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- **Authentic exam practice:** Develop your exam technique and time management skills with realistic papers mirroring the latest syllabus and exam format.
- **Targeted content:** Strengthen your understanding across all key topic areas, with a focus on areas predicted to appear in the 2025 exams.
- **Detailed solutions:** Gain valuable insights into effective problem-solving approaches and reinforce your learning with comprehensive, step-by-step solutions.

Boost your confidence and achieve your full potential in the iGCSE Maths examinations with this essential resource!

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME: **Ginger Mathematician Predicted Paper**

CENTRE NUMBER | | | | | | CANDIDATE NUMBER | | | | |

MATHEMATICS **0580/21**

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 [ ].
For extra guidance, use the All of iGCSE Maths Playlist

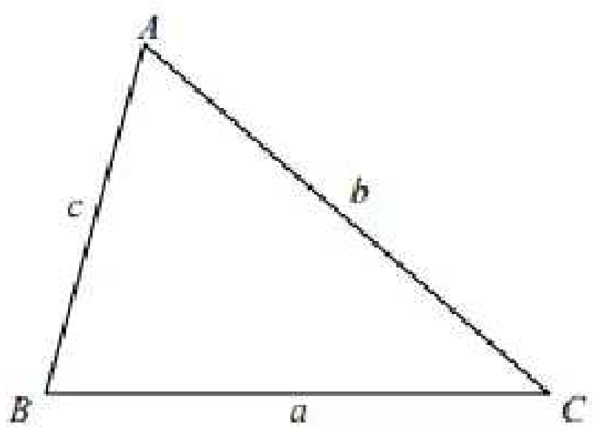
This document has **17** pages. Any blank pages are indicated.

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 $ax^2 + bx + c = 0$, 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 Work out $\frac{4}{9} \times \frac{27}{20}$.

Give your answer as a fraction in its simplest form.

.... [1]

2 Write down the order of rotational symmetry of a parallelogram.

.... [1]

3 Convert 22400 cm^2 into m^2

.... m^2 [2]

4 John has a biased 6-sided die.

Number	1	2	3	4	5	6
Probability	0.10		0.25	0.20	0.30	0.10

John rolls the die.

Calculate the probability that it lands on a prime number.

.... [3]

5 Find the value of $343^{\frac{2}{3}}$.

.... [2]

6 Find the Highest Common Factor (HCF) of 51 and 119

.... [2]

7 y is inversely proportional to $(x + 1)^3$

When $x = 1$, $y = 0.5$

(a) Calculate the value of y when $x = 3$.

y = ... [4]

(b) Find the value of x when $y = \frac{1}{16}$.

x = ... [3]

8 **(a)** Simplify.

$\sqrt{8} + \sqrt{50}$

.... [2]

(b) Rationalise the denominator.

$$\frac{2}{\sqrt{3}+1}$$

.... [2]

9 **Without using a calculator**, work out $3\frac{2}{7} + \frac{4}{9}$.

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

.... [3]

10

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

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 35.775 **kilometres**.

Find the value of T.

T = ... min [4]

11 The scale of a map is 1 : 2000.
The area of a road is $400m^2$.
Calculate the area of the road on the map, giving your answer in cm^2.

.... cm^2 [3]

12

(a) Dina invests \$2000 in an account that pays simple interest at a rate of r% per year.

At the end of 3 years, the account has earned \$300 in **interest**.

Calculate the value of r.

r = ... [3]

(b)

(i) Hence, or otherwise, calculate the total value of her investment after 6 years.

\$.. [2]

(ii) Marcus invests \$2500 in a bank which pays simple interest at a rate of 2% per year.

At the end of 6 years, whose investment is most valuable? Give a compaison to justify your answer.

....

....

....[2]

13

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.

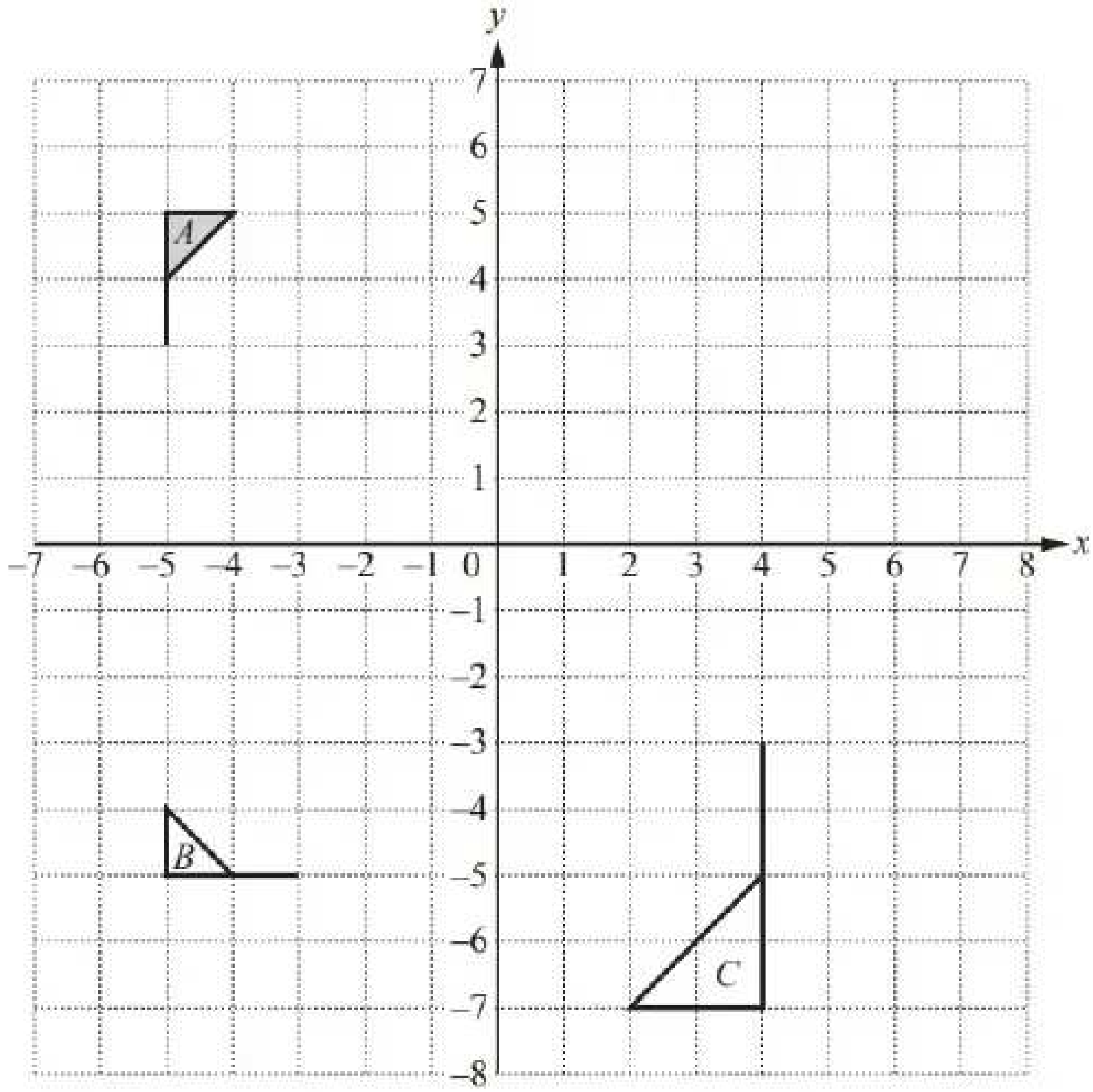
Give your answer in exact form.

.... [3]

(c) Write down the gradient of a line that is perpendicular to the line AB

.... [2]

14



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

(i) Flag B onto Flag A,

....

.... [3]

(ii) Flag A onto Flag C,

....

.... [3]

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

.... [4]

16

(a) x is an integer.

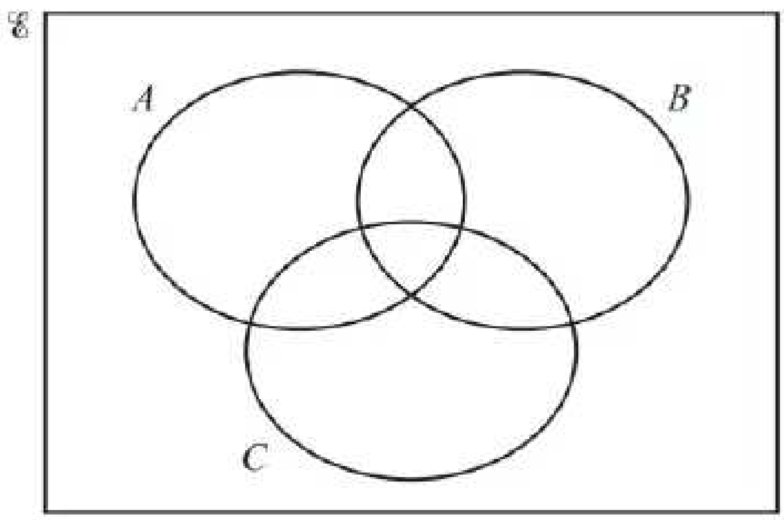
$\mathscr{E} = \{x: 1 \leqslant x \leqslant 10\}$

$A = \{x: x \text{ is a factor of } 12\}$

$B = \{x: x \text{ is an odd number}\}$

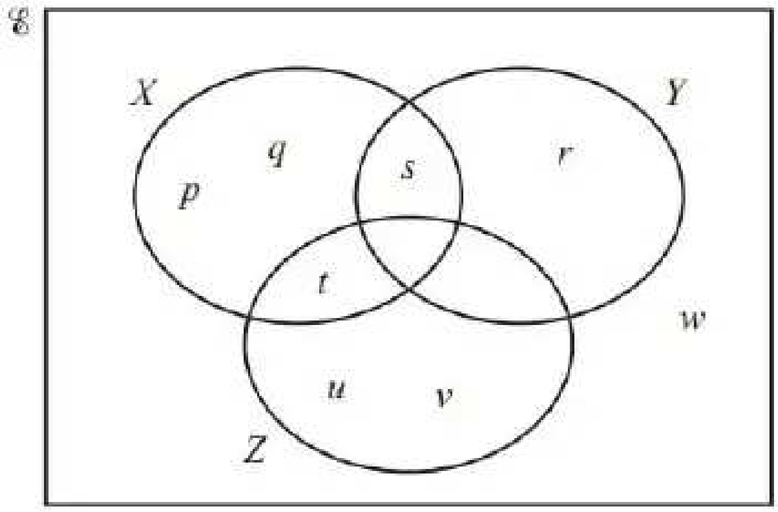
$C = \{x: x \text{ is a prime number}\}$

(i) Complete the Venn diagram to show this information.



[3]

(b)



(i) Use set notation to complete the statement.

$\{u, v\}$ ....$(X' \cap Y') \cap$.... Z [1]

(ii) Shade $X \cap (Z \cup Y)'$. [1]

17 A plane leaves airport A and flies 8 km on a bearing of 090° to reach point B. From point B, it changes direction and flies 6 km on a bearing of 180° to reach point C.

(a) Calculate the distance from point A to point C.

....km [3]

(b) Given that $\sin^{-1}\left(\frac{4}{5}\right) = 53.1°$, determine the bearing of point C from point A.

.... [3]

18 Find the nth term of each of the following sequences:

(a) 2, 5, 8, 11, 14, …

.... [2]

(b) -2, 2, 8, 16, 26, …

.... [3]

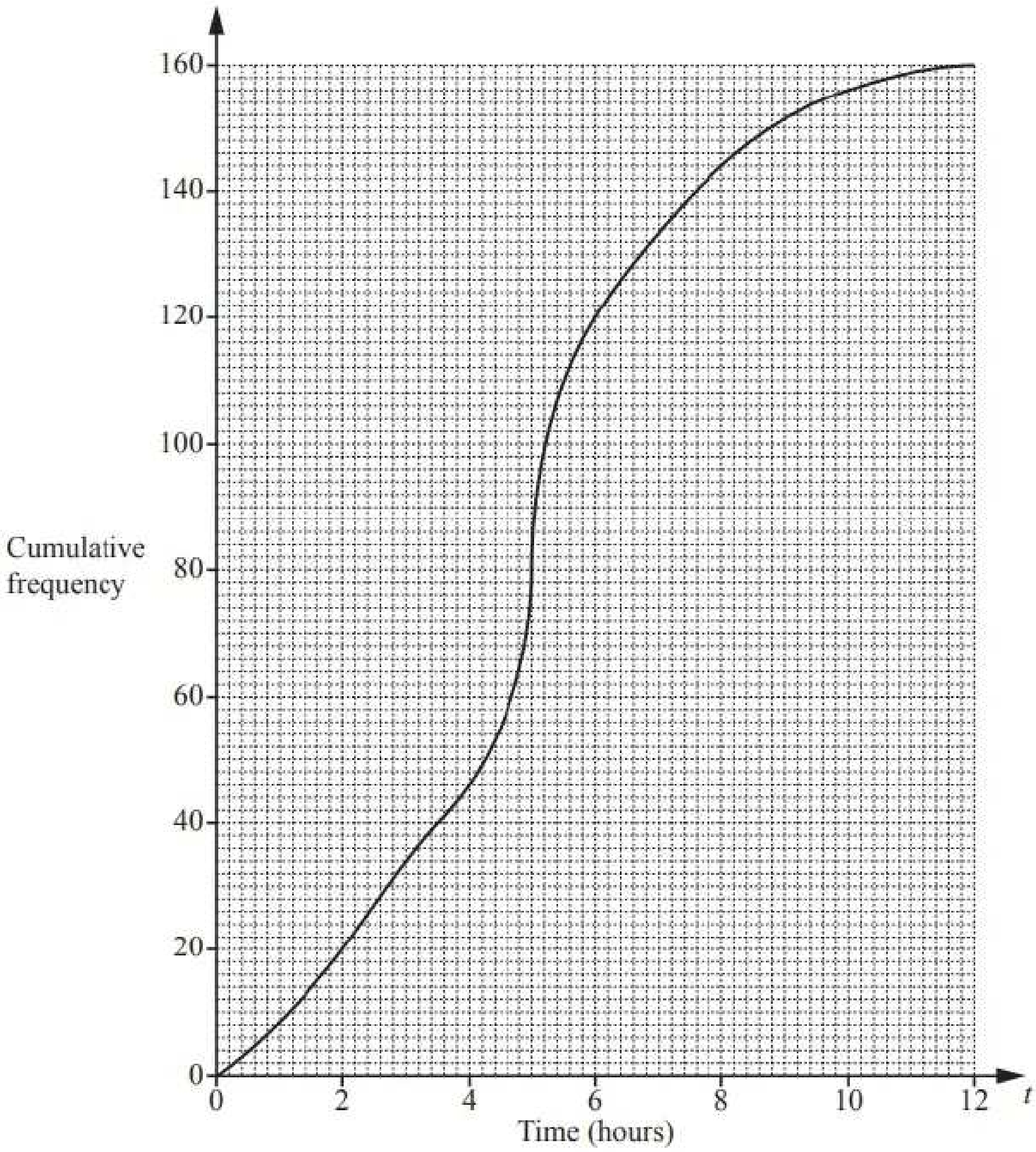
19 Calculate the area of a semicircle with diameter 10cm.

Give your answer in exact form.

.... [3]

20

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]

21

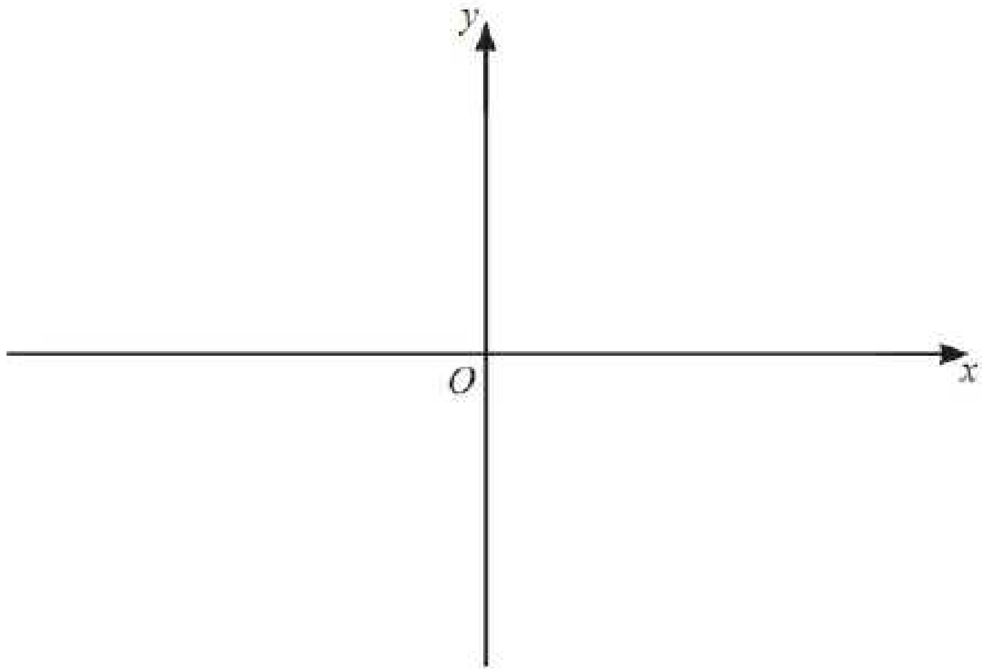
(a) Write $x^2 - 8x + 12$ in the form $(x - a)^2 + b$.

.... [2]

(b) Hence, write down the coordinates of the turning point of the graph of $y = x^2 - 8x + 12$.

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

(c)



On the diagram, sketch the graph of $y = x^2 - 8x + 12$. [3]

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

$$2x^2 + 3y = -8$$
$$\frac{4}{3} + y = -2x$$

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

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

23 $\mathbf{a} = \begin{pmatrix} 2 \\ -4 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 3 \\ 6 \end{pmatrix}$

Find

(a) 3**a**,

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

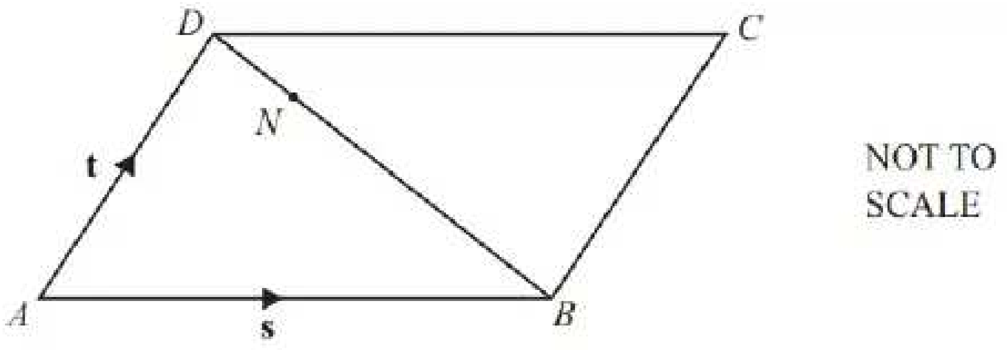
(b) 2**b**,

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

(c) 4**a** + **b**

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

24



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 **s** and **t**, an expression in its simplest form for

(a) $\overrightarrow{BD}$,

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

(b) $\overrightarrow{CN}$.

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

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1

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

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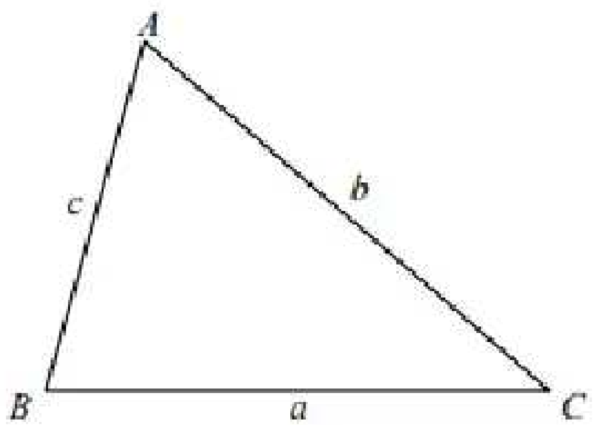
Volume, V, of cone of radius r, height h. $V = \frac{1}{3}\pi r^2 h$

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

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

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.

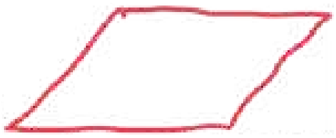
1 Work out $\frac{4}{9} \times \frac{27}{20}$.

Give your answer as a fraction in its simplest form.

$\frac{4}{9} \times \frac{27}{20} = \frac{3}{5}$

.... $\frac{3}{5}$ [1]

2 Write down the order of rotational symmetry of a parallelogram.



.... 2 [1]

3 Convert 22400 cm^2 into m^2

1 cm = 0.01 m

$1 cm^2 = (0.01)^2 = 0.0001 m^2$

×22400 $22400 cm^2 = 2.24 m^2$ × 22400

.... 2.24 m^2 [2]

4 John has a biased 6-sided die.

Number	1	2	3	4	5	6
Probability	0.10	0.05	0.25	0.20	0.30	0.10

John rolls the die. 1 − 0.10 − 0.25 − 0.20 − 0.30 − 0.10 = 0.05

Calculate the probability that it lands on a prime number.

2, 3 or 5

0.05 + 0.25 + 0.30 = 0.60

.... 0.6 [3]

5 Find the value of $343^{\frac{2}{3}}$.

$(\sqrt[3]{343})^2$

$= 7^2 = 49$.

.... 49 [2]

6 Find the Highest Common Factor (HCF) of 51 and 119

51 → 3, 17   119 → 7, 17

$51 = 3 \times 17$

$119 = 7 \times 17$

$\therefore HCF = 17.$

....17 [2]

7 y is inversely proportional to $(x+1)^3$

When $x = 1, y = 0.5$

(a) Calculate the value of y when $x = 3$.

$y \propto \frac{1}{(x+1)^3}$

$y = \frac{k}{(x+1)^3}$

$0.5 = \frac{k}{(1+1)^3} = \frac{k}{2^3} = \frac{k}{8}$

$\therefore k = 4$

$y = \frac{4}{(x+1)^3}$

$y = \frac{4}{(3+1)^3} = \frac{4}{4^3} = \frac{4}{64} = \frac{1}{16}$

$y =$ ..$\frac{1}{16}$.. [4]

(b) Find the value of x when $y = \frac{1}{16}$.

$\frac{1}{16} = \frac{4}{(x+1)^3}$

$(x+1)^3 = \frac{4}{\frac{1}{16}} = 4 \times 16 = 64$

$\therefore x + 1 = 4$

$\Rightarrow x = 3.$

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

8 **(a)** Simplify.

$\sqrt{8} + \sqrt{50}$

$\sqrt{8} = 2\sqrt{2}$, $\sqrt{50} = 5\sqrt{2}$

$2\sqrt{2} + 5\sqrt{2} = 7\sqrt{2}$

.... $7\sqrt{2}$ [2]

(b) Rationalise the denominator.

$$\frac{2}{\sqrt{3}+1}$$

$$= \frac{2}{\sqrt{3}+1} \times \frac{\sqrt{3}-1}{\sqrt{3}-1}$$

$$= \frac{2(\sqrt{3}-1)}{(\sqrt{3}+1)(\sqrt{3}-1)} = \frac{2(\sqrt{3}-1)}{3-1}$$

$$= \frac{2(\sqrt{3}-1)}{2} = \sqrt{3} - 1$$

.... $\sqrt{3} - 1$ [2]

9 **Without using a calculator**, work out $3\frac{2}{7} + \frac{4}{9}$.

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

$$3\frac{2}{7} = \frac{23}{7}$$

$$\frac{23}{7} + \frac{4}{9}$$

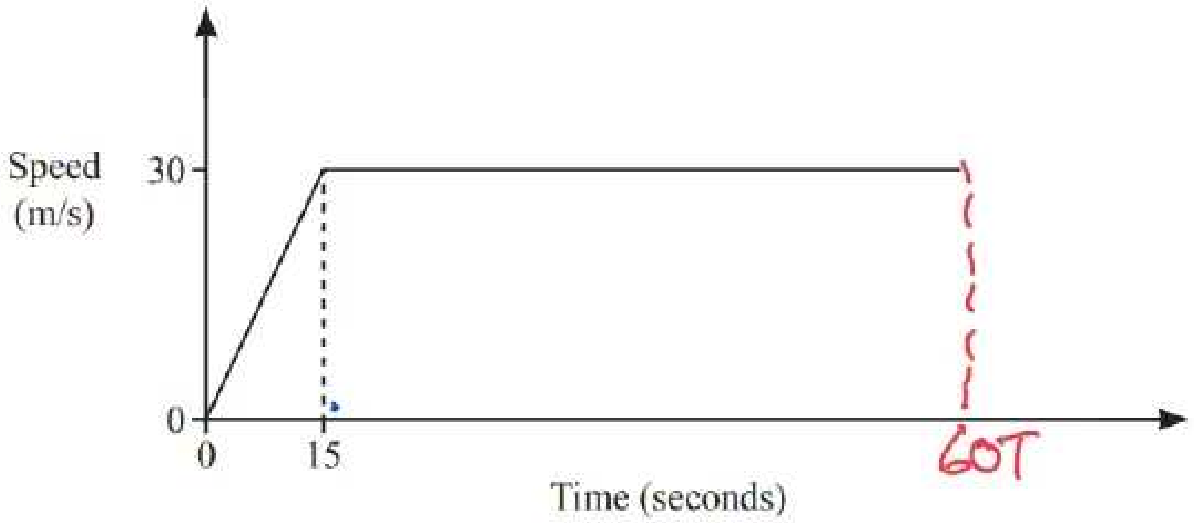
$$= \frac{23 \times 9}{63} + \frac{4 \times 7}{63}$$

$$= \frac{235}{63}$$

$$= 3\frac{46}{63}$$

.... $3\frac{46}{63}$ [3]

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



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.

$a = \frac{\Delta s}{\Delta t} = \frac{30}{15} = 2 m/s^2$

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

(b) After T **minutes**, the total distance travelled is ~~45~~ 35.775 **kilometres**.

60T seconds. 35775 m

Find the value of T.

Distance = area under the curve.

$35775 = \frac{1}{2}(30)(15) + 30(60T - 15)$

$35775 = 225 + 1800T - 450$

$1800T = 36000$

$T = 20$

$T =$ ....20......................... min [4]

11 The scale of a map is 1 : 2000.
The area of a road is 400m^2.
Calculate the area of the road on the map, giving your answer in cm^2.

Linear SF: 1 : 2000

Area SF: 1 : 2000^2 ⇒ 1 : 40 000 (÷100) ; x : 400 (÷100)

$x = \frac{1}{100} m^2 = 0.01 m^2$

$1 m^2 = 10\,000 cm^2$

$\therefore 0.01 m^2 = 100 cm^2$

..................................100 cm^2 [3]

12

(a) Dina invests \$2000 in an account that pays simple interest at a rate of r% per year.

At the end of 3 years, the account has earned \$300 in **interest**.

Calculate the value of r.

$\frac{Prt}{100} = 300$

$\frac{2000 \times r \times 3}{100} = 300$

$20 \times r \times 3 = 300$

$60r = 300$

$\therefore r = 5$

r = 5 .... [3]

(b)

(i) Hence, or otherwise, calculate the total value of her investment after 6 years.

At the end of 6 years, interest gained is:
2x \$300 = \$600.

∴ Total value = \$2000 + \$600
= \$2600

\$ 2600 .... [2]

(ii) Marcus invests \$2500 in a bank which pays simple interest at a rate of 2% per year.

At the end of 6 years, whose investment is most valuable? Give a compaison to justify your answer.

Marcus: $2500 + \frac{2500 \times 2 \times 6}{100} = 2500 + 300$
$= \$2800$.

Marcus' investment is most valuable. He has made \$2800, whereas Dina has made \$2600. .... [2]

13

A is the point $(5, -5)$ and B is the point $(9, 3)$.

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

$\left(\frac{5+9}{2}, \frac{-5+3}{2}\right)$

$\hookrightarrow \left(\frac{14}{2}, \frac{-2}{2}\right)$

$\hookrightarrow (7, -1)$

(.......7......., ...−1.......) [2]

(b) Find the length of AB.

Give your answer in exact form.

$\sqrt{(9-5)^2+(3--5)^2}$

$= \sqrt{4^2+8^2}$

$= \sqrt{16+64}$

$= \sqrt{80}$

$= 4\sqrt{5}$

.... $4\sqrt{5}$ [3]

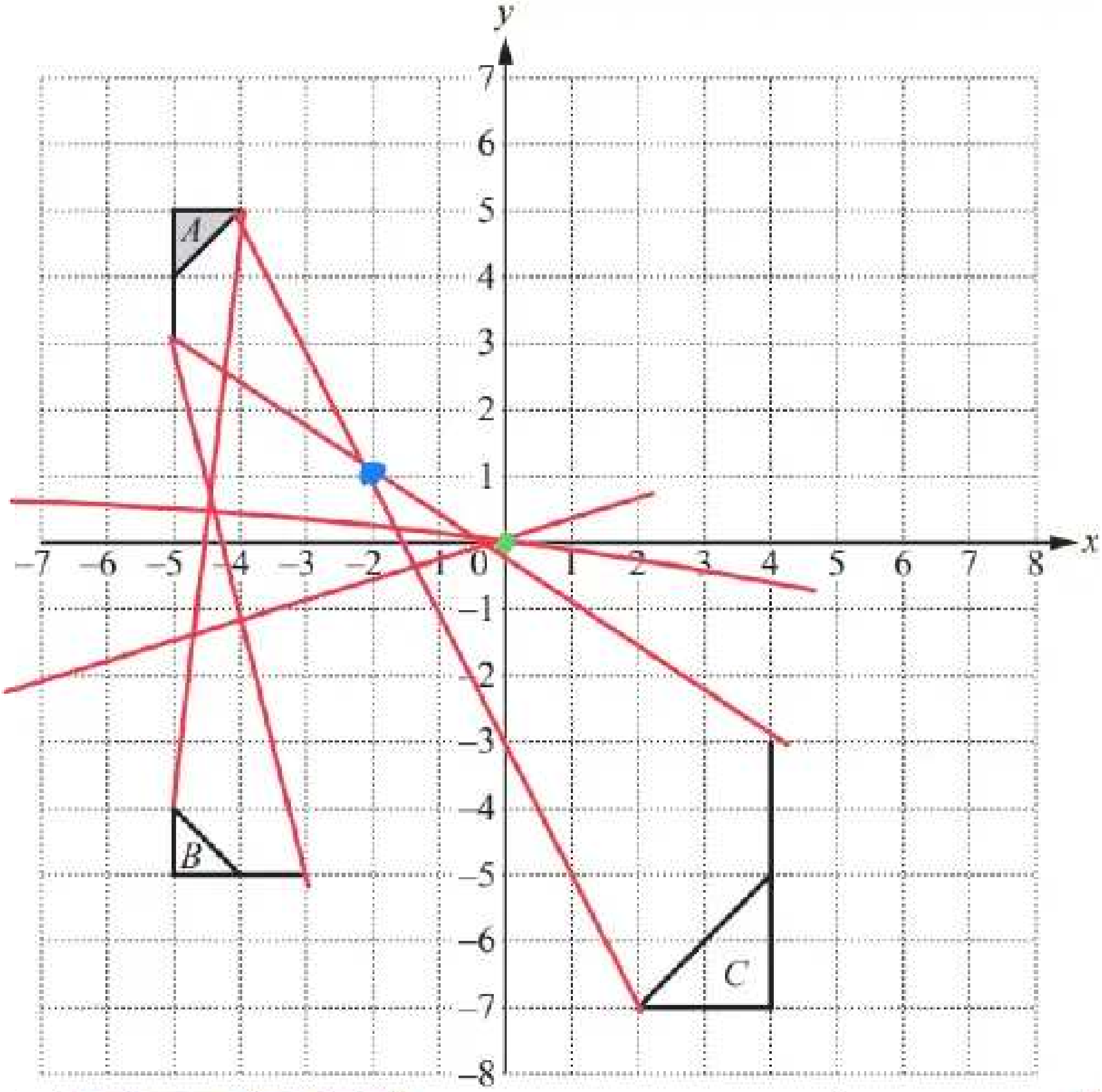
(c) Write down the gradient of a line that is perpendicular to the line AB

$m_{AB} = \frac{3--5}{9-5} = \frac{8}{4} = 2$

$\therefore m_{\perp} = -\frac{1}{2}$

.... $-\frac{1}{2}$ [2]

14



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

(i) Flag B onto Flag A,

Rotation, centre (0,0) ; 90° anticlockwise.

.... [3]

(ii) Flag A onto Flag C,

Enlargement, centre (−2,1) ;
scale factor −2. [3]

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

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

$\frac{x+4}{2x+3}$ .... [4]

16

(a) x is an integer.

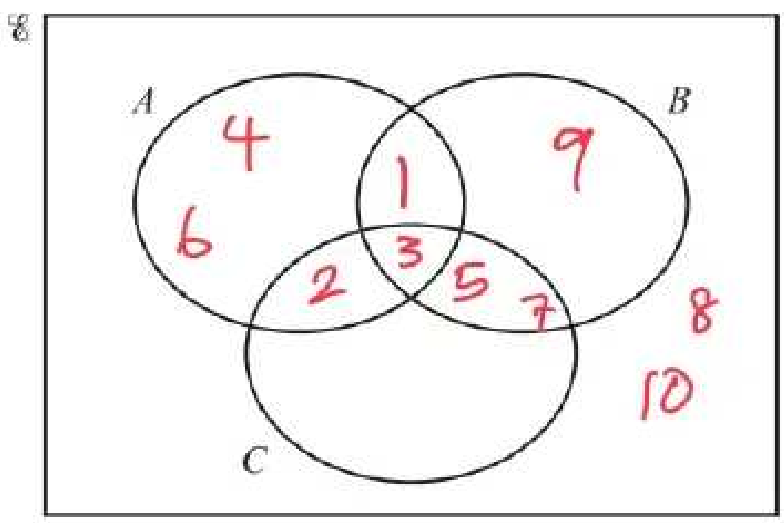
$\mathscr{E} = \{x: 1 \leqslant x \leqslant 10\}$

$A = \{x: x \text{ is a factor of } 12\}$

$B = \{x: x \text{ is an odd number}\}$

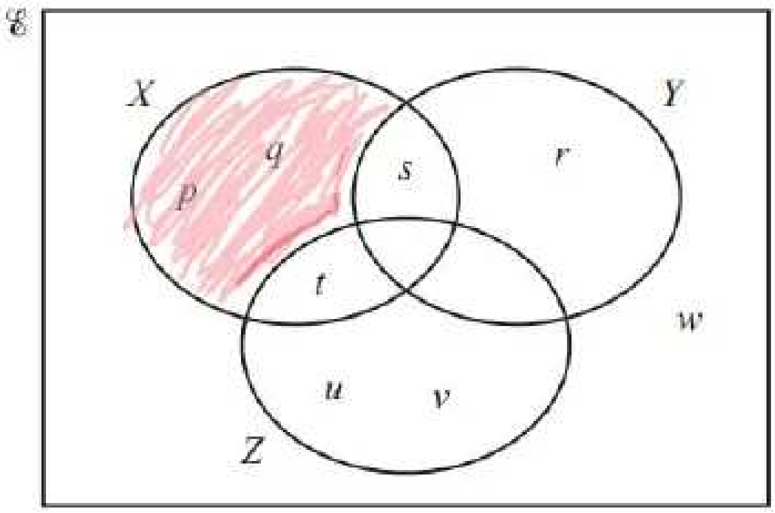
$C = \{x: x \text{ is a prime number}\}$

(i) Complete the Venn diagram to show this information.



[3]

(b)



(i) Use set notation to complete the statement.

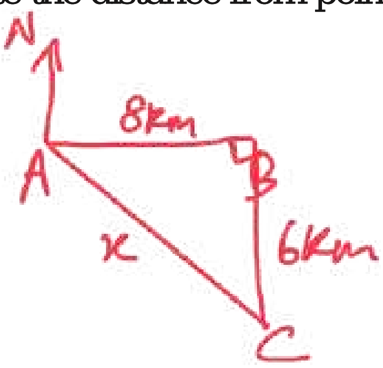
$\{u, v\}$ ......$\subset$...... Z [1]

(ii) Shade $X \cap (Z \cup Y)'$. [1]

$\subset$

17 A plane leaves airport A and flies 8 km on a bearing of 090° to reach point B. From point B, it changes direction and flies 6 km on a bearing of 180° to reach point C.

(a) Calculate the distance from point A to point C.



$x^2 = 8^2 + 6^2$

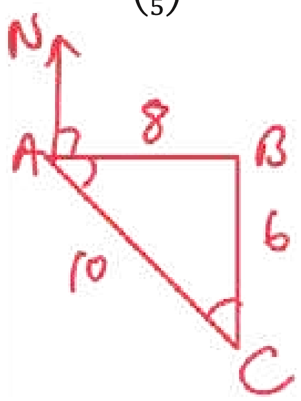
$x = \sqrt{8^2 + 6^2}$

$x = \sqrt{64 + 36} = \sqrt{100}$

$\therefore x = 10$ km

......10...... km [3]

(b) Given that $\sin^{-1}\left(\frac{4}{5}\right) = 53.1°$, determine the bearing of point C from point A.



$\sin BCA = \frac{8}{10} = \frac{4}{5}$

$\sin^{-1}\left(\frac{4}{5}\right) = 53.1° \Rightarrow \angle BCA = 53.1°$

$\angle BAC = 180 - 90 - 53.1° = 36.9°$.

$\therefore 090° + 36.9° = 126.9°$

......126.9°...... [3]

18 Find the nth term of each of the following sequences:

(a) 2, 5, 8, 11, 14, …

$+3 \; +3 \; +3 \ldots$

$3n - 1$.

0th term i.e, the term before the first.

$3n - 1$ .... [2]

(b) -2, 2, 8, 16, 26, …

$+4 \; +6 \; +8 \; +10$

$+2 \; +2 \; +2$

$\div 2 \to n^2 + bn + c$

n^2+bn+c	$-2, 2, 8, 16 \ldots$
$-\; n^2$	$1, 4, 9, 16, \ldots$
$bn+c$	$-3, -2, -1, 0$

$+1 \; +1 \; +1$

$\therefore bn + c = n - 4$

$\therefore n^2 + n - 4$

$n^2 + n - 4$ .... [3]

19 Calculate the area of a semicircle with diameter 10cm.

Give your answer in exact form.

$r = \frac{d}{2} = \frac{10}{2} = 5\text{cm}$

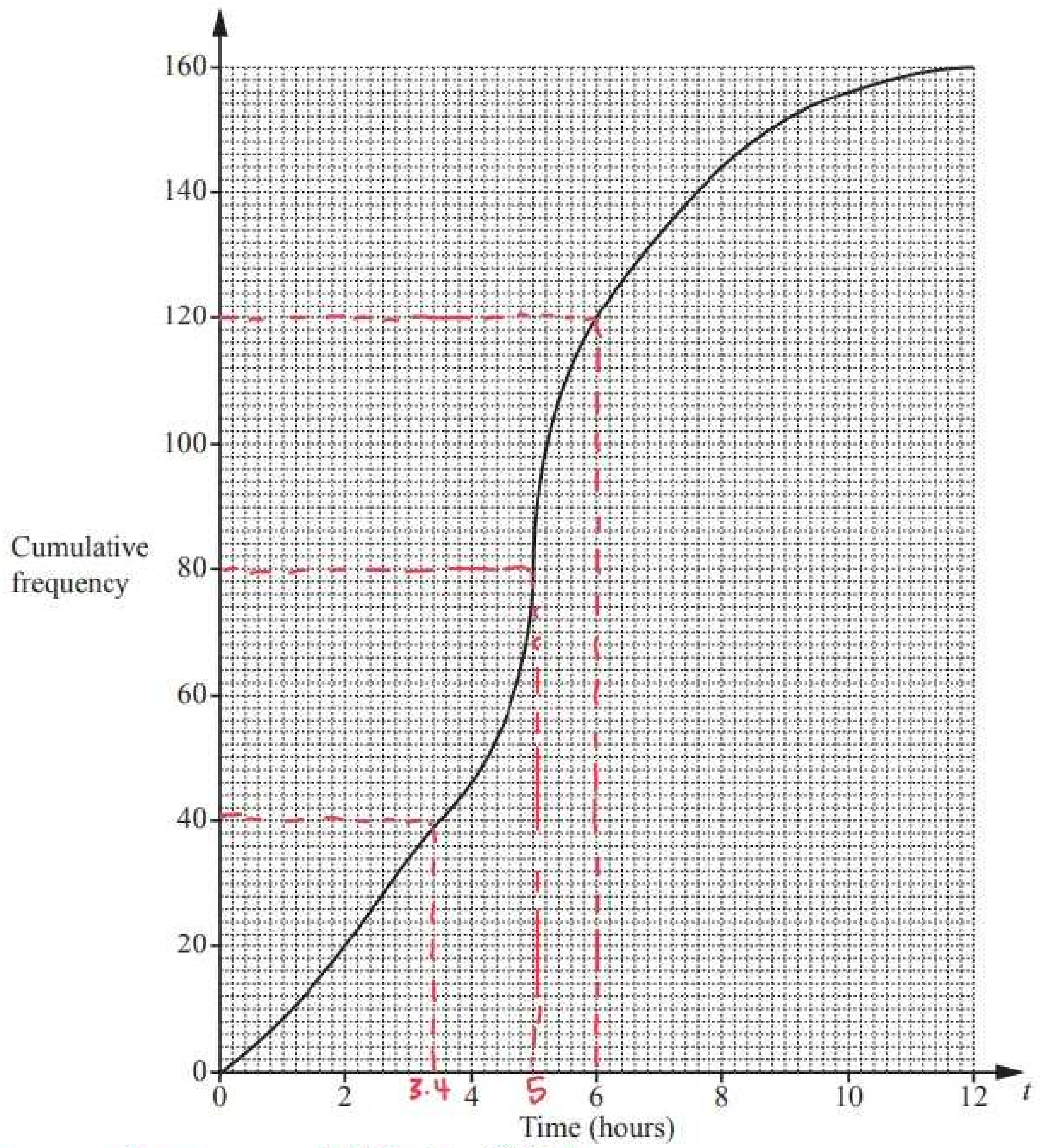
$A = \frac{\pi r^2}{2} = \frac{\pi (5)^2}{2}$

$= \frac{25\pi}{2} \text{cm}^2$

$\frac{25\pi}{2} \text{cm}^2$ .... [3]

20

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,

........................5..................hours [1]

(ii) the interquartile range,

IQR = UQ − LQ
= 6 − 3.4
= 2.6 hrs.

........................2.6..................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	26	74	24	12	4

[2]

21

(a) Write $x^2 - 8x + 12$ in the form $(x - a)^2 + b$.

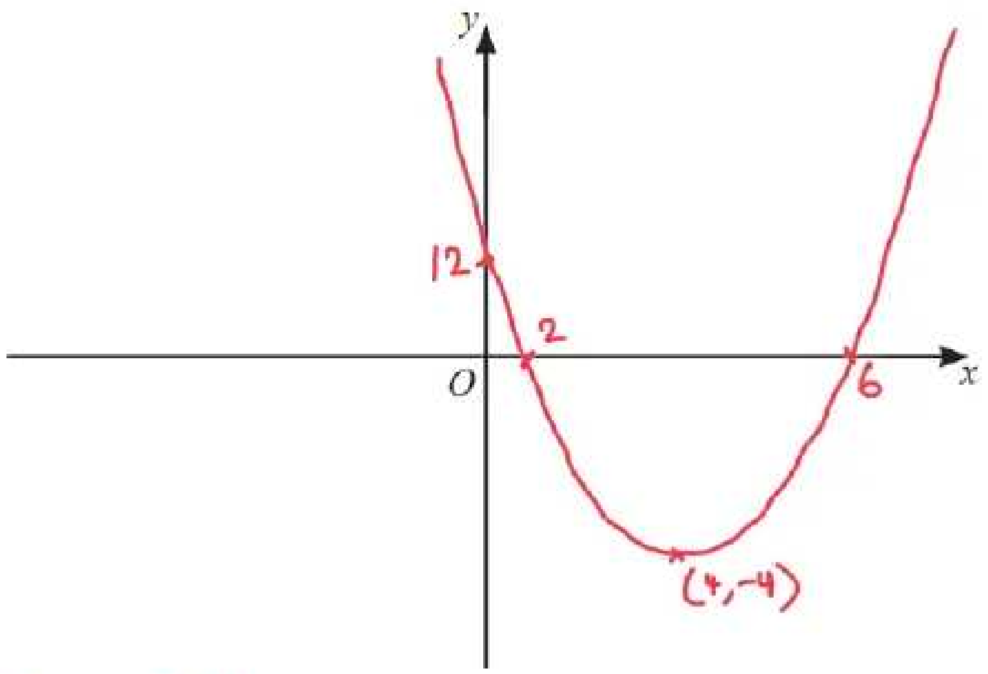
$(x-4)^2 - 16 + 12$
$= (x-4)^2 - 4$

$(x-4)^2 - 4$ .... [2]

(b) Hence, write down the coordinates of the turning point of the graph of $y = x^2 - 8x + 12$.

(......4...... , ...-4......) [1]

(c)



On the diagram, sketch the graph of $y = x^2 - 8x + 12$. [3]

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

$$2x^2 + 3y = -8$$
$$\frac{4}{3} + y = -2x \Rightarrow y = -2x - \frac{4}{3}$$

$2x^2 + 3(-2x - \frac{4}{3}) = -8$

$2x^2 - 6x - 4 = -8$

$2x^2 - 6x + 4 = 0$

$x^2 - 3x + 2 = 0$

$(x-2)(x-1) = 0$

$x = 2$, $x = 1$

$\hookrightarrow y = -2(2) - \frac{4}{3}$ $\quad$ $\hookrightarrow y = -2(1) - \frac{2}{3}$

$y = -\frac{16}{3}$ $\quad$ $y = -\frac{10}{3}$

$x =$ ....1.... , $y =$ ....$-\frac{10}{3}$....

$x =$ ....2.... , $y =$ ....$-\frac{16}{3}$.... [5]

23 $\mathbf{a} = \begin{pmatrix} 2 \\ -4 \end{pmatrix}$ $\quad$ $\mathbf{b} = \begin{pmatrix} 3 \\ 6 \end{pmatrix}$

Find

(a) 3**a**,

$\begin{pmatrix} 6 \\ -12 \end{pmatrix}$ [1]

(b) 2**b**,

$\begin{pmatrix} 6 \\ 12 \end{pmatrix}$ [1]

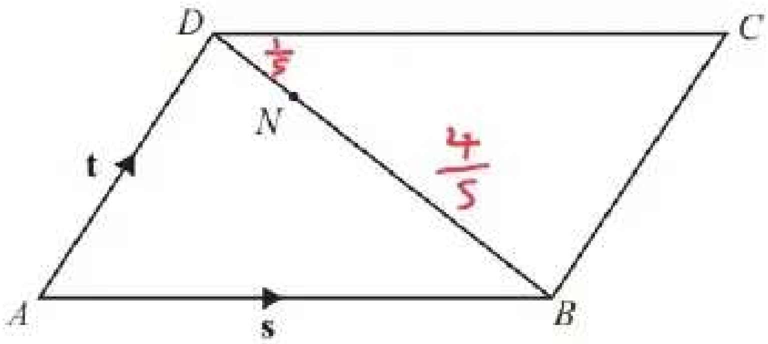
(c) 4**a** + **b**

$\begin{pmatrix} 8 \\ -16 \end{pmatrix} + \begin{pmatrix} 3 \\ 6 \end{pmatrix}$

$\hookrightarrow \begin{pmatrix} 11 \\ -10 \end{pmatrix}$

$\begin{pmatrix} 11 \\ -10 \end{pmatrix}$ [2]

24



$ABCD$ 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 **s** and **t**, an expression in its simplest form for

(a) $\overrightarrow{BD}$,

$\overrightarrow{BD} =$ $t - s$ [1]

(b) $\overrightarrow{CN}$.

$\overrightarrow{CN} = \overrightarrow{CB} + \frac{4}{5}\overrightarrow{BD}$

$= -t + \frac{4}{5}(t - s)$

$\therefore \overrightarrow{CN} = -t + \frac{4}{5}t - \frac{4}{5}s$

$= -\frac{1}{5}t - \frac{4}{5}s$

$\overrightarrow{CN} =$ $-\frac{1}{5}t - \frac{4}{5}s$ [3]

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Cambridge Assessment International Education

1

Cambridge IGCSE™

CANDIDATE NAME — **Ginger Mathematician Predicted Paper**

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

MATHEMATICS **0580/41**

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

2 hours

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

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

INFORMATION

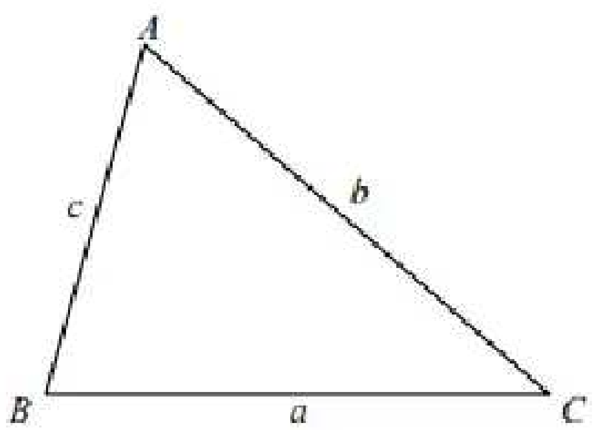
- The total mark for this paper is 100.
- The number of marks for each question or part question is shown in brackets [ ].
For extra guidance, use the All of iGCSE Maths Playlist

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 $a \neq 0$, $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

For the triangle shown,



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

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

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

1 Martin receives $800 from his grandmother.

(a) He decides to spend $150 and to divide the remaining $650 in the ratio savings:holiday = 9:4.
Calculate the amount of his savings.

$.. [2]

(b)

i He uses 80% of the $150 to buy some clothes.
Calculate the cost of the clothes.

$\frac{80}{100} \times 150 = 120$

$.. [2]

ii The money remaining from the $150 is 37.5% of the cost of a day trip to Athens. Calculate the cost of the trip.

$0.375 \times x = 30 \qquad x = 80$

$x = \frac{30}{0.375}$

$ 80 .... [2]

(c)

i Martin invests $400 of his savings for 2 years at 5% per annum compound interest.
Calculate the amount he has at the end of the 2 years.

$.. [2]

ii Martin's sister also invests $400, at r% per annum simple interest.
At the end of 2 years, she has exactly the same amount as Marcus.

Calculate the value of r.

r = ... [2]

2

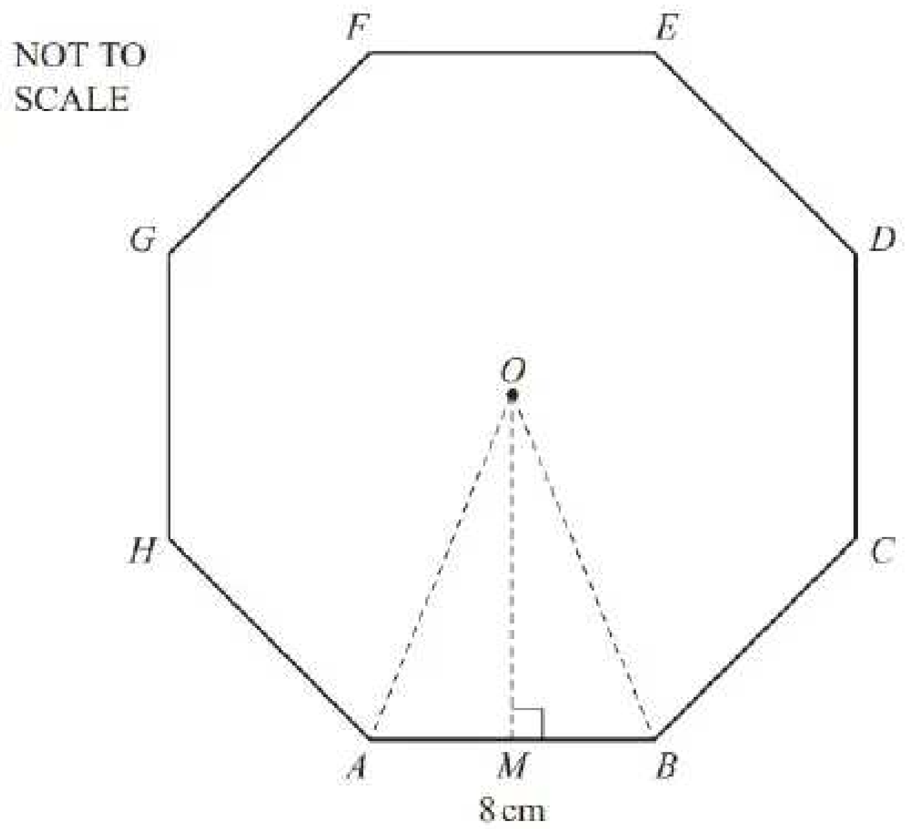
(a) Write down the name of a polygon with 8 sides.

.... [1]

(b) Find the size of the interior angle of a regular polygon with 8 sides.

.... [2]

(c) A regular 8-sided polygon, centre O, and side 8 cm, is shown below.
M is the mid-point of the side AB.



(i) Show that $OM = 9.66$ cm correct to 3 significant figures.

[3]

(ii) Calculate the area of the polygon.

....cm^2 [3]

(d) The polygon forms the cross-section of a box.
The box is a prism of height 12cm.

Calculate the volume of the box.

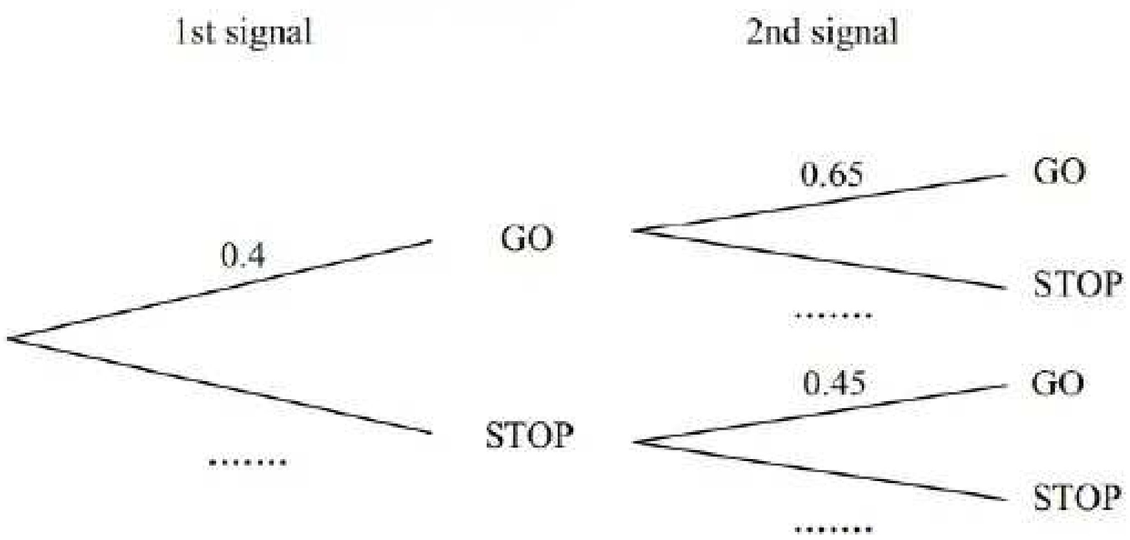
....cm^3 [1]

(e) The box contains 100 toffees in the shape of spheres, each with a radius of 2cm.
Calculate the percentage of the volume of the box **not** filled by the toffees.

....cm^3 [5]

3 There are 2 sets of road signals on the direct 12 kilometre route from Liverpool to Manchester. The signals say either "GO" or "STOP".

(a) Complete the tree diagram for a driver travelling along this route.



[3]

(b) Find the probability that a car driver

i finds both signals are "GO",

....[2]

ii finds exactly one of the signals is "GO",

....[3]

iii does not find two "STOP" signals

....[2]

(c) With no stops, Damon completes the 12km journey at an average speed of 40 kilometres per hour.

i find the time taken in minutes for this journey.

....mins [1]

ii When Damon has to stop at a signal, it adds 3 minutes to this journey time. Calculate his average speed, in kilometres per hour, if he stops at both road signals.

....kph [2]

(d) Elsa takes a different route from Liverpool to Manchester. This route is 15 kilometres and there are no road signals. Elsa's average speed for this journey is 40 kilometres per hour. Find

i the time taken in minutes for this journey,

(e)

....mins [1]

i the probability that Damon takes more time than this on his 12 kilometre journey.

.... [2]

4 $x = \sqrt{b^3 c}$

(a) Find the value of x when $b = 4$ and $c = 9$.

$x =$ .... [2]

(b) Rearrange the formula to write c in terms of x and b.

$c =$ .... [2]

5 Solve.

(a) $2(3 - 8x) = 54$

.... [2]

(b) $\frac{1}{y} = \frac{y+2}{3}$

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

6

200 students were asked how many hours they exercise each week.

The table shows the results.

Time (t hours)	$0 < t \leqslant 5$	$5 < t \leqslant 10$	$10 < t \leqslant 15$	$15 < t \leqslant 20$	$20 < t \leqslant 25$	$25 < t \leqslant 30$	$30 < t \leqslant 35$	$35 < t \leqslant 40$
Number of students	12	15	23	30	40	35	25	20

(a) Calculate an estimate of the mean.

.... h [4]

(b) Use the information in the table above to complete the cumulative frequency table.

Time (t hours)	$t \leqslant 5$	$t \leqslant 10$	$t \leqslant 15$	$t \leqslant 20$	$t \leqslant 25$	$t \leqslant 30$	$t \leqslant 35$	$t \leqslant 40$
Cumulative frequency	12	27	50	80	120			200

[1]

7 This question is about sequences.

(a) Find the 22nd term in the following sequence:

-2, 3, 8, 13, …

.... [3]

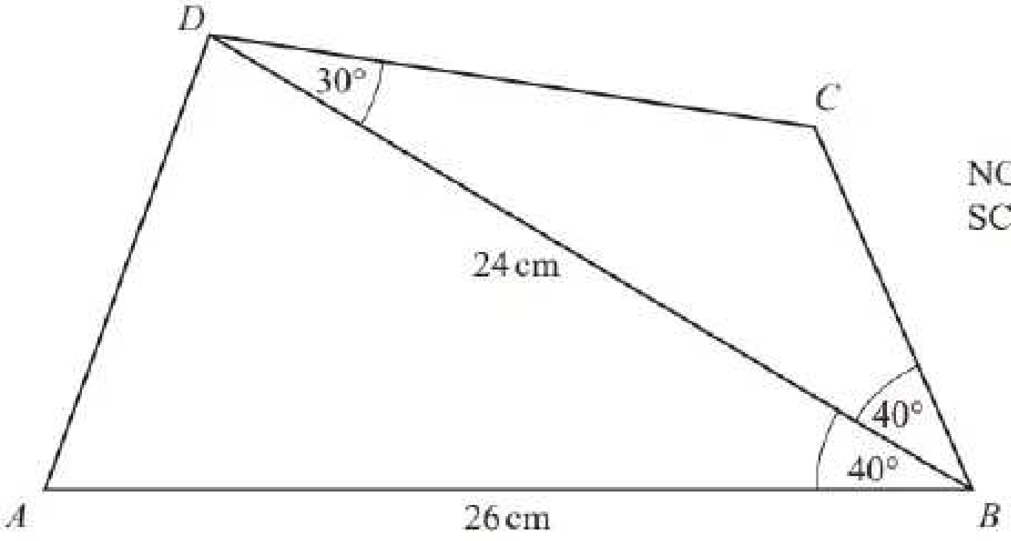
(b) T_n is defined by the terms:

0.5, 1, 2, 4, …

What is the smallest value of n for which T_n exceeds 875?

n =... [4]

8



ABCD is a quadrilateral and *BD* is a diagonal.
AB = 26 cm, *BD* = 24 cm, angle *ABD* = 40°, angle *CBD* = 40° and angle *CDB* = 30°.

(a) Calculate the area of triangle *ABD*.

.... cm^2 [2]

(b) Calculate the length of AD.

.... cm [4]

(c) Calculate the length of BC.

.... cm [4]

(d) Calculate the shortest distance from the point C to the line BD.

.... cm [2]

9 $f(x) = x^2 - 4x + 3$ and $g(x) = 2x - 3$

(a) Solve $f(x) = 0$

.... [2]

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

.... [2]

(c) Solve $f(x) = g(x)$, giving each of your answers correct to 2 decimal places.

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

(d) Find gf(-2x), simplifying your expression.

.... [4]

(e) Hence, or otherwise, find the value of gf(4)

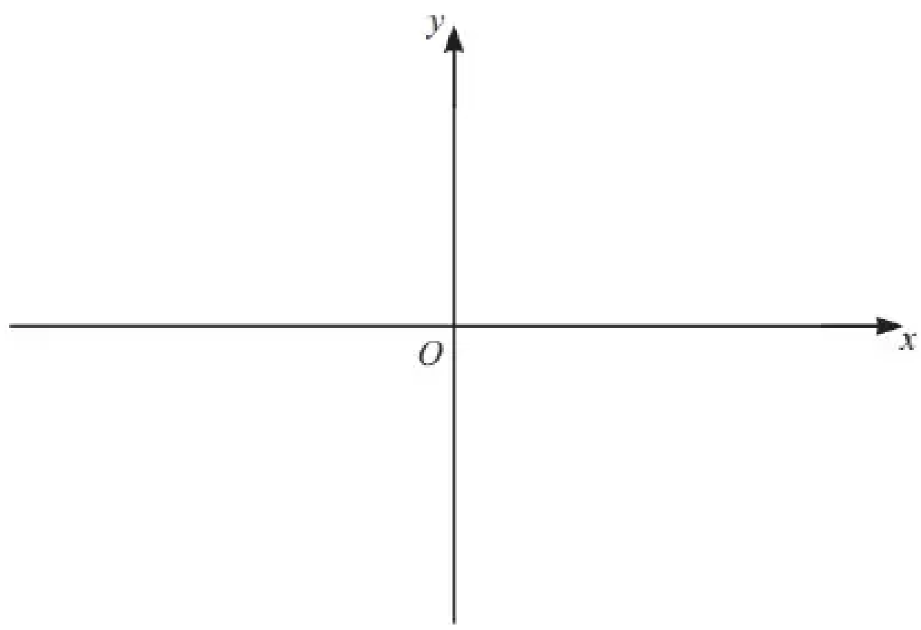
.... [2]

10

(a) Solve the equation $\sin x = 0.357$ for $0° \leq x \leq 360°$.

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

(b) Sketch the curve $y = x^3 - 4x$.



[3]

(c) A curve has equation $y = x^3 + px^2 + qx + r$

The stationary points of the curve occur when $x = 1$ and $x = -2$

Given that the curve passes through the point (0, 4), work out the values of p, q and r.

$p =$ ...., $q =$ ...., $r =$ .... [8]

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Cambridge Assessment International Education

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CANDIDATE NAME: **Ginger Mathematician Predicted Paper**

CENTRE NUMBER | SOLUTIONS | CANDIDATE NUMBER

MATHEMATICS **0580/41**

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

2 hours

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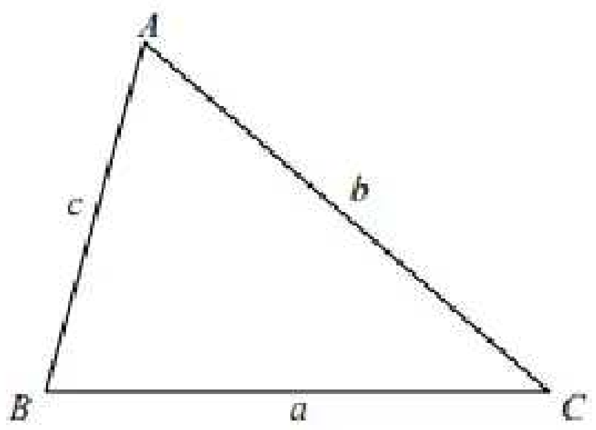
Volume, V, of sphere of radius r.	$V = \frac{4}{3}\pi r^3$

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

For the triangle shown,



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

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

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

1 Martin receives $800 from his grandmother.

(a) He decides to spend $150 and to divide the remaining $650 in the ratio savings:holiday = 9:4.
Calculate the amount of his savings.

$\frac{9}{9+4} \times \$650$
$= \frac{9}{13} \times 650$
$= \$450$

$..... 450. ..... [2]

(b)

i He uses 80% of the $150 to buy some clothes.
Calculate the cost of the clothes.

0.8×150
$= \$120$

$..... 120 ..... [2]

ii The money remaining from the $150 is 37.5% of the cost of a day trip to Athens. Calculate the cost of the trip.

$\$150 - \$120 = \$30.$
$0.375x = 30$
$\therefore x = \frac{30}{0.375} = \$80$

$..... 80 ..... [2]

(c)

i Martin invests $400 of his savings for 2 years at 5% per annum compound interest.
Calculate the amount he has at the end of the 2 years.

$400\left(1 + \frac{5}{100}\right)^2$
$= \$441$

$..... 441 ..... [2]

ii Martin's sister also invests $400, at r% per annum simple interest.
At the end of 2 years, she has exactly the same amount as Marcus.

Calculate the value of r.

$400 + \frac{400 \times r \times 2}{100} = 441$
$\frac{800r}{100} = 41$
$8r = 41$
$\therefore r = 5.125$

r = ... 5.125 ..... [2]

2

(a) Write down the name of a polygon with 8 sides.

Octagon .... [1]

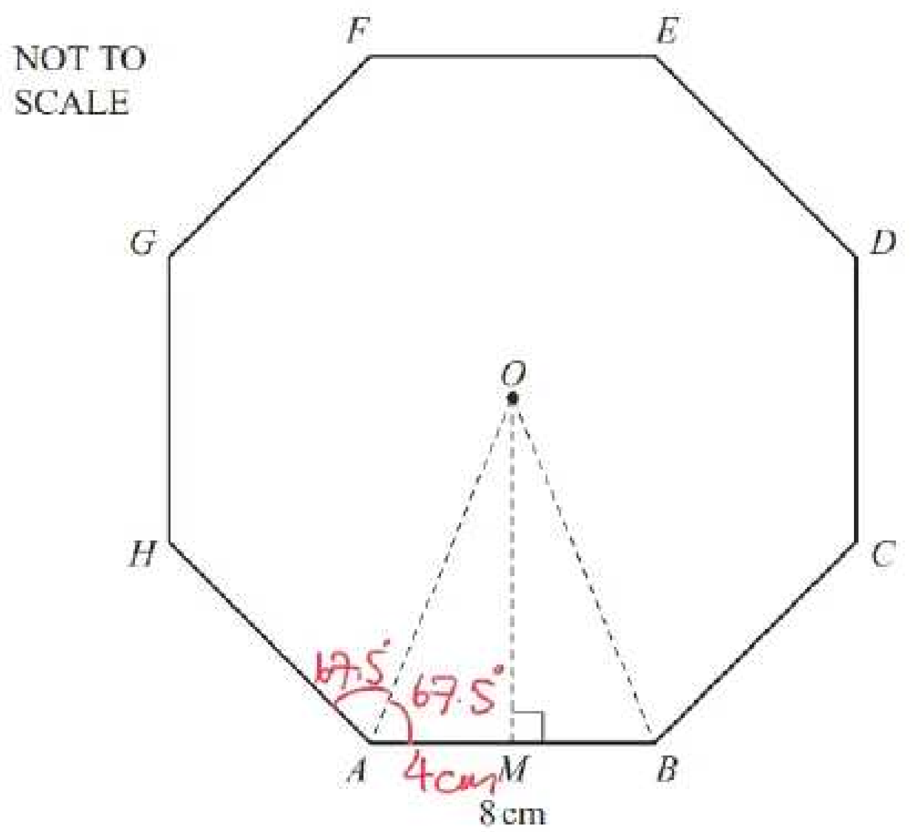
(b) Find the size of the interior angle of a regular polygon with 8 sides.

$\frac{180(n-2)}{n} = \frac{180(8-2)}{8}$

$= 135°$

135 .... [2]

(c) A regular 8-sided polygon, centre O, and side 8 cm, is shown below.
M is the mid-point of the side AB.



(i) Show that $OM = 9.66$ cm correct to 3 significant figures.

$\tan 67.5 = \frac{OM}{4}$

$OM = 4\tan 67.5$

$\therefore OM = 9.656...$

$= 9.66$ cm (3 s.f.)

[3]

(ii) Calculate the area of the polygon.

Area of $\triangle AOB$.

$8 \times \left[\frac{1}{2} \times 8 \times 9.66\right]$

$= 309.01\ldots$

$= 309\ cm^2$ (3 s.f.)

.......................309.......................cm^2 [3]

(d) The polygon forms the cross-section of a box.
The box is a prism of height 12cm.

Calculate the volume of the box.

$309 \times 12 = 3708$

$= 3710\ cm^3$ (3 s.f.)

.......................3710.......................cm^3 [1]

(e) The box contains 100 toffees in the shape of spheres, each with a radius of 2cm.
Calculate the percentage of the volume of the box **not** filled by the toffees.

$100 \times \left[\frac{4}{3}\pi \times (2)^3\right]$

$= \frac{3200}{3}\pi$

$V_{not\ filled} = 3710 - \frac{3200\pi}{3}$

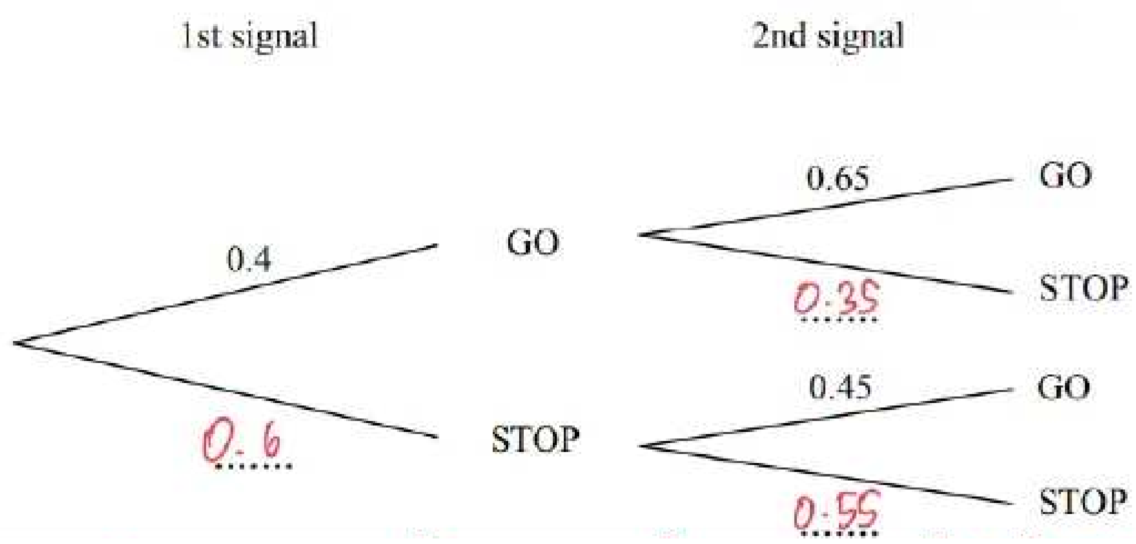
$\% = \frac{3710 - \frac{3200\pi}{3}}{3710} \times 100$

$= 9.68\%$ (3 s.f.)

.......................9.68.......................% [5]

3 There are 2 sets of road signals on the direct 12 kilometre route from Liverpool to Manchester. The signals say either "GO" or "STOP".

(a) Complete the tree diagram for a driver travelling along this route.



[3]

(b) Find the probability that a car driver

i finds both signals are "GO",

$0.4 \times 0.65 = 0.26$

.......................0.26.......[2]

ii finds exactly one of the signals is "GO",

$(0.4 \times 0.35) + (0.6 \times 0.45)$
$= 0.4$

.......................0.41.......[3]

iii does not find two "STOP" signals

$1 - (0.6 \times 0.55)$
$= 0.67$

.......................0.67.......[2]

(c) With no stops, Damon completes the 12km journey at an average speed of 40 kilometres per hour.

i find the time taken in minutes for this journey.

$\frac{12}{40} \times 60 = 18$ mins

..........18..........mins [1]

ii When Damon has to stop at a signal, it adds 3 minutes to this journey time. Calculate his average speed, in kilometres per hour, if he stops at both road signals.

$t = 18 + (2 \times 3) = 24$ mins.

$= \frac{24}{60}$ hrs $= 0.4$ hrs.

$s = \frac{12}{0.4} = 30$ Km/h

..........30..........kph [2]

(d) Elsa takes a different route from Liverpool to Manchester. This route is 15 kilometres and there are no road signals. Elsa's average speed for this journey is 40 kilometres per hour. Find

i the time taken in minutes for this journey,

(e)

$\frac{15}{40} \times 60 = 22.5$ mins

..........22.5..........mins [1]

i the probability that Damon takes more time than this on his 12 kilometre journey.

Damon would take more time if he found 2 'stop' signals.

$\therefore P = 0.6 \times 0.55$

$= 0.33$

..........0.33.......... [2]

4 $x = \sqrt{b^3 c}$

(a) Find the value of x when $b = 4$ and $c = 9$.

$x = \sqrt{(4)^3 \times 9} = \sqrt{64 \times 9}$

$= 24$

$x =$ ....24.......... [2]

(b) Rearrange the formula to write c in terms of x and b.

$x^2 = b^3 c$

$\therefore c = \frac{x^2}{b^3}$

$c =$ ....$\frac{x^2}{b^3}$.......... [2]

5 Solve

(a) $2(3-8x)=54$

$6-16x=54$

$16x=-48$

$\therefore x=-3$

$x = -3$ [2]

(b) $\frac{1}{y}=\frac{y+2}{3}$ (cross-multiply)

$3=y(y+2)$

$y^2+2y-3=0$

$(y+3)(y-1)=0$

$y=-3$ or $y=1$

$y =$ −3 or $y =$ 1 [3]

6

$\Sigma f = 200$

200 students were asked how many hours they exercise each week.

The table shows the results.

Midpoint (x)	2.5	7.5	12.5	17.5	22.5	27.5	32.5	37.5
Time (t hours)	$0<t\leqslant 5$	$5<t\leqslant 10$	$10<t\leqslant 15$	$15<t\leqslant 20$	$20<t\leqslant 25$	$25<t\leqslant 30$	$30<t\leqslant 35$	$35<t\leqslant 40$
Number of students (f)	12	15	23	30	40	35	25	20

(a) Calculate an estimate of the mean.

$$\frac{\Sigma fx}{\Sigma f} = \frac{(12\times 2.5)+(15\times 7.5)+(23\times 12.5)+(30\times 17.5)+(40\times 22.5)+(35\times 27.5)+(25\times 32.5)+(20\times 37.5)}{200}$$

$$= \frac{4380}{200} = 21.9$$

21.9 h [4]

(b) Use the information in the table above to complete the cumulative frequency table.

Time (t hours)	$t \leqslant 5$	$t \leqslant 10$	$t \leqslant 15$	$t \leqslant 20$	$t \leqslant 25$	$t \leqslant 30$	$t \leqslant 35$	$t \leqslant 40$
Cumulative frequency	12	27	50	80	120	155	180	200

+15 +23 +30 +40 +35 +25 +20

[1]

7 This question is about sequences.

(a) Find the 22nd term in the following sequence:

0th term

-7, -2, 3, 8, 13, …

+5 +5 +5 +5

$V_n = 5n - 7$

$V_{22} = 5(22) - 7$

$= 103$

....103 [3]

(b) T_n is defined by the terms:

0.5, 1, 2, 4, … geometric progression

×2 ×2 ×2

What is the smallest value of n for which T_n exceeds 875?

$ar^{n-1} \rightarrow 0.5 \times 2^{n-1}$

$0.5 \times 2^{n-1} > 875$

$2^{n-1} > 1750$

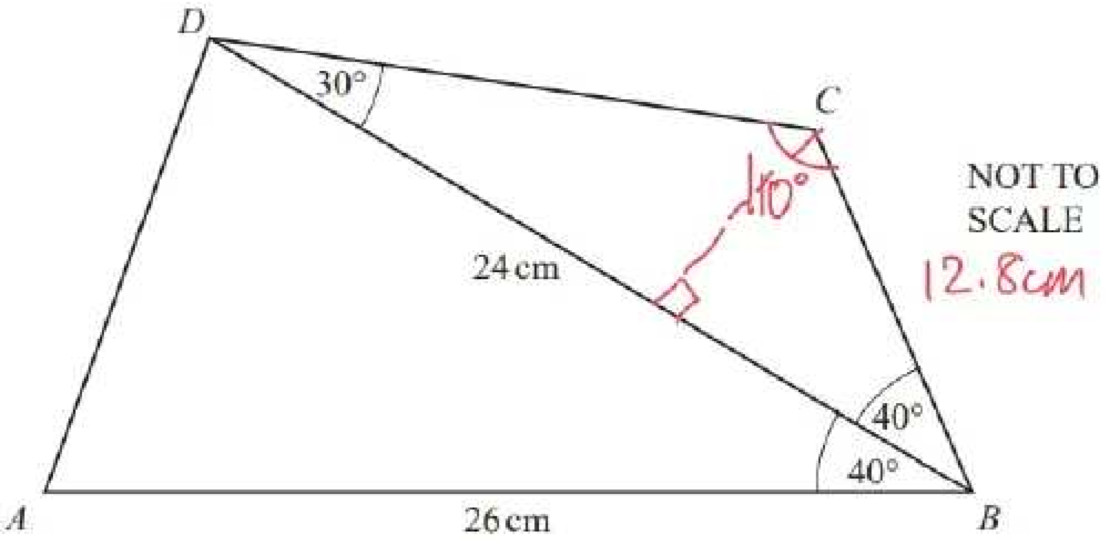
$2^{10} = 1024, \quad 2^{11} = 2048$

$\therefore n - 1 = 11$

$\Rightarrow n = 12$

n = ...12 [4]

8



ABCD is a quadrilateral and *BD* is a diagonal.
$AB = 26$ cm, $BD = 24$ cm, angle $ABD = 40°$, angle $CBD = 40°$ and angle $CDB = 30°$.

(a) Calculate the area of triangle *ABD*.

$\frac{1}{2} \times 26 \times 24 \times \sin 40$

$= 201\ cm^2$ (3 s.f.)

..........................201.......... cm^2 [2]

(b) Calculate the length of AD.

$AD^2 = 24^2 + 26^2 - 2(24)(26)\cos 40$

$AD = \sqrt{24^2 + 26^2 - 2(24)(26)\cos 40}$

$= 17.2$ cm (3s.f.)

17.2 cm [4]

(c) Calculate the length of BC.

$\frac{BC}{\sin 30} = \frac{24}{\sin 110}$

$BC = \frac{24 \sin 30}{\sin 110} = 12.8$ cm

12.8 cm [4]

(d) Calculate the shortest distance from the point C to the line BD. → perpendicular

$\sin 40 = \frac{x}{12.8}$

$x = 12.8 \times \sin 40 = 8.21$

8.21 cm [2]

9 $f(x) = x^2 - 4x + 3$ and $g(x) = 2x - 3$

(a) Solve $f(x) = 0$

$x^2 - 4x + 3 = 0$

$(x-3)(x-1) = 0$

$x = 3$ or $x = 1$

$x = 3$ or $x = 1$ [2]

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

Let $y = 2x - 3$

$x = 2y - 3$

$x + 3 = 2y$

$y = \frac{x+3}{2}$ ↗ $\therefore g^{-1}(x) = \frac{x+3}{2}$

$\frac{x+3}{2}$ [2]

(c) Solve $f(x) = g(x)$, giving each of your answers correct to 2 decimal places.

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

$x^2 - 6x + 6 = 0$

$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(6)}}{2(1)}$ ↗ $x = 4.732\ldots$ or $x = 1.267\ldots$

$x =$ 4.73 or $x =$ 1.27 [3]

(d) Find gf(-2x), simplifying your expression.

$g(f(-2x))$

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

$= 4x^2 + 8x + 3$

$\therefore g(4x^2 + 8x + 3)$

$= 2(4x^2 + 8x + 3) - 3$

$= 8x^2 + 16x + 6 - 3 =$

$8x^2 + 16x + 3$ .... [4]

(e) Hence, or otherwise, find the value of gf(4)

$-2x = 4 \Rightarrow x = -2$

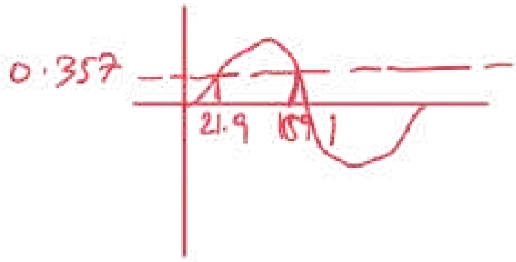
$8(-2)^2 + 16(-2) + 3$

$\therefore gf(4) = 3$

3 .... [2]

10

(a) Solve the equation $\sin x = 0.357$ for $0° \leq x \leq 360°$.



$x = \sin^{-1}(0.357)$

$x = 20.9$

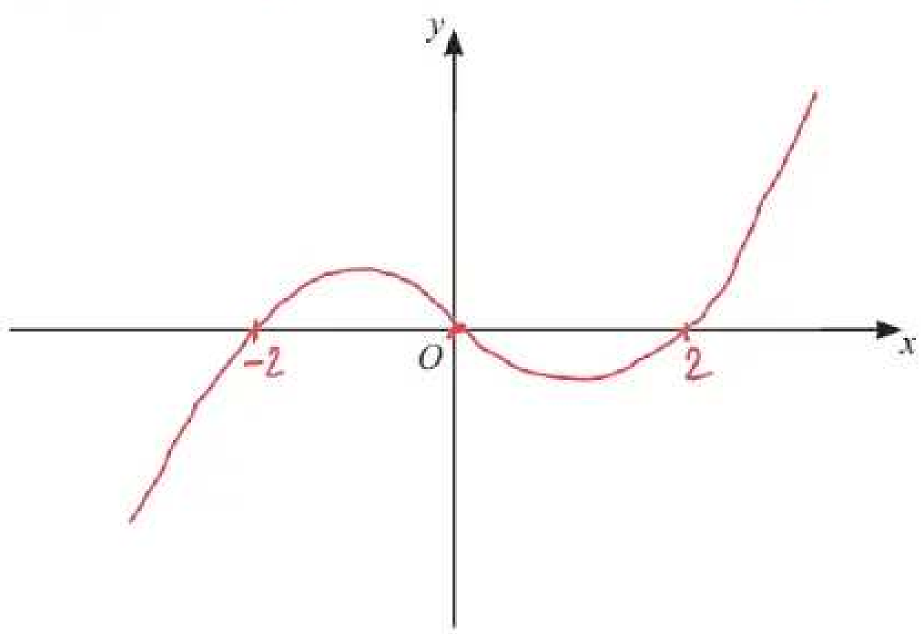
$180 - 20.9$

$= 159.1$

$x =$ 20.9 .... or $x =$ 159.1 .... [2]

(b) Sketch the curve $y = x^3 - 4x$.

$y = x(x^2 - 4) = x(x+2)(x-2)$



coefficient of x^3 is +ve

→ positive cubic

y intercept

when $x = 0$, $y = 0$

when $y = 0$,

$x = 0$ or $x = 2$ or $x = -2$

x intercepts

[3]

(c) A curve has equation $y = x^3 + px^2 + qx + r$

The stationary points of the curve occur when $x = 1$ and $x = -2$

Given that the curve passes through the point (0, 4), work out the values of p, q and r.

occur when $\frac{dy}{dx} = 0$

$\frac{dy}{dx} = 3x^2 + 2px + q$

$3(1)^2 + 2p(1) + q = 0 \Rightarrow 2p + q = -3 \quad \ldots (1)$

$3(-2)^2 + 2p(-2) + q = 0 \Rightarrow -4p + q = -12 \quad \ldots (2)$

(1) − (2) $6p = 9$

$\therefore p = \frac{3}{2}$

Substituting $p = \frac{3}{2}$ into (1),

$2\left(\frac{3}{2}\right) + q = -3$

$3 + q = -3$

$\hookrightarrow q = -6.$

$y = x^3 + \frac{3}{2}x^2 - 6x + r$

$4 = (0)^3 + \frac{3}{2}(0)^2 - 6(0) + r$

$\therefore 4 = r$

$\therefore y = x^3 + \frac{3}{2}x^2 - 6x + 4$

$p =$ $\frac{3}{2}$ ...., $q =$ -6 ...., $r =$ 4 .... [8]

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