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MATHEMATICS

0580/21

Paper 2 Non-calculator (Extended)

October/November 2025

2 hours

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- Calculators must **not** be used in this paper.
- You may use tracing paper.
- You must show all necessary working clearly.

INFORMATION

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

This document has **16** pages.

List of formulas

Area, A , of triangle, base b , height h .

$$A = \frac{1}{2}bh$$

Area, A , of circle of radius r .

$$A = \pi r^2$$

Circumference, C , of circle of radius r .

$$C = 2\pi r$$

Curved surface area, A , of cylinder of radius r , height h .

$$A = 2\pi r h$$

Curved surface area, A , of cone of radius r , sloping edge l .

$$A = \pi r l$$

Surface area, A , of sphere of radius r .

$$A = 4\pi r^2$$

Volume, V , of prism, cross-sectional area A , length l .

$$V = Al$$

Volume, V , of pyramid, base area A , height h .

$$V = \frac{1}{3}Ah$$

Volume, V , of cylinder of radius r , height h .

$$V = \pi r^2 h$$

Volume, V , of cone of radius r , height h .

$$V = \frac{1}{3}\pi r^2 h$$

Volume, V , of sphere of radius r .

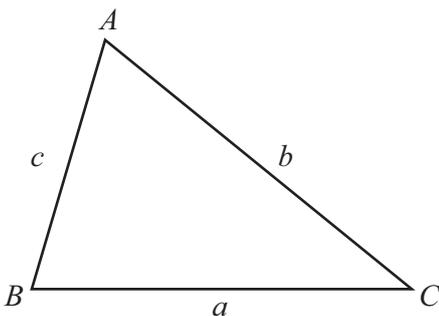
$$V = \frac{4}{3}\pi r^3$$

For the equation

$$ax^2 + bx + c = 0, \text{ where } a \neq 0,$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

For the triangle shown,



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

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

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



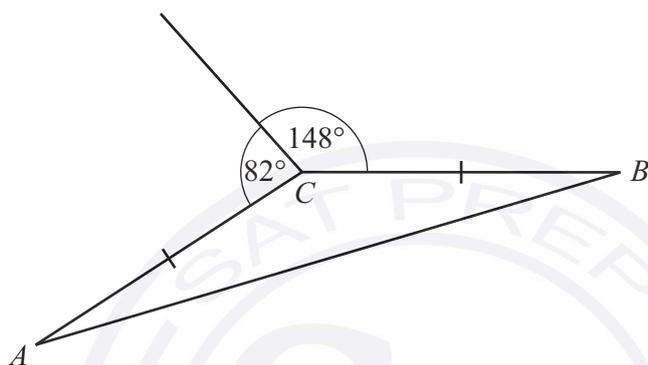


Calculators must **not** be used in this paper.

1 Divide \$90 in the ratio 2 : 3.

\$, \$ [2]

2



NOT TO SCALE

In the diagram, $AC = BC$.

Work out angle CAB .

Angle $CAB =$ [3]

3 Find the interior angle of a regular 20-sided polygon.

..... [2]



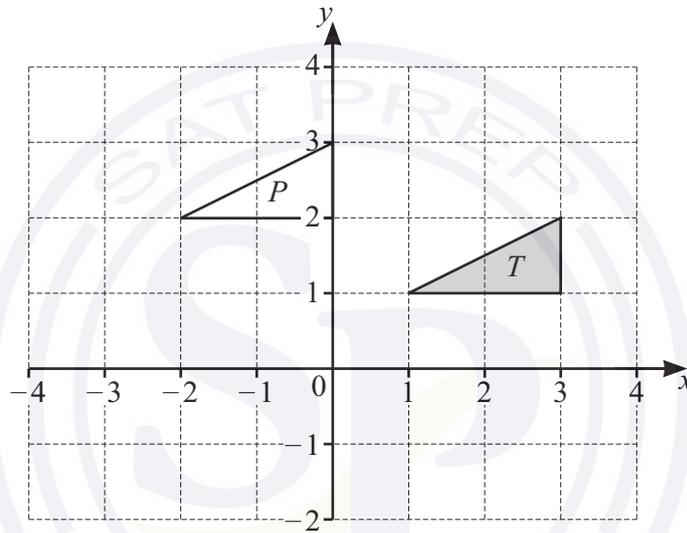
DO NOT WRITE IN THIS MARGIN

- 4 The area of a triangle is 12 cm^2 .
The length of the base of the triangle is 8 cm.

Work out the height of the triangle.

..... cm [2]

5



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

.....
 [2]

- (b) Draw the image of triangle *T* after an enlargement of scale factor 2, centre (3, 3). [2]

6 Find the value of

- (a) $5^{-5} \times 5^5$

..... [1]

- (b) $125^{\frac{2}{3}}$

..... [2]





7 Simplify.

(a) $\frac{p}{t} \div \frac{2}{t}$

..... [2]

(b) $\frac{3x}{4} - \frac{x-1}{2}$

..... [2]

8 The cost of one orange is t cents.
The cost of one apple is w cents.

The total cost of 3 oranges and 1 apple is 51 cents.
The total cost of 6 oranges and 5 apples is 129 cents.

Use simultaneous equations to find the value of t and the value of w .
You must show all your working.

$t =$

$w =$

[5]



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- 9 Nina walks at an average speed of 5 km/h, correct to the nearest km/h. She walks for exactly 2 hours.

Work out the lower bound for the distance Nina walks.

..... km [2]

- 10 $C = \{n: n \text{ is an integer and } 1 \leq n \leq 8\}$
 $A = \{\text{factors of } 12\}$
 $B = \{\text{odd numbers}\}$

Find

(a) $A \cap B$

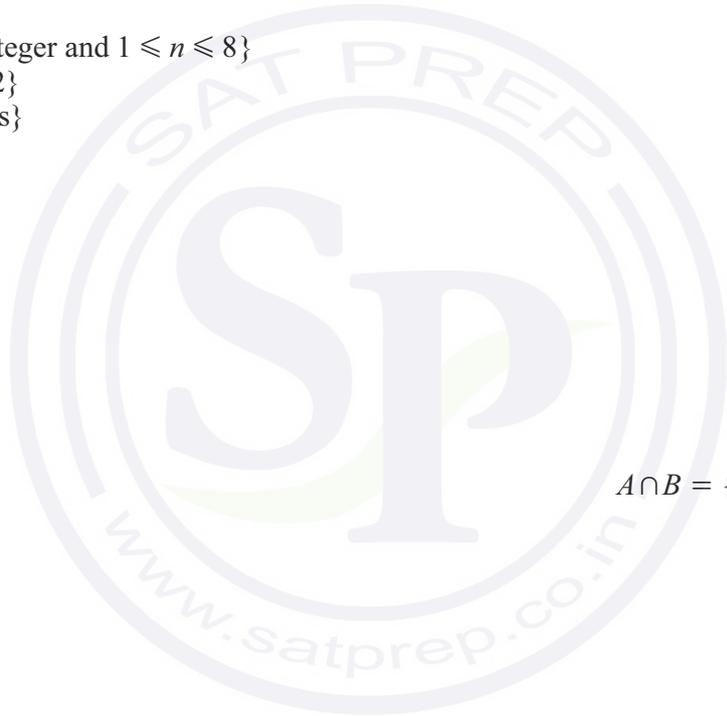
$A \cap B = \{.....\}$ [1]

(b) $n(A \cup B)$.

..... [1]

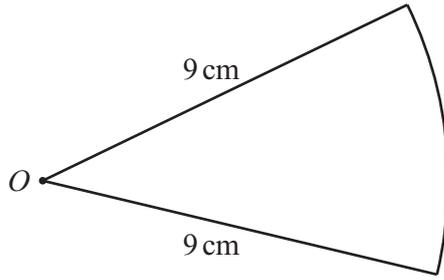
- 11 Write $0.\dot{2}\dot{4}$ as a fraction in its simplest form.

..... [2]





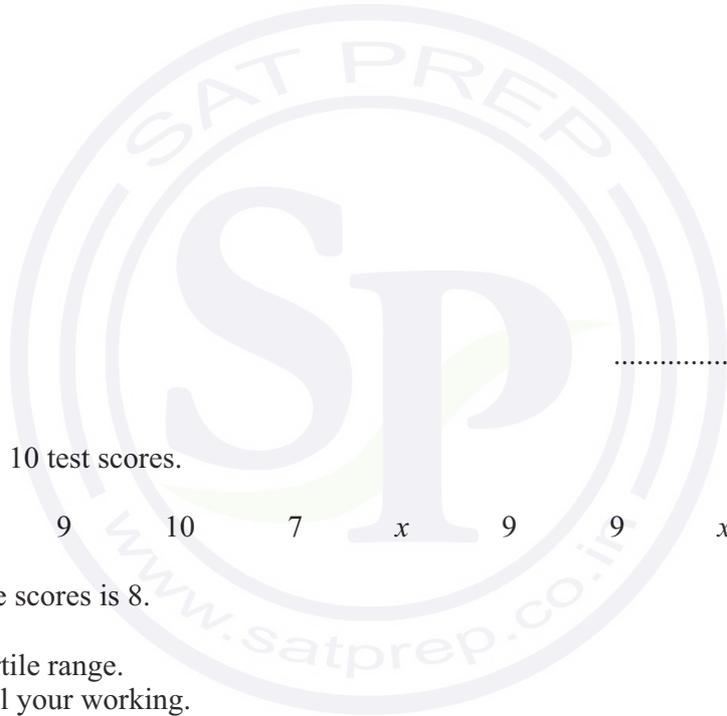
12 The diagram shows a sector of a circle with centre O and radius 9 cm.



NOT TO SCALE

The perimeter of the sector is $(18 + 2\pi)$ cm.

Find the area of the sector.
Give your answer in terms of π .



..... cm^2 [4]

13 These are Rahul's 10 test scores.

- 9 8 9 10 7 x 9 9 x 7

The mean of these scores is 8.

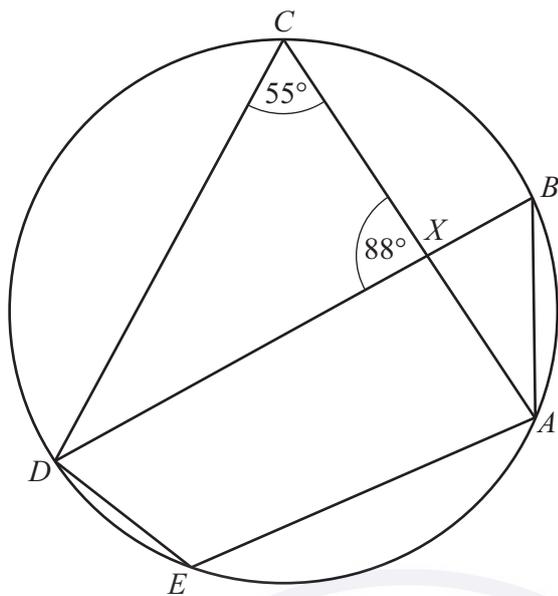
Find the interquartile range.
You must show all your working.

..... [4]

[Turn over]



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NOT TO SCALE

A, B, C, D and E lie on the circle.
 AC and BD intersect at X .
 Angle $ACD = 55^\circ$ and angle $CXD = 88^\circ$.

(a) Complete the statements, giving a geometrical reason in each part.

Angle $CDB = \dots\dots\dots$ because $\dots\dots\dots$

$\dots\dots\dots$

Angle $ABD = \dots\dots\dots$ because $\dots\dots\dots$

$\dots\dots\dots$

Angle $AED = \dots\dots\dots$ because $\dots\dots\dots$

$\dots\dots\dots$

[6]

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(b) Triangle CXD is mathematically similar to triangle BXA .
 $DX = 8.0$ cm, $BX = 2.7$ cm and $AX = 4.0$ cm.

(i) Work out the length of CX .

$CX = \dots\dots\dots$ cm [2]

(ii) Complete the statement.

Area of triangle CXD : area of triangle $BXA = \dots\dots\dots : \dots\dots\dots$ [1]

15 (a) Write 66 000 in standard form.

$\dots\dots\dots$ [1]

(b) Work out $(3.7 \times 10^8) + (3.7 \times 10^7)$.

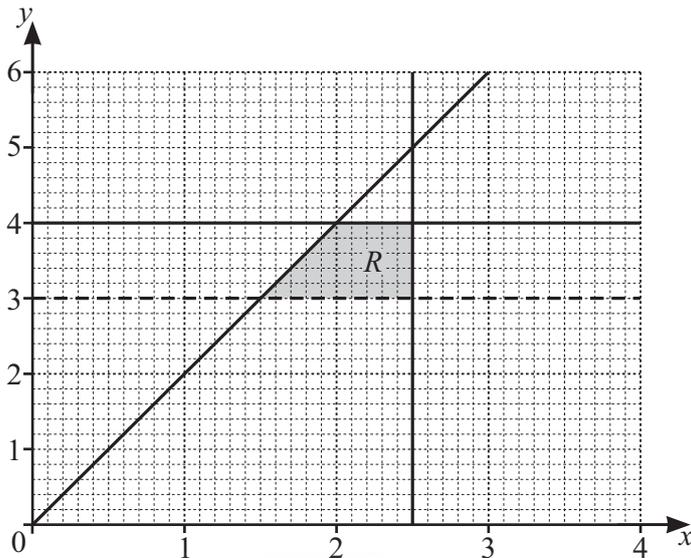
Give your answer in standard form.

$\dots\dots\dots$ [2]



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16



Write down all the inequalities that define the region R .

.....

.....

.....

.....

[4]

17 $I = M(k^2 + c^2)$

(a) Find the value of I when $M = 7$, $k = 3$ and $c = 2$.

$I =$ [2]

(b) Rearrange the formula to write k in terms of I , M and c .

$k =$ [3]

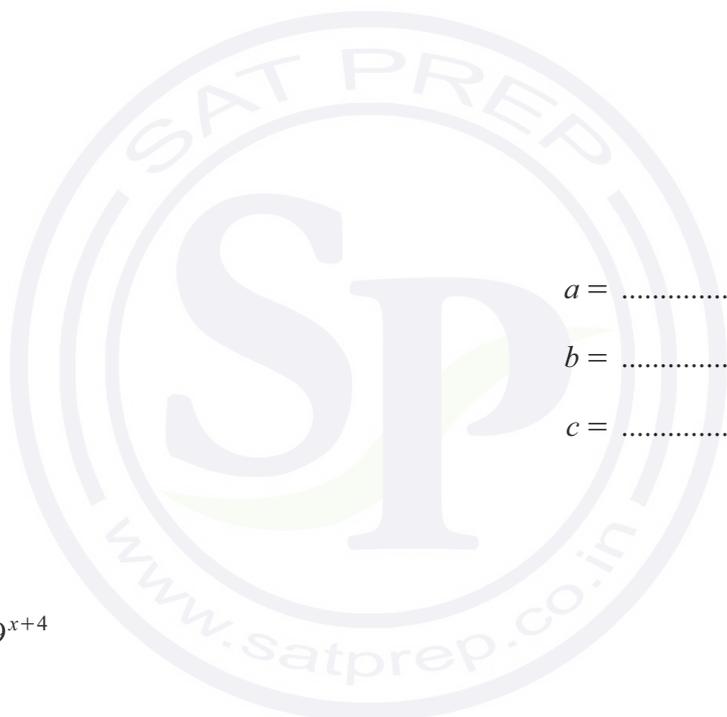




18 $f(x) = 2x + 5$

$$f(x)f(x) - ff(x) = ax^2 + bc + c$$

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



$a = \dots\dots\dots$

$b = \dots\dots\dots$

$c = \dots\dots\dots$

[4]

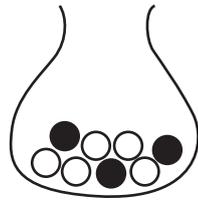
19 Solve.

$$\left(\frac{1}{3}\right)^x = 9^{x+4}$$

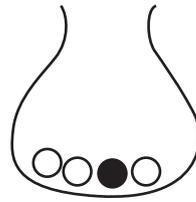
$x = \dots\dots\dots$ [3]



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Bag A



Bag B

Bag A contains 5 white balls and 3 black balls.
Bag B contains 3 white balls and 1 black ball.

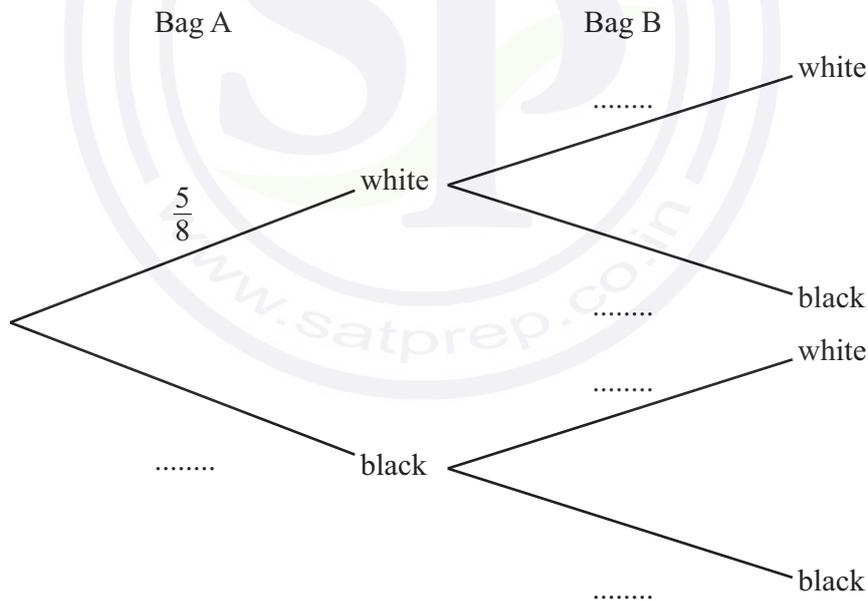
- (a) Two balls are picked at random from bag B without replacement.

Find the probability that both balls are black.

..... [1]

- (b) The balls are replaced into bag B.
Kyle picks a ball at random from each bag.

- (i) Complete the tree diagram.



[2]

- (ii) Find the probability that the two balls are the same colour.

..... [3]





- (c) The balls are replaced into their bags.
Jo picks a ball at random from bag A and places it into bag B.
She then picks a ball at random from bag B.

Find the probability that she picks a black ball from bag B.



..... [3]



DO NOT WRITE IN THIS MARGIN



21 (a) $(3 - \sqrt{5})(2 + 3\sqrt{5}) = a + b\sqrt{5}$

Find the value of a and the value of b .

$a = \dots\dots\dots$

$b = \dots\dots\dots$

[2]

(b) Rationalise the denominator.
Write your answer in its simplest form.

$$\frac{6}{\sqrt{2}}$$

$\dots\dots\dots$

[2]

22 Solve.

$$\frac{2}{x-1} = \frac{x}{x+2}$$

$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [5]

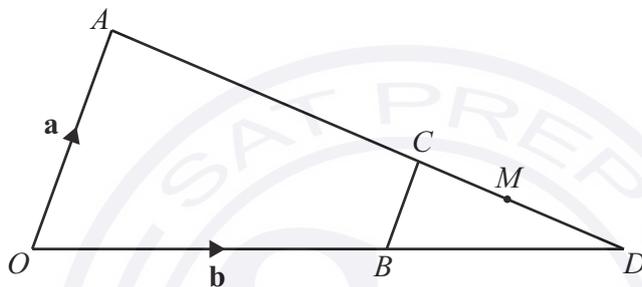




23 Find the coordinates of the turning point on the graph of $y = 7 - 2x - x^2$.

(..... ,) [4]

24



NOT TO SCALE

In the diagram, OBD and ACD are straight lines.
 O is the origin, the position vector of A is \mathbf{a} and the position vector of B is \mathbf{b} .

$$\vec{BC} = \frac{1}{3}\vec{OA}$$

M is the midpoint of CD .

Find the position vector of M .
Give your answer in terms of \mathbf{a} and \mathbf{b} , in its simplest form.

..... [4]

Questions 25 and 26 are printed on the next page.



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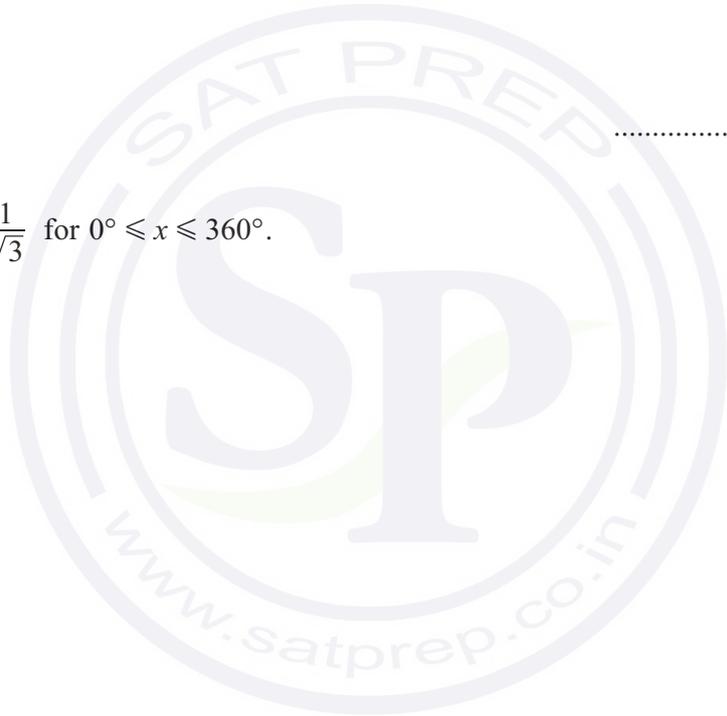
25 Simplify.

$$\frac{10ax + 6bx - 25a - 15b}{4x^2 - 25}$$

..... [4]

26 Solve $\tan x = -\frac{1}{\sqrt{3}}$ for $0^\circ \leq x \leq 360^\circ$.

$x = \dots\dots\dots, x = \dots\dots\dots$ [3]



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Volume, V , of cylinder of radius r , height h .

$$V = \pi r^2 h$$

Volume, V , of cone of radius r , height h .

$$V = \frac{1}{3}\pi r^2 h$$

Volume, V , of sphere of radius r .

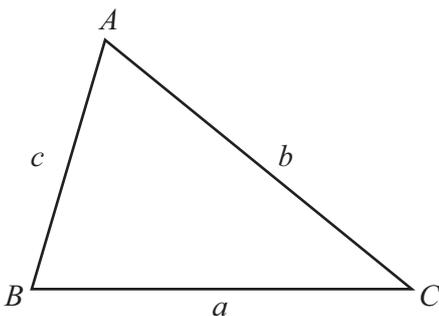
$$V = \frac{4}{3}\pi r^3$$

For the equation

$$ax^2 + bx + c = 0, \text{ where } a \neq 0,$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

For the triangle shown,



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

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

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





Calculators must **not** be used in this paper.

- 1 The temperature at 4 am is -12°C .
The temperature at 4 pm is 21°C .

Find the increase in temperature from 4 am to 4 pm.

..... $^{\circ}\text{C}$ [1]

- 2 Find **all** the common factors of 8 and 12.

..... [1]

- 3 A cuboid has length 6 cm, width 5 cm and height 2.5 cm.

Work out the volume of the cuboid.

..... cm^3 [2]

- 4 A computer costs \$560.
In a sale, this cost is reduced by 20%.

Find the cost of the computer in the sale.

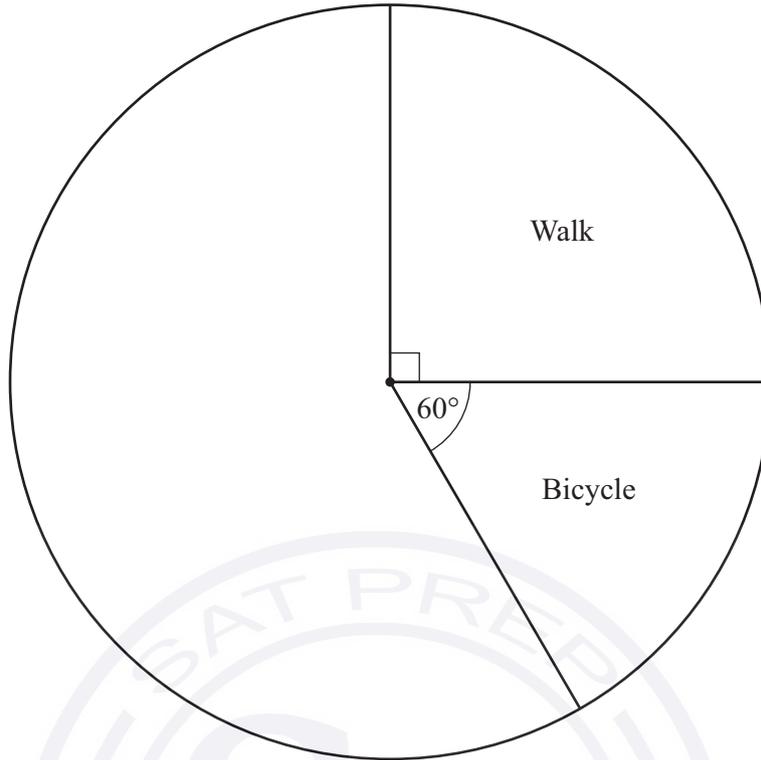
\$ [2]



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5 The pie chart shows some information about the way 600 students travel to school.



(a) Work out the number of students that walk to school.

..... [2]

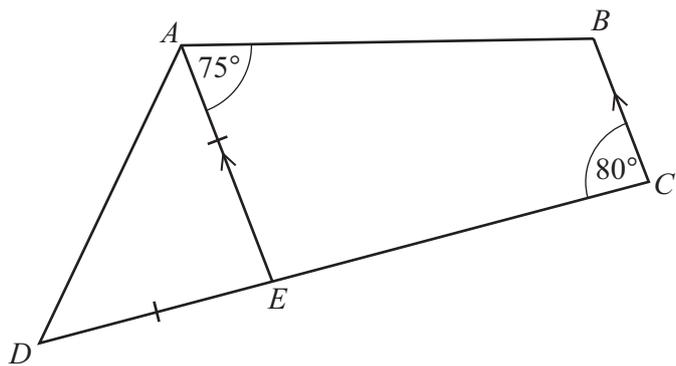
(b) 120 of the students travel to school by car.
The remaining students travel by bus.

Complete the pie chart.

[3]



6



NOT TO SCALE

$ABCD$ is a quadrilateral.
 E lies on CD and AE is parallel to BC .
 $EA = ED$.

Find

(a) angle ABC

Angle $ABC = \dots\dots\dots$ [1]

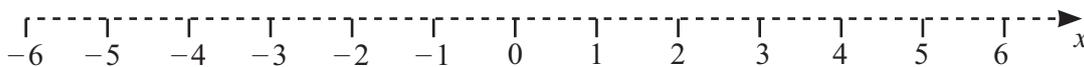
(b) angle AED

Angle $AED = \dots\dots\dots$ [1]

(c) angle DAB .

Angle $DAB = \dots\dots\dots$ [2]

7 Represent the inequality $-4 < x \leq 3$ on the number line.



[2]



DO NOT WRITE IN THIS MARGIN



- 8 Kemi buys p pens that each cost 40 cents. She pays with \$20.

Write an expression, in terms of p , for the change, in **cents**, Kemi receives from the \$20.

..... cents [2]

- 9 Rajid has a full bottle of juice. He drinks $\frac{1}{3}$ of the full bottle on Monday. He drinks $\frac{3}{7}$ of the full bottle on Tuesday.

Find the fraction of the bottle of juice remaining.

..... [3]

10 $b = dm + 2mk$

- (a) $d = 3.14$, $m = 7.92$ and $k = 10.16$.

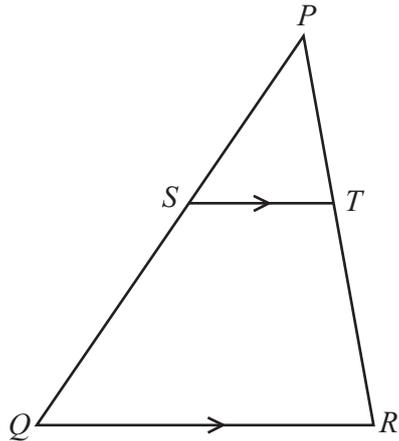
By rounding each value correct to 1 significant figure, work out an estimate for b .

..... [3]

- (b) Rearrange the formula to make m the subject.

$m =$ [2]





NOT TO SCALE

In the diagram, S lies on PQ and T lies on PR .
 ST is parallel to QR .

- (a) Explain why triangle PQR is mathematically similar to triangle PST .
Give a geometrical reason for each statement you make.

.....

.....

.....

..... [3]

- (b) $ST = 3$ cm, $QR = 9$ cm and $PS = 5$ cm.

Work out PQ .

$PQ = \dots\dots\dots$ cm [2]

- (c) The area of triangle PST is $2k$ cm².

Find, in terms of k , the area of quadrilateral $QRTS$.

$\dots\dots\dots$ cm² [2]



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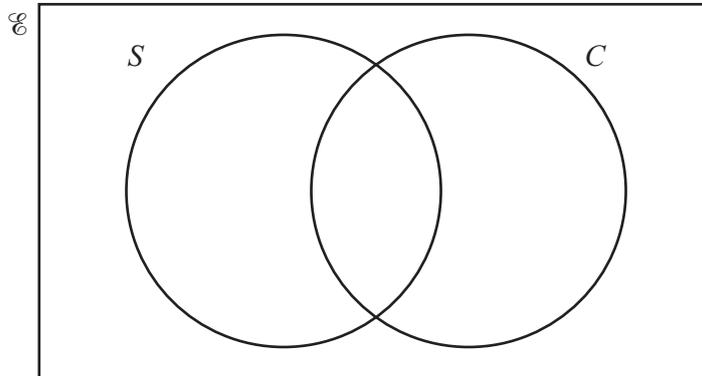


12 A fitness club has 100 members.

60 swim (S).

70 cycle (C).

25 do not swim or cycle.



(a) Complete the Venn diagram.

[3]

(b) One member of the fitness club is chosen at random.

For this member, find

(i) $P(C)$

..... [1]

(ii) $P(S \cap C)$

..... [1]

(iii) $P(S \cup C')$.

..... [1]





DO NOT WRITE IN THIS MARGIN

13

$$M = 2^7 \times 3^3 \times 5^2$$

- (a) Write $14M$ as a product of its prime factors.
Give your answer in index form.

..... [2]

- (b) R is an integer.

$$\frac{M}{R} \text{ is a cube number.}$$

Find the smallest possible value of R .

$R =$ [2]

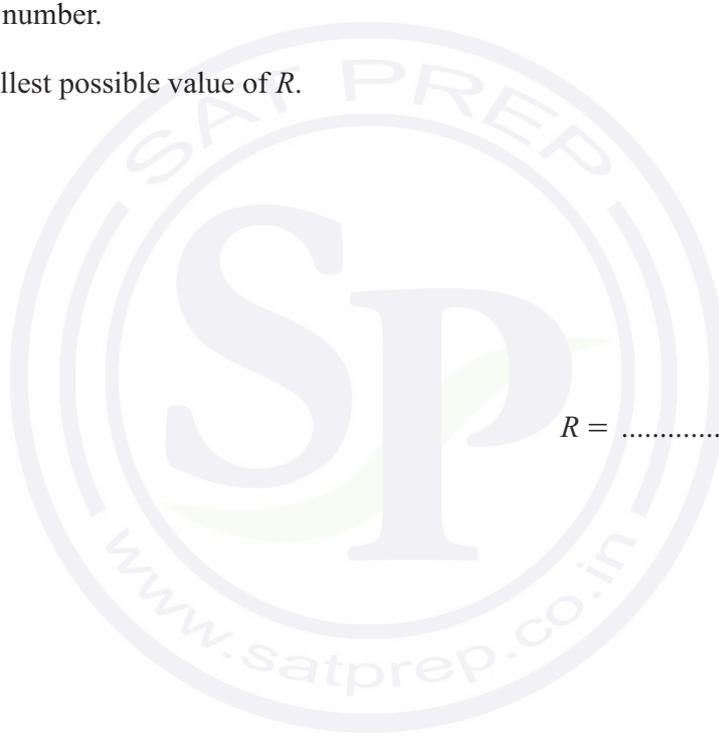
14 Find the value of

- (a) $3^2 \div 3^{-2}$

..... [2]

- (b) $16^{-\frac{3}{2}}$

..... [2]





15 Factorise.

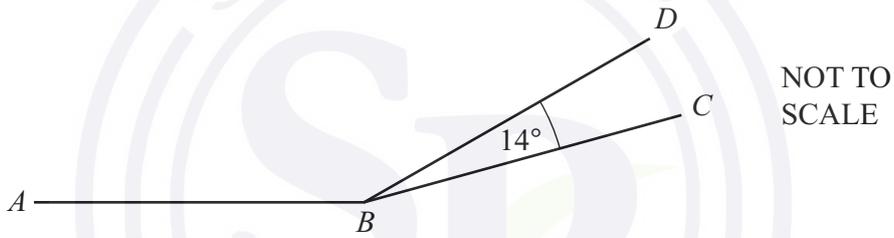
(a) $x^2 - 64$

..... [1]

(b) $5x(x - 2y) + 6(x - 2y)^2$

..... [2]

16



AB and *BD* are two sides of a regular 15-sided polygon.
AB and *BC* are two sides of a regular *n*-sided polygon.
 Angle *DBC* = 14°.

Work out the value of *n*.

n = [4]





17 *B* is the point $(-3, 1)$ and *D* is the point $(-5, 9)$.
BD is a diagonal of the kite *ABCD*.

(a) The ratio of the lengths of the diagonals $BD : AC = 2 : 3$.

Work out the length of *AC*.

Give your answer as a surd in its simplest form.

..... [5]

(b) Find the coordinates of the midpoint of *BD*.

(..... ,) [2]

(c) The diagonal *AC* of the kite passes through the midpoint of *BD*.

Find an equation of *AC*.

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

$y =$ [4]



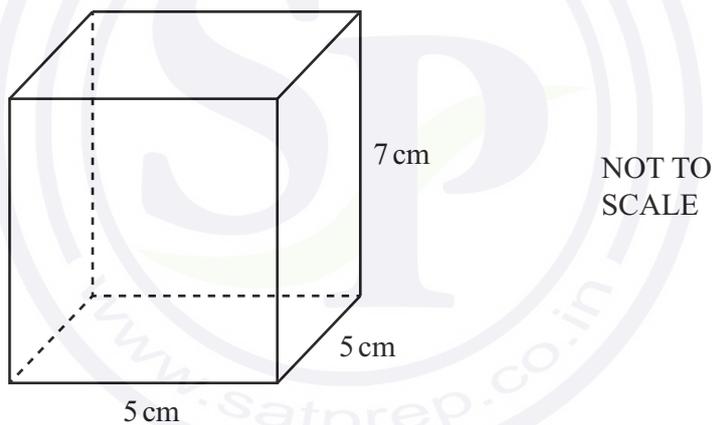
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18 Rationalise the denominator and simplify.

$$\frac{20}{4 + \sqrt{6}}$$

19



The diagram shows a box in the shape of a cuboid.
Mala has a straight rod of length 10 cm.

Show that this rod does **not** fit completely inside the box.

[3]

[3]





20 $f(x) = \frac{21}{2x-1}, x \neq \frac{1}{2}$ $g(x) = 3x+4$

(a) Find

(i) $g(2)$

..... [1]

(ii) $gf(-1)$

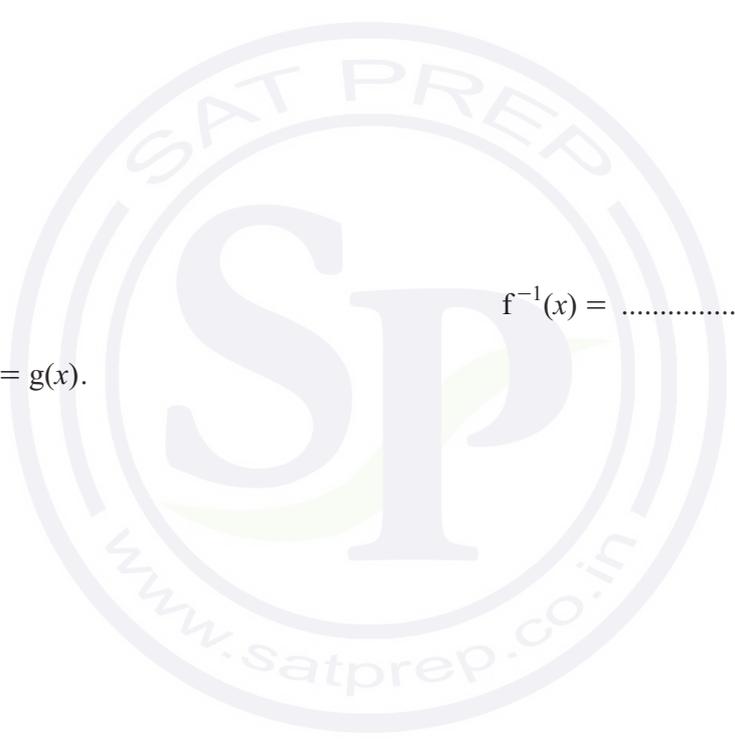
..... [2]

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

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

(b) Solve $f(x) = g(x)$.

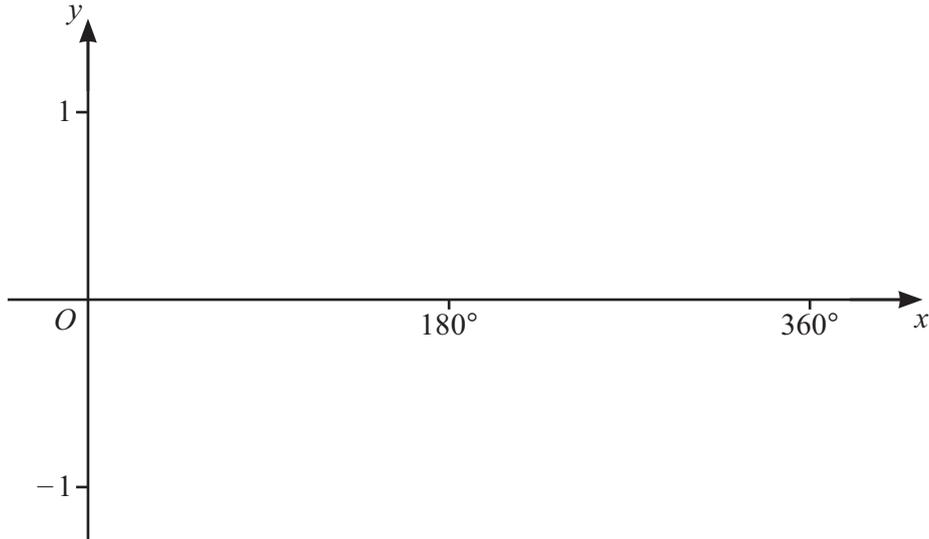
$x =$ or $x =$ [5]



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21 (a)



On the diagram, sketch the graph of $y = \cos x$ for $0^\circ \leq x \leq 360^\circ$. [2]

(b) Solve the equation $2 \cos x + \sqrt{3} = 0$ for $0^\circ \leq x \leq 360^\circ$.

$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [3]

22 A graph with equation $y = x^2 + bx + c$ has a minimum point at $(-5, 12)$.

Find the value of b and the value of c .

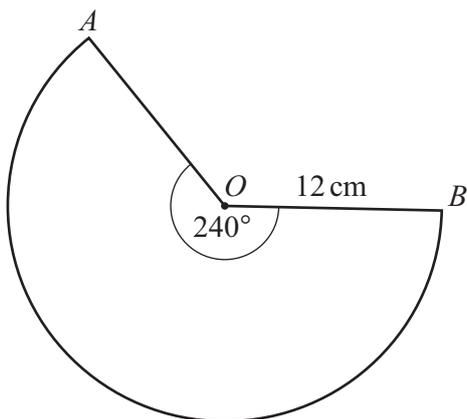
$b = \dots\dots\dots$

$c = \dots\dots\dots$

[3]



23



NOT TO SCALE

The diagram shows a major sector, AOB , of a circle.
 The sector angle is 240° and the radius is 12 cm.

- (a) Show that the length of the major arc AB is 16π cm.

[1]

- (b) OA is joined to OB to form a cone.

Work out the volume of the cone.

Give your answer in the form $\frac{(a\sqrt{b})\pi}{3}$ where a is an integer and b is a prime number.

..... cm^3 [6]

Question 24 is printed on the next page.



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24

$$27^{nx} = (9^x)^2$$

Find the value of n .

$n = \dots\dots\dots [2]$



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MATHEMATICS

0580/23

Paper 2 Non-calculator (Extended)

October/November 2025

2 hours

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- Calculators must **not** be used in this paper.
- You may use tracing paper.
- You must show all necessary working clearly.

INFORMATION

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

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



List of formulas

Area, A , of triangle, base b , height h .

$$A = \frac{1}{2}bh$$

Area, A , of circle of radius r .

$$A = \pi r^2$$

Circumference, C , of circle of radius r .

$$C = 2\pi r$$

Curved surface area, A , of cylinder of radius r , height h .

$$A = 2\pi rh$$

Curved surface area, A , of cone of radius r , sloping edge l .

$$A = \pi rl$$

Surface area, A , of sphere of radius r .

$$A = 4\pi r^2$$

Volume, V , of prism, cross-sectional area A , length l .

$$V = Al$$

Volume, V , of pyramid, base area A , height h .

$$V = \frac{1}{3}Ah$$

Volume, V , of cylinder of radius r , height h .

$$V = \pi r^2 h$$

Volume, V , of cone of radius r , height h .

$$V = \frac{1}{3}\pi r^2 h$$

Volume, V , of sphere of radius r .

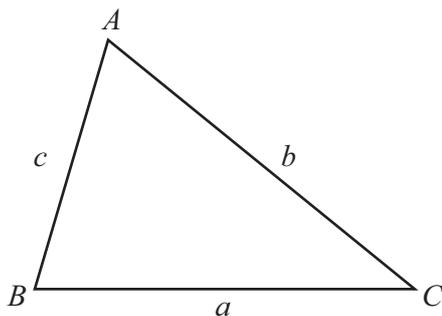
$$V = \frac{4}{3}\pi r^3$$

For the equation

$$ax^2 + bx + c = 0, \text{ where } a \neq 0,$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

For the triangle shown,



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

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

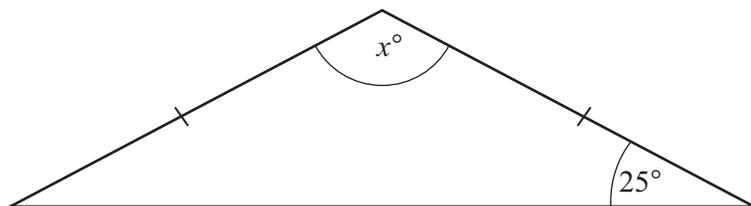
$$\text{Area} = \frac{1}{2}ab \sin C$$





Calculators must **not** be used in this paper.

1



NOT TO SCALE

The diagram shows an isosceles triangle.

Find the value of x .

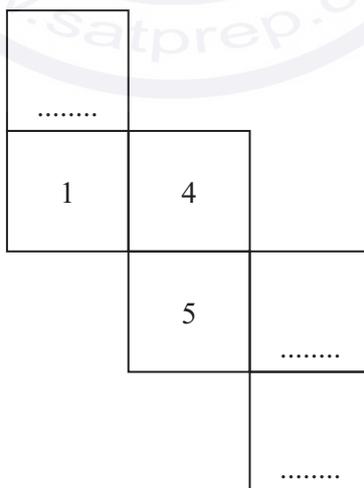
$x = \dots\dots\dots$ [2]

2 Find the largest **odd** number that is a common factor of 90 and 120.

$\dots\dots\dots$ [1]

3 The diagram shows a net for a dice.
The dice has six faces numbered 1 to 6.
The sum of each pair of opposite faces on the dice is 7.

Write the missing numbers on the net.

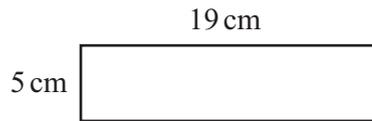


[1]



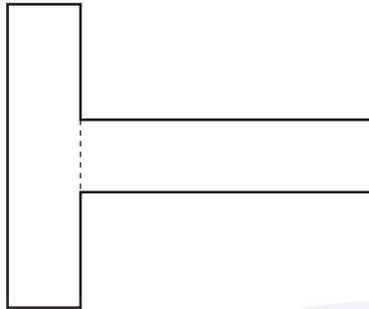
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4 A rectangle measures 5 cm by 19 cm.



NOT TO SCALE

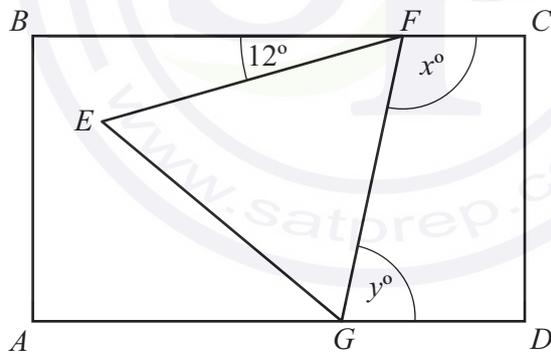
Two of these rectangles are joined to make a shape.



NOT TO SCALE

Work out the perimeter of the shape.

5



NOT TO SCALE

..... cm [2]

The diagram shows a rectangle $ABCD$.

EFG is an equilateral triangle that touches the rectangle at F and G .

Find the value of x and the value of y .

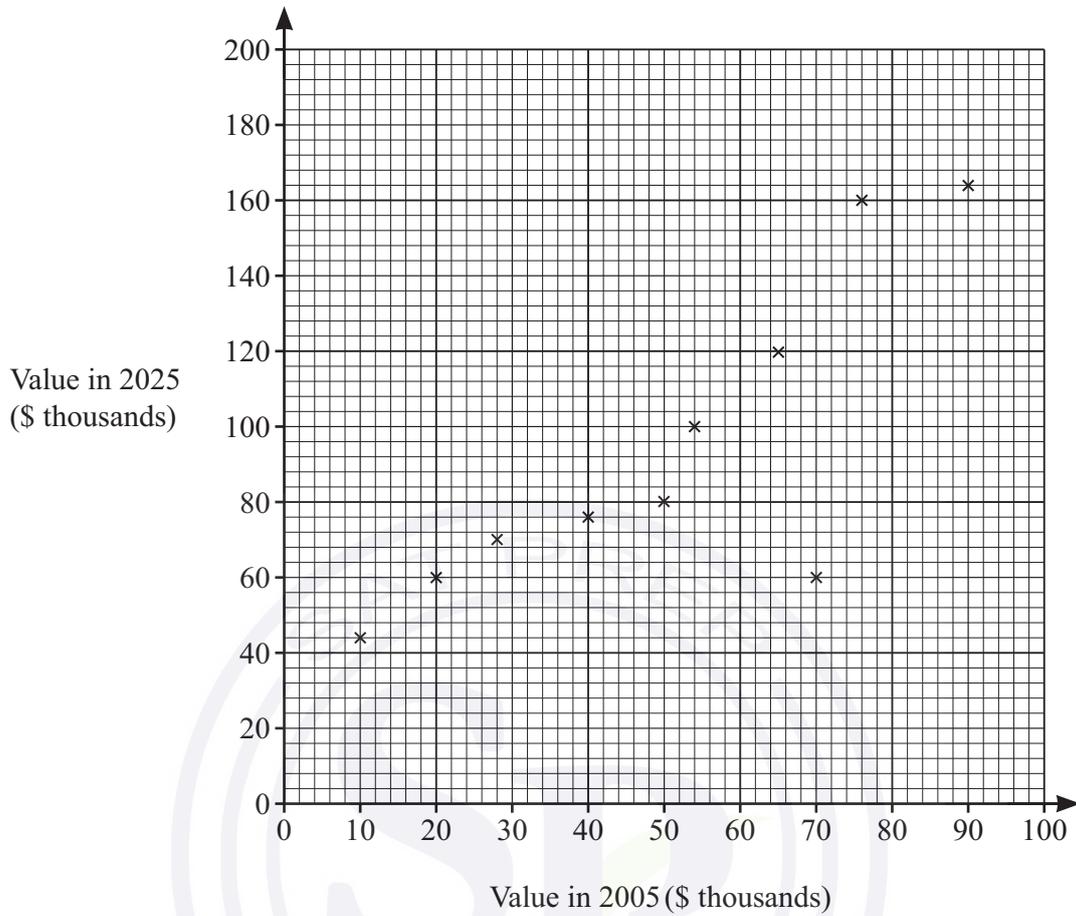
$x = \dots\dots\dots$

$y = \dots\dots\dots$

[2]



- 6 The scatter diagram shows the value, in thousands of dollars, of ten paintings in 2005 and the value of the same paintings in 2025.



- (a) The value of one of the paintings in 2025 is less than expected.
Draw a circle around the point that represents this painting. [1]
- (b) Another painting had a value of \$75 000 in 2005 and \$140 000 in 2025.
On the scatter diagram, plot this point. [1]
- (c) Write down the number of paintings with a value of less than \$53 000 in 2005.
..... [1]
- (d) What type of correlation is shown on the scatter diagram?
..... [1]



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7 (a) The sum of all the prime numbers less than 10 is equal to 17.

Find the sum of all the prime numbers less than 16.

..... [2]

(b) x is an integer.

The sum of the prime numbers greater than 6 and less than x is equal to 18.

Find a possible value for x .

$x =$ [1]

8 $\vec{DE} = \begin{pmatrix} 3 \\ -4 \end{pmatrix}$

(a) Find $5\vec{DE}$.

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

(b) Find $|\vec{DE}|$.

..... [2]

(c) D is the point $(-2, -3)$.

Find the coordinates of the point E .

(..... ,) [2]

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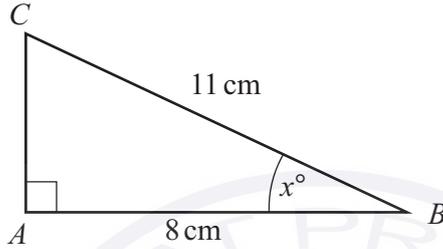
9

$$n^{15} \div n^x = n^5$$

Find the value of x .

$x = \dots\dots\dots$ [1]

10



NOT TO SCALE

The diagram shows a right-angled triangle ABC .

(a) Work out the exact length of AC .

$\dots\dots\dots$ cm [3]

(b) $\cos x = k$

Write down the value of k .

$k = \dots\dots\dots$ [1]





11 Sarah rolls a fair 6-sided dice twice.

Find the probability she rolls a number greater than 4 both times.

..... [2]

12 (a) Write down the value of 73^0 .

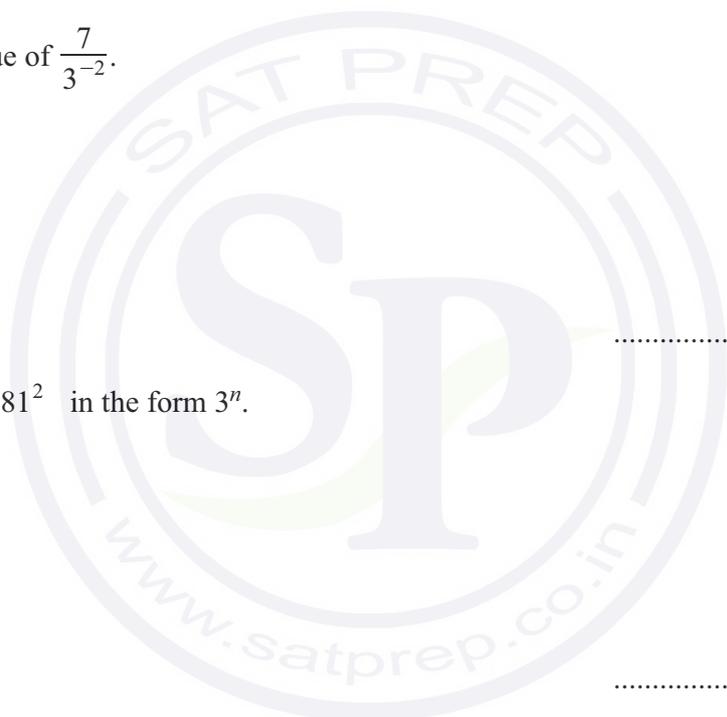
..... [1]

(b) Find the value of $\frac{7}{3^{-2}}$.

..... [2]

(c) Write 27×81^2 in the form 3^n .

..... [2]

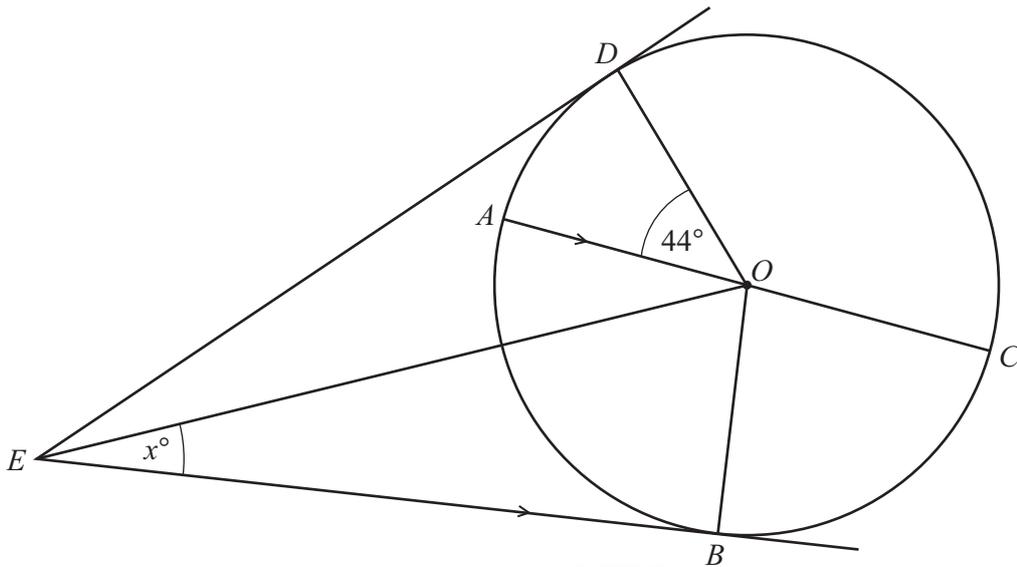


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13



NOT TO SCALE

A, B, C and D are points on the circumference of a circle with centre O .
 ED and EB are tangents to the circle.
 AC is parallel to EB .
 Angle $AOD = 44^\circ$.

Find the value of x .

$x = \dots\dots\dots$ [4]

14 The minimum point on a quadratic curve is $(-3, -5)$.

(a) Find the equation of the line of symmetry of the curve.

$\dots\dots\dots$ [1]

(b) Write the equation of the curve in the form $y = (x + a)^2 + b$.

$y = \dots\dots\dots$ [1]



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15 Factorise.

(a) $x^2 - 7x + 12$

..... [2]

(b) $5x + 10y + 6ny + 3nx$

..... [2]

16 The table shows three sequences.

	1st term	2nd term	3rd term	4th term	5th term	<i>n</i> th term
Sequence <i>A</i>	8	13	18	23	28	
Sequence <i>B</i>	$\frac{3}{2}$	$\frac{4}{3}$	$\frac{5}{4}$	$\frac{6}{5}$	$\frac{7}{6}$	
Sequence <i>C</i>	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4	

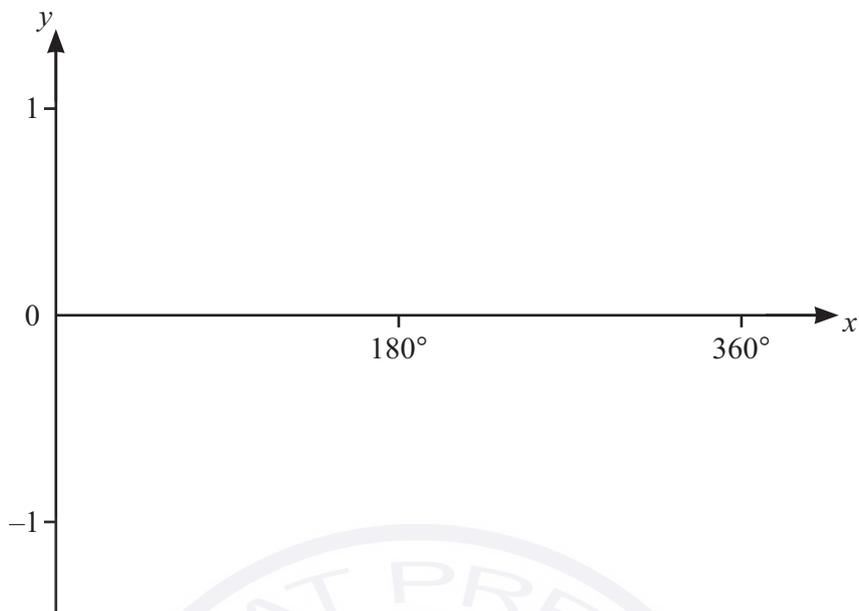
Complete the table to show the *n*th term of each sequence.

[5]





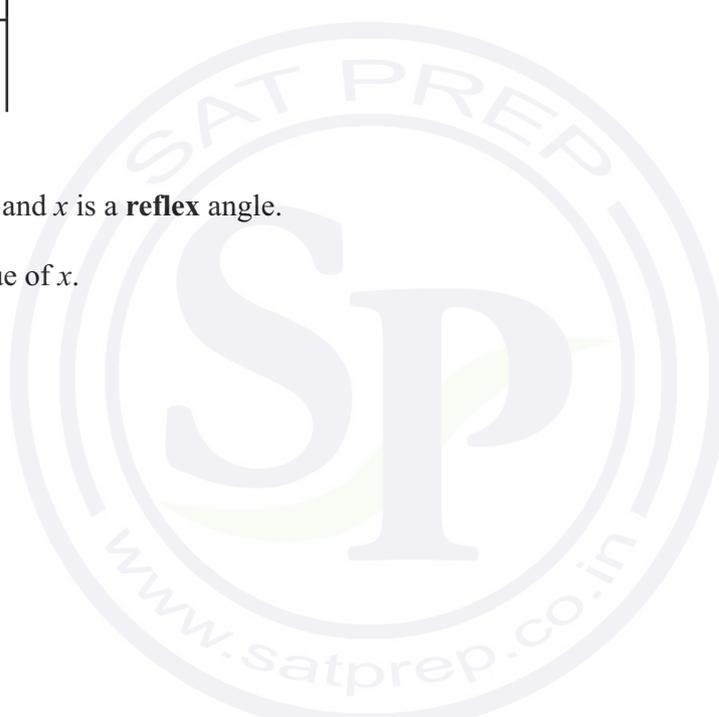
17 (a) Sketch the graph of $y = \cos x$ for $0^\circ \leq x \leq 360^\circ$.



[2]

(b) $\cos x^\circ = \frac{1}{\sqrt{2}}$ and x is a **reflex** angle.

Find the value of x .



$x = \dots\dots\dots$ [2]

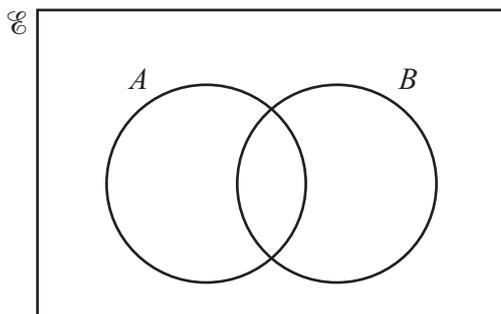


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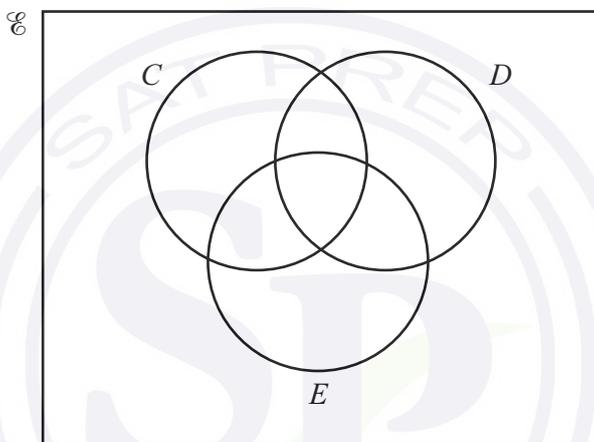
18 Shade the region in each Venn diagram.

(a) $(A \cap B)'$



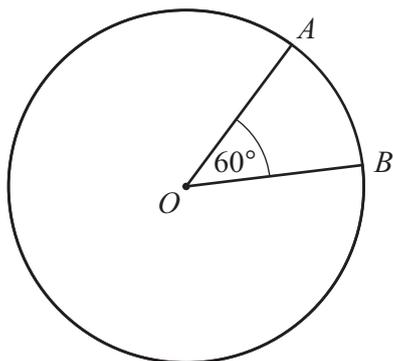
[1]

(b) $(C \cup D) \cap E'$



[1]





NOT TO SCALE

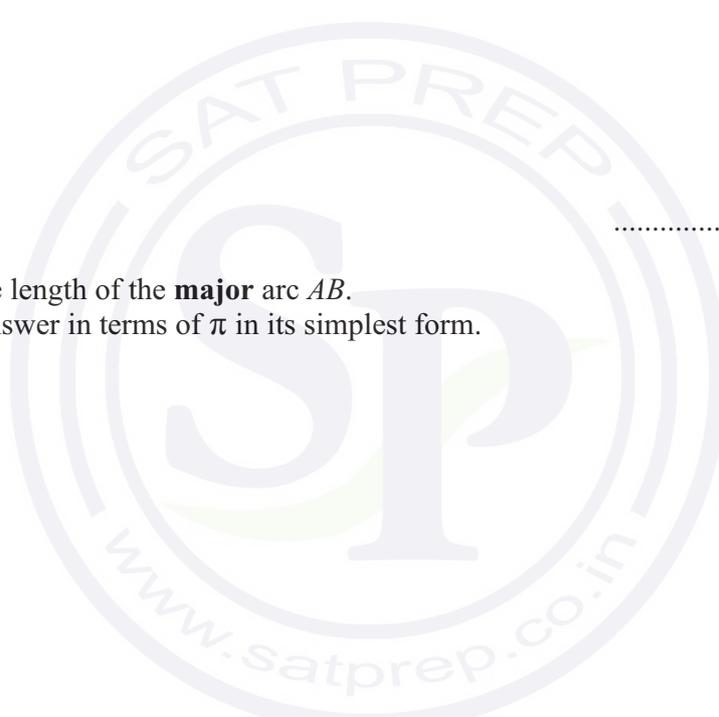
The diagram shows a circle, centre O , radius 12 cm.

- (a) Work out the area of the **minor** sector AOB .
Give your answer in terms of π in its simplest form.

..... cm² [2]

- (b) Calculate the length of the **major** arc AB .
Give your answer in terms of π in its simplest form.

..... cm [3]



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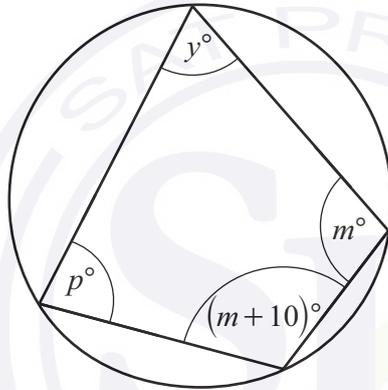




20 Work out $0.1\dot{1}\dot{4} + 0.2$.
Give your answer as a fraction.

..... [3]

21



NOT TO SCALE

The diagram shows a cyclic quadrilateral.
The ratio $p : m = 2 : 3$.

Find the value of y .

$y =$ [4]



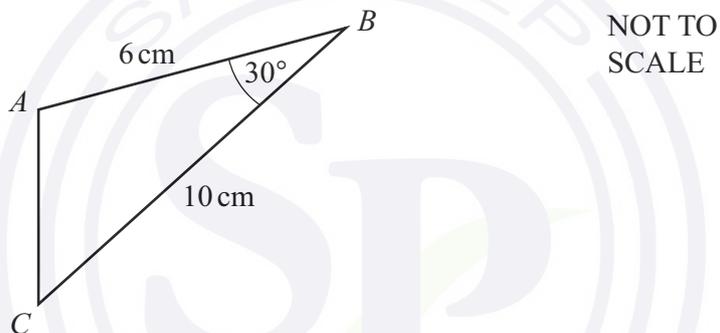


22 The equation of line L is $y = -\frac{1}{2}x + 7$.

Find an equation of the line perpendicular to line L that passes through the point $(3, 5)$.
Give your answer in the form $y = mx + c$.

$y = \dots\dots\dots$ [3]

23



NOT TO SCALE

Work out the area of triangle ABC .

$\dots\dots\dots\text{ cm}^2$ [3]



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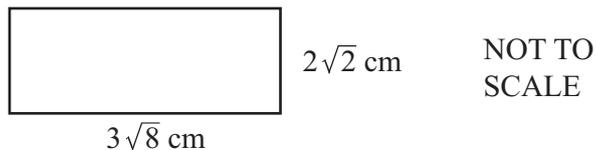


24 (a) Simplify.

$$\sqrt{125} - \sqrt{20}$$

..... [2]

(b)



The area of this rectangle is k cm².

Work out the value of k .

$k =$ [2]

(c) Rationalise the denominator.

$$\frac{1}{\sqrt{7} + 2}$$

..... [2]





- 25 Mahir picks one number at random from the numbers 5, 10 and 15. He then picks one number at random from the numbers 4, 5 and 6. He adds the two numbers.

The sample space diagram shows some of the possible outcomes.

		First number		
		5	10	15
Second number	+			
	4		14	19
	5		15	20
	6		16	21

- (a) Complete the sample space diagram. [1]
- (b) Given that the total of the two numbers is odd, find the probability that one of the numbers added is 15.

..... [2]

- 26 Write as a single fraction in its simplest form.

(a) $\frac{mp}{25y} \times \frac{15}{m}$

..... [2]

(b) $\frac{3}{2x-5} + \frac{4}{x-3}$

..... [3]

[Turn over]



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27 Solve the simultaneous equations.

$$y = x^2 - 8x + 22$$

$$y + 2 = 3x$$

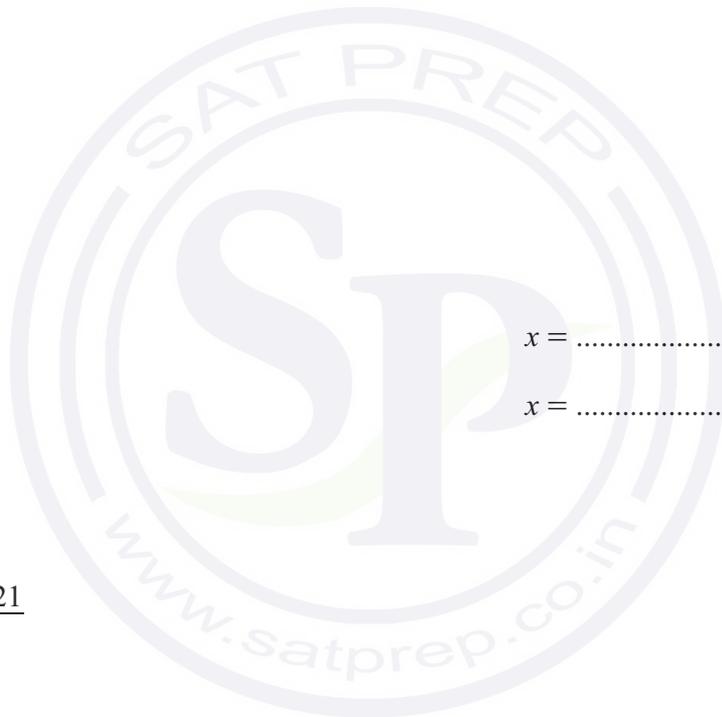
$x = \dots\dots\dots, y = \dots\dots\dots$

$x = \dots\dots\dots, y = \dots\dots\dots$

[6]

28 Simplify.

$$\frac{2x^2 - 11x - 21}{x^2 - 49}$$

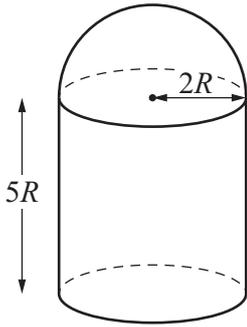


..... [4]

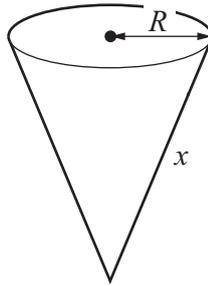




29 In this question all measurements are in centimetres.



Solid A



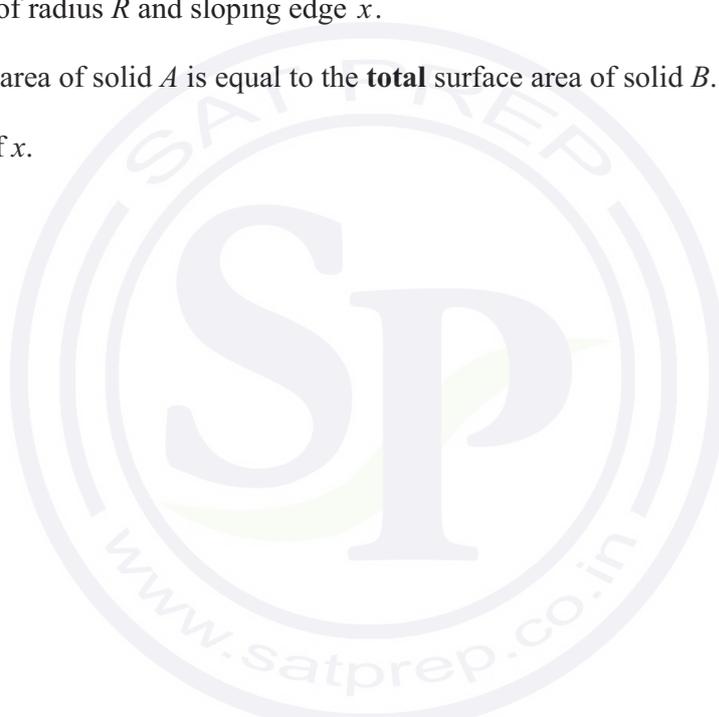
Solid B

NOT TO SCALE

Solid A is made from a cylinder and a hemisphere, both of radius $2R$.
The cylinder has height $5R$.
Solid B is a cone of radius R and sloping edge x .

The **total** surface area of solid A is equal to the **total** surface area of solid B.

Find R in terms of x .



$R = \dots\dots\dots [5]$



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MATHEMATICS

0580/21

Paper 2 Non-calculator (Extended)

May/June 2025

2 hours

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
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INFORMATION

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List of formulas

Area, A , of triangle, base b , height h .

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$$A = \pi r^2$$

Circumference, C , of circle of radius r .

$$C = 2\pi r$$

Curved surface area, A , of cylinder of radius r , height h .

$$A = 2\pi rh$$

Curved surface area, A , of cone of radius r , sloping edge l .

$$A = \pi rl$$

Surface area, A , of sphere of radius r .

$$A = 4\pi r^2$$

Volume, V , of prism, cross-sectional area A , length l .

$$V = Al$$

Volume, V , of pyramid, base area A , height h .

$$V = \frac{1}{3}Ah$$

Volume, V , of cylinder of radius r , height h .

$$V = \pi r^2 h$$

Volume, V , of cone of radius r , height h .

$$V = \frac{1}{3}\pi r^2 h$$

Volume, V , of sphere of radius r .

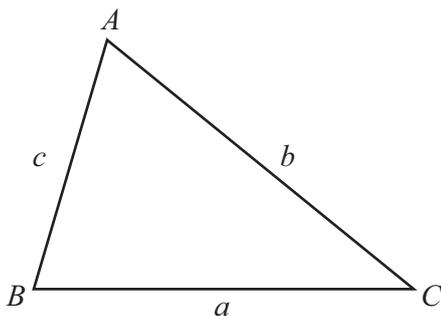
$$V = \frac{4}{3}\pi r^3$$

For the equation

$$ax^2 + bx + c = 0, \text{ where } a \neq 0,$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

For the triangle shown,



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

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

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





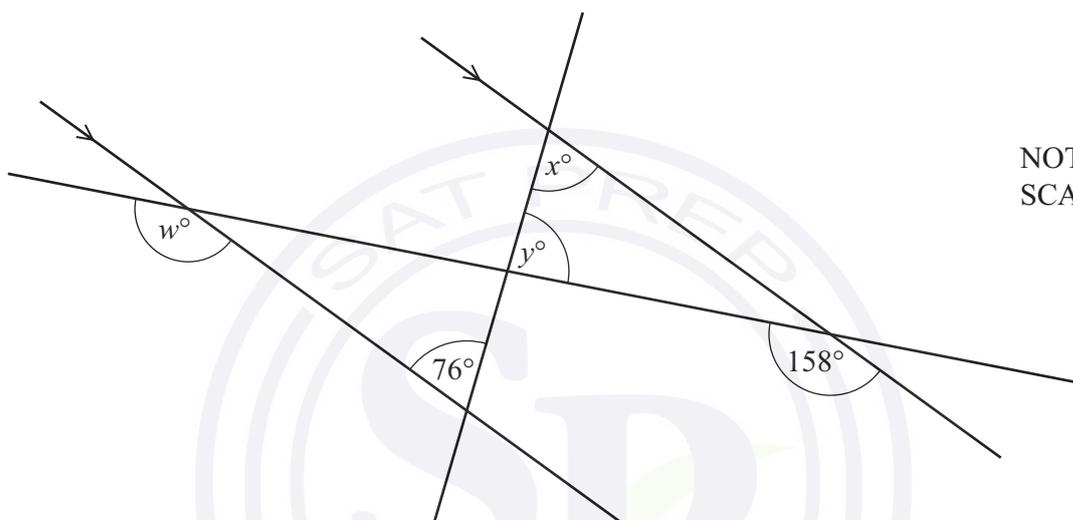
Calculators must **not** be used in this paper.

1 Simplify.

$$7c - 5d + c + 3d$$

..... [2]

2



The diagram shows two parallel lines intersecting two straight lines.

Find the values of w , x and y .

$w =$

$x =$

$y =$

[4]



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3 Sally invests \$1500 at 3% per year simple interest.

Work out the total value of her investment at the end of 6 years.

\$ [3]

4 Work out.

$$\frac{5}{6} - \frac{2}{3} \times \frac{3}{8}$$

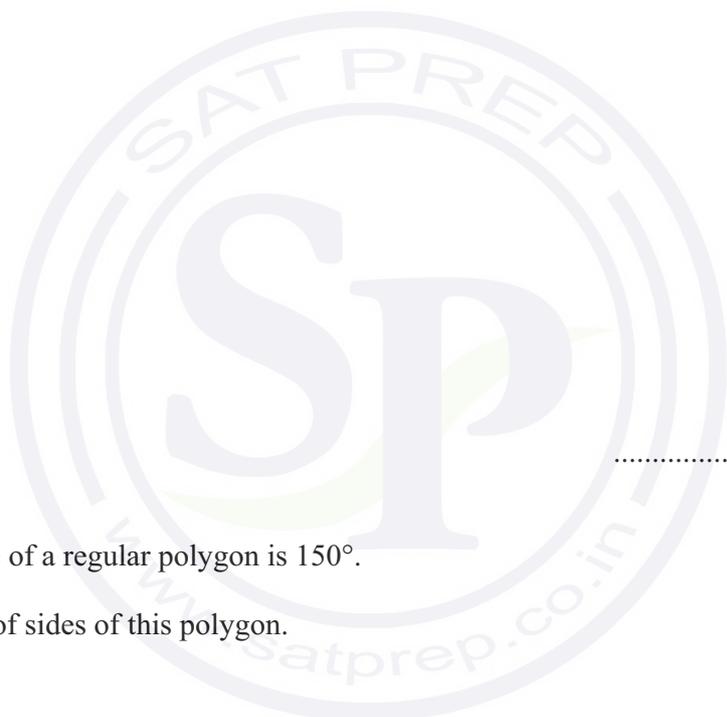
..... [3]

5 The interior angle of a regular polygon is 150°.

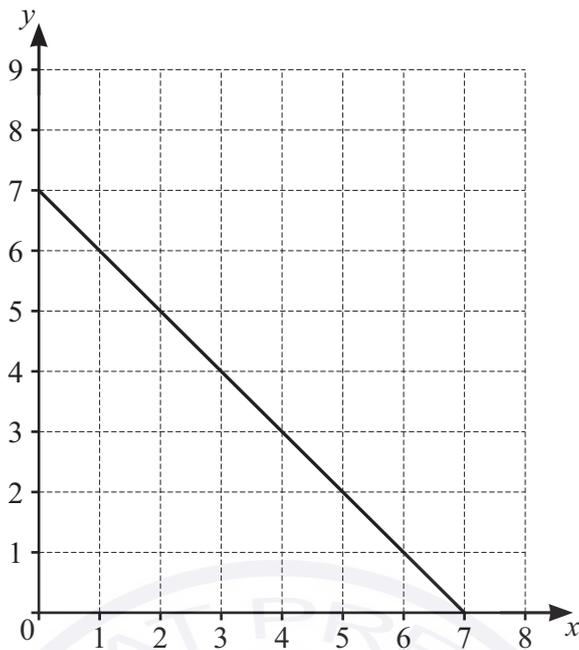
Find the number of sides of this polygon.

..... [2]

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6



The line $x + y = 7$ is drawn on the grid.

(a) On the grid, draw the line $y = 2x + 1$. [2]

(b) Use your graph to solve these simultaneous equations.

$$x + y = 7$$

$$y = 2x + 1$$

$x = \dots\dots\dots$

$y = \dots\dots\dots$

[1]

7 Write the recurring decimal $0.2\dot{6}$ as a fraction.
Give your answer in its simplest form.

$\dots\dots\dots$ [3]



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8 $\mathbf{m} = \begin{pmatrix} 11 \\ 5 \end{pmatrix}$ $\mathbf{n} = \begin{pmatrix} 8 \\ -3 \end{pmatrix}$

(a) Find $2\mathbf{m} - \mathbf{n}$.

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

(b) The vector $\begin{pmatrix} 5 \\ \sqrt{y} \end{pmatrix}$ has a magnitude of 7.

Find the value of y .

$y = \dots\dots\dots$ [2]

9 The table shows some information about the marks scored by a group of students in a test.

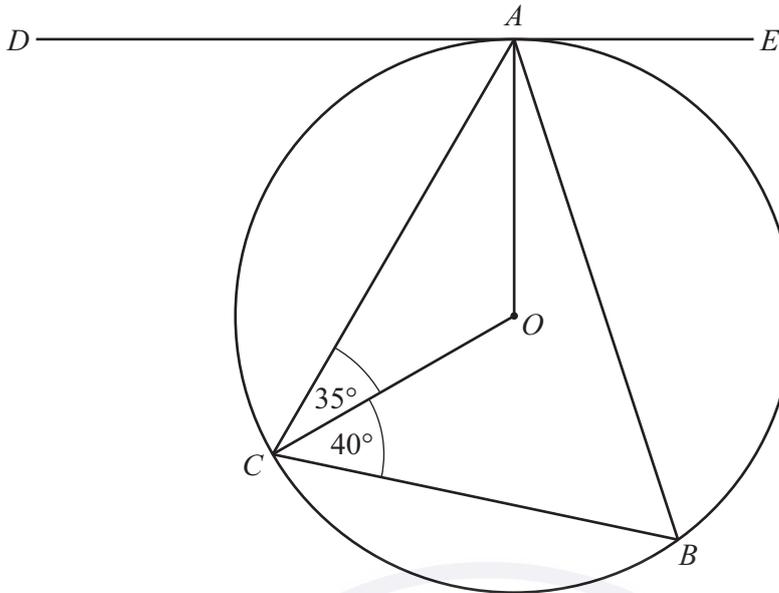
Test mark	4	5	8
Frequency	2	4	n

The mean mark is 6.

Work out the value of n .

$n = \dots\dots\dots$ [3]





NOT TO SCALE

A, B and C are three points on a circle, centre O .
 DE is a tangent to the circle at A .
 Angle $ACO = 35^\circ$ and angle $BCO = 40^\circ$.

Find

(a) angle AOC

Angle $AOC = \dots\dots\dots [1]$

(b) angle ABC

Angle $ABC = \dots\dots\dots [1]$

(c) angle DAC

Angle $DAC = \dots\dots\dots [1]$

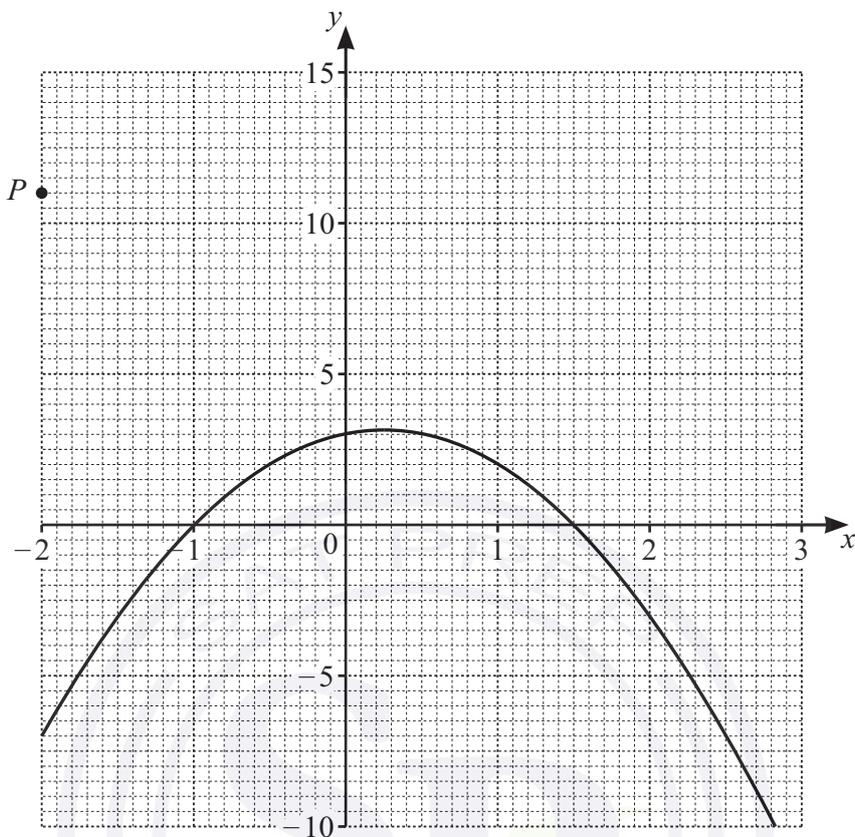
(d) angle OAB .

Angle $OAB = \dots\dots\dots [1]$



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11 The diagram shows the graph of $y = f(x)$ and the point $P(-2, 11)$.



The tangent from P touches the graph of $y = f(x)$ at the point (a, b) .
The values of a and b are integers.

(a) By drawing this tangent, find the value of a and the value of b .

$a = \dots\dots\dots$, $b = \dots\dots\dots$ [2]

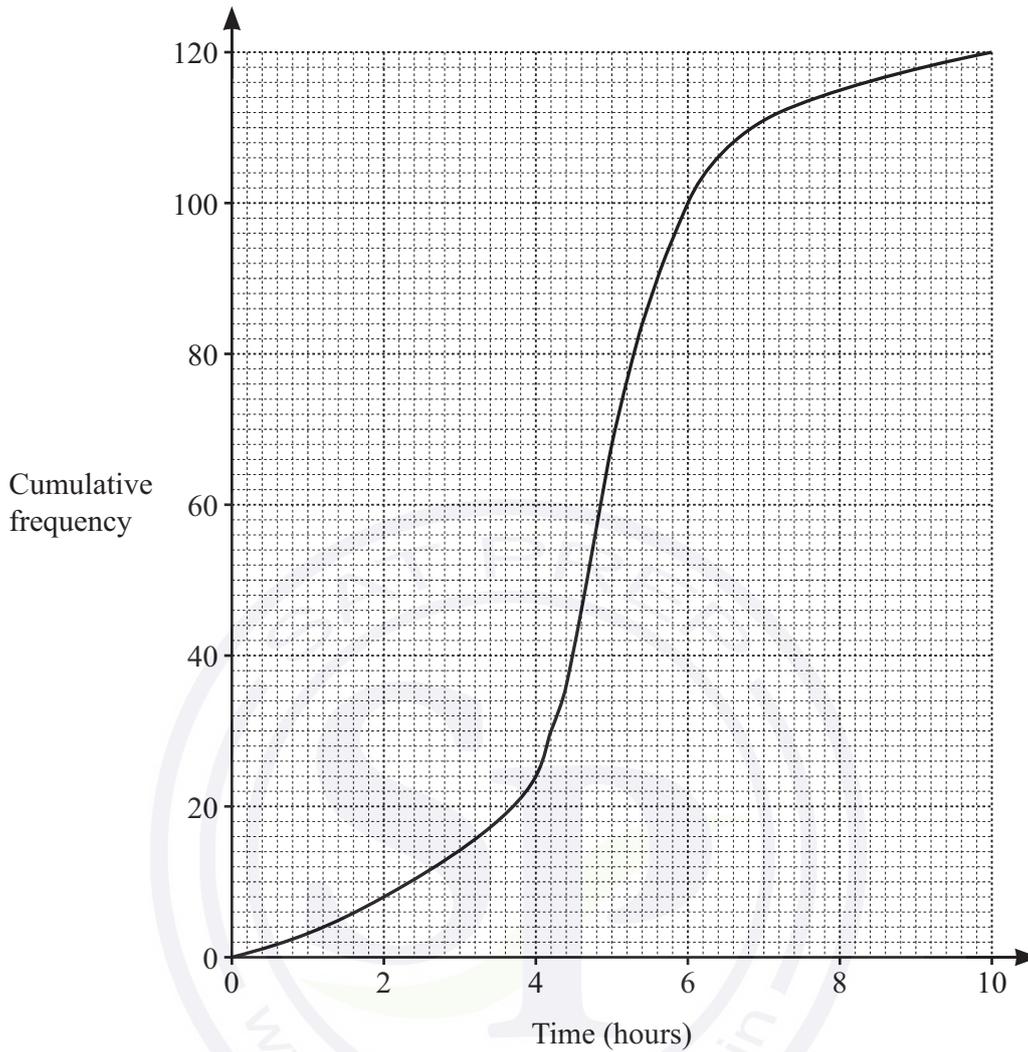
(b) Find the equation of the tangent.
Give your answer in the form $y = mx + c$.

$y = \dots\dots\dots$ [3]





- 12 The time spent on the internet by each of 120 adults is recorded for one day. The cumulative frequency diagram shows this information.



- (a) Use the cumulative frequency diagram to find an estimate of the interquartile range.

..... h [2]

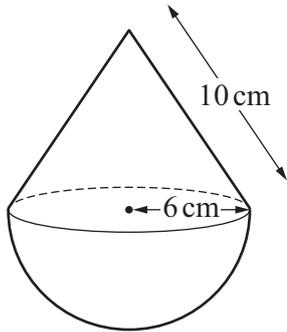
- (b) 70% of the adults spent less than k hours on the internet.

Use the cumulative frequency diagram to find an estimate of the value of k .

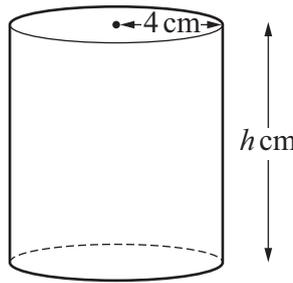
$k =$ [2]



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Solid A



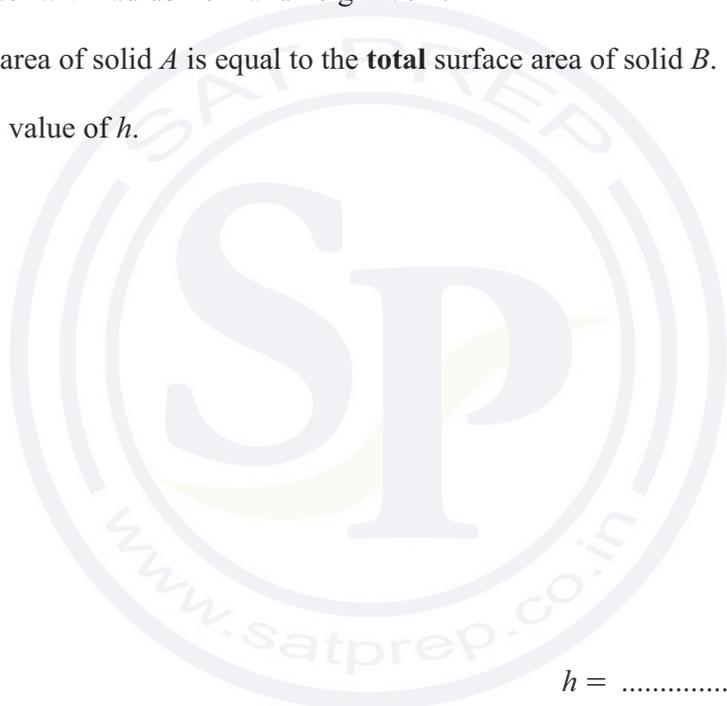
Solid B

NOT TO SCALE

The diagram shows solid *A* and solid *B*.
 Solid *A* is made from a hemisphere and a cone each with radius 6 cm.
 The cone has sloping edge 10 cm.
 Solid *B* is a cylinder with radius 4 cm and height *h* cm.

The **total** surface area of solid *A* is equal to the **total** surface area of solid *B*.

(a) Work out the value of *h*.



h = [5]

(b) Work out the height of solid *A*.

..... cm [3]





14

$$f(x) = 3x - 4$$

$$g(x) = 4x + 1$$

(a) Find $f(-2)$.

..... [1]

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

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

(c) $fg(x) = ax + b$

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

$a =$ $b =$ [2]

(d) Simplify.

$$\frac{2}{f(x)} - \frac{5}{g(x)}$$

Give your answer as a single fraction in terms of x .

..... [3]



DO NOT WRITE IN THIS MARGIN



15 (a) Expand and simplify.

$$(2 - \sqrt{5})(1 - 3\sqrt{5})$$

..... [2]

(b) Rationalise the denominator.
Give your answer in its simplest form.

$$\frac{6}{\sqrt{10}}$$

..... [2]

16 Expand and simplify.

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

..... [3]





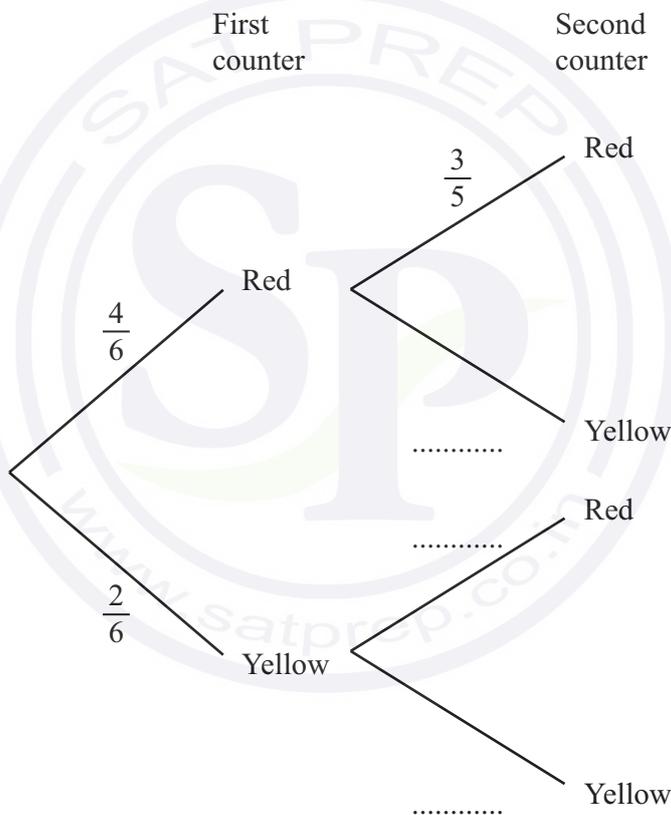
- 17 (a) A bag contains 6 red marbles, 3 green marbles and 1 blue marble.
Two marbles are picked at random from the bag **with replacement**.

Find the probability that both marbles are green.

..... [2]

- (b) Another bag contains 4 red counters and 2 yellow counters.
Two counters are picked at random from this bag **without replacement**.

(i) Complete the tree diagram.



[2]

- (ii) Find the probability that one of the two counters is yellow.

..... [3]



DO NOT WRITE IN THIS MARGIN



18 One day, Anya runs 12 km at a speed of x km/h.
The next day she walks 10 km at a speed of $(x - 4)$ km/h.

(a) Write down an expression, in terms of x , for the time she spends running.

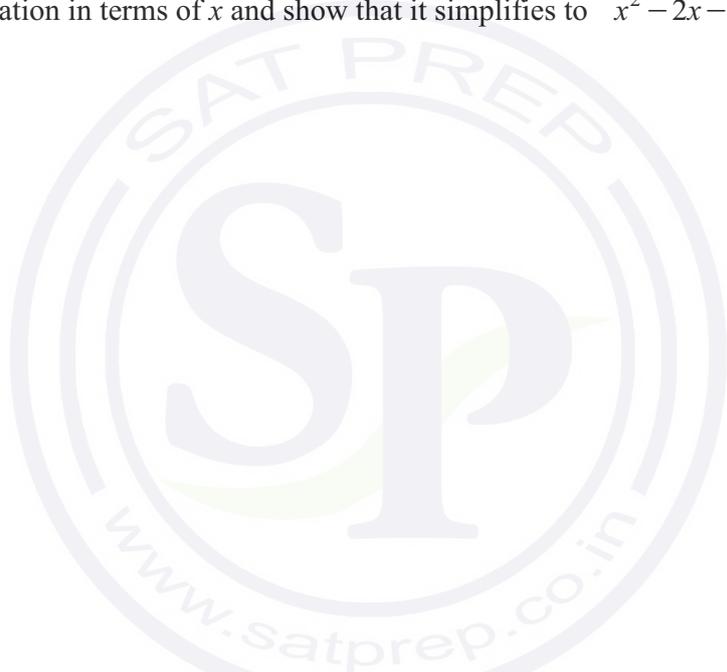
..... h [1]

(b) Write down an expression, in terms of x , for the time she spends walking.

..... h [1]

(c) The time Anya spends walking is 1 hour more than the time she spends running.

Write an equation in terms of x and show that it simplifies to $x^2 - 2x - 48 = 0$.



[4]

(d) Use factorisation to solve the equation $x^2 - 2x - 48 = 0$.

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

(e) Find the time Anya spends running.

..... h [1]

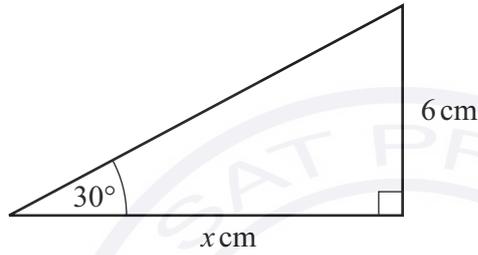




19 Find the value of $27^{-\frac{2}{3}}$.

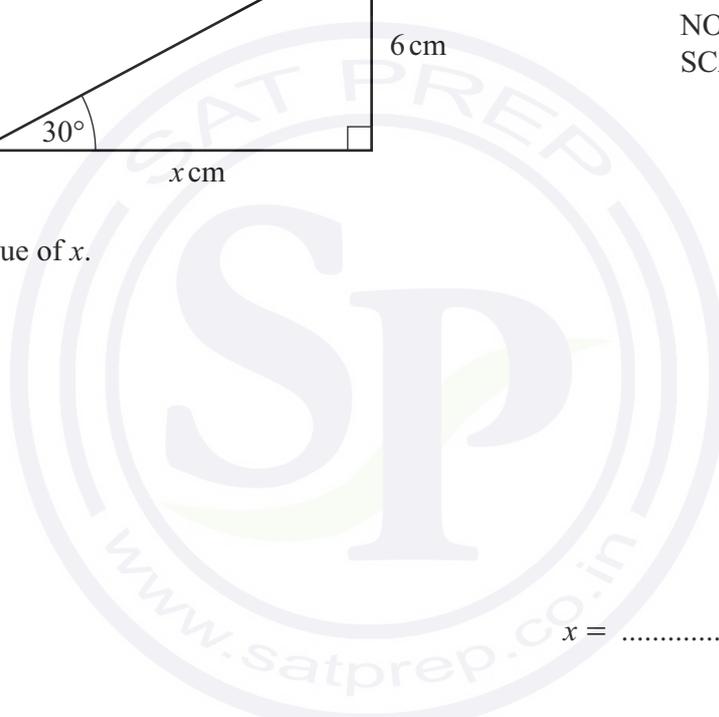
..... [2]

20



NOT TO SCALE

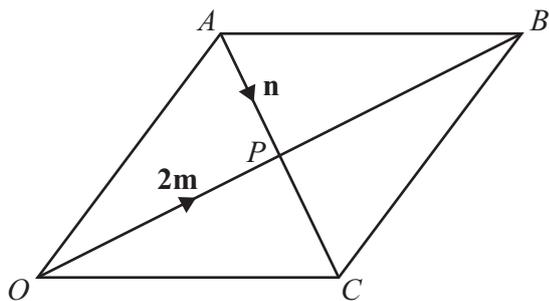
Find the exact value of x .



$x =$ [4]



DO NOT WRITE IN THIS MARGIN



NOT TO SCALE

$OABC$ is a rhombus and O is the origin.
 The diagonals of the rhombus intersect at P .
 $\vec{OP} = 2\mathbf{m}$ and $\vec{AP} = \mathbf{n}$.

(a) Find, in terms of \mathbf{m} and \mathbf{n} , in its simplest form

(i) \vec{OA}

$\vec{OA} = \dots\dots\dots$ [1]

(ii) \vec{OC} .

$\vec{OC} = \dots\dots\dots$ [1]

(b) D is the point such that $\vec{AD} = 10\mathbf{m} - 3\mathbf{n}$.

Show that $OADC$ is a trapezium.

[3]





22 A curve has equation $y = x^n + qx^2 + 9x$.

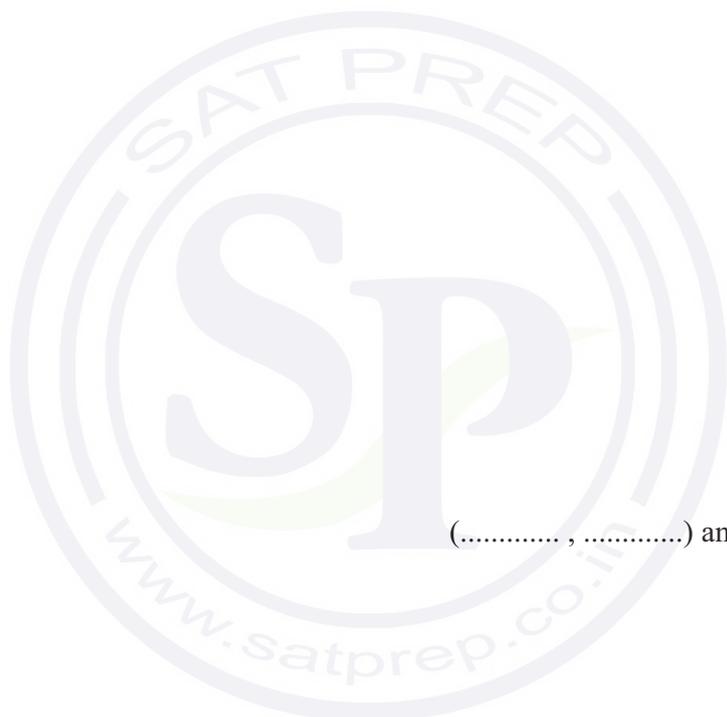
$$\frac{dy}{dx} = 3x^2 - 12x + 9$$

(a) Find the value of n , and the value of q .

$$n = \dots\dots\dots q = \dots\dots\dots [2]$$

(b) Work out the coordinates of the turning points of the curve.

$$(\dots\dots\dots, \dots\dots\dots) \text{ and } (\dots\dots\dots, \dots\dots\dots) [4]$$



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23 Simplify.

$$\frac{2x^2 + 10x}{x^2 - 25}$$

..... [3]





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MATHEMATICS

0580/22

Paper 2 Non-calculator (Extended)

May/June 2025

2 hours

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- Calculators must **not** be used in this paper.
- You may use tracing paper.
- You must show all necessary working clearly.

INFORMATION

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

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

List of formulas

Area, A , of triangle, base b , height h .

$$A = \frac{1}{2}bh$$

Area, A , of circle of radius r .

$$A = \pi r^2$$

Circumference, C , of circle of radius r .

$$C = 2\pi r$$

Curved surface area, A , of cylinder of radius r , height h .

$$A = 2\pi r h$$

Curved surface area, A , of cone of radius r , sloping edge l .

$$A = \pi r l$$

Surface area, A , of sphere of radius r .

$$A = 4\pi r^2$$

Volume, V , of prism, cross-sectional area A , length l .

$$V = Al$$

Volume, V , of pyramid, base area A , height h .

$$V = \frac{1}{3}Ah$$

Volume, V , of cylinder of radius r , height h .

$$V = \pi r^2 h$$

Volume, V , of cone of radius r , height h .

$$V = \frac{1}{3}\pi r^2 h$$

Volume, V , of sphere of radius r .

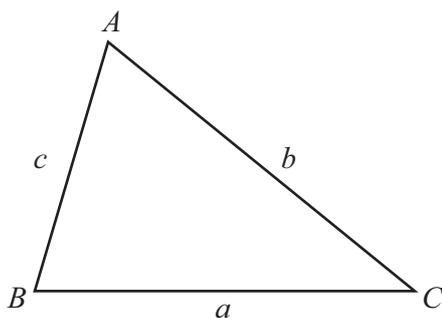
$$V = \frac{4}{3}\pi r^3$$

For the equation

$$ax^2 + bx + c = 0, \text{ where } a \neq 0,$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

For the triangle shown,



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

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

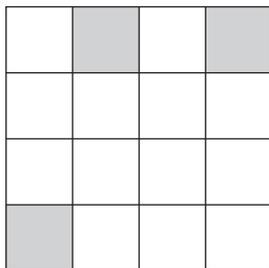
$$\text{Area} = \frac{1}{2}ab \sin C$$





Calculators must **not** be used in this paper.

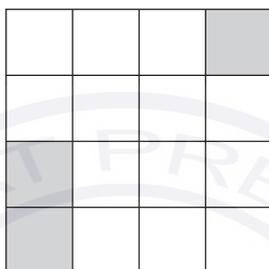
1 (a)



Shade **one** more small square so that the diagram has one line of symmetry.

[1]

(b)

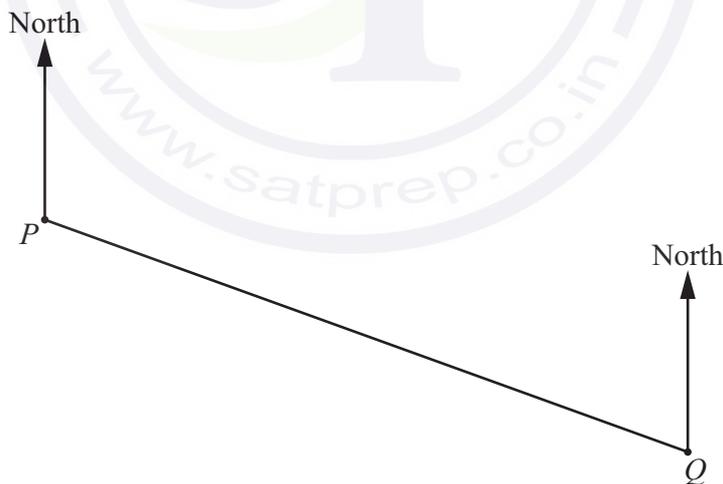


Shade **one** more small square so that the diagram has rotational symmetry of order 2.

[1]

2 The scale drawing shows the positions of two villages, *P* and *Q*.

The scale is 1 cm represents 0.5 km.



(a) Find the actual distance between village *P* and village *Q*.

..... km [2]

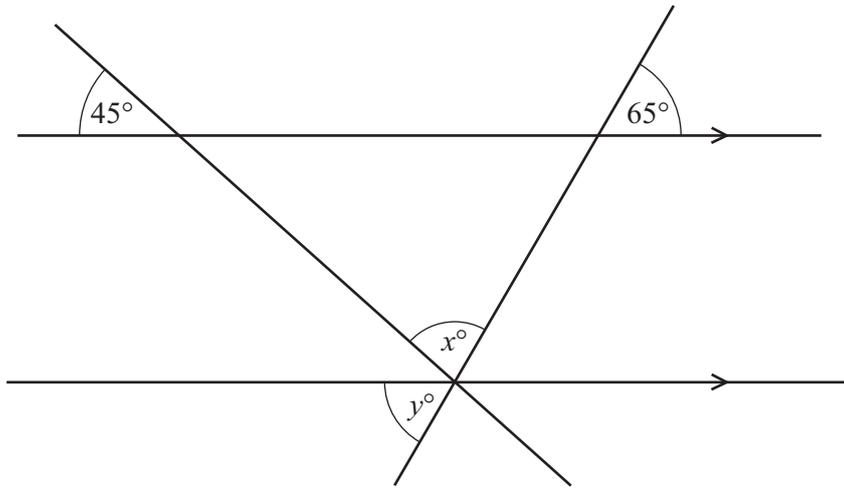
(b) Measure the bearing of village *Q* from village *P*.

..... [1]



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3



NOT TO SCALE

The diagram shows two straight lines intersecting two parallel lines.

Find the value of x and the value of y .

$x = \dots\dots\dots$

$y = \dots\dots\dots$

[3]

4



Samira picks one of these cards at random and replaces it.

(a) Find the probability that she picks an odd number.

$\dots\dots\dots$ [1]

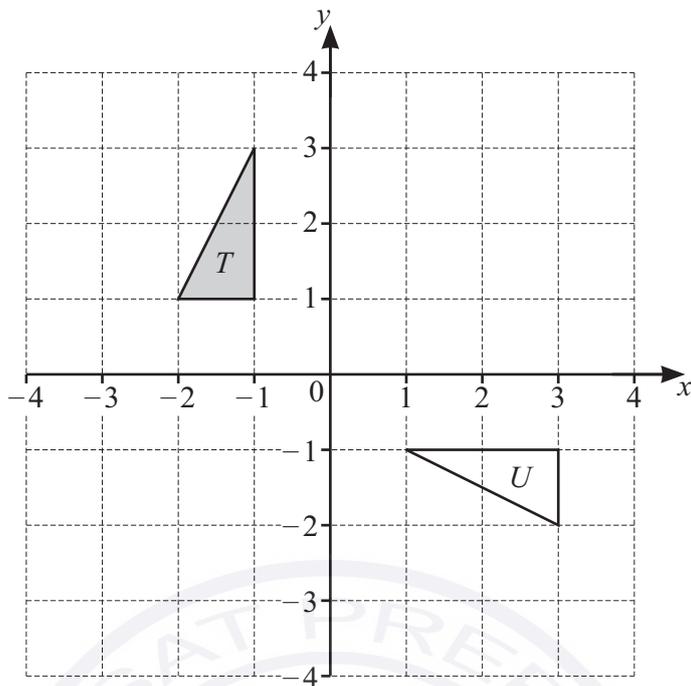
(b) Samira repeats this 35 times.

Calculate the number of times Samira is expected to pick an odd number.

$\dots\dots\dots$ [1]



5



(a) Translate triangle T by the vector $\begin{pmatrix} 0 \\ -2 \end{pmatrix}$. [1]

(b) Describe fully the **single** transformation that maps triangle T onto triangle U .

..... [3]

6 Solve.

(a) $8x + 7 = 39$

$x =$ [2]

(b) $2(5y - 1) = 24$

$y =$ [3]



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7 These are the first 4 terms of a sequence.

11 8 5 2

(a) Find the next term of this sequence.

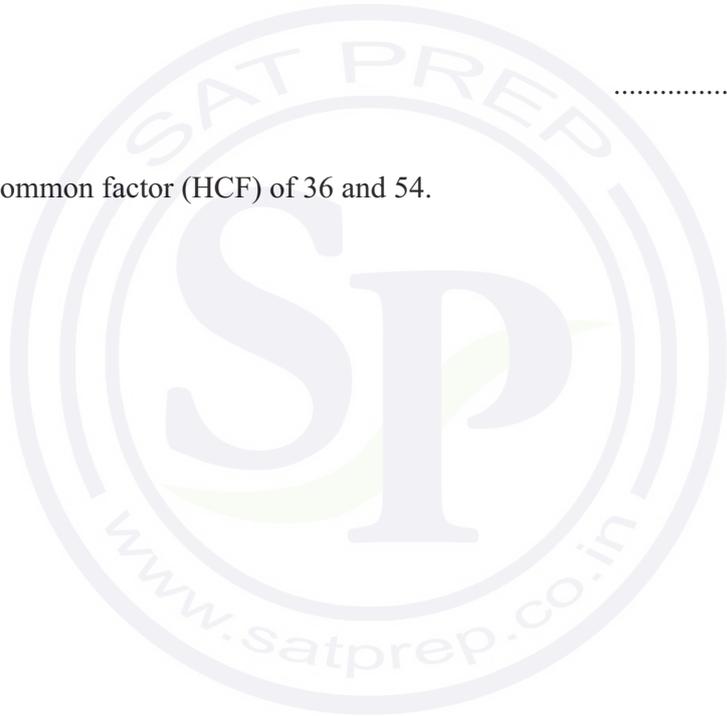
..... [1]

(b) Find the n th term of this sequence.

..... [2]

8 Find the highest common factor (HCF) of 36 and 54.

..... [2]





9 *A* is the point (3, -1).

$$\vec{AB} = \begin{pmatrix} 2 \\ -4 \end{pmatrix}$$

(a) $\vec{AC} = 2\vec{AB}$

Find the coordinates of the point *C*.

(..... ,) [2]

(b) The length of *AB* is $k\sqrt{5}$.

Find the value of *k*.

$k = \dots\dots\dots$ [2]

(c) *P* is a point on *AB*.

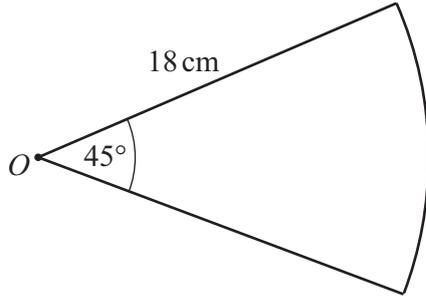
$$AP : PB = 1 : 3$$

Find the position vector of *P*.

(.....) [2]



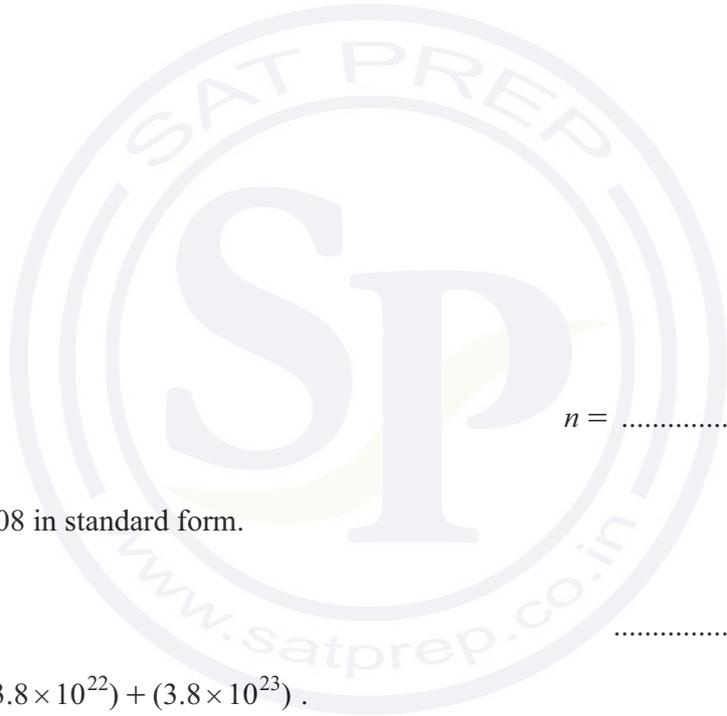
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NOT TO SCALE

The diagram shows a sector of a circle, centre O .
The length of the arc is $n\pi$ cm .

Find the value of n .



$n = \dots\dots\dots$ [2]

11 (a) Write 0.007 08 in standard form.

$\dots\dots\dots$ [1]

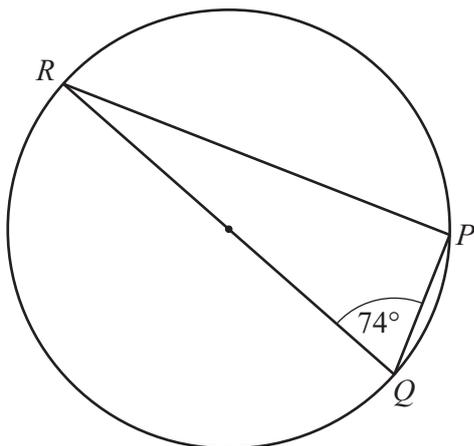
(b) Work out $(3.8 \times 10^{22}) + (3.8 \times 10^{23})$.
Give your answer in standard form.

$\dots\dots\dots$ [2]





12

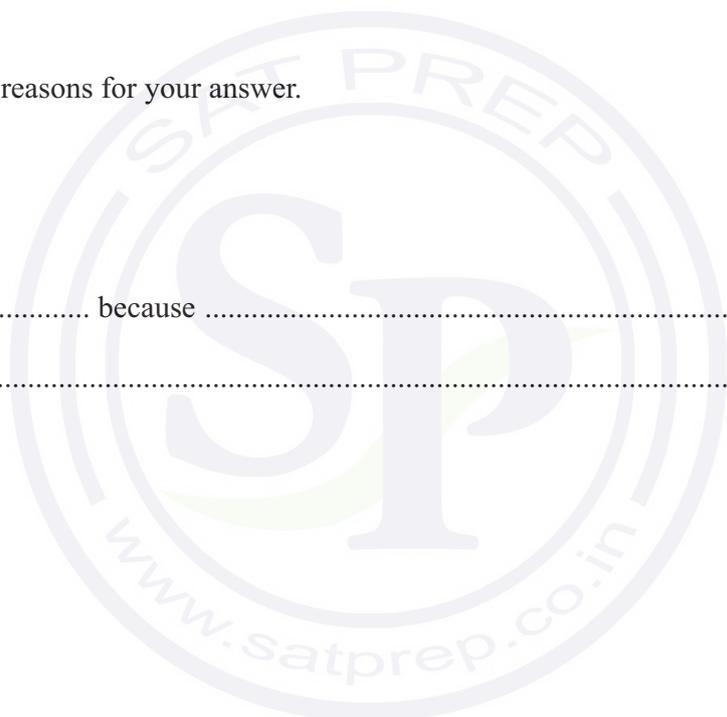


NOT TO SCALE

P, Q and R lie on a circle.
 QR is a diameter.

Find angle PRQ .
 Give geometrical reasons for your answer.

Angle $PRQ = \dots\dots\dots$ because $\dots\dots\dots$
 $\dots\dots\dots$ [2]



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13 (a) 100 students solve a puzzle.

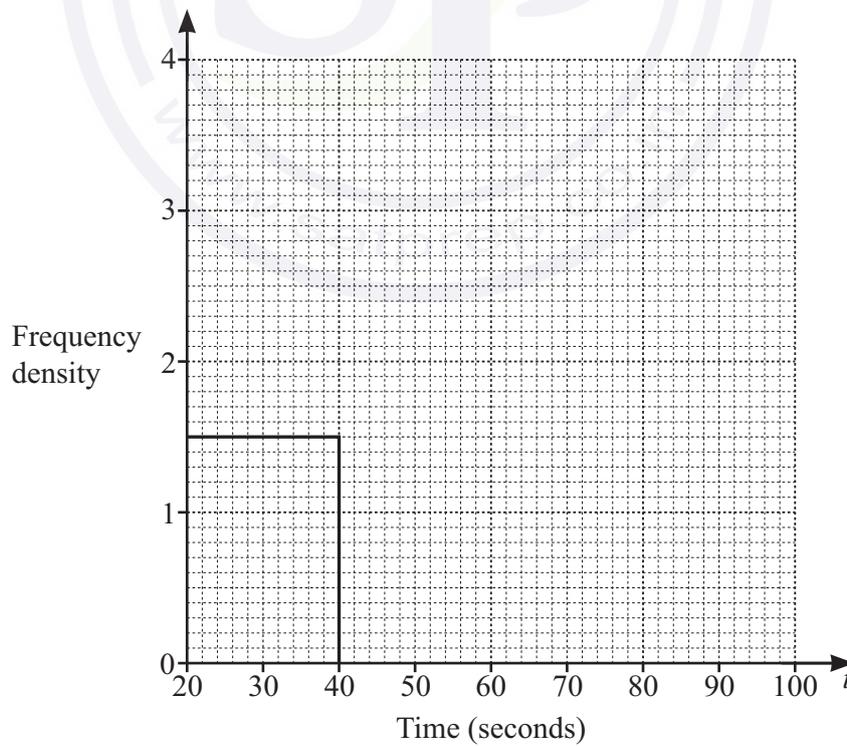
The table shows information about the time taken by each student to solve the puzzle.

Time (t seconds)	$20 < t \leq 40$	$40 < t \leq 60$	$60 < t \leq 100$
Frequency	30	40	30

(i) Work out an estimate of the mean.

.....s [4]

(ii) Complete the histogram to show the information in the table.



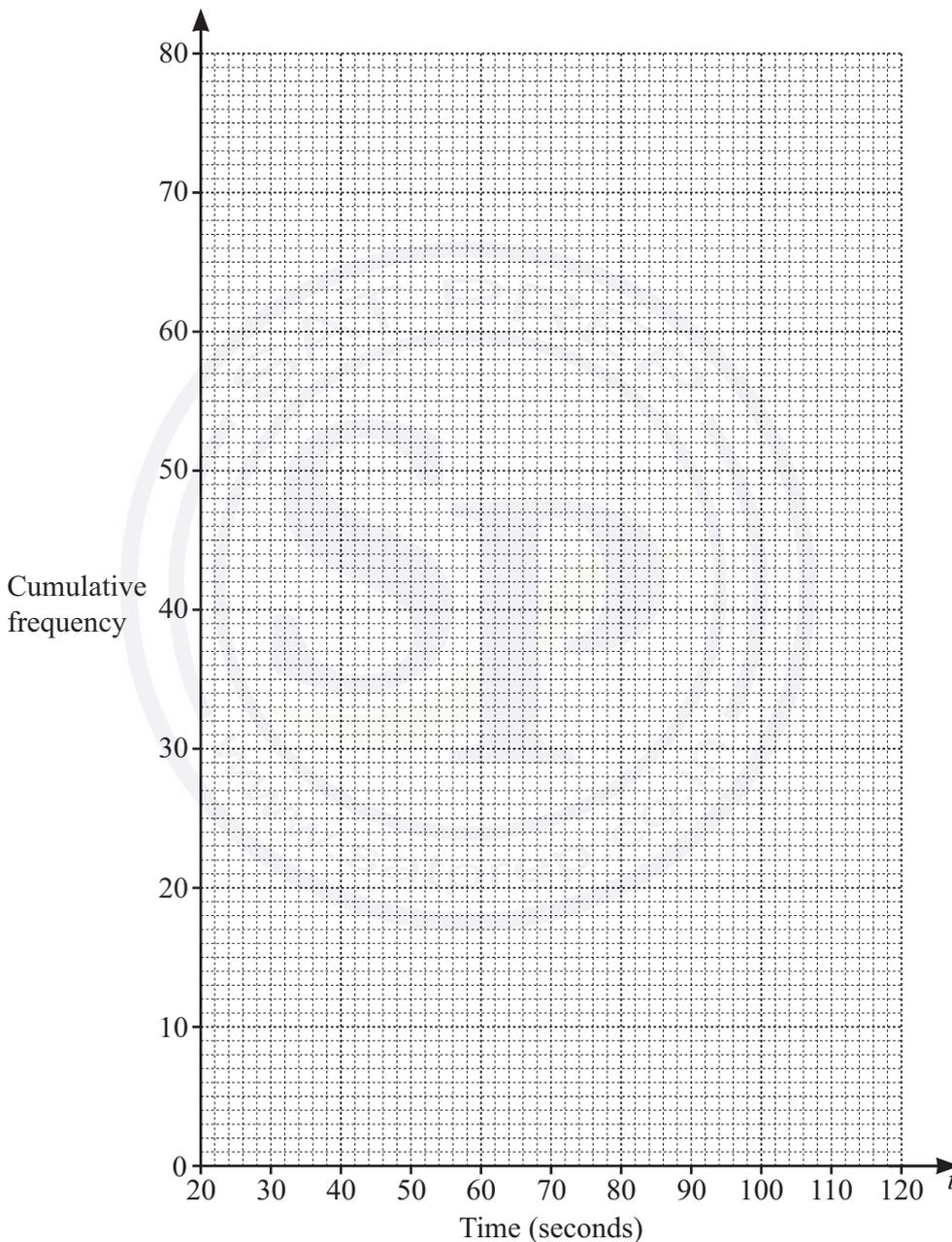
[2]



- (b) 80 adults solve the same puzzle as the students.
The cumulative frequency table shows information about the time taken by each adult to solve the puzzle.

Time (t seconds)	$t \leq 20$	$t \leq 40$	$t \leq 60$	$t \leq 80$	$t \leq 100$	$t \leq 120$
Cumulative frequency	0	12	36	60	74	80

- (i) On the grid, draw a cumulative frequency diagram.



[3]

- (ii) Use your cumulative frequency diagram to find an estimate for

- (a) the median

..... s [1]

- (b) the lower quartile.

..... s [1]



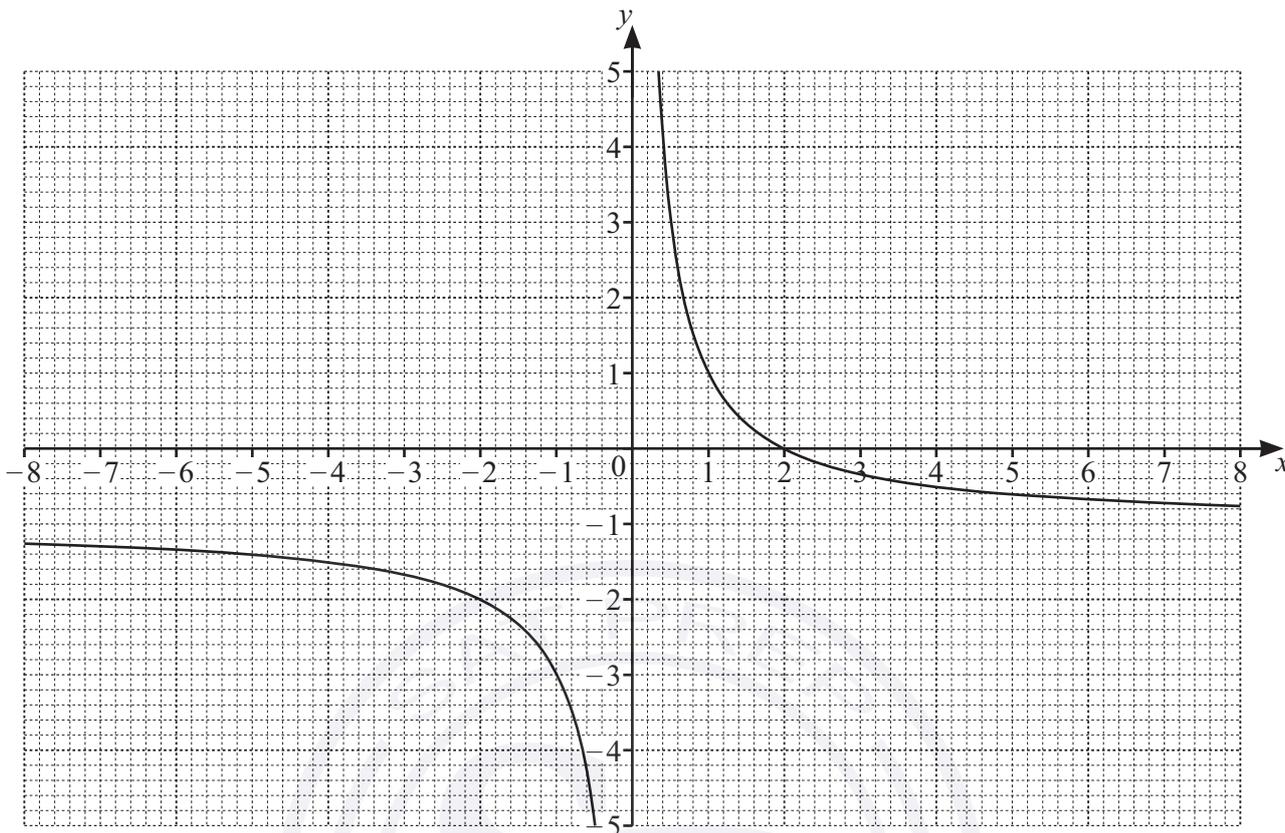
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14 Write $0.2\dot{5}$ as a fraction.

..... [2]





The diagram shows the graph of $y = \frac{2}{x} - 1$.

(a) Write down the coordinates of the point where the graph crosses the x -axis.

(..... ,) [1]

(b) Write down the equation of each asymptote.

.....

.....

[2]

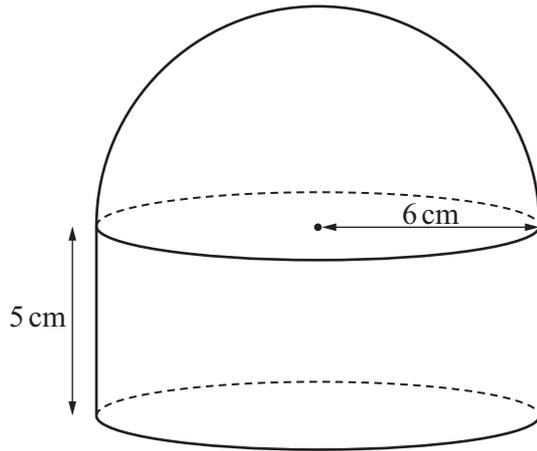
(c) By drawing a suitable straight line on the grid, solve $\frac{2}{x} - x - 1 = 0$.

$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [3]



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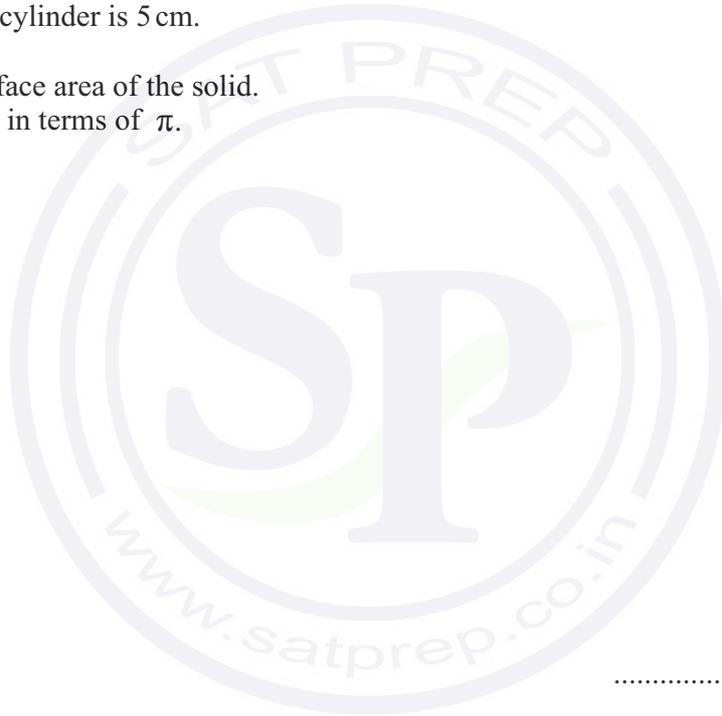
16



NOT TO SCALE

The diagram shows a solid made by joining a hemisphere to a cylinder.
 The radius of both the hemisphere and the cylinder is 6 cm.
 The height of the cylinder is 5 cm.

Find the **total** surface area of the solid.
 Give your answer in terms of π .



..... cm^2 [4]

17 Find the value of

(a) $125^{\frac{2}{3}}$

..... [2]

(b) $4^{-\frac{5}{2}}$

..... [2]





DO NOT WRITE IN THIS MARGIN

18 (a) $\frac{9}{\sqrt{3}}$

Rationalise the denominator.
Give your answer in its simplest form.

..... [2]

(b) $(5 - \sqrt{2})(1 + 3\sqrt{2}) = c + k\sqrt{2}$

Find the value of c and the value of k .

$c =$
 $k =$ [2]

19 Write as a single fraction in its simplest form.

(a) $\frac{5a}{6} \times \frac{3b}{a}$

..... [2]

(b) $\frac{p}{2} + \frac{3t}{4}$

..... [2]

(c) $\frac{2}{x-2} - \frac{3}{x+1}$

..... [3]

[Turn over]





20

$$y \propto \frac{1}{\sqrt{x}}$$

(a) When $x = 9$, $y = 2$.

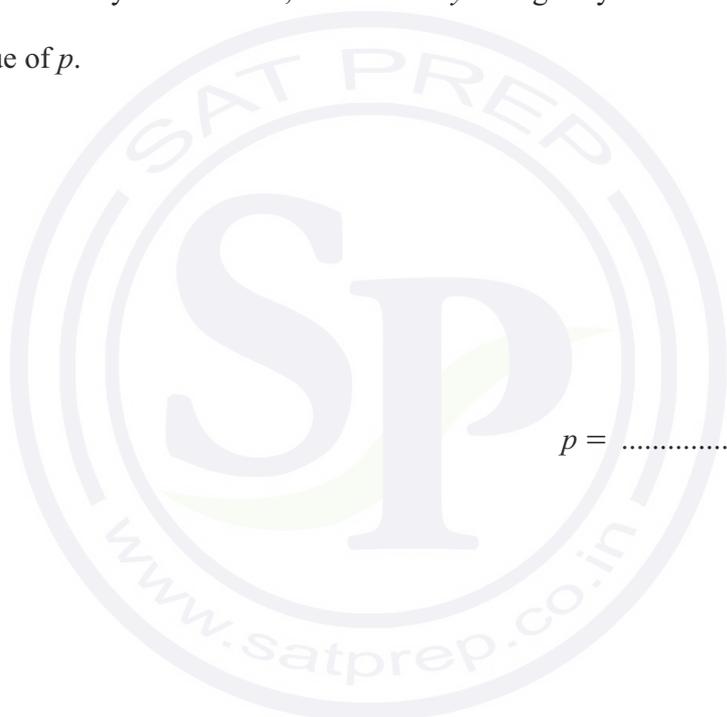
Find the value of y when $x = 36$.

$$y = \dots\dots\dots [3]$$

(b) When x is increased by a factor of 4, the value of y changes by a factor of p .

Find the value of p .

$$p = \dots\dots\dots [1]$$

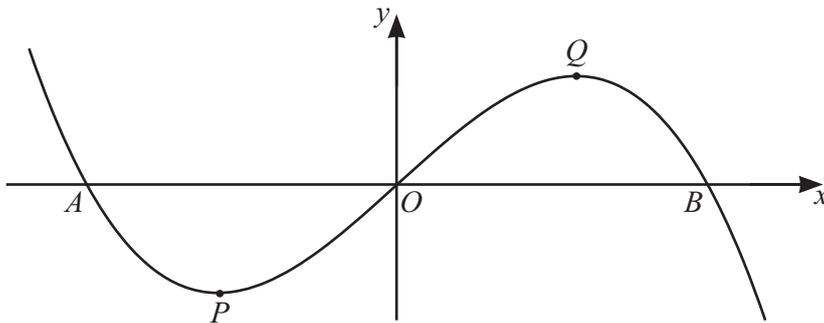


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21



NOT TO SCALE

The diagram shows the graph of $y = 3x - x^3$.
 The graph crosses the x -axis at A , at O and at B .
 The turning points of the graph are at P and at Q .

- (a) Find the x -coordinate of A and the x -coordinate of B .
 Give your answers as exact values.

x -coordinate of A

x -coordinate of B

[3]

- (b) (i) Differentiate $3x - x^3$.

..... [2]

- (ii) Find the coordinates of P and Q .

P (..... ,)

Q (..... ,)

[4]



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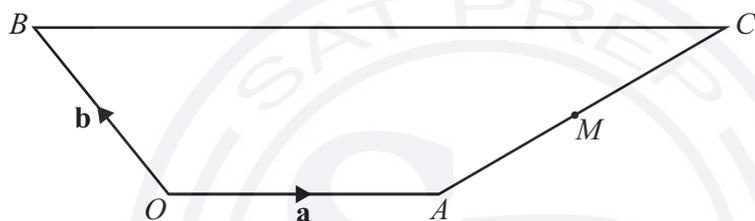
22 (a) Write down the exact value of $\tan 60^\circ$.

..... [1]

(b) Solve $2 \sin x - 1 = 0$ for $0^\circ \leq x \leq 360^\circ$.

$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [3]

23



NOT TO SCALE

In the diagram, OA is parallel to BC .
 $BC = 3OA$
 M is the midpoint of AC .
 The position vector of A is \mathbf{a} and the position vector of B is \mathbf{b} .

Find the position vector of M .
 Give your answer in terms of \mathbf{a} and \mathbf{b} , in its simplest form.

..... [3]

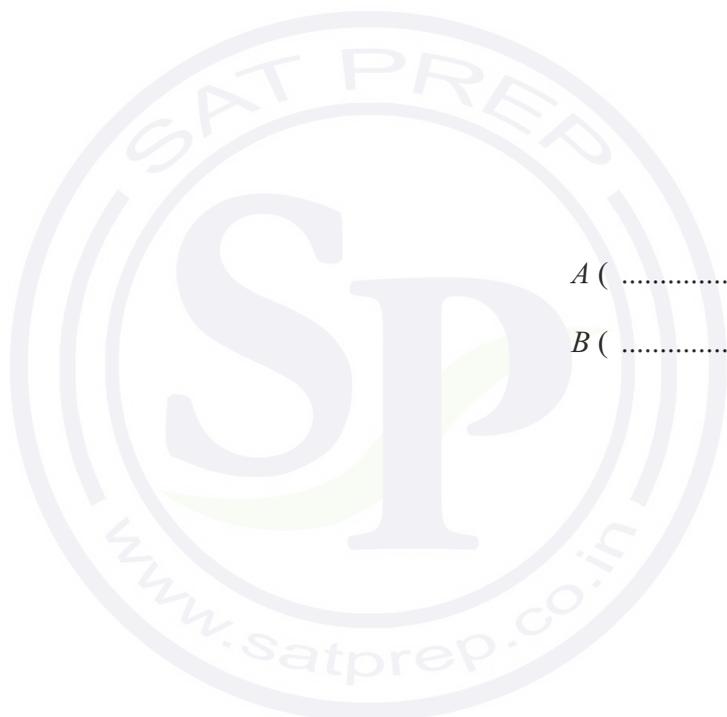


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24 The line $y = 7x + 3$ intersects the curve $y = x^2 + 5x - 12$ at the points A and B .

Find the coordinates of A and B .



A (..... ,)

B (..... ,)

[5]





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MATHEMATICS

0580/23

Paper 2 Non-calculator (Extended)

May/June 2025

2 hours

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You will need: Geometrical instruments

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- You must show all necessary working clearly.

INFORMATION

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

This document has **16** pages.

List of formulas

Area, A , of triangle, base b , height h .

$$A = \frac{1}{2}bh$$

Area, A , of circle of radius r .

$$A = \pi r^2$$

Circumference, C , of circle of radius r .

$$C = 2\pi r$$

Curved surface area, A , of cylinder of radius r , height h .

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Curved surface area, A , of cone of radius r , sloping edge l .

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Volume, V , of prism, cross-sectional area A , length l .

$$V = Al$$

Volume, V , of pyramid, base area A , height h .

$$V = \frac{1}{3}Ah$$

Volume, V , of cylinder of radius r , height h .

$$V = \pi r^2 h$$

Volume, V , of cone of radius r , height h .

$$V = \frac{1}{3}\pi r^2 h$$

Volume, V , of sphere of radius r .

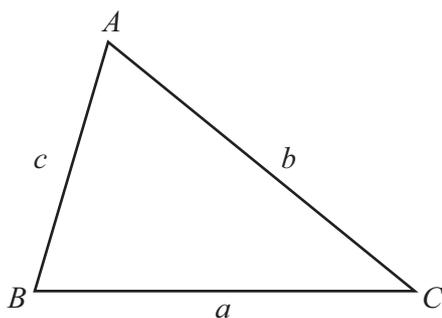
$$V = \frac{4}{3}\pi r^3$$

For the equation

$$ax^2 + bx + c = 0, \text{ where } a \neq 0,$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

For the triangle shown,



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

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

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





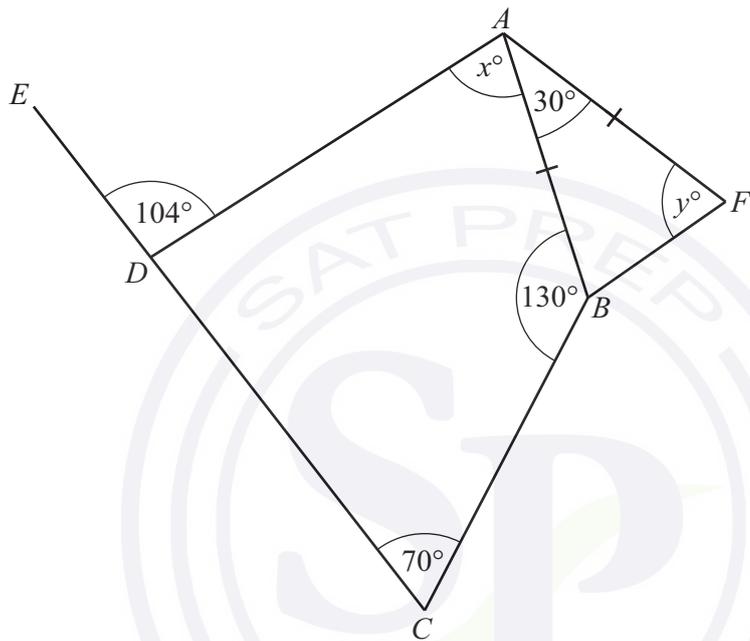
Calculators must **not** be used in this paper.

- 1 The probability of picking a green pen from a box is 0.17 .

Find the probability of not picking a green pen from the box.

..... [1]

2



NOT TO SCALE

ABCD is a quadrilateral.
CDE is a straight line.
AFB is an isosceles triangle.

Find the value of *x* and the value of *y*.

x =

y =

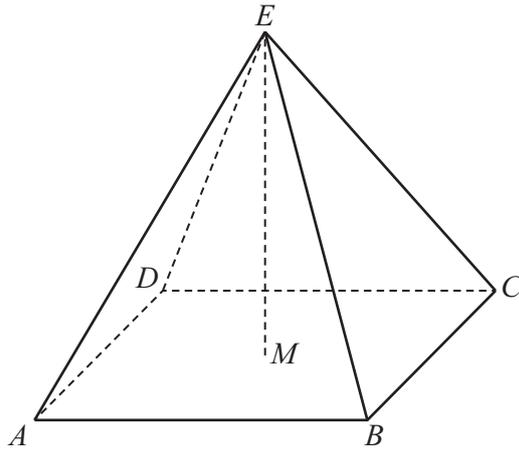
[4]



DO NOT WRITE IN THIS MARGIN



3



NOT TO SCALE

The diagram shows a pyramid $ABCDE$ with a square base.
 M is the centre of the square base.
 E is vertically above M .

(a) Write down the number of planes of symmetry of this pyramid.

..... [1]

(b) Using two of the letters from A, B, C, D, E and M , complete the statement about the pyramid.

The axis of rotational symmetry passes through the points and [1]

4 The number of ice creams sold increases as the temperature rises.

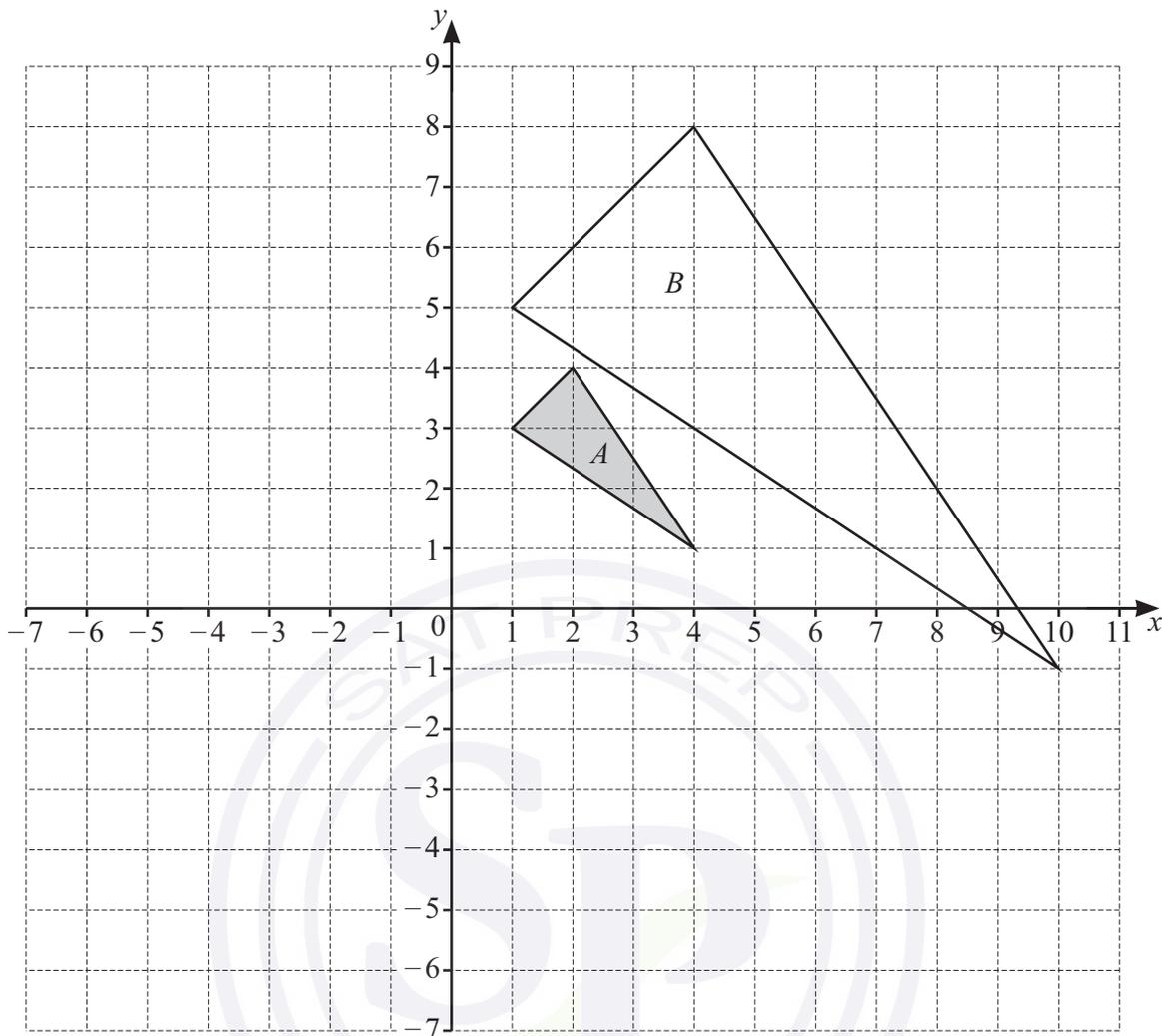
What type of correlation does this statement describe?

..... [1]





5



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

.....

[3]

(b) On the grid, draw the image of

(i) triangle *A* after a reflection in the line $x = -1$

[2]

(ii) triangle *A* after a rotation 90° clockwise, centre $(1, -2)$.

[2]



DO NOT WRITE IN THIS MARGIN



- 6 There are 15 giraffes in a group.
The table gives information about the heights of the 15 giraffes.

One giraffe has a height of 2.6 m
No giraffe is shorter than 2.5 m
The range of heights for the 15 giraffes is 2.3 m
More than 3 giraffes have the same height
The modal height for the giraffes is 3.9 m

The stem-and-leaf diagram shows information about the height of 9 of these giraffes.

2	5
3	2 7 7
4	1 1 4 5 7

Key: 4|1 represents a giraffe height of 4.1 m

Use the information in the table to complete the stem-and-leaf diagram for the group of 15 giraffes.

[3]





7 Work out.

(a) $\frac{5}{6} - \frac{7}{12}$

Give your answer as a fraction in its simplest form.

..... [2]

(b) $1\frac{1}{3} \div \frac{8}{15}$

Give your answer as a mixed number in its simplest form.

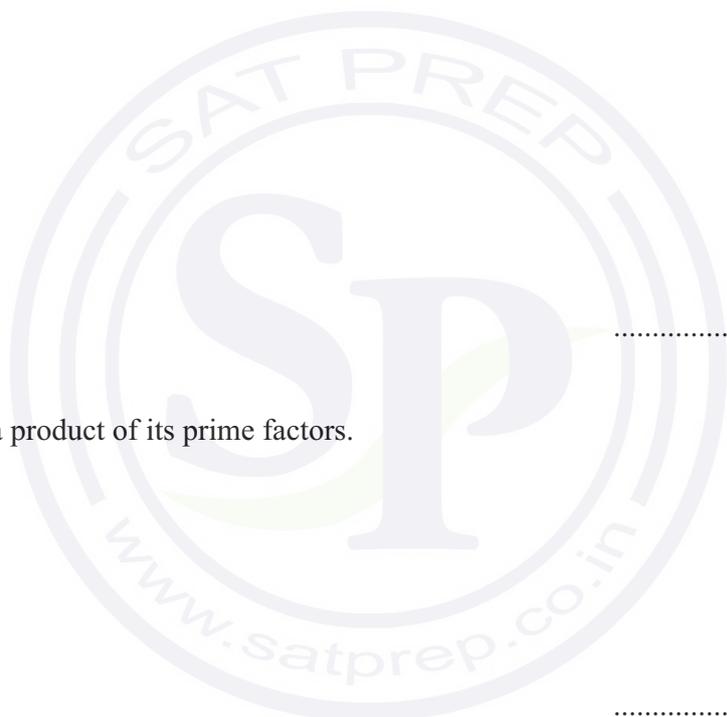
..... [3]

8 (a) Write 42 as a product of its prime factors.

..... [2]

(b) Find the highest common factor (HCF) of 84 and 70.

..... [2]



DO NOT WRITE IN THIS MARGIN



9 (a) Solve.
 $5x^2 = 12 - 17x$

$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [4]

(b) $ax^2 + a = b$ where a and b are integers.

One solution of this equation is $x = 6$.

Write down the other solution.

$x = \dots\dots\dots$ [1]

10 Solve the simultaneous equations.

$$4x - 5y = 13$$

$$3x - 2y = 8$$

$x = \dots\dots\dots$

$y = \dots\dots\dots$

[4]





DO NOT WRITE IN THIS MARGIN

- 11 Angela picks a number at random from the numbers 1, 2 and 3. She then picks a number at random from the numbers 4, 5 and 6. She adds the two numbers to find the total.

(a) Complete the table to show the possible outcomes.

		First number			
		1	2	3	
Second number	+	4	5	6	7
	4				
	5				
	6				

[2]

- (b) Given that the total is odd, find the probability that one of the numbers Angela picks is 3.

..... [2]

12 (a) $v = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$

Find $5v$.

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

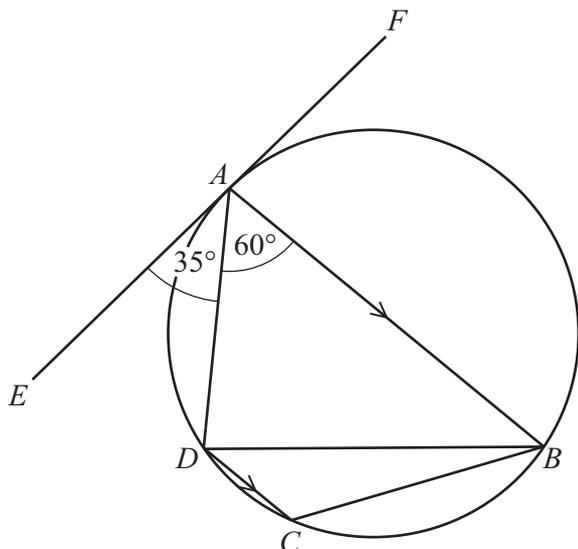
- (b) H is the point $(-3, 8)$ and K is the point $(-4, 0)$.

$\vec{HJ} = \begin{pmatrix} 7 \\ -2 \end{pmatrix}$

Find $|\vec{JK}|$.

..... [4]





NOT TO SCALE

A, B, C and D are points on a circle.
 EF is a tangent to the circle at A .
 AB is parallel to DC .

(a) Find angle DCB , giving a geometrical reason.

Angle $DCB = \dots\dots\dots$ because $\dots\dots\dots$
 $\dots\dots\dots$ [2]

(b) Find angle DBC .

Angle $DBC = \dots\dots\dots$ [2]

14 Find the lowest common multiple (LCM) of $15xy^3$ and $18x^4y$.

$\dots\dots\dots$ [2]





15 (a) Simplify.
 $\sqrt{27} + \sqrt{12}$

..... [2]

(b) $\frac{40\sqrt{8}}{5\sqrt{2}} = k$, where k is an integer.

Find the value of k .

$k =$ [2]

(c) Rationalise the denominator.

$$\frac{1}{3 - \sqrt{5}}$$

..... [2]

16 Write 0.328 as a fraction in its simplest form.

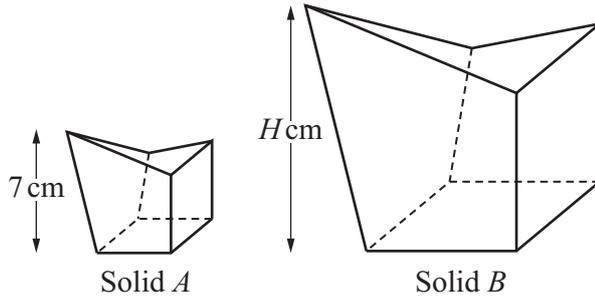
..... [3]



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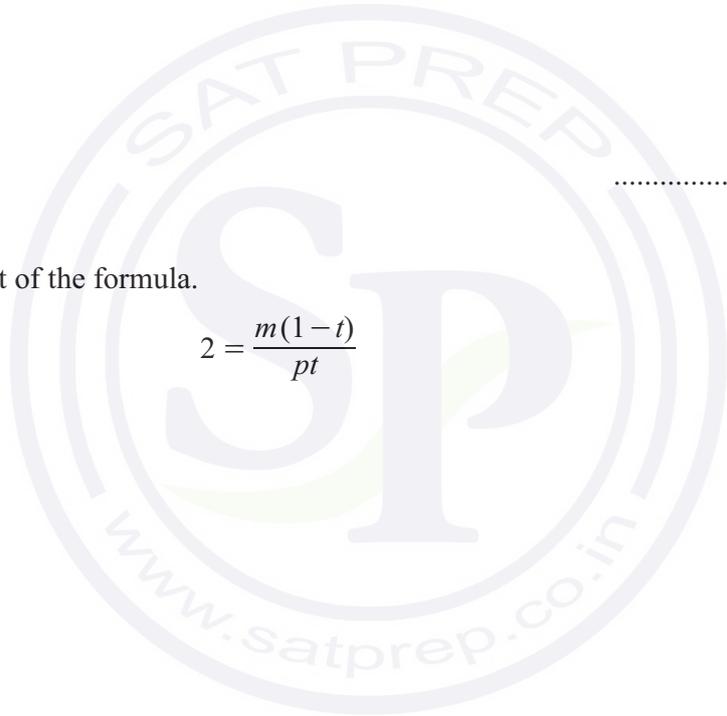
17 Solid *A* is mathematically similar to solid *B*.



NOT TO SCALE

The height of solid *A* is 7 cm and its surface area is 60 cm².
 The surface area of solid *B* is 540 cm².

Calculate the height of solid *B*.



18 Make *t* the subject of the formula.

$$2 = \frac{m(1-t)}{pt}$$

..... cm [3]

t = [4]

19 Simplify.

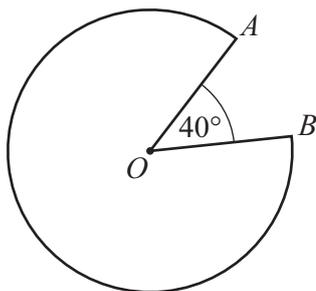
$$\frac{7x - x^2}{49 - x^2}$$

..... [3]





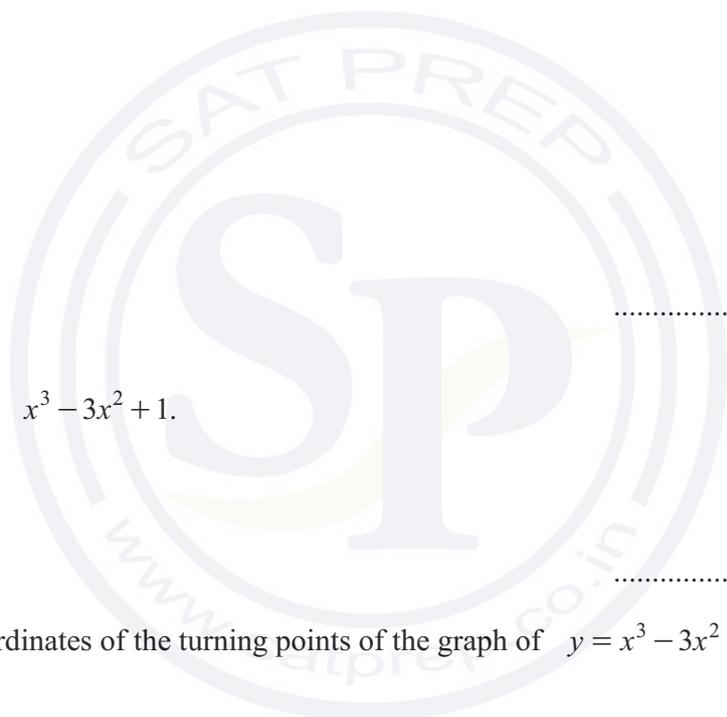
20



NOT TO SCALE

The diagram shows a sector of a circle, centre O .
 The radius of the circle is 6 cm.

Calculate the length of the major arc AB .
 Give your answer in its simplest form in terms of π .



21 (a) Differentiate $x^3 - 3x^2 + 1$.

.....cm [3]

..... [2]

(b) Find the coordinates of the turning points of the graph of $y = x^3 - 3x^2 + 1$.

(..... ,)

(..... ,)

[4]



DO NOT WRITE IN THIS MARGIN



22

$f(x) = 2x + 5$

$g(x) = x - 4$

$h(x) = 5^x$

(a) Find $f(3)$.

..... [1]

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

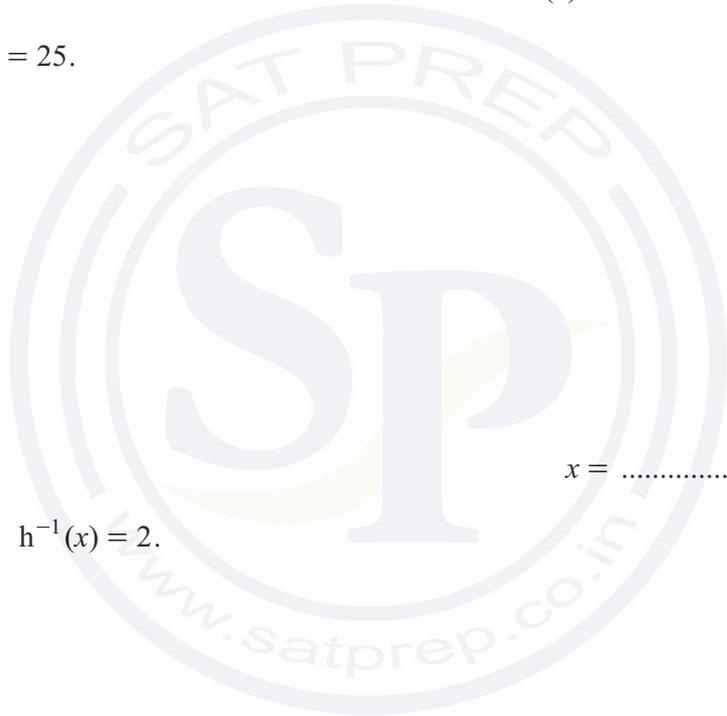
$f^{-1}(x) =$ [2]

(c) Solve $fg(x) = 25$.

$x =$ [3]

(d) Find x when $h^{-1}(x) = 2$.

$x =$ [2]



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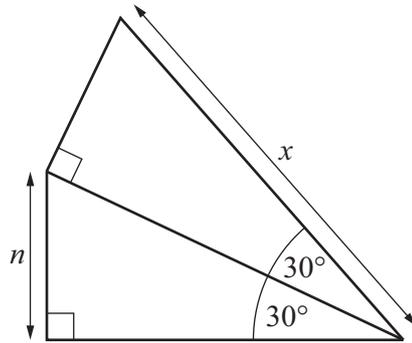




23 (a) Write down the value of $\cos 90^\circ$.

..... [1]

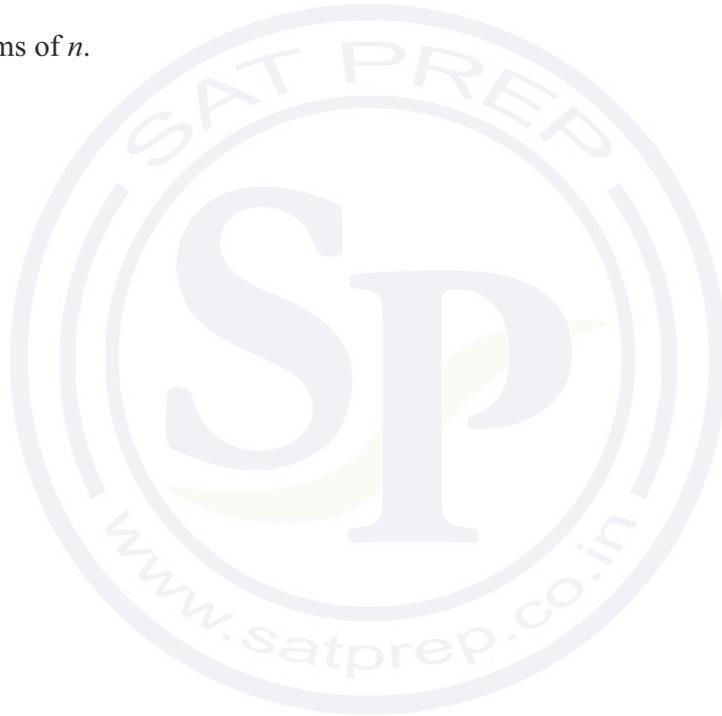
(b)



NOT TO SCALE

The diagram shows two different right-angled triangles joined by a common side.

Find x in terms of n .



$x =$ [5]

Question 24 is on the next page.



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24 (a) A is the point $(a, 12)$ and B is the point $(b, 27)$.

(i) Find the y -coordinate of the midpoint of AB .

..... [1]

(ii) The line AB has gradient 3.

Find an expression for a in terms of b .

$a =$ [3]

(b) D is the point $(22, 34)$ and E is the point $(23, 39)$.
 D is the point on CE such that $2CE = 5DE$.

Find the coordinates of C .

(..... ,) [3]

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MATHEMATICS

0580/22

Paper 2 Non-calculator (Extended)

February/March 2025

2 hours

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- Calculators must **not** be used in this paper.
- You may use tracing paper.
- You must show all necessary working clearly.

INFORMATION

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

This document has **20** pages.



List of formulas

Area, A , of triangle, base b , height h . $A = \frac{1}{2}bh$

Area, A , of circle of radius r . $A = \pi r^2$

Circumference, C , of circle of radius r . $C = 2\pi r$

Curved surface area, A , of cylinder of radius r , height h . $A = 2\pi rh$

Curved surface area, A , of cone of radius r , sloping edge l . $A = \pi rl$

Surface area, A , of sphere of radius r . $A = 4\pi r^2$

Volume, V , of prism, cross-sectional area A , length l . $V = Al$

Volume, V , of pyramid, base area A , height h . $V = \frac{1}{3}Ah$

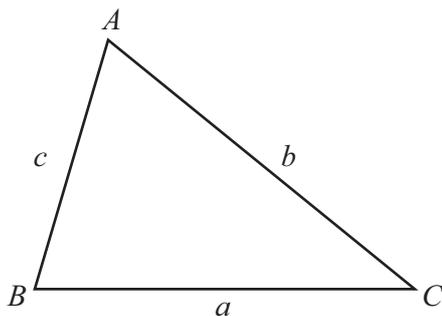
Volume, V , of cylinder of radius r , height h . $V = \pi r^2 h$

Volume, V , of cone of radius r , height h . $V = \frac{1}{3}\pi r^2 h$

Volume, V , of sphere of radius r . $V = \frac{4}{3}\pi r^3$

For the equation $ax^2 + bx + c = 0$, where $a \neq 0$, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

For the triangle shown,



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

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

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





Calculators must **not** be used in this paper.

- 1 Oranges cost 220 rupees per kilogram.

Work out the cost of 9 kg of these oranges.

..... rupees [1]

- 2 Aryan goes on a journey.
He leaves home at 11 40 and arrives at 14 18.

Find how many hours and minutes the journey took.

..... h min [1]

- 3 A quadrilateral has one line of symmetry.
The diagonals of the quadrilateral cross at right angles.

Write down the mathematical name of the quadrilateral.

..... [1]



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4 $V = 4mp^2$

(a) Find V when $m = 10$ and $p = -3$.

$V = \dots\dots\dots$ [2]

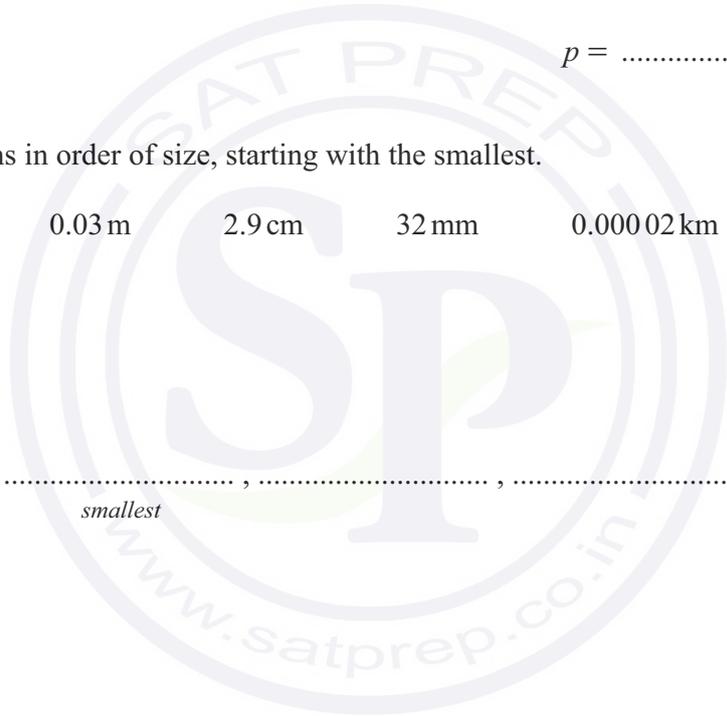
(b) Find the positive value of p when $V = 3200$ and $m = 2$.

$p = \dots\dots\dots$ [2]

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

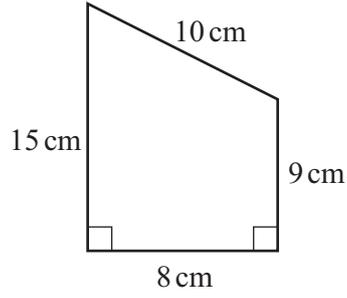
0.03 m 2.9 cm 32 mm 0.000 02 km

$\dots\dots\dots$, $\dots\dots\dots$, $\dots\dots\dots$, $\dots\dots\dots$ [2]
smallest





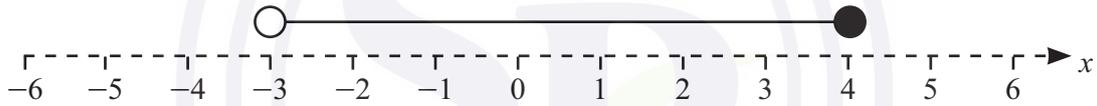
6



NOT TO SCALE

Work out the area of the trapezium.

7



Write down the inequality for x represented on the number line.

..... cm^2 [2]

..... [2]



DO NOT WRITE IN THIS MARGIN



- 8 Pryanka plays a game in which she can win, lose or draw.
The table shows the probability of her winning or losing a game.

Result of game	win	lose	draw
Probability	0.3	0.25	

- (a) Complete the table.

[2]

- (b) Pryanka plays this game 120 times.

Work out the expected number of games she wins.

..... [1]

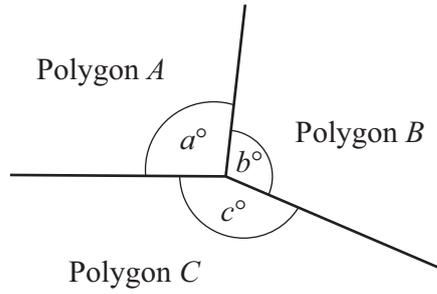
9

$$D = \sqrt{\frac{1.95 \times 9.92^2}{8.07}}$$

By writing each number correct to 1 significant figure, work out an estimate for D .

$D =$ [3]





NOT TO SCALE

Three regular polygons A , B and C meet at a point.
 The interior angles of the polygons are in the ratio $a : b : c = 3 : 4 : 5$.

Show that polygon C has twice the number of sides as polygon B .



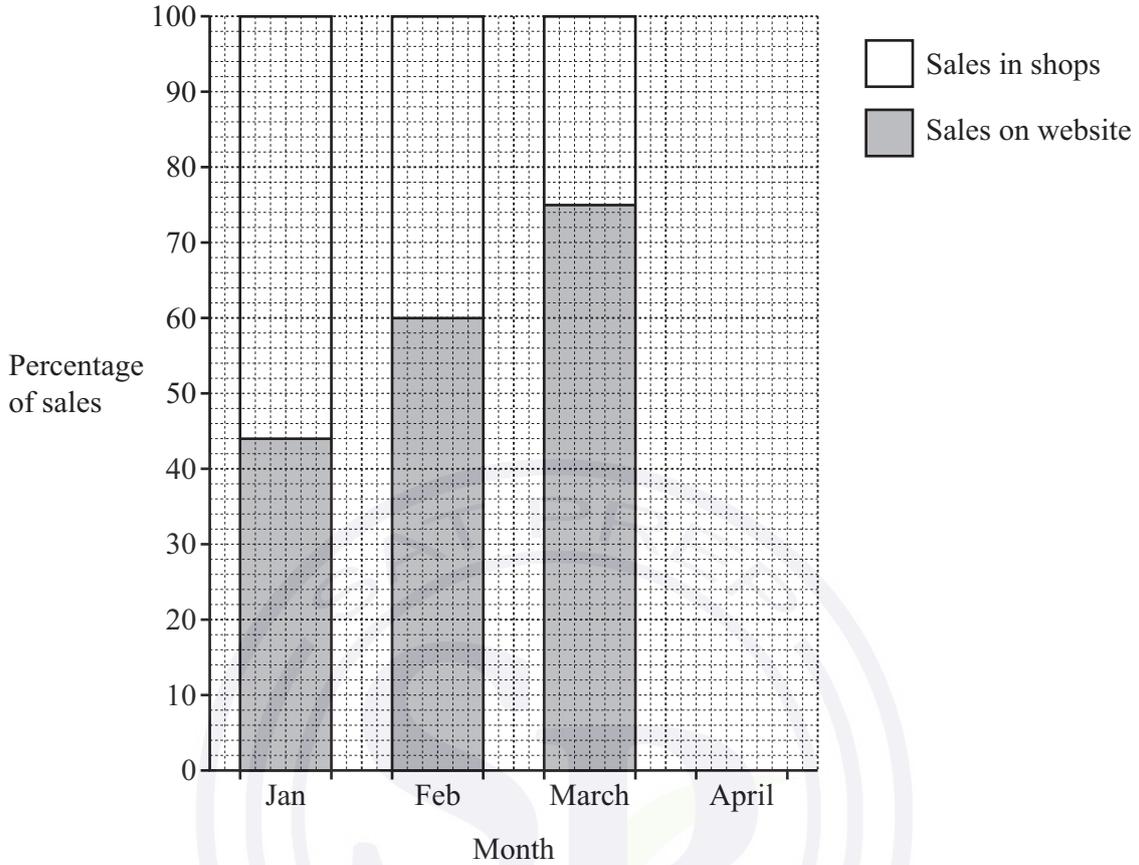
[5]



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- 11 A company sells items either on a website or in shops.
The composite bar chart shows the percentage of sales on the website and in shops for January, February and March.



- (a) In April, $\frac{17}{20}$ of the company's sales were on the website.

On the grid, draw the bar for April.

[2]

- (b) In February, the company had sales of \$3.5 million.

Work out the value of sales **in shops** in February.

\$ million [3]





- (c) In May, the company had sales of \$6 million.
In June, the company had sales of \$7.5 million.

Find the percentage increase in sales from May to June.

..... % [3]

- (d) In 2024, the company had total sales of \$52 million.
This was an increase of 30% on the total sales for 2023.

Work out the total sales in 2023.

\$ million [2]

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

$$\frac{x}{4} + \frac{3x}{8} - \frac{x+2}{12}$$

..... [3]

- (b) Factorise.

$$3x(a + 4y) - ay - 4y^2$$

..... [1]

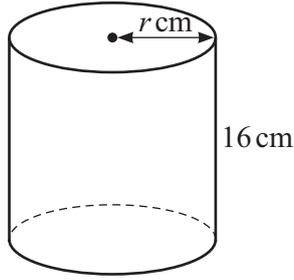


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13



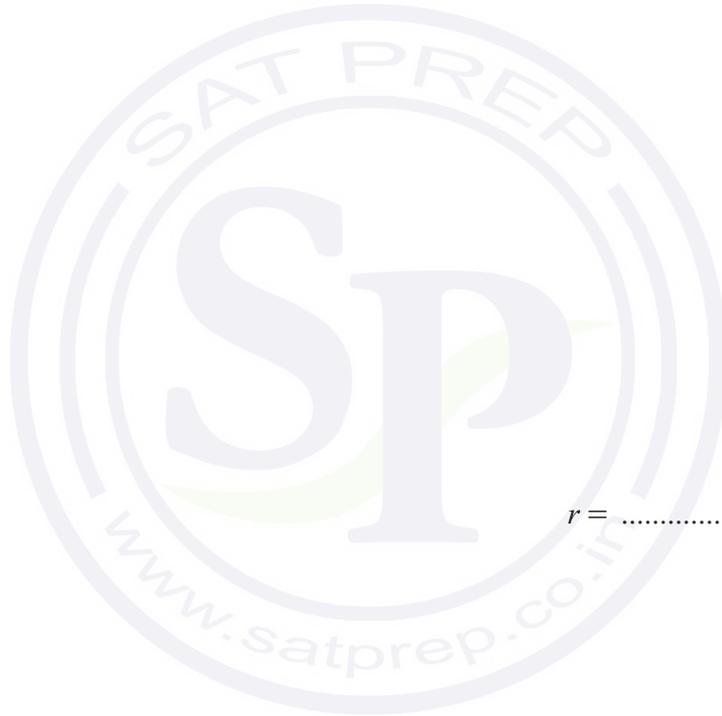
10



NOT TO SCALE

The diagram shows a cylinder with radius r cm and height 16 cm.
A sphere has radius 3 cm.
The volume of the cylinder is equal to the volume of the sphere.

Find the value of r .

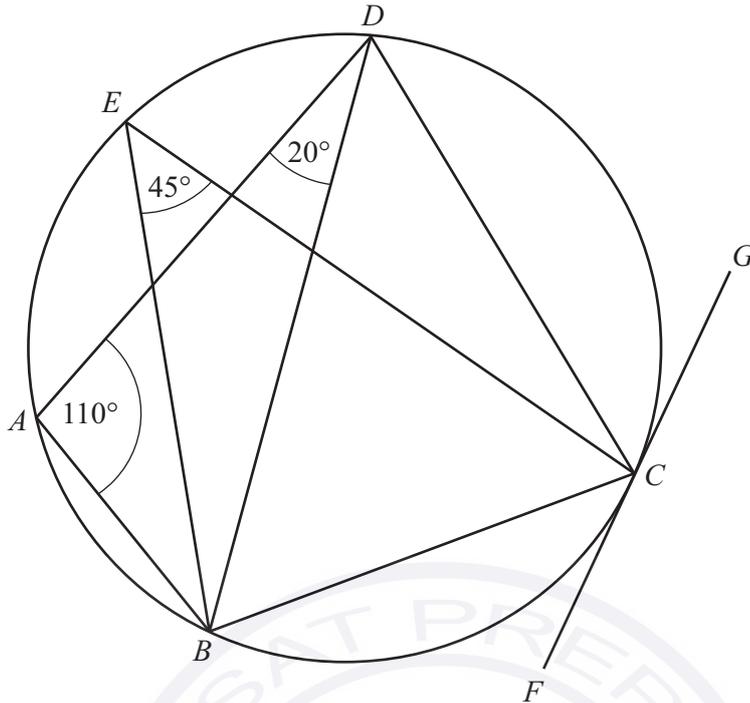


$r = \dots\dots\dots$ [4]





NOT TO SCALE



A, B, C, D and E lie on a circle.
 FG is a tangent to the circle at C .
 Angle $BAD = 110^\circ$, angle $ADB = 20^\circ$ and angle $BEC = 45^\circ$.

- (a) Find angle BCD .
 Give a geometrical reason for your answer.

Angle $BCD = \dots\dots\dots$ because $\dots\dots\dots$
 $\dots\dots\dots$ [2]

- (b) (i) Find angle DBC .

Angle $DBC = \dots\dots\dots$ [2]

- (ii) Find angle DCG .

Angle $DCG = \dots\dots\dots$ [1]



DO NOT WRITE IN THIS MARGIN



15 Point A has coordinates $(-4, 1)$ and $\vec{BA} = \begin{pmatrix} -5 \\ -12 \end{pmatrix}$.

(a) Find the coordinates of point B .

(.....,) [2]

(b) Point C has coordinates $(5, -2)$.

Find the vector \vec{CA} .

$\vec{CA} = \begin{pmatrix} \\ \end{pmatrix}$ [2]

(c) $\vec{EF} = 3\vec{BA}$

Find $|\vec{EF}|$.

..... [3]





16 The stem-and-leaf diagram shows the mass of each of 13 packets.

3	1 2 8
4	0 1 2 3 3 8
5	1 2 3 4

Key: 3 | 1 represents 31 g

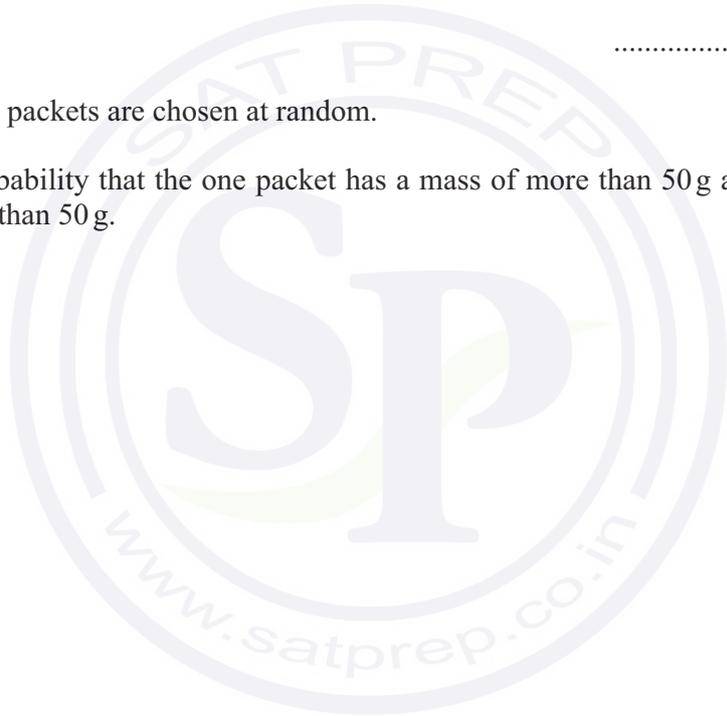
(a) Work out the interquartile range.

..... g [3]

(b) Two of these packets are chosen at random.

Find the probability that the one packet has a mass of more than 50 g and the other packet has a mass of less than 50 g.

..... [3]



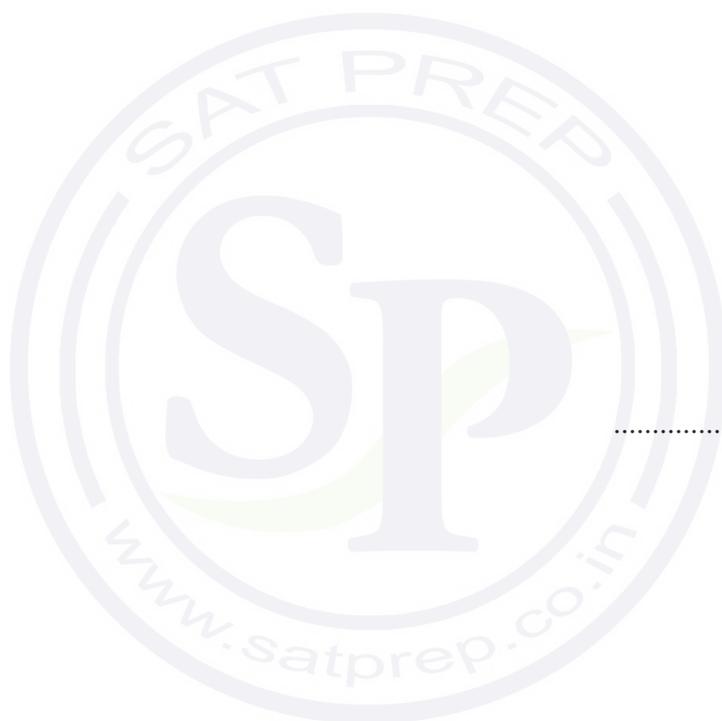
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17 Work out.

$$\frac{5}{9} + 0.28$$

Give your answer as a fraction in its simplest form.

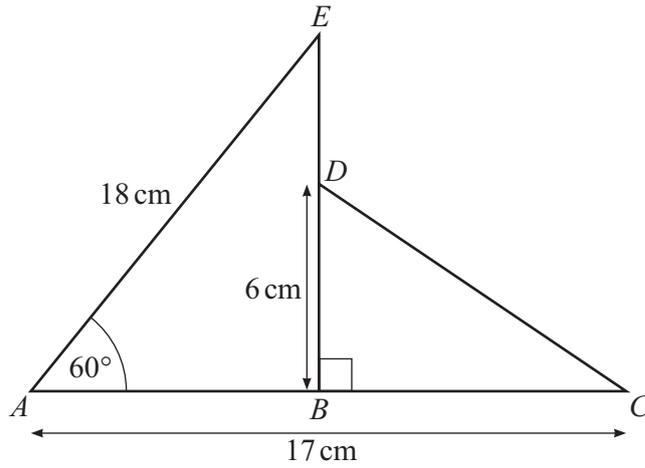


[4]



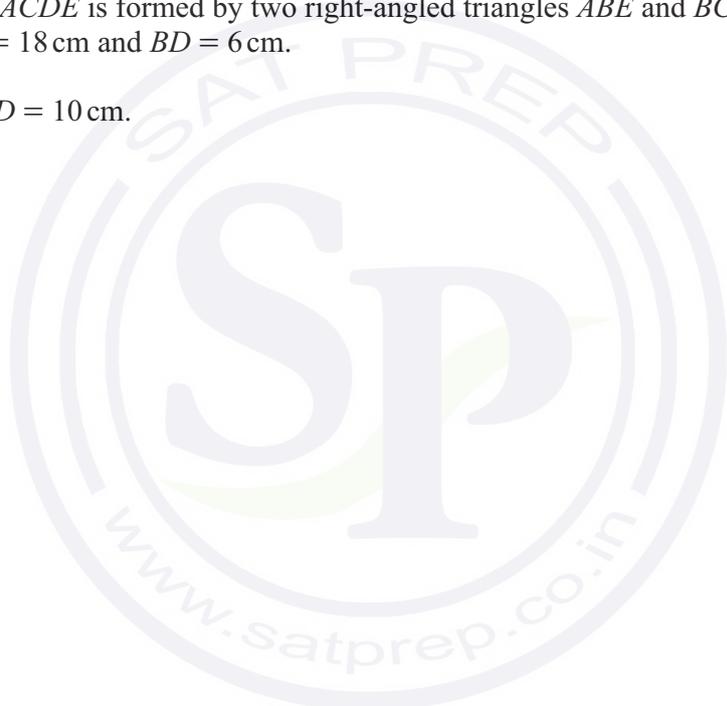


NOT TO SCALE



The quadrilateral $ACDE$ is formed by two right-angled triangles ABE and BCD .
 $AC = 17$ cm, $AE = 18$ cm and $BD = 6$ cm.

(a) Show that $CD = 10$ cm.



[5]

(b) Find the perimeter of the quadrilateral $ACDE$.
 Give your answer in the form $p + k\sqrt{q}$.

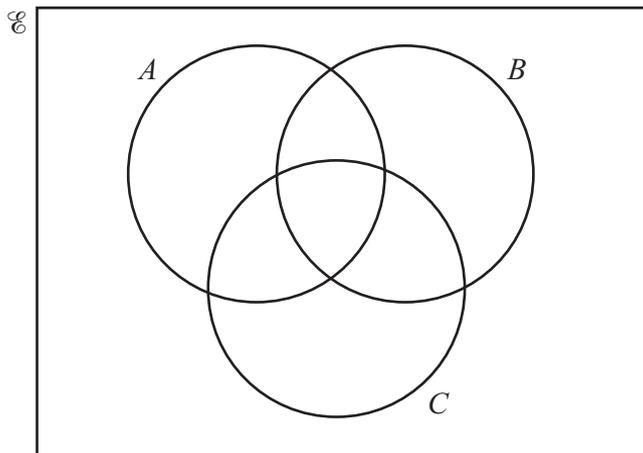
..... cm [4]



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19



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

[1]

20 (a) Simplify.

$$\sqrt{300} + \sqrt{48}$$

[2]

(b) Rationalise the denominator and simplify.

$$\frac{9}{2 + \sqrt{7}}$$

[3]





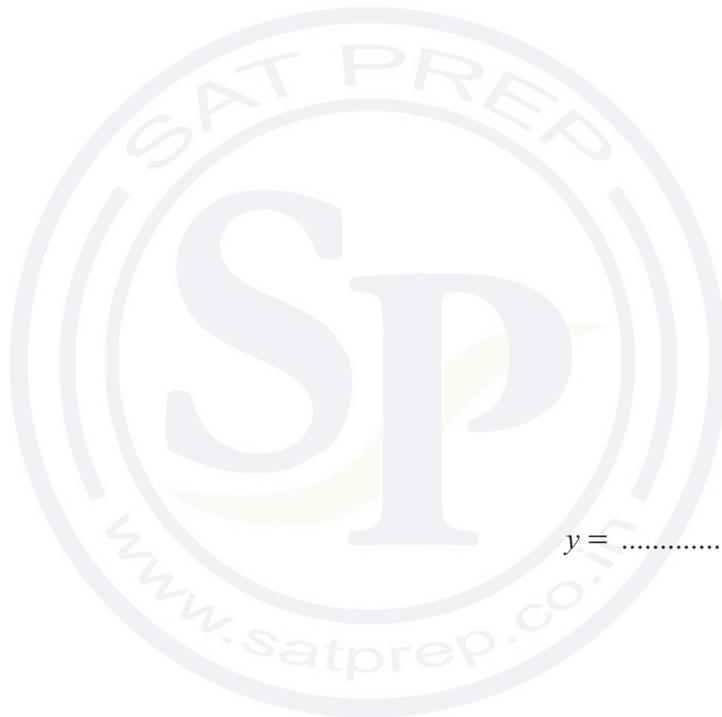
21 (a) Write down the coordinates of the point where the graph of $y = 5x - 3$ crosses the y -axis.

(.....,) [1]

(b) A is the point $(1, 7)$ and B is the point $(5, 15)$.

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

$y = \dots\dots\dots$ [5]



DO NOT WRITE IN THIS MARGIN



22 A curve has equation $y = x^3 + x^2 - x$.

The curve has a stationary point at $(\frac{1}{3}, -\frac{5}{27})$.

(a) Find the coordinates of the other stationary point.

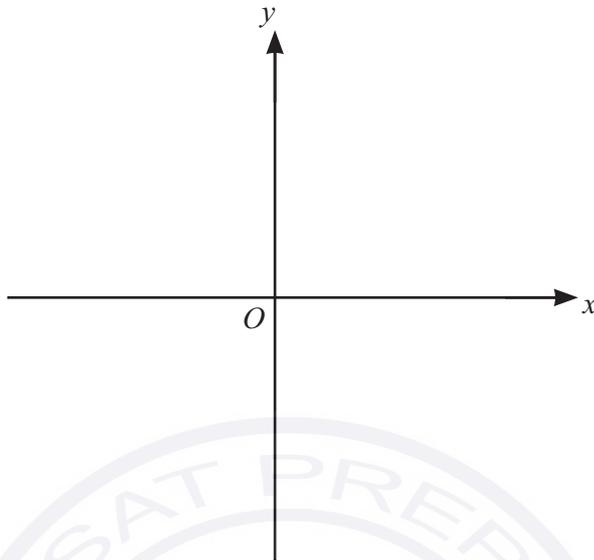


(.....,) [5]





- (b) By sketching the graph of $y = x^3 + x^2 - x$, determine whether the stationary point $\left(\frac{1}{3}, -\frac{5}{27}\right)$ is a maximum or a minimum.



- (c) The equation $x^3 + x^2 - x = k$ has fewer than 3 solutions.
 Find the range of possible values for k .
 $\left(\frac{1}{3}, -\frac{5}{27}\right)$ is a [2]

..... [2]

Question 23 is printed on the next page.



DO NOT WRITE IN THIS MARGIN



23 (a) Simplify $\left(\frac{x^2}{4}\right)^{\frac{3}{2}}$.

..... [2]

(b) $16^x \times \left(\frac{1}{2}\right)^x = 4^{x+3}$

Find the value of x .



$x =$ [4]

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