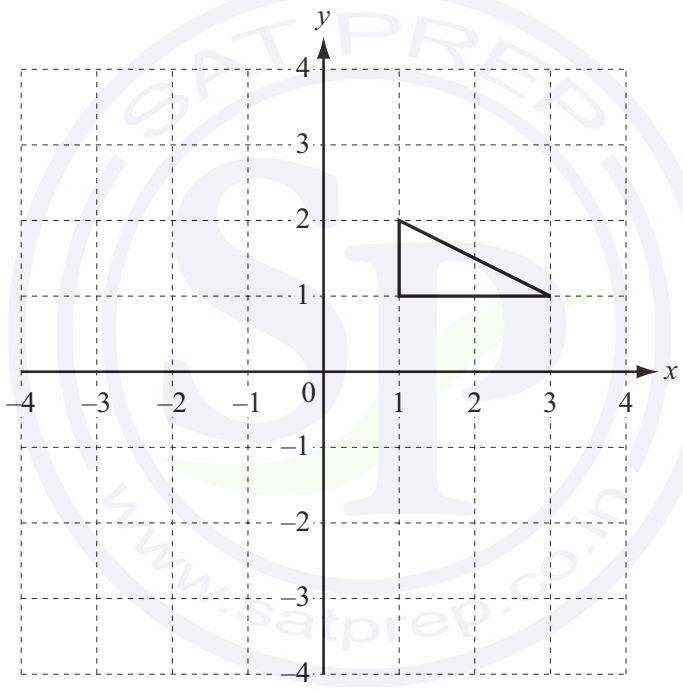
Answer(b) ..... m^3 [1]

[Turn over

17 (p, q) is the image of the point (x, y) under this combined transformation.

$$\begin{pmatrix} p \\ q \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

(a) Draw the image of the triangle under the combined transformation.



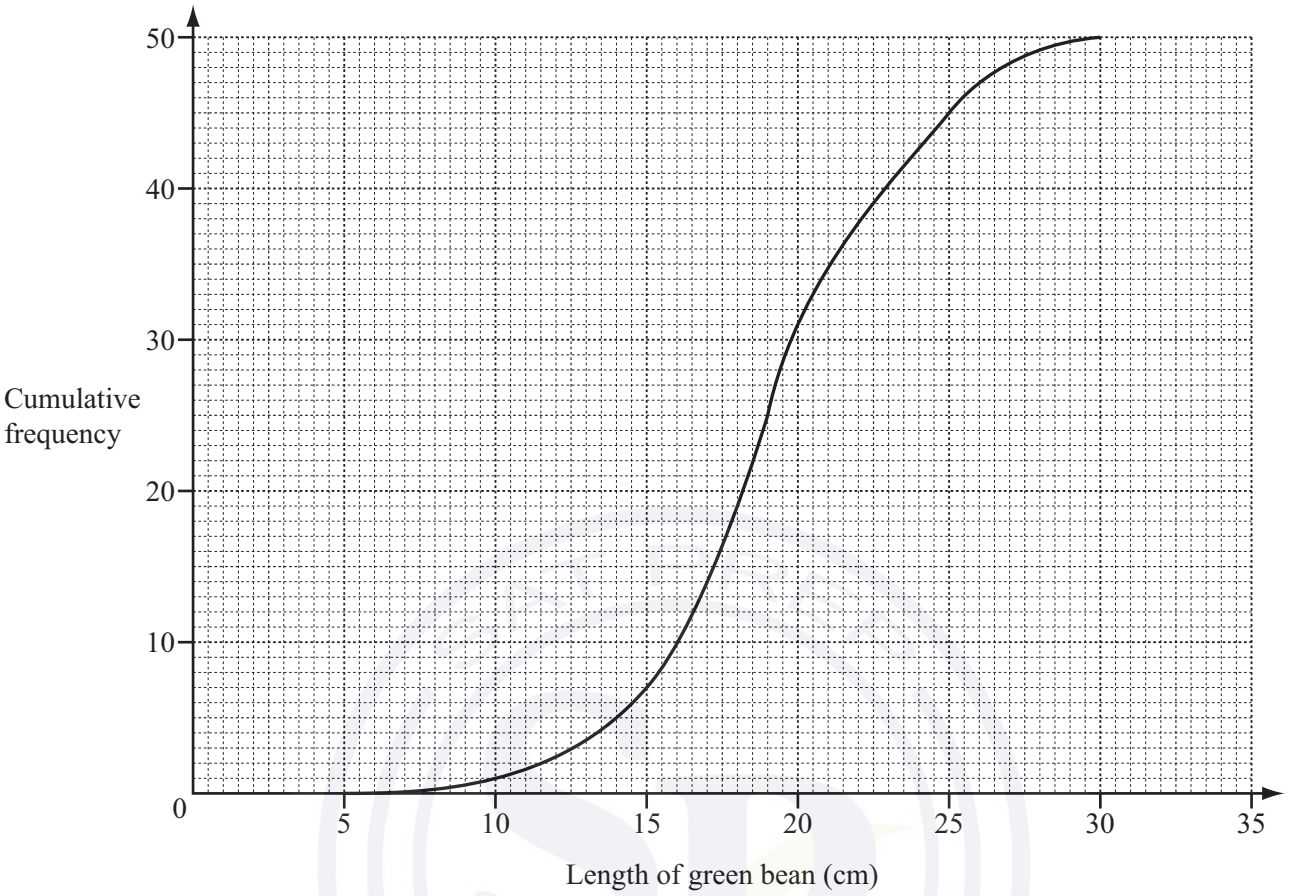
[3]

(b) Describe fully the **single** transformation represented by $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$.

Answer (b) ..... [2]

For Examiner's Use

18 A gardener measured the lengths of 50 green beans from his garden.
The results have been used to draw this cumulative frequency diagram.



Work out

(a) the median,

Answer(a) ..... cm [1]

(b) the number of green beans that are longer than 26 cm,

Answer(b) ..... [2]

(c) the inter-quartile range,

Answer(c) ..... cm [2]

(d) the probability that a green bean chosen at random is more than 14 cm long.

Answer(d) ..... [2]

Question 19 is printed on the next page.

For Examiner's Use

19 $f(x) = 2x + 3$ $g(x) = x^2$

(a) Find $fg(6)$.

Answer(a) ..... [2]

(b) Solve the equation $gf(x) = 100$.

Answer(b) $x =$ ..... or $x =$ ..... [3]

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

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

(d) Find $ff^{-1}(5)$.

Answer(d) ..... [1]

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

5046734294

MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2013**

1 hour 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.
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Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
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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 70.

This document consists of **12** printed pages.

For Examiner's Use

1 One January day in Munich, the temperature at noon was 3°C.
At midnight the temperature was –8°C.

Write down the difference between these two temperatures.

Answer ..... °C [1]

---

2 **(a)** Calculate $\sqrt{5.7} - 1.03^2$.

Write down all the numbers displayed on your calculator.

Answer(a) ..... [1]

(b) Write your answer to **part (a)** correct to 3 decimal places.

Answer(b) ..... [1]

---

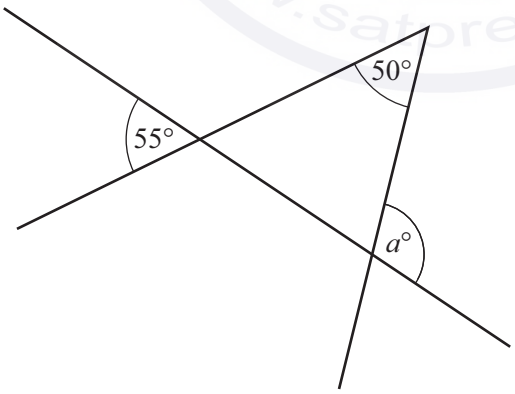
3 Pedro and Eva do their homework.
Pedro takes 84 minutes to do his homework.

The ratio Pedro's time : Eva's time = 7 : 6.

Work out the number of minutes Eva takes to do her homework.

Answer ..... min [2]

4



NOT TO SCALE

Use the information in the diagram to find the value of a.

Answer a = ... [2]

For Examiner's Use

5 Show that $1\frac{1}{2} \div \frac{3}{16} = 8$.

Do not use a calculator and show all the steps of your working.

Answer

[2]

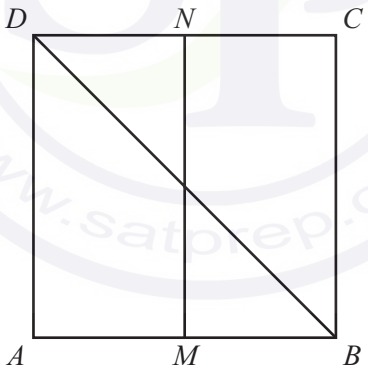
---

6 Factorise completely.

$12xy - 3x^2$

Answer ..... [2]

7



The diagram shows a square $ABCD$.
M is the midpoint of AB and N is the midpoint of CD.

(a) Complete the statement.

The line MN is the locus of points inside the square which are

..... [1]

(b) Shade the region inside the square containing points which are nearer to AB than to BC **and** nearer to A than to B. [1]

[Turn over

8 Solve the inequality.

$$3x - 1 \leqslant 11x + 2$$

Answer ..... [2]

---

9 An equilateral triangle has sides of length 16.1 cm, correct to the nearest millimetre.

Find the lower and upper bounds of the perimeter of the triangle.

Answer Lower bound = ... cm

Upper bound = ... cm [2]

---

10 Factorise completely.

$$ap + bp - 2a - 2b$$

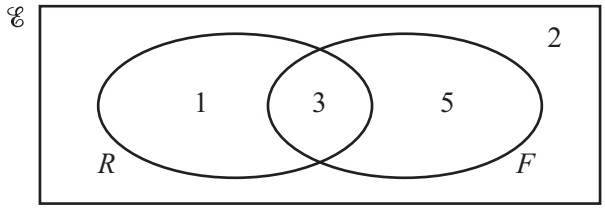
Answer ..... [2]

---

11 Write $(27x^{12})^{\frac{1}{3}}$ in its simplest form.

Answer ..... [2]

12



11 students are asked if they like rugby (R) and if they like football (F).
The Venn diagram shows the results.

(a) A student is chosen at random.

What is the probability that the student likes rugby **and** football?

Answer(a) ..... [1]

(b) On the Venn diagram shade the region $R' \cap F'$. [1]

---

13 Martina changed 200 Swiss francs (CHF) into euros (€).
The exchange rate was €1 = 1.14 CHF.

Calculate how much Martina received.
Give your answer correct to the nearest euro.

Answer € ..... [3]

---

14 Bruce invested $420 at a rate of 4% per year compound interest.

Calculate the **total** amount Bruce has after 2 years.
Give your answer correct to 2 decimal places.

Answer $ ..... [3]

[Turn over

For Examiner's Use

15 A sphere has a volume of $80\,cm^3$.

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

Answer ..... cm [3]

---

16 A water pipe has a circular cross section of radius 0.75 cm.
Water flows through the pipe at a rate of 16 cm/s.

Calculate the time taken for 1 litre of water to flow through the pipe.

Answer ..... s [3]

For Examiner's Use

17 Find the equation of the line passing through the points (0, –1) and (3, 5).

Answer ..... [3]

---

18 **(a)** Factorise $x^2 + x - 30$.

Answer(a) ..... [2]

(b) Simplify $\dfrac{(x-5)(x+4)}{x^2+x-30}$.

Answer(b) ..... [1]

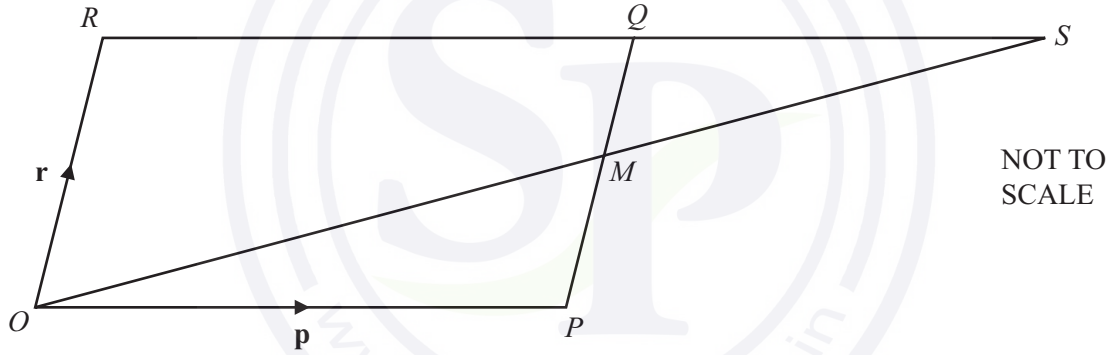
[Turn over

19 t varies inversely as the square root of u.
$t = 3$ when $u = 4$.

Find t when $u = 49$.

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

20



NOT TO SCALE

$OPQR$ is a parallelogram, with O the origin.
M is the midpoint of PQ.
OM and RQ are extended to meet at S.
$\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OR} = \mathbf{r}$.

(a) Find, in terms of **p** and **r**, in its simplest form,

(i) $\overrightarrow{OM}$,

Answer(a)(i) $\overrightarrow{OM} =$ ..... [1]

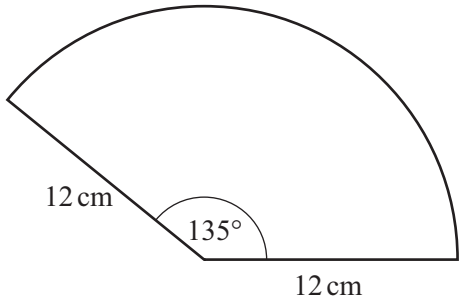
(ii) the position vector of S.

Answer(a)(ii) ..... [1]

(b) When $\overrightarrow{PT} = -\frac{1}{2}\mathbf{p} + \mathbf{r}$, what can you write down about the position of T?

Answer(b) ..... [1]

21



NOT TO SCALE

The diagram shows a sector of a circle of radius 12 cm with an angle of 135°.

Calculate the perimeter of the sector.

Answer ..... cm [3]

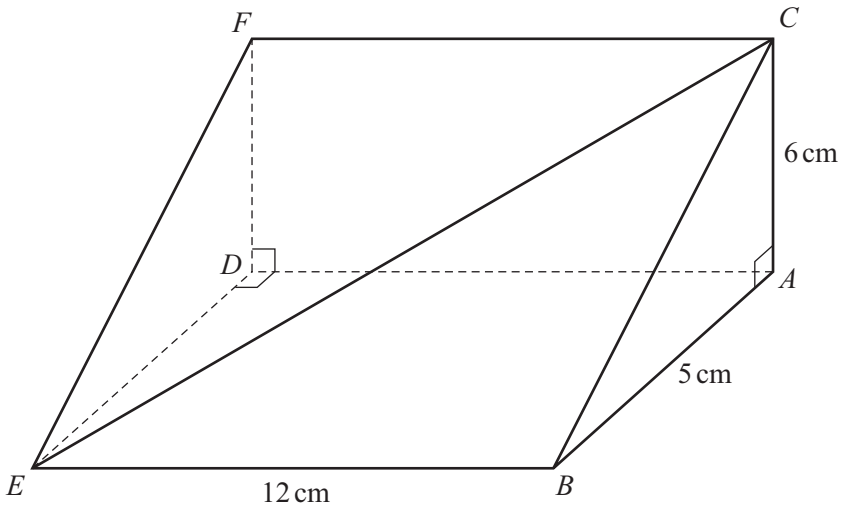
---

22 Write as a single fraction in its simplest form.

$$\frac{2}{x+3} + \frac{3}{x+2}$$

Answer ..... [3]

23



NOT TO SCALE

The diagram shows a triangular prism of length 12 cm.
Triangle ABC is a cross section of the prism.
Angle $BAC = 90°$, $AC = 6$ cm and $AB = 5$ cm.

Calculate the angle between the line CE and the base $ABED$.

Answer ..... [4]

---

24 $\mathbf{A} = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 4 & 3 \\ 1 & 2 \end{pmatrix}$

Find

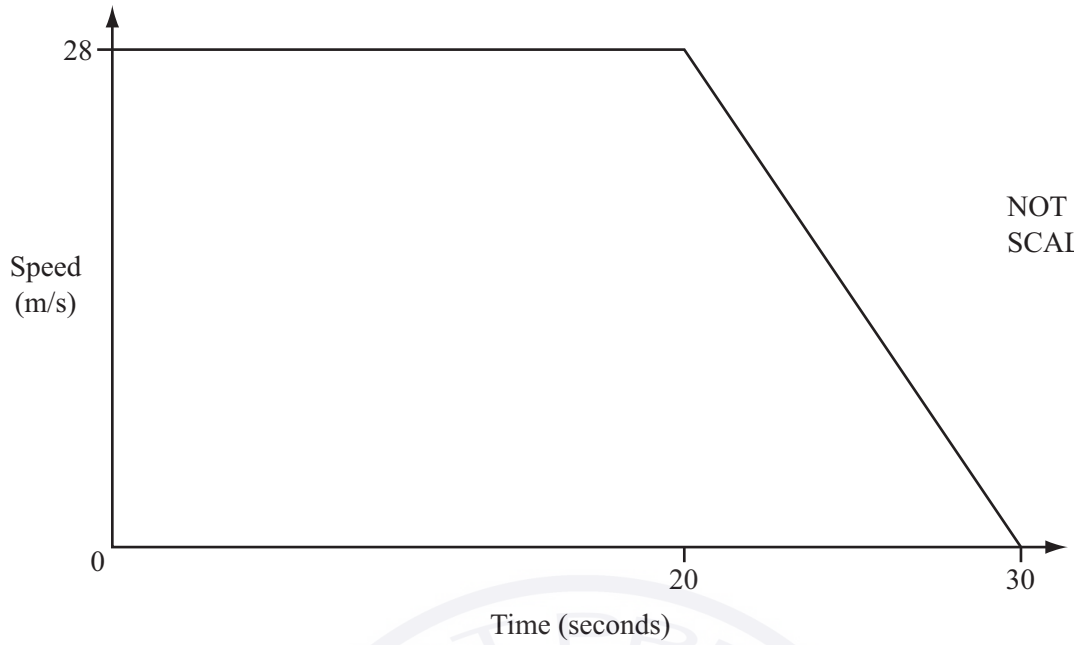
(a) **AB**,

Answer(a) **AB** = [2]

(b) $\mathbf{B}^{-1}$, the inverse of **B**.

Answer(b) $\mathbf{B}^{-1}$ = [2]

25



The diagram shows the speed-time graph of a car.
It travels at 28 m/s for 20 seconds and then decelerates until it stops after a further 10 seconds.

(a) Calculate the deceleration of the car.

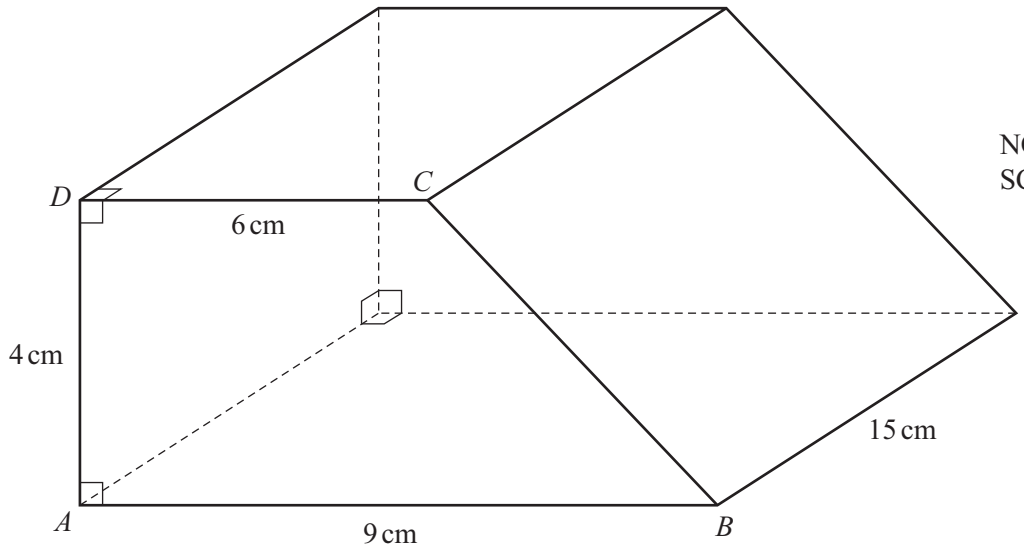
Answer(a) ..... m/s^2 [1]

(b) Calculate the distance travelled during the 30 seconds.

Answer(b) ..... m [3]

Question 26 is printed on the next page.

26



The diagram shows a solid prism of length 15 cm.
The cross section of the prism is the trapezium $ABCD$.
Angle DAB = angle CDA = 90°.
AB = 9 cm, DC = 6 cm and AD = 4 cm.

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

Answer ..... cm^2 [5]

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

8725174968

MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2013**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

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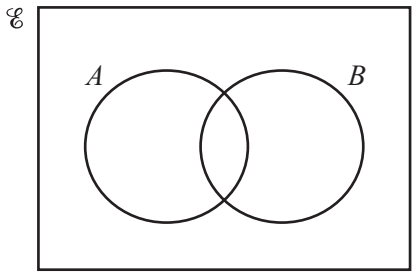
Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees 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 70.

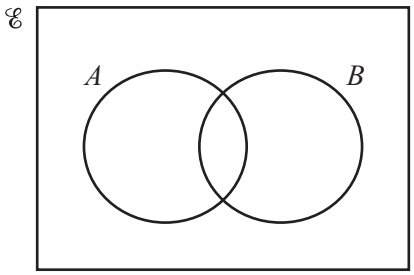
This document consists of **12** printed pages.

For Examiner's Use

1 Shade the required region on each Venn diagram.



$A' \cup B$



$A' \cap B'$

[2]

---

2 Factorise completely.

$kp + 3k + mp + 3m$

Answer ..... [2]

---

3 The first five terms of a sequence are shown below.

13 9 5 1 –3

Find the nth term of this sequence.

Answer ..... [2]

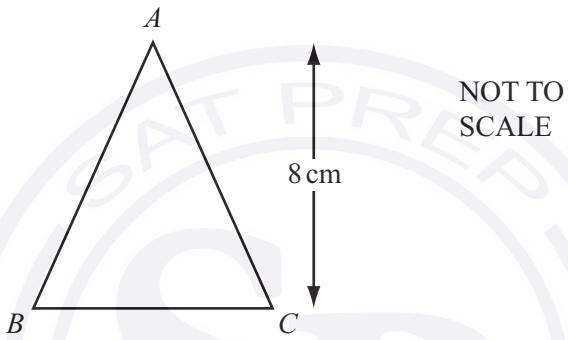
For Examiner's Use

4 Calculate $(4.3 \times 10^8) + (2.5 \times 10^7)$.

Give your answer in standard form.

Answer ..... [2]

5



Triangle ABC has a height of 8 cm and an area of 42 cm².

Calculate the length of BC.

Answer BC = ... cm [2]

For Examiner's Use

6 George and his friend Jane buy copies of the same book on the internet.
George pays $16.95 and Jane pays £11.99 on a day when the exchange rate is $1 = £0.626.

Calculate, in dollars, how much more Jane pays.

Answer $ ..... [2]

---

7 **(a)** Use your calculator to work out $\sqrt{65} - 1.7^2$.

Write down all the numbers displayed on your calculator.

Answer(a) ..... [1]

(b) Write your answer to **part (a)** correct to 2 significant figures.

Answer(b) ..... [1]

---

8 Joe measures the side of a square correct to 1 decimal place.
He calculates the **upper** bound for the area of the square as 37.8225 cm^2.

Work out Joe's measurement for the side of the square.

Answer ..... cm [2]

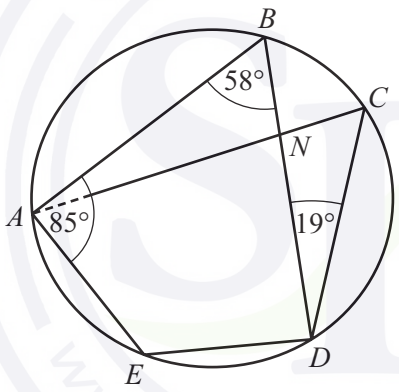
For Examiner's Use

9 A car, 4.4 metres long, has a fuel tank which holds 65 litres of fuel when full.
The fuel tank of a mathematically similar model of the car holds 0.05 litres of fuel when full.

Calculate the length of the model car in centimetres.

Answer ..... cm [3]

10



NOT TO SCALE

A, *B*, *C*, *D* and *E* are points on a circle.
Angle *ABD* = 58°, angle *BAE* = 85° and angle *BDC* = 19°.
BD and *CA* intersect at *N*.

Calculate

(a) angle *BDE*,

Answer(a) Angle *BDE* = ... [1]

(b) angle *AND*.

Answer(b) Angle *AND* = ... [2]

For Examiner's Use

11 Without using a calculator, work out $\frac{6}{7} \div 1\frac{2}{3}$.

Write down all the steps in your working.

Answer ..... [3]

---

12 Solve the equation.

$$5(2y - 17) = 60$$

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

---

13 Carol invests \$6250 at a rate of 2% per year compound interest.

Calculate the **total** amount Carol has after 3 years.

Answer \$ ..... [3]

---

14 y is inversely proportional to x^3.
$y = 5$ when $x = 2$.

Find y when $x = 4$.

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

---

15 Use the quadratic equation formula to solve

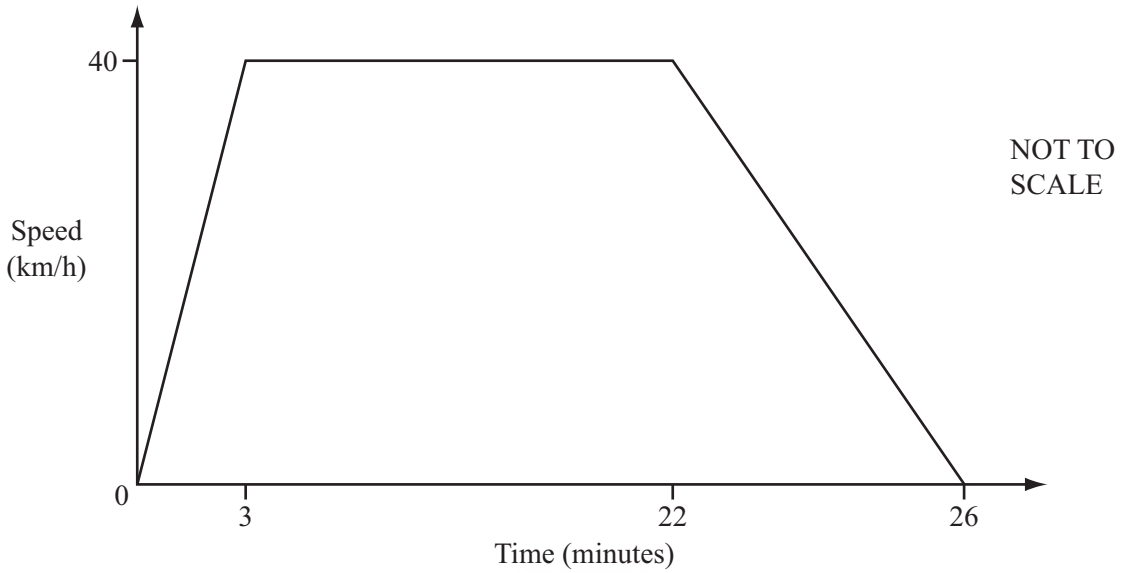
$$2x^2 + 7x - 3 = 0 .$$

Show all your working and give your answers correct to 2 decimal places.

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

[Turn over

16



The diagram shows the speed-time graph of a train journey between two stations.

The train accelerates for 3 minutes, travels at a constant maximum speed of 40 km/h, then takes 4 minutes to slow to a stop.

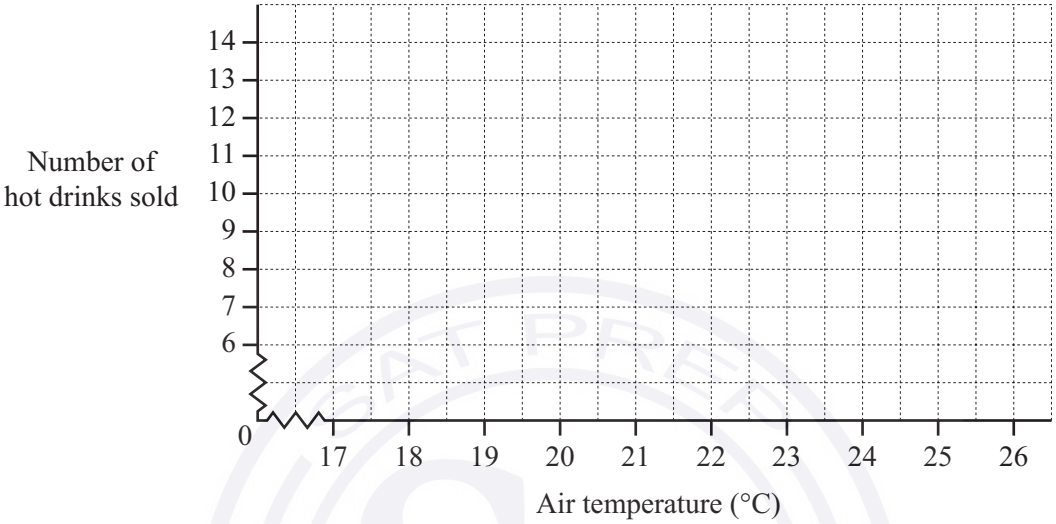
Calculate the distance in kilometres between the two stations.

Answer ..... km [4]

17 The owner of a small café records the average air temperature and the number of hot drinks he sells each day for a week.

Air temperature (°C)	18	23	19	23	24	25	20
Number of hot drinks sold	12	8	13	10	9	7	12

(a) On the grid, draw a scatter diagram to show this information.



[2]

(b) What type of correlation does your scatter diagram show?

Answer(b) ..... [1]

(c) Draw a line of best fit on the grid. [1]

---

18 Solve $6x + 3 < x < 3x + 9$ for **integer** values of x.

Answer ..... [4]

19

For Examiner's Use

Scale: 1 cm to 8 m

The rectangle *ABCD* is a scale drawing of a rectangular football pitch.
The scale used is 1 centimetre to represent 8 metres.

(a) Construct the locus of points 40 m from *A* and inside the rectangle. [2]

(b) Using a straight edge and compasses only, construct the perpendicular bisector of *DB*. [2]

(c) Shade the region on the football pitch which is more than 40 m from *A* **and** nearer to *D* than to *B*. [1]

20 The heights, in metres, of 200 trees in a park are measured.

Height (h m)	$2 < h \leqslant 6$	$6 < h \leqslant 10$	$10 < h \leqslant 13$	$13 < h \leqslant 17$	$17 < h \leqslant 19$	$19 < h \leqslant 20$
Frequency	23	47	45	38	32	15

(a) Find the interval which contains the median height.

Answer(a) ..... [1]

(b) Calculate an estimate of the mean height.

Answer(b) ..... m [4]

(c) Complete the cumulative frequency table for the information given in the table above.

Height (h m)	$2 < h \leqslant 6$	$h \leqslant 10$	$h \leqslant 13$	$h \leqslant 17$	$h \leqslant 19$	$h \leqslant 20$
Cumulative frequency	23					

[2]

Question 21 is printed on the next page.

[Turn over

For Examiner's Use

21 $f(x) = 5x + 4$ $g(x) = \frac{1}{2x}$, $x \neq 0$ $h(x) = \left(\frac{1}{2}\right)^x$

Find

(a) fg(5) ,

Answer(a) ..... [2]

(b) gg(x) in its simplest form,

Answer(b) gg(x) = ... [2]

(c) $f^{-1}(x)$,

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

(d) the value of x when $h(x) = 8$.

Answer(d) x = ... [2]

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

6914173111

MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2013**

1 hour 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 70.

This document consists of **12** printed pages.

For Examiner's Use

1 Sheila can pay her hotel bill in Euros (€) or Pounds (£).
The bill was €425 or £365 when the exchange rate was £1 = €1.14 .

In which currency was the bill cheaper?
Show all your working.

Answer ..... [2]

---

2 The Ocean View Hotel has 300 rooms numbered from 100 to 399.
A room is chosen at random.

Find the probability that the room number ends in zero.

Answer ..... [2]

---

3 The time in Lisbon is the same as the time in Funchal.
A plane left Lisbon at 08 30 and arrived in Funchal at 10 20.
It then left Funchal at 12 55 and returned to Lisbon.
The return journey took 15 minutes more.

What time did the plane arrive in Lisbon?

Answer ..... [2]

For Examiner's Use

4 Use a calculator to find

(a) $\sqrt{5\frac{5}{24}}$,

Answer(a) ..... [1]

(b) $\frac{\cos 40°}{7}$.

Answer(b) ..... [1]

---

5 Write the following in order of size, **smallest** first.

$(1.5)^{\frac{2}{3}}$ $\quad$ $\left(\frac{2}{3}\right)^{1.5}$ $\quad$ $\left(\frac{2}{3}\right)^{-1.5}$ $\quad$ $\left(-\frac{2}{3}\right)^{\frac{2}{3}}$

Answer ..... < ..... < ..... < ..... [2]

---

6 The volumes of two similar cones are $36\pi\,\text{cm}^3$ and $288\pi\,\text{cm}^3$.
The base radius of the smaller cone is 3 cm.

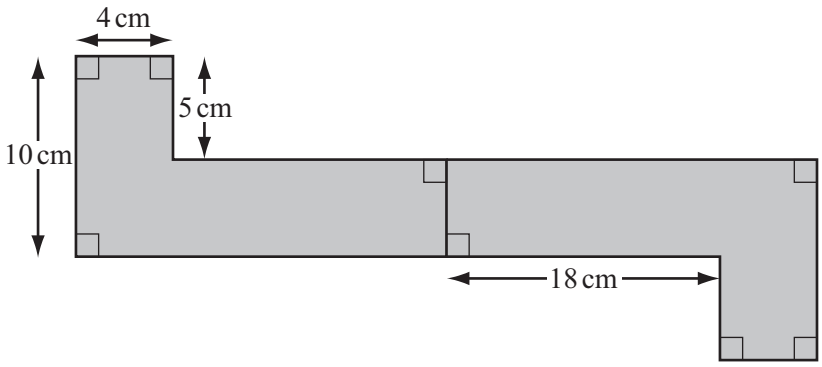
Calculate the base radius of the larger cone.

Answer ..... cm [3]

[Turn over

For Examiner's Use

7



NOT TO SCALE

The shaded shape has rotational symmetry of order 2.

Work out the shaded area.

Answer ..... cm^2 [3]

---

8 The mass, m, of a sphere varies directly with the **cube** of its radius, r.
$m = 160$ when $r = 2$.

Find m when $r = 5$.

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

For Examiner's Use

9 Calculate, giving your answers in standard form,

(a) $2 \times (5.5 \times 10^4)$,

Answer(a) ..... [2]

(b) $(5.5 \times 10^4) - (5 \times 10^4)$.

Answer(b) ..... [2]

---

10 Find the value of $2x + y$ for the simultaneous equations.

$$3x + 5y = 48$$
$$2x - y = 19$$

Answer $2x + y =$ ..... [4]

For Examiner's Use

11 The sum of the prime numbers less than 8 is equal to 17.

(a) Find the sum of the prime numbers less than 21.

Answer(a) ..... [2]

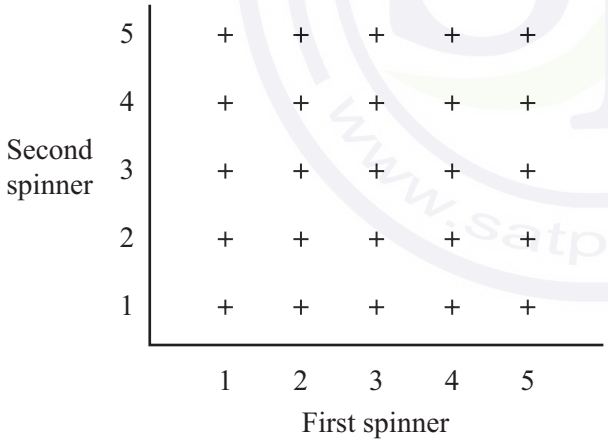
(b) The sum of the prime numbers less than x is 58.

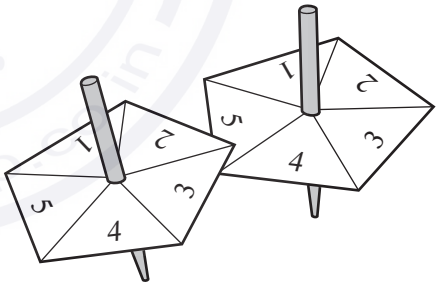
Find an integer value for x.

Answer(b) $x =$ ..... [2]

---

12 Two spinners have sections numbered from 1 to 5.
Each is spun once and each number is equally likely.
The possibility diagram is shown below.





Find the probability that

(a) both spinners show the same number,

Answer(a) ..... [2]

(b) the sum of the numbers shown on the two spinners is 7.

Answer(b) ..... [2]

For Examiner's Use

13 Write as a single fraction in its simplest form.

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

Answer ..... [4]

---

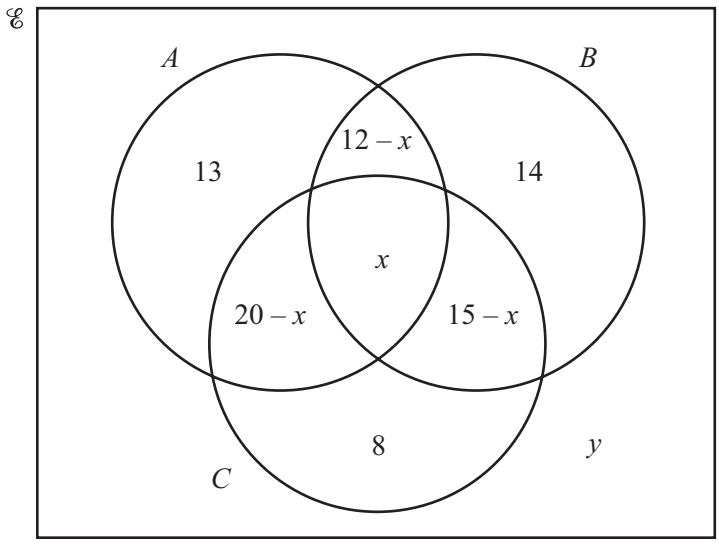
14 **(a)** Solve $3n + 23 < n + 41$.

Answer(a) ..... [2]

(b) Factorise completely $ab + bc + ad + cd$.

Answer(b) ..... [2]

15



The Venn diagram shows the number of elements in sets A, B and C.

(a) $n(A \cup B \cup C) = 74$

Find x.

Answer(a) $x =$ ..... [2]

(b) $n(\mathscr{E}) = 100$

Find y.

Answer(b) $y =$ ..... [1]

(c) Find the value of $n((A \cup B)' \cap C)$.

Answer(c) ..... [1]

16 $f(x) = x + \frac{2}{x} - 3, \ x \neq 0$ $\qquad$ $g(x) = \frac{x}{2} - 5$

Find

(a) fg(18),

Answer(a) ..... [2]

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

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

---

17 $\mathbf{M} = \begin{pmatrix} 2 & 3 \\ 3 & 6 \end{pmatrix}$ $\qquad$ $\mathbf{N} = \begin{pmatrix} 2 & 1 & 5 \\ 1 & 7 & 2 \end{pmatrix}$

(a) Work out **MN**.

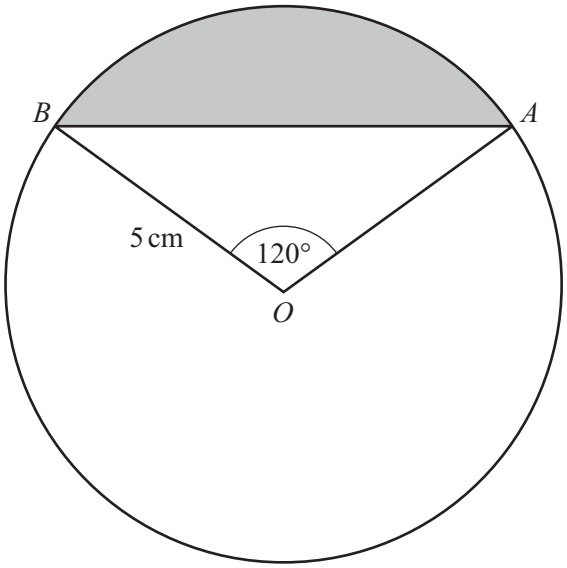
Answer(a) [2]

(b) Find $\mathbf{M}^{-1}$, the inverse of **M**.

Answer(b) [2]

[Turn over

18



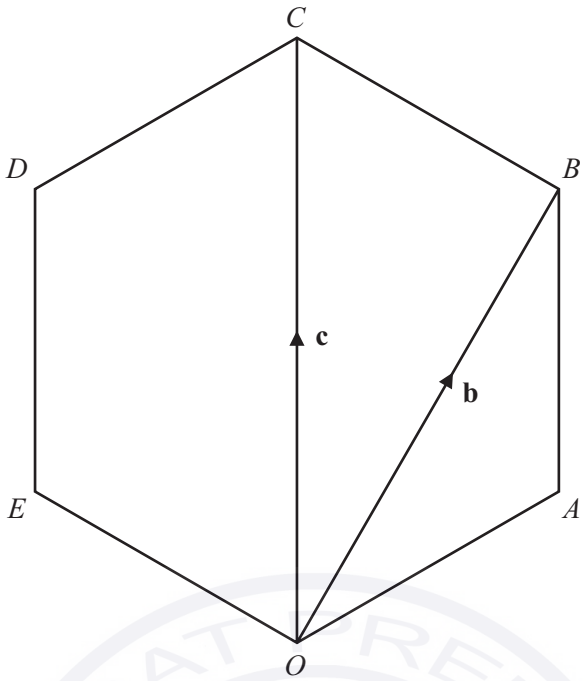
NOT TO SCALE

A and *B* lie on a circle centre *O*, radius 5 cm.
Angle *AOB* = 120°.

Find the area of the shaded segment.

Answer ..... cm^2 [4]

19



OABCDE is a regular polygon.

(a) Write down the geometrical name for this polygon.

Answer(a) ..... [1]

(b) O is the origin. $\overrightarrow{OB} = \mathbf{b}$ and $\overrightarrow{OC} = \mathbf{c}$.

Find, in terms of **b** and **c**, in their simplest form,

(i) $\overrightarrow{BC}$,

Answer(b)(i) $\overrightarrow{BC}$ = ... [1]

(ii) $\overrightarrow{OA}$,

Answer(b)(ii) $\overrightarrow{OA}$ = ... [2]

(iii) the position vector of E.

Answer(b)(iii) ..... [1]

Question 20 is printed on the next page.

20 (a)

$$y = \sqrt{8 + \frac{4}{x}}$$

Find y when $x = 2$.
Give your answer correct to 4 decimal places.

Answer(a) $y =$ ..... [2]

(b) Rearrange $y = \sqrt{8 + \frac{4}{x}}$ to make x the subject.

Answer(b) $x =$ ..... [4]