Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS **0580/21**

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

1 hour 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

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

INFORMATION

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

This document has **12** pages.

DC (DE/SG) 336460/3

[Turn over

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

Work out the time the concert finishes.

..... [1]

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

..... [1]

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

$\frac{2}{7}$ 0.2861

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

1^3 ..... 4^0

[2]

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

Calculate the length of the longer part.

..... m [2]

5 Work out.

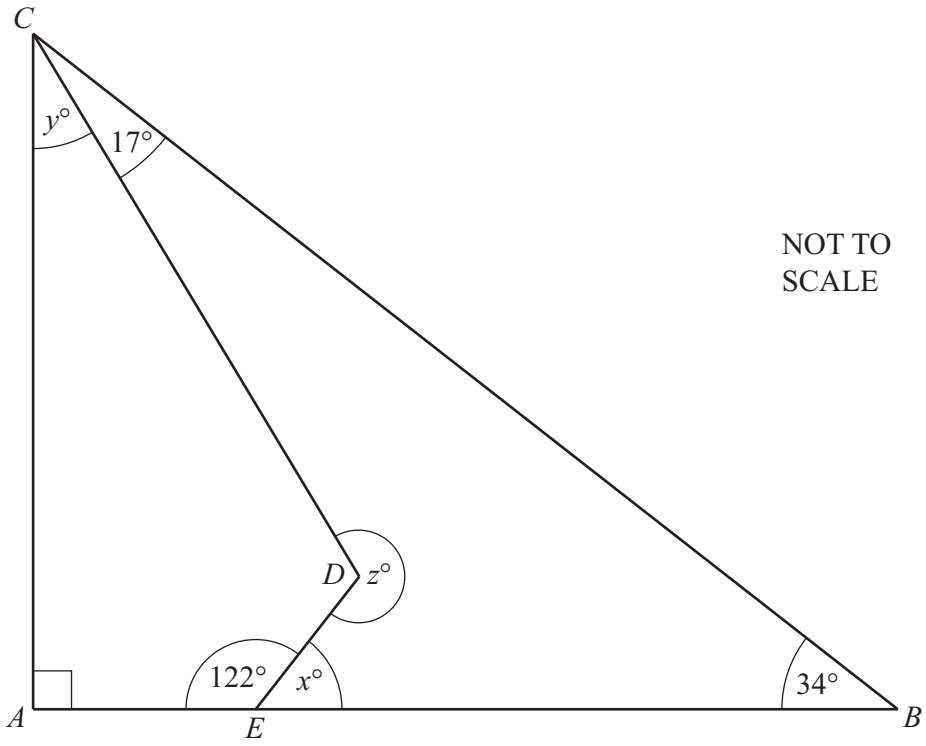
(a) $3\begin{pmatrix} 6 \\ -4 \end{pmatrix}$

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

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

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

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



Find the value of

(a) x

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

(b) y

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

(c) z.

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

7 Factorise.

$28x - 35$

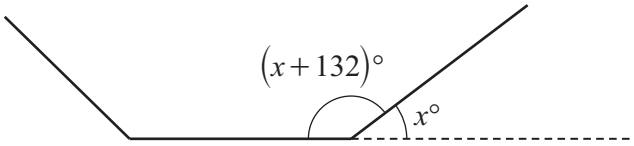
..... [1]

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

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

$ ..... [2]

9



NOT TO SCALE

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

Calculate the number of sides of this polygon.

..... [3]

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

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

Work out the probability that she loses the game.

..... [2]

(b) Jacinda plays the game 150 times.

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

..... [1]

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

..... [3]

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

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

$x =$ .....

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

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

Find the second term in this sequence.

..... [1]

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

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

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

[4]

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

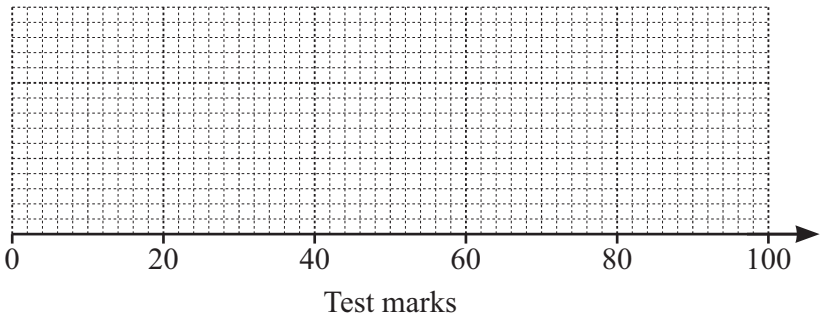
Calculate the volume of the smaller statue.
[Density = mass ÷ volume.]

..... cm^3 [4]

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

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

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



[3]

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

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

1. .....

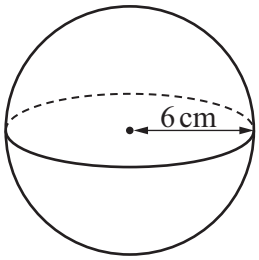
.....

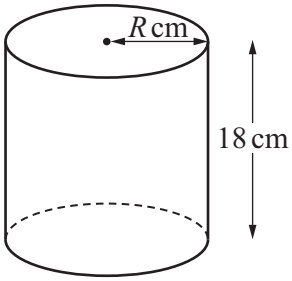
2. .....

.....

[2]

16





NOT TO SCALE

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

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

..... cm^2 [4]

17 Solve.

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

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

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

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

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

..... [1]

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

..... [2]

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

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

{ ..... } [1]

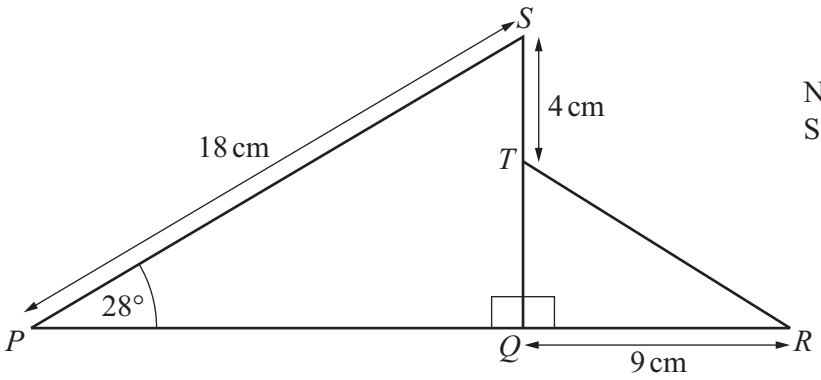
(b) **(i)** Find $Q \cup R$.

{ ..... } [1]

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

..... [1]

20



NOT TO SCALE

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

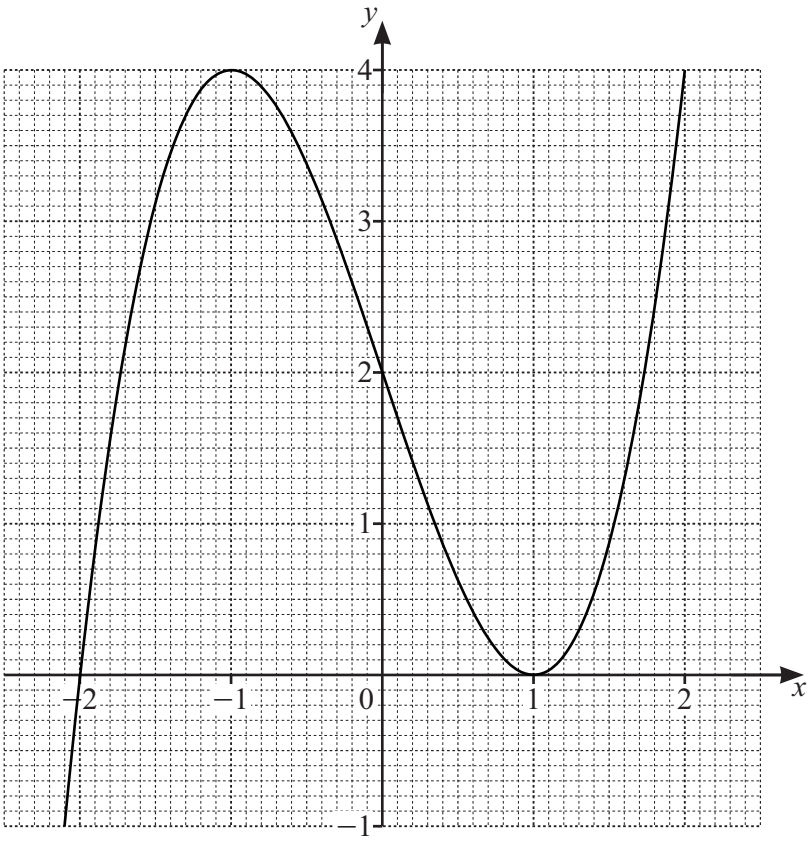
Calculate angle QTR.

Angle QTR = ... [5]

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

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

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



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

[2]

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

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

Question 23 is printed on the next page.

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

Find the value of p and the value of k.

$p =$ .....

$k =$ .....

[2]

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MATHEMATICS **0580/21**

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

MARK SCHEME

Maximum Mark: 70

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

[Turn over

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Mathematics-Specific Marking Principles

1 Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.

2 Unless specified in the question, non-integer answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.

3 Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.

4 Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).

5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.

6 Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations
cao – correct answer only
dep – dependent
FT – follow through after error
isw – ignore subsequent working
oe – or equivalent
SC – Special Case
nfww – not from wrong working
soi – seen or implied

Question	Answer	Marks	Partial Marks
1	22 32 or 10 32 pm	**1**	
2	$\frac{4}{5}$ or 0.8	**1**	
3	< = =	**2**	**B1** for two correct
4	3.2	**2**	**M1** for $\frac{5.6}{3+4}[\times k]$ where k = 1, 3 or 4
5(a)	$\begin{pmatrix}18\\-12\end{pmatrix}$	**1**	
5(b)	$\begin{pmatrix}-3\\4\end{pmatrix}$	**1**	
6(a)	58	**1**	
6(b)	39	**1**	
6(c)	251	**1**	
7	$7(4x – 5)$ final answer	**1**	
8	234	**2**	**M1** for $\frac{3000 \times 2.6[\times 3]}{100}$
9	15	**3**	**B2** for [x =] 24 OR **M1** for $x + x + 132 = 180$ oe soi **M1** for $\frac{360}{\textit{their } x}$ oe provided this gives an integer answer
10(a)	0.24 oe	**2**	**M1** for 1 – 0.28 oe
10(b)	42	**1**	

Question	Answer	Marks	Partial Marks
11	$\frac{16}{3}$ or $\frac{25}{7}$ | $2\frac{1}{3}-\frac{4}{7}$	**B1**	Correct step for dealing with mixed numbers Allow $\frac{16k}{3k}$ or $\frac{25k}{7k}$
	$\frac{112}{21}$ and $\frac{75}{21}$ | $[2]\frac{7}{21}$ and $\frac{12}{21}$	**M1**	Correct method to find common denominator e.g. $5\frac{7}{21}$ and $3\frac{12}{21}$
	$1\frac{16}{21}$ cao	**A1**	
12	Correctly eliminating one variable	**M1**	
	$x = -3$	**A1**	If A0 scored **SC1** for 2 values satisfying one of the original equations.
	$y = 4$	**A1**	
13(a)	11	**1**	
13(b)	$4n$ –10 oe final answer and $2n^3 + 1$ oe final answer	**4**	**B2** for $4n - 10$ oe final answer or **B1** for $4n + j$ or $kn - 10$ ($k \neq 0$) or $4n - 10$ seen then spoilt **B2** for $2n^3 + 1$ oe final answer or **B1** for any cubic expression in n or 3rd difference = 12 or for correct answer seen then spoilt
14	160	**4**	**M3** for $V \div \frac{2500}{8} = \frac{12^3}{15^3}$ oe or for answer figs 16 from $\frac{figs25}{8} \times \frac{12^3}{15^3}$ or **B2** for 1.28 [kg] OR **M1** for 2500 ÷ 8 oe or 312.5 seen **M1** for $\left(\frac{12}{15}\right)^3$ or $\left(\frac{15}{12}\right)^3$ oe
15(a)	Correct box-and-whisker plot L = 15 LQ = 38 Median = 53 UQ = 66 H = 96	**3**	**B1** for UQ = 66 or Lowest = 15 soi **M1** for at least 3 values correct within box and whisker plot

Question	Answer	Marks	Partial Marks
15(b)	Class Q scored fewer marks on average [as median is lower] oe Class Q have a larger spread of marks [as IQR is higher] oe	**2**	**B1** for each
16	144π cao	**4**	**M2** for [R^2 =] $\dfrac{\frac{4}{3}\times\pi\times6^3}{18\times\pi}$ oe or **M1** for $\frac{4}{3}\times\pi\times6^3=\pi\times R^2\times18$ oe **M1** for $2\times\pi\times theirR\times18$ oe
17	$\dfrac{[--]7\pm\sqrt{([-]7)^2-4(3)(-16)}}{2\times3}$ oe	**B2**	**B1** for $\sqrt{([-]7)^2-4(3)(-16))}$ or better and if in the form $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$ then **B1** for p = – (–7) and r = 2(3)
	3.75 and –1.42	**B2**	**B1** for each or **SC1** for answers 3.8 or 3.754… **and** –1.4 or –1.42… or –1.421 or 3.75 and –1.42 seen in working or –3.75 and 1.42 as final answers
18(a)	–3	**1**	
18(b)	–5	**2**	**M1** for $\frac{1}{4^2}$ or 4^{-2}
19(a)	9	**1**	
19(b)(i)	1, 3, 4, 6, 9	**1**	
19(b)(ii)	2	**1**	**FT** 5 – numbers of odds in **(b)(i)**
20	63.7 or 63.68 to 63.69	**5**	**M4** for tan [QTR] = $\dfrac{9}{18\sin28-4}$ oe OR **M3** for 18sin28 – 4 or **M2** for 18sin28 or **M1** for $\frac{QS}{18}=\sin28$ oe and **M1** for tan [QTR] = $\dfrac{9}{theirQT}$ oe

Question	Answer	Marks	Partial Marks
21	126.9 and 306.9	**3**	**B2** for one correct answer or **M1** for tan $x = -\frac{4}{3}$ oe If M1 or 0 scored, **SC1** for two angles with a difference of 180
22(a)	$x^2 - x - x + 1$ or $x^2 + 2x - x - 2$	**M1**	
	A correct unsimplified expansion e.g. $x^3 + 2x^2 - x^2 - 2x - x^2 - 2x + x + 2$ oe leading to $[y =] x^3 - 3x + 2$	**A1**	
22(b)	$y = 2 - 0.5x$ ruled	**B2**	**B1** for $[y =] 2 - 0.5x$ soi or for $y = 2 - kx$ drawn or for $y = k - 0.5x$ drawn
	–1.5 to –1.6 0 1.5 to 1.6	**B2**	**B1** for two correct values
23	$[p =] 10$ $[k =] -46$	**2**	**B1** for each

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[Turn over

1 These are the first eight terms of a sequence.

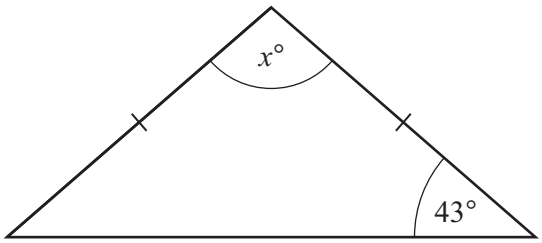
$c \quad -3 \quad -9 \quad -15 \quad -21 \quad -27 \quad -33 \quad k$

Find the value of c and the value of k.

$c =$ .....

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

2 The diagram shows an isosceles triangle.



NOT TO SCALE

Find the value of x.

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

3

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

Complete each statement with a number from the list.

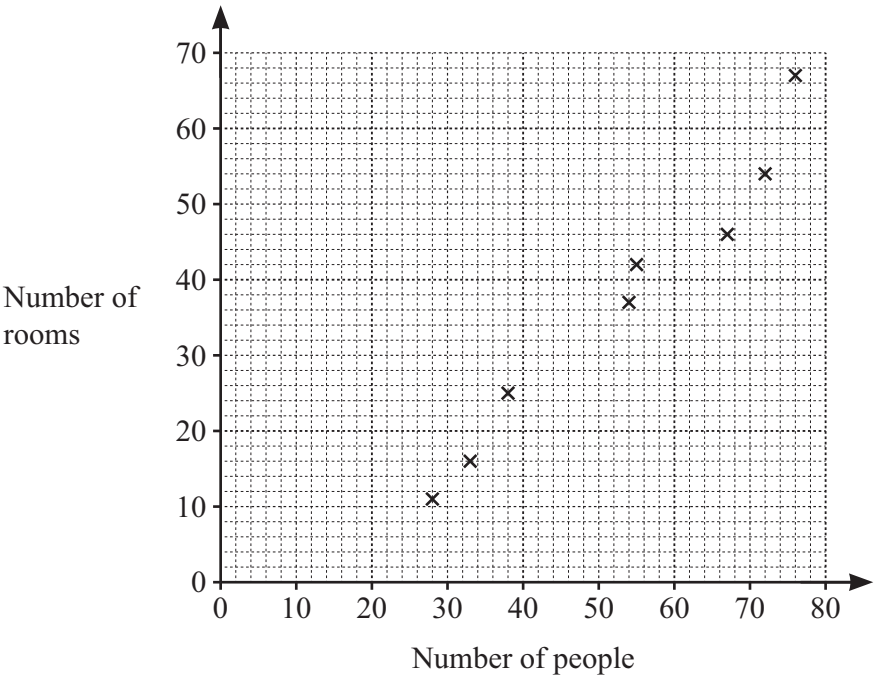
..... is a natural number.

..... is an irrational number.

..... is the reciprocal of 4.

[3]

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



(a) One of the buildings has 67 rooms.

Write down the number of people in this building.

..... [1]

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

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

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

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

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

..... [1]

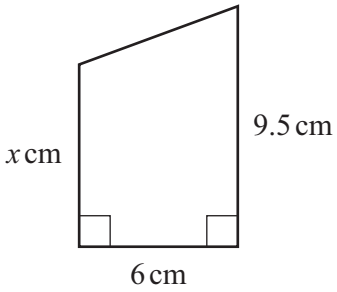
(d) What type of correlation is shown in the scatter diagram?

..... [1]

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

..... cm^2 [1]

6 The diagram shows a trapezium.



NOT TO SCALE

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

Calculate the value of x.

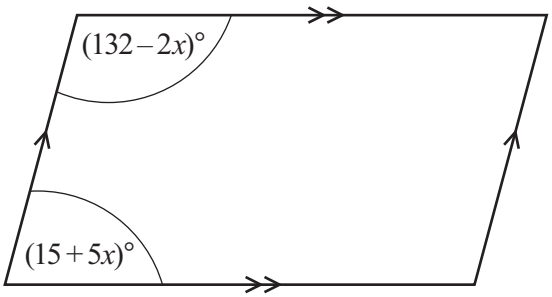
$x =$ ..... [2]

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

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

..... [2]

8 The diagram shows a parallelogram.

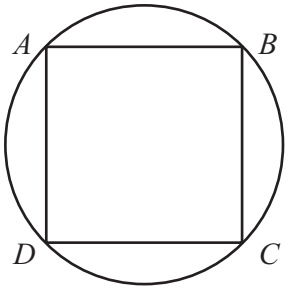


NOT TO SCALE

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

..... [4]

9



NOT TO SCALE

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

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

..... cm^2 [3]

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

..... [1]

11 Factorise fully.

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

..... [2]

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

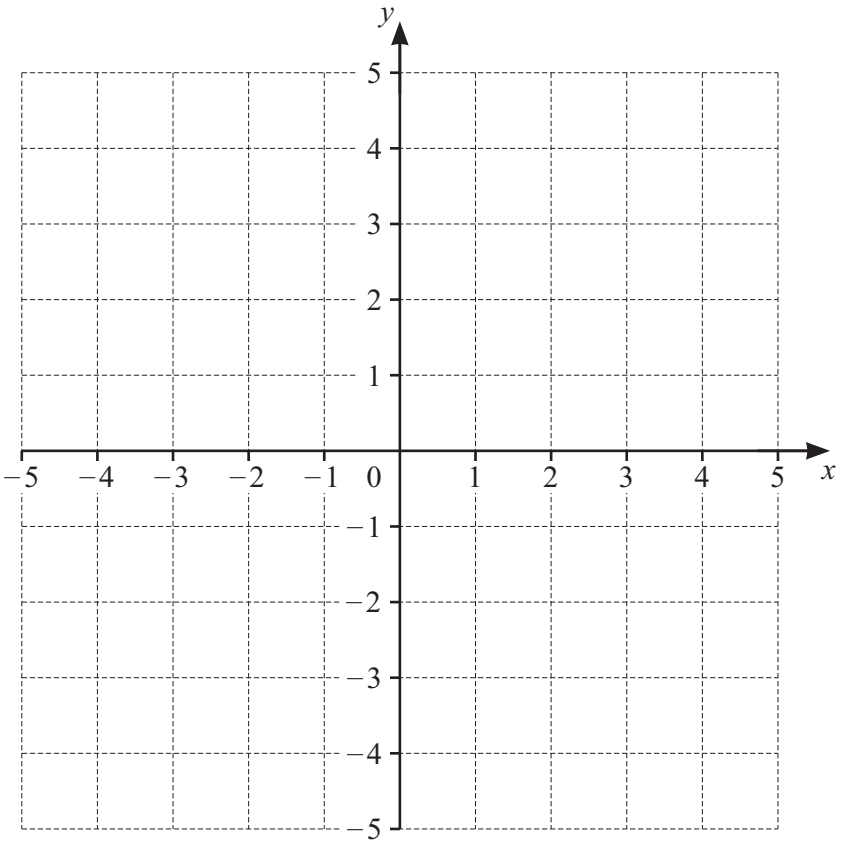
..... [3]

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

Find y when $x = 1.56$.

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

13



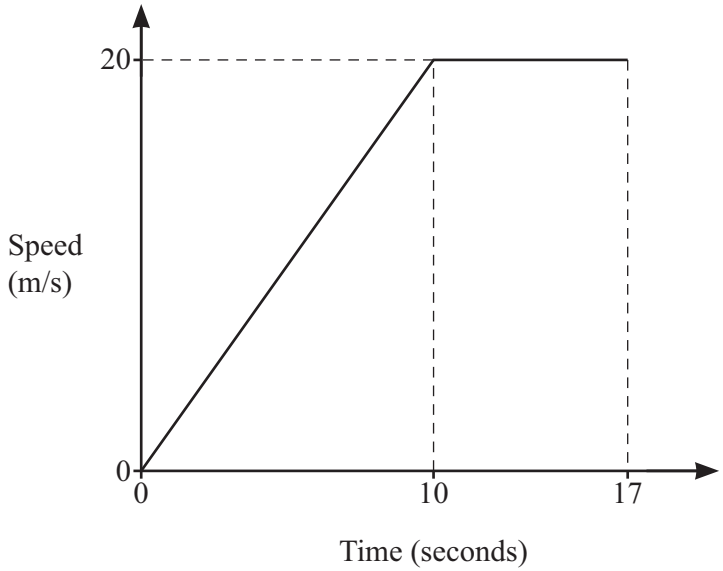
The region R satisfies these inequalities.

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

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

[4]

14



NOT TO SCALE

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

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

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

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

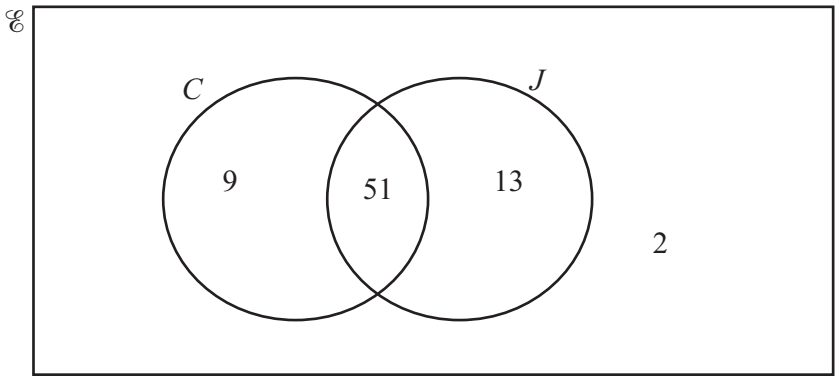
..... m [3]

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

Calculate the number of bacteria after 3 hours.

..... [2]

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

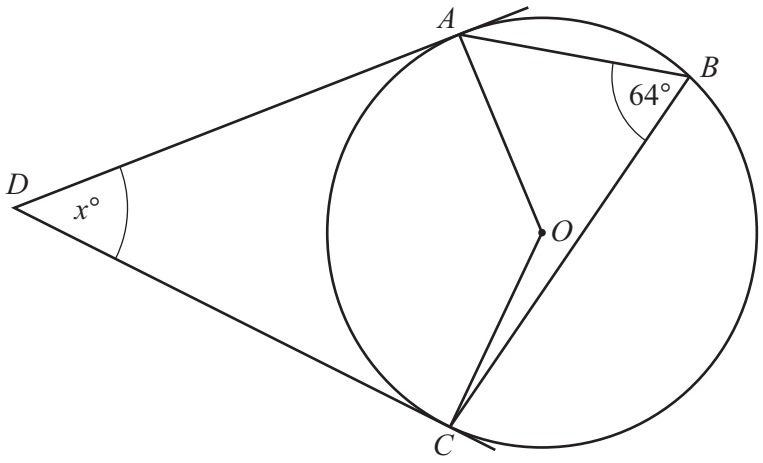


A person is chosen at random from those who have a car.

Find the probability that this person also has a job.

..... [1]

17



NOT TO SCALE

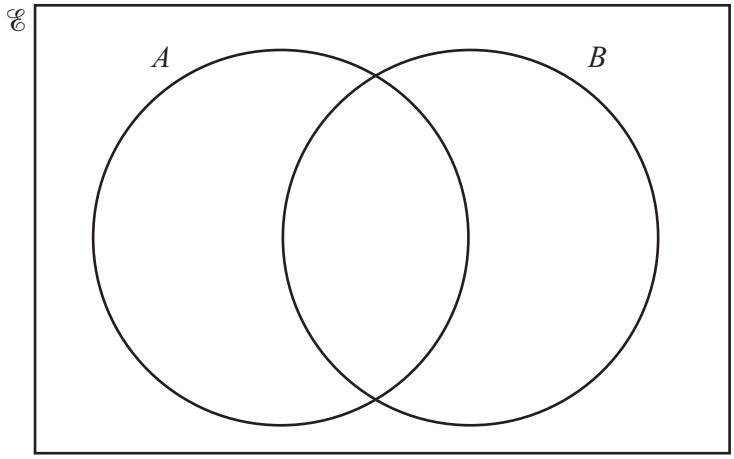
A, B and C are points on the circumference of a circle with centre O.
DA and DC are tangents to the circle.
Angle $ABC = 64°$.

Work out the value of x.

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

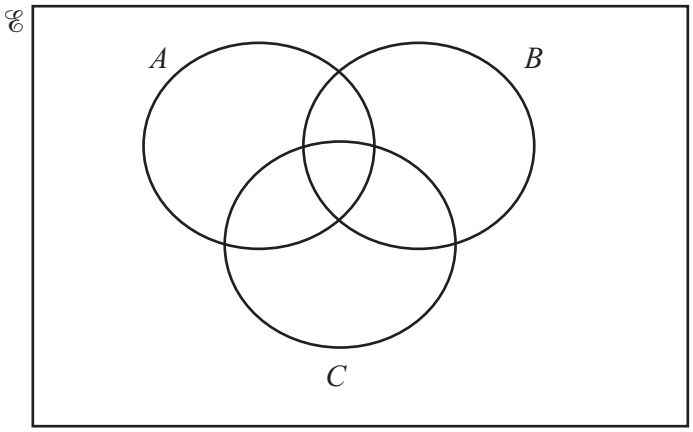
18 **(a)** $\mathscr{E} = \{8 \times 10^{-1}, \quad 0.\dot{8}, \quad 8\%, \quad \sqrt{0.08}\}$

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



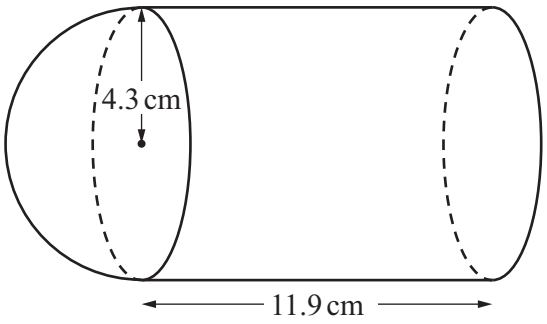
Complete the Venn diagram. [3]

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



[1]

19



NOT TO SCALE

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

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

..... cm^3 [3]

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

..... cm^2 [4]

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

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

..... [2]

21 Expand and simplify.

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

..... [3]

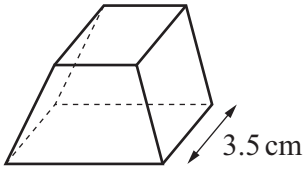
22 A is the point $(17, 9)$ and B is the point $(23, 39)$.

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

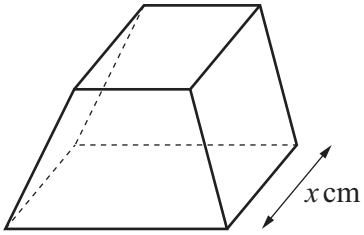
$y =$ ..... [5]

Question 23 is printed on the next page.

23



Small box



Large box

NOT TO SCALE

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

Calculate the value of x.

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

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MATHEMATICS **0580/22**

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

MARK SCHEME

Maximum Mark: 70

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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[Turn over

Generic Marking Principles

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Mathematics-Specific Marking Principles

1 Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.

2 Unless specified in the question, non-integer answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.

3 Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.

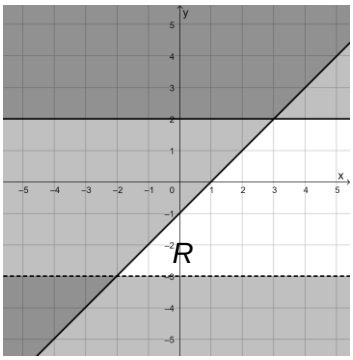
4 Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).

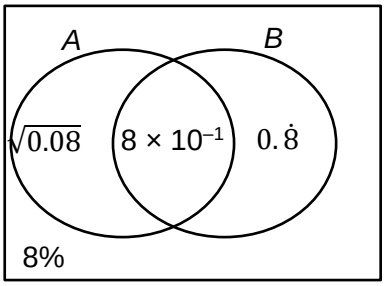
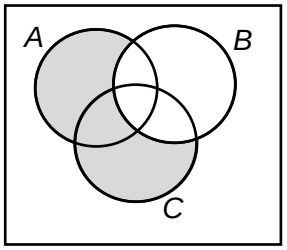
5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.

6 Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations
cao – correct answer only
dep – dependent
FT – follow through after error
isw – ignore subsequent working
oe – or equivalent
SC – Special Case
nfww – not from wrong working
soi – seen or implied

Question	Answer	Marks	Partial Marks
1	[c =] 3 [k =] –39	**2**	**B1** for each or **SC1** for $c = -39$ and $k = 3$
2	94	**2**	**M1** for $x + 2 \times 43 = 180$ oe
3	24 $\sqrt{3}$ 0.25	**3**	**B1** for each
4(a)	76	**1**	
4(b)	Point correctly plotted at (42, 33)	**1**	
4(c)(i)	Correct ruled line of best fit	**1**	
4(c)(ii)	An integer in the range 27 to 33	**1**	**FT** *their* line of best fit provided line shows positive correlation and answer is an integer
4(d)	Positive	**1**	
5	75 100	**1**	
6	4.5 oe	**2**	**M1** for $\frac{1}{2} \times 6 \times (x + 9.5) = 42$ oe or $42 \times \frac{2}{6} - 9.5$ oe
7	$\frac{2}{7} \times \frac{11}{6}$ or $\frac{22}{77} \div \frac{42}{77}$ oe with common denominator	**M1**	
	$\frac{11}{21}$ cao	**A1**	
8	70	**4**	**B3** for $x = 11$ OR **M1** for $132 - 2x + 15 + 5x = 180$ oe **M1** for collecting x terms on one side and number terms on the other for *their* equation. **M1** for $15 + 5 \times$ *their* x oe where $-3 <$ *their* $x < 15$ or for $132 - 2 \times$ *their* x oe where $21 <$ *their* $x < 66$

Question	Answer	Marks	Partial Marks
9	36π cao	**3**	**B2** for answer 113 or 113.0 to 113.1… or an answer in terms of π which rounds to 113 or **M1** for correct first step for finding d or r e.g. $72 + 72 = d^2$ oe $72 = r^2 + r^2$ oe or $\left(\frac{\sqrt{72}}{2}\right)^2 + \left(\frac{\sqrt{72}}{2}\right)^2 = r^2$ oe $\sqrt{72} = \frac{r}{sin45}$ oe $\frac{1}{2} \times r \times r = \frac{72}{4}$ oe
10	1.4 oe	**1**	
11(a)	$3x(8x – 3y)$ final answer	**2**	**B1** for $3(8x^2 – 3xy)$ or $x(24x – 9y)$ or $3x(8x – 3y)$ seen then spoilt
11(b)	$7(3x + 2y)(3x – 2y)$ final answer	**3**	**B2** for $(21x + 14y)(3x – 2y)$ or $(3x + 2y)(21x – 14y)$ or $7(3x + 2y)(3x – 2y)$ seen then spoilt or **M1** for $7(9x^2 – 4y^2)$ or $[...](3x + 2y)(3x – 2y)$
12	5.6 oe	**3**	**M1** for $y = k\sqrt{x+1}$ oe **M1** for $y =$ *their* $k\sqrt{1.56+1}$ oe
13		**4**	**B1** for $y = 2$ solid line **B1** for $y = x – 1$ solid line **B1** for $y = –3$ dashed line **B1** for correct region identified satisfying the given inequalities
14(a)	2	**1**	
14(b)	240	**3**	**M2** for correct complete area statement e.g. $\frac{1}{2} \times 20 \times 10 + 7 \times 20$ oe or **M1** for one correct area

Question	Answer	Marks	Partial Marks
15	60835	**2**	**M1** for $40\,000\times\left(1+\frac{15}{100}\right)^3$ oe
16	$\frac{17}{20}$ oe	**1**	
17	52	**2**	**M1** for 360 – 90 – 90 – 128 oe or **B1** for [obtuse angle] *AOC* = 128 or *AOD* or *COD* = 64 or *DAO* or *DCO* = 90
18(a)		**3**	**B2** for three correctly placed or **B1** for two correctly placed or correct conversion of 8×10^{-1}, 8% and $\sqrt{0.08}$ to 0.8, 0.08, 0.2[8…] or 0.3
18(b)		**1**	
19(a)	858 or 857.7 to 857.9	**3**	**M2** for $\left[\frac{1}{2}\times\right]\frac{4}{3}\times\pi\times4.3^3+\pi\times4.3^2\times11.9$ oe or **M1** for $\left[\frac{1}{2}\times\right]\frac{4}{3}\times\pi\times4.3^3$ or $\pi\times4.3^2\times11.9$
19(b)	496 or 495.7 to 495.8…	**4**	**M3** for $\frac{1}{2}\times4\times\pi\times4.3^2+\pi\times4.3^2+2\times\pi\times4.3\times11.9$ oe OR **M1** for $\pi\times4.3^2\times k$ where k is a whole number **M1** for $2\times\pi\times4.3\times11.9$
20	7^{n-2} oe final answer	**2**	**M1** for recognition of terms being powers of 7

Question	Answer	Marks	Partial Marks
21	$2x^3 + 17x^2 + 38x + 15$ final answer	**3**	**B2** for correct expansion of the three brackets unsimplified or for simplified four-term expression of correct form with three terms correct or **B1** for correct expansion of two of the given brackets with at least three terms out of four correct
22	$[y =] -\frac{1}{5}x + 28$ final answer	**5**	**B1** for midpoint (20, 24) soi **M1** for [gradient =] $\frac{39-9}{23-17}$ oe **M1** for $\frac{-1}{\textit{their gradient}}$ **M1** for substitution of *their* midpoint into *their* $y = mx + c$ oe
23	4.2 oe	**3**	**M2** for $\sqrt[3]{1+\frac{72.8}{100}} \times 3.5$ oe or **M1** for $\frac{\sqrt[3]{172.8}}{\sqrt[3]{100}}$ oe or $\frac{\sqrt[3]{100}}{\sqrt[3]{172.8}}$ oe or $\frac{x^3}{3.5^3} = \frac{172.8}{100}$ oe

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CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS **0580/23**

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

1 hour 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

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

INFORMATION

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

This document has **12** pages.

[Turn over

1

61	62	63	64	65	66	67	68	69

From the list of numbers, write down

(a) a cube number

..... [1]

(b) a prime number.

..... [1]

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

Find the time taken for this journey.

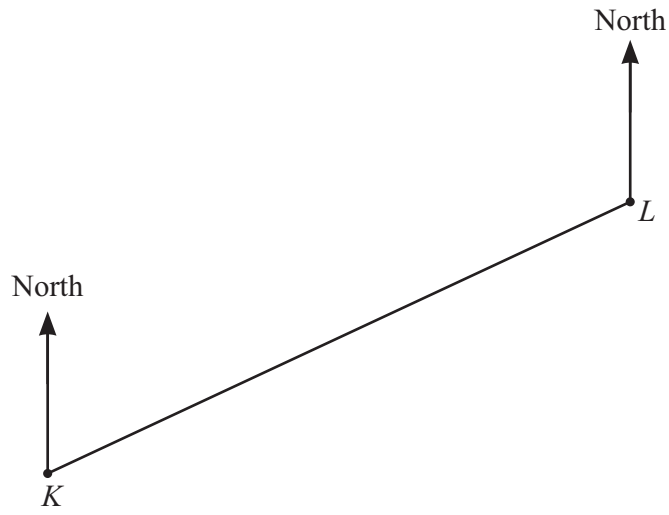
..... h ..... min [1]

3 Simplify.

$3p - t - p - 4t$

..... [2]

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



Scale : 1 cm to 10 km

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

..... km [2]

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

..... [1]

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

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

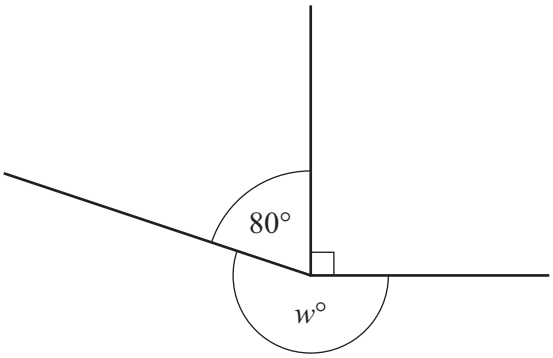
(a) Find the median.

..... [1]

(b) Calculate the mean.

..... [3]

6



NOT TO SCALE

The diagram shows three lines meeting at a point.

Find the value of w.

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

7 Solve the equation.

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

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

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

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

\$ ..... [2]

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

..... [2]

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

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

..... [3]

11 Solve the simultaneous equations.

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

$p =$ .....

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

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

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

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

13 Find the nth term of each sequence.

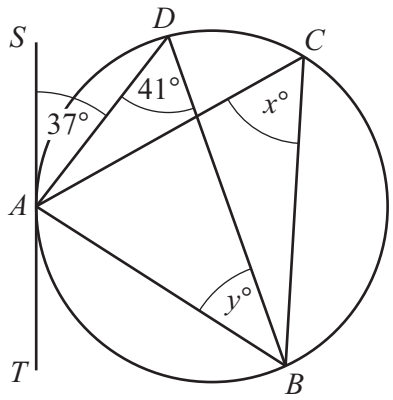
(a) 21, 13, 5, −3, −11, …

..... [2]

(b) 2.5, 5, 10, 20, 40, …

..... [2]

14 (a)



NOT TO SCALE

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

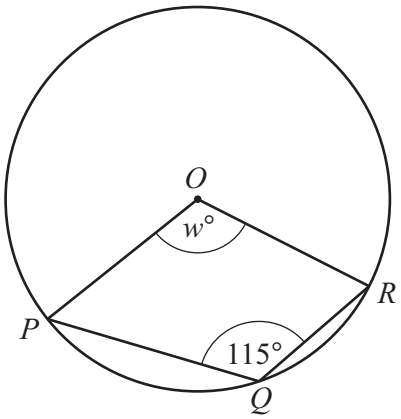
(i) Find the value of *x*.

x = ... [1]

(ii) Find the value of *y*.

y = ... [1]

(b)



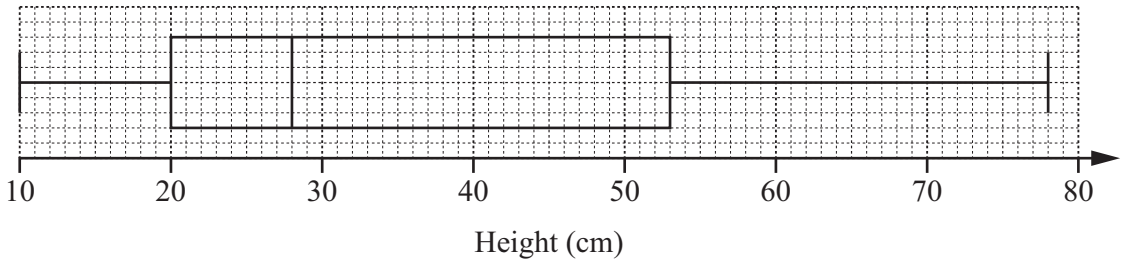
NOT TO SCALE

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

Find the value of *w*.

w = ... [2]

15



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

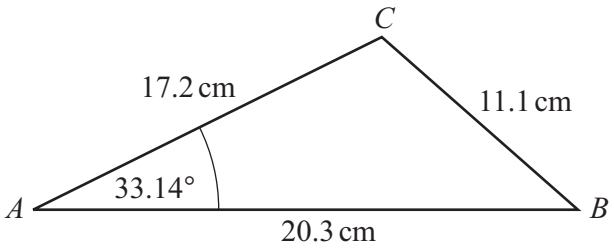
(a) Find the median height.

..... cm [1]

(b) Find the interquartile range of the heights.

..... cm [1]

16



NOT TO SCALE

Calculate the shortest distance from C to AB.

..... cm [3]

17 Simplify.

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

..... [2]

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

..... [2]

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

Calculate the height of the larger solid.

..... cm [3]

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

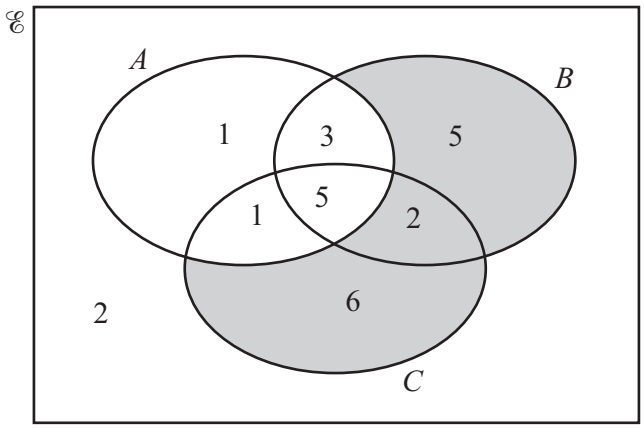
Find y in terms of x.

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

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

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

21



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

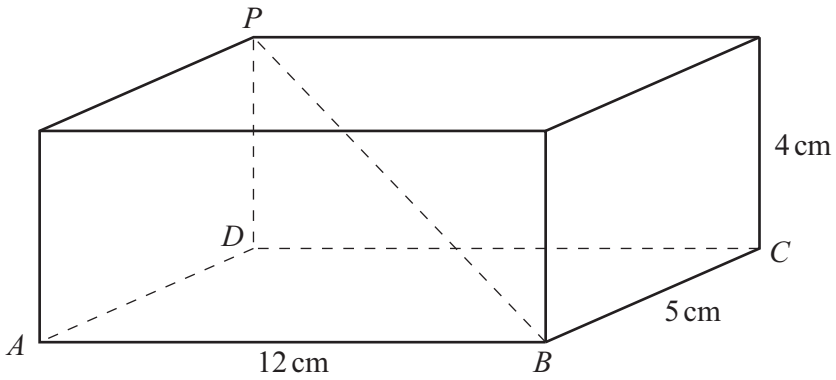
(a) Use set notation to describe the shaded region.

..... [1]

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

..... [1]

22



NOT TO SCALE

The diagram shows a cuboid with a diagonal PB.

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

..... [4]

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

..... [2]

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

Calculate the upper bound of the width of the rectangle.

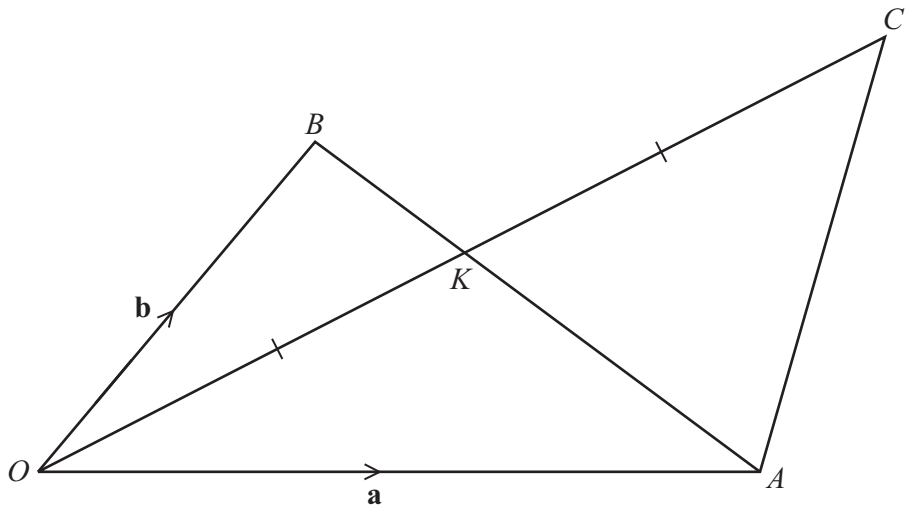
..... m [3]

25 Simplify.

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

..... [4]

26



NOT TO SCALE

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

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

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

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MATHEMATICS **0580/23**

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

MARK SCHEME

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4 Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).

5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.

6 Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Types of mark

M Method marks, awarded for a valid method applied to the problem.

A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.

B Mark for a correct result or statement independent of Method marks.

When a part of a question has two or more 'method' steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation 'dep' is used to indicate that a particular M or B mark is dependent on an earlier mark in the scheme.

Abbreviations

awrt answers which round to
cao correct answer only
dep dependent
FT follow through after error
isw ignore subsequent working
nfww not from wrong working
oe or equivalent
rot rounded or truncated
SC Special Case
soi seen or implied

Question	Answer	Marks	Partial Marks
1(a)	64	**1**	
1(b)	61 or 67 or both	**1**	
2	7[h] 45 [min]	**1**	
3	$2p - 5t$ final answer	**2**	**B1** for $2p$ or $-5t$ in final answer or for $2p - 5t$ seen then spoilt
4(a)	85	**2**	**B1** for 8.5 or **M1** for *their* 8.5 × 10
4(b)	065	**1**	
5(a)	2	**1**	

Question	Answer	Marks	Partial Marks
5(b)	2.25	**3**	**M1** for [3×0] + 1×1 + 7×2 + 8×3 + [0×4] + [0×5] + 1×6 oe or for 45 **M1 dep** for $\frac{their\Sigma fx}{20}$ dep on first M1
6	190	**1**	
7	–1	**2**	**M1** for $5h - h = 3 - 7$ or $7 - 3 = h - 5h$ or better
8	$12b + 5m$	**2**	**B1** for $12b + km$ or $kb + 5m$ or correct answer seen and spoilt
9	156	**2**	**M1** for $180 - 360 \div 15$ oe or $\frac{180\times(15-2)}{15}$ oe
10	$\frac{9}{4}$ oe or $\frac{23}{12}$ oe | $1\frac{1}{4} - \frac{11}{12}$	**B1**	Correct step for dealing with mixed numbers Allow $\frac{9k}{4k}$ or $\frac{23k}{12k}$
	$\frac{27}{12}$ and $\frac{23}{12}$ | $[1]\frac{3}{12}$ and $\frac{11}{12}$	**M1**	Correct method to find common denominator e.g. $2\frac{3}{12}$ and $1\frac{11}{12}$
	$\frac{1}{3}$ cao	**A1**	
11	[p =] 2 [q =] $-\frac{1}{2}$ oe	**2**	**B1** for each
12	V^3y final answer	**2**	**M1** for $V^3 = \frac{x}{y}$
13(a)	$29 - 8n$ oe final answer	**2**	**B1** for $k - 8n$ or $29 - cn$ $c \neq 0$, or $29 - 8n$ seen then spoilt
13(b)	$5\times 2^{n-2}$ oe final answer	**2**	**B1** for 2^k or correct answer seen and spoilt
14(a)(i)	41	**1**	
14(a)(ii)	37	**1**	

Question	Answer	Marks	Partial Marks
14(b)	130	**2**	**M1** for $2(180-115)$ or $360-2\times115$ or for reflex $POR = 230$ or for an opposite angle in cyclic quad drawn in and labelled 65
15(a)	28	**1**	
15(b)	33	**1**	
16	9.4[0] or 9.403...	**3**	**M2** for $\sin 33.14 = \frac{\text{dist}}{17.2}$ oe or **M1** for recognition that the line from C is perpendicular to AB
17(a)	$6x^{15}$ final answer	**2**	**B1** for kx^{15} or $6x^{c}$ as final answer or correct answer seen and spoilt
17(b)	$25y^{50}$ final answer	**2**	**B1** for ky^{50} or $25y^{c}$ as final answer or correct answer seen and spoilt
18	7.2	**3**	**M2** for $4.8\times\sqrt[3]{\frac{81}{24}}$ oe or **M1** for $\sqrt[3]{\frac{81}{24}}$ oe or for $\left(\frac{4.8}{h}\right)^3 = \frac{24}{81}$ oe
19	$[y =]\ \frac{6}{\sqrt{x+2}}$ oe final answer	**2**	**M1** for $y = \frac{k}{\sqrt{x+2}}$ oe
20	116.6 and 296.6	**3**	**B2** for one correct answer or **M1** for $\tan x = -2$ If 0 or M1 scored, **SC1** for two angles with a difference of 180 in range from 0 to 360
21(a)	$(B\cup C)\cap A'$ oe	**1**	
21(b)	5	**1**	

Question	Answer	Marks	Partial Marks
22	17.1 or 17.10...	**4**	**M3** for $\tan = \frac{4}{\sqrt{12^2+5^2}}$ oe or **M2** for $12^2 + 5^2$ oe or $12^2+5^2+4^2$ oe or **M1** for recognising angle *PBD*
23	$(x+4)^2-23$ final answer	**2**	**B1** for $(x+4)^2$
24	7 nfww	**3**	**M2** for $\frac{150\text{to}151}{22-0.5}$ or for $\frac{150+0.5}{21\text{to}22}$ oe or **M1** for 150 + 0.5 or 150 – 0.5 or 22 + 0.5 or 22 – 0.5 oe seen
25	$\frac{3x-2}{1+y}$ final answer	**4**	**B2** for $(3x-2)(1-y)$ or $(2-3x)(y-1)$ or **B1** for $3x-2-y(3x-2)$ or for $3x(1-y)-2(1-y)$ **B1** for $(1-y)(1+y)$ or $(y-1)(-1-y)$ or $-(y-1)(1+y)$
26	$-\frac{1}{3}\mathbf{a} + \frac{4}{3}\mathbf{b}$ oe final simplified answer	**4**	**B3** for correct unsimplified answer or **B2** for $\overrightarrow{OK}$ or $\overrightarrow{KC} = \frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$ oe or **M1** for $\overrightarrow{AK} = \frac{2}{3}$ (**–a** + **b**) oe or $\overrightarrow{BK} = \frac{1}{3}$ (**–b** + **a**) oe or a correct vector route for $\overrightarrow{AC}$ along lines in diagram

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS **0580/41**

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

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

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

INFORMATION

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

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

DC (DE/FC) 336592/3

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

..... [2]

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

..... [2]

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

..... [2]

(b) Simplify.

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

..... [1]

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

..... [2]

(c) Solve.

$4 + 2x = 15$

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

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

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

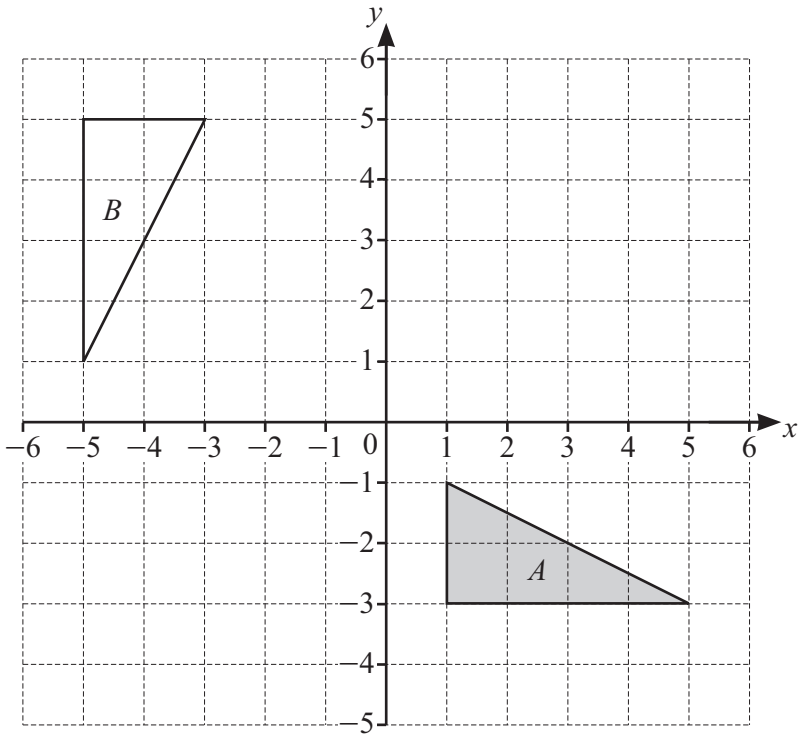
(e) $P = d + \sqrt[3]{m^2}$

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

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

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

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



(a) On the grid, draw

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

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

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

.....

..... [3]

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

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

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

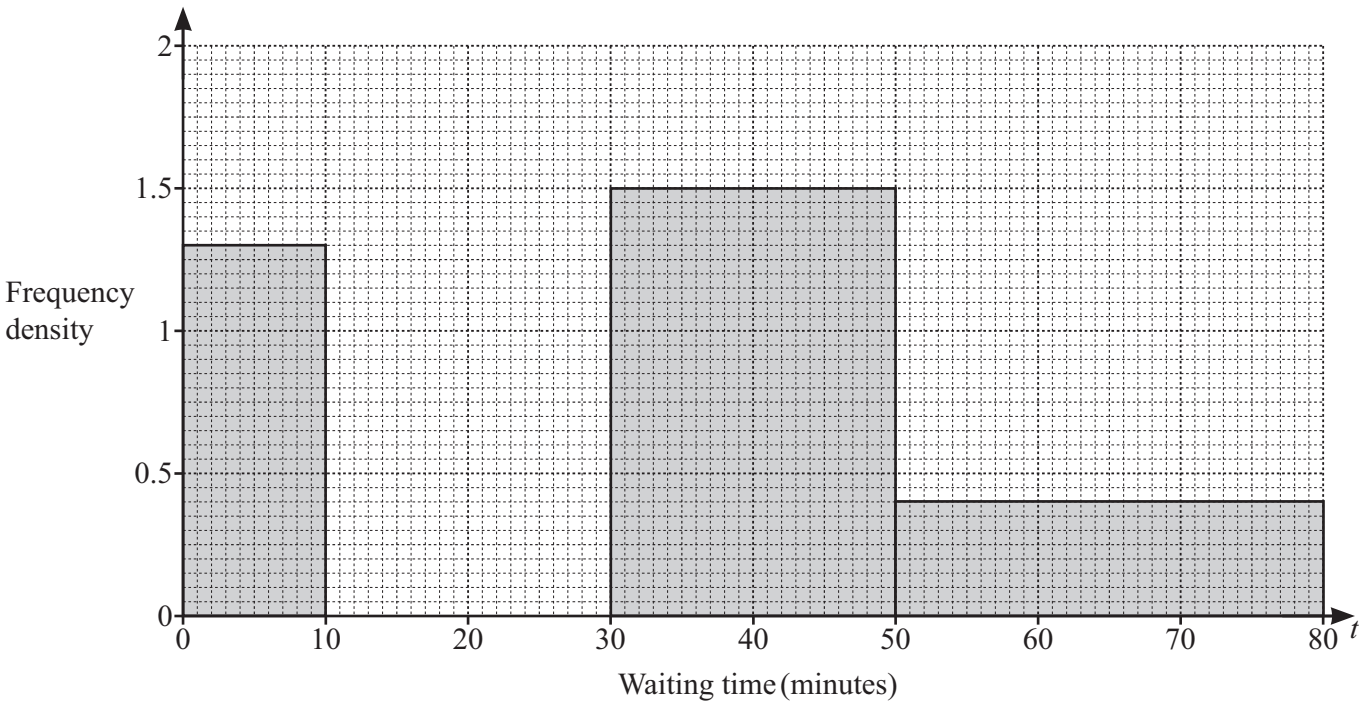
3 **(a)** The table shows the waiting times for 120 patients at a medical centre.

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

Calculate an estimate of the mean waiting time.

..... min [4]

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



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

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

[4]

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

Name	Number of lengths
Enzo	11.25
Rashid	18.75
Blessy	20

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

..... % [2]

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

Enzo : Rashid : Blessy.

Give your answer in its simplest form.

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

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

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

..... m/s [3]

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

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

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

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

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

..... [3]

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

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

..... m [3]

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

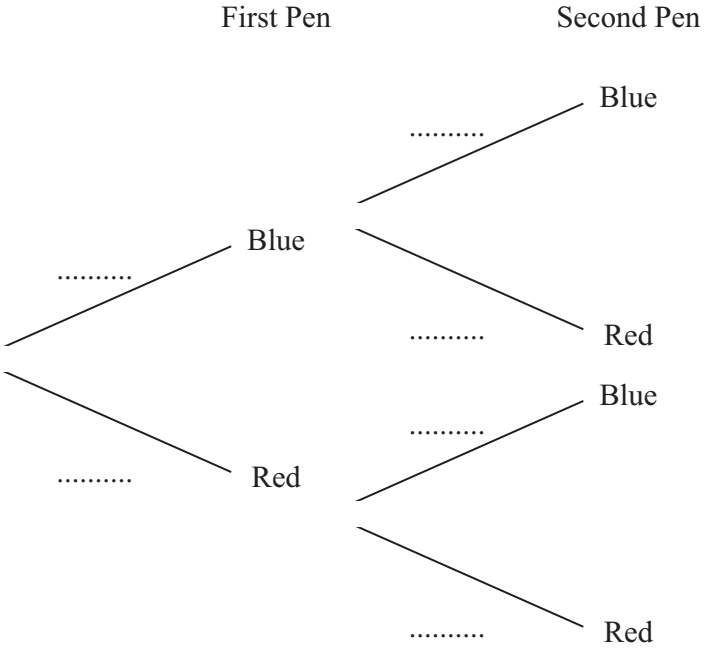
(a) Mia picks a pen from the box at random.

Find the probability that she picks a red pen.

..... [1]

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

(i) Complete the tree diagram.



[2]

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

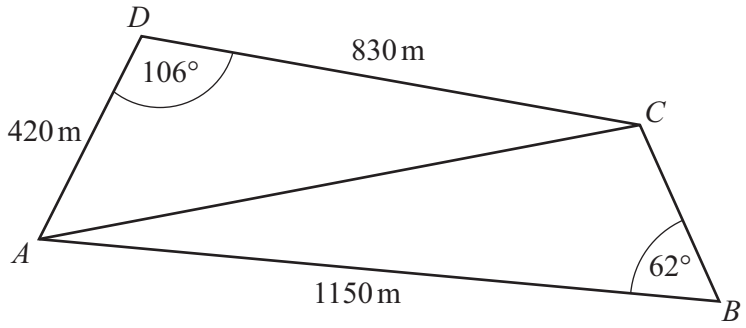
..... [3]

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

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

..... [3]

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



NOT TO SCALE

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

[3]

(b) Angle ACB is obtuse.

Calculate angle ACB.

Angle ACB = ... [4]

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

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

\$ ..... [4]

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

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

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

(a) Complete these two statements.

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

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

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

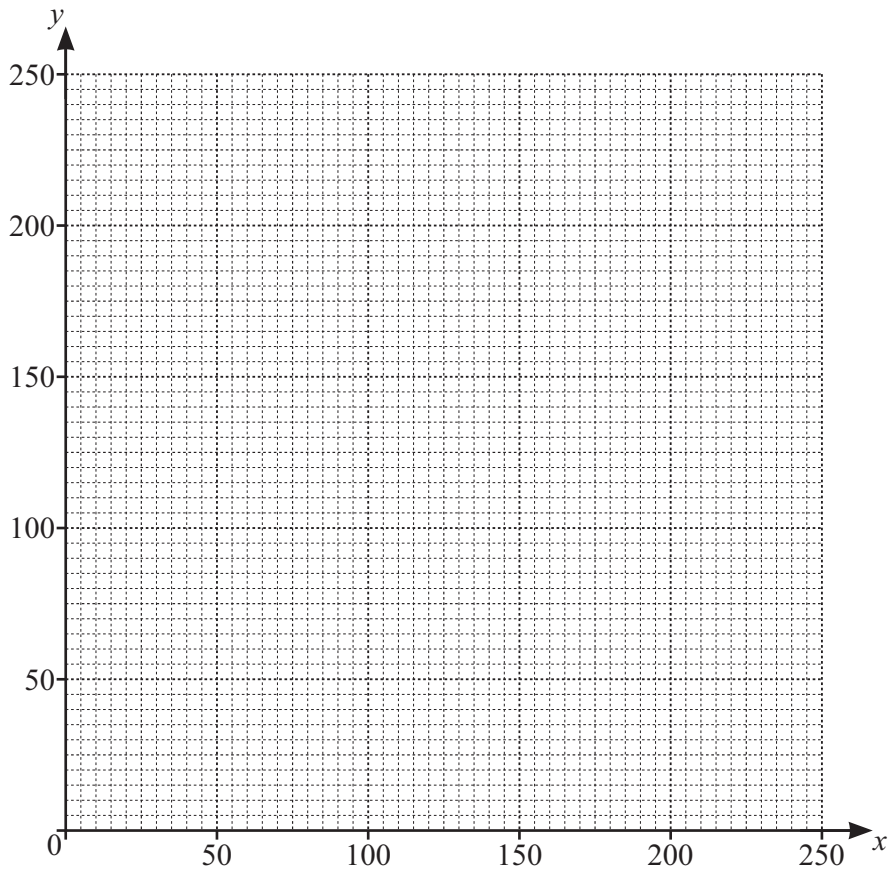
Show that $2x + 3y \geqslant 450$.

[1]

(c) The region R satisfies these four inequalities.

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

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



[7]

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

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

\$ ..... [2]

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

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

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

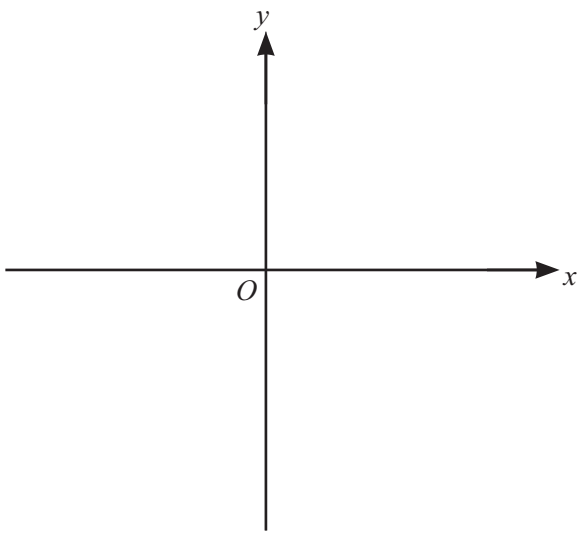
(ii) Find $f^{-1}(x)$.

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

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

..... [3]

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



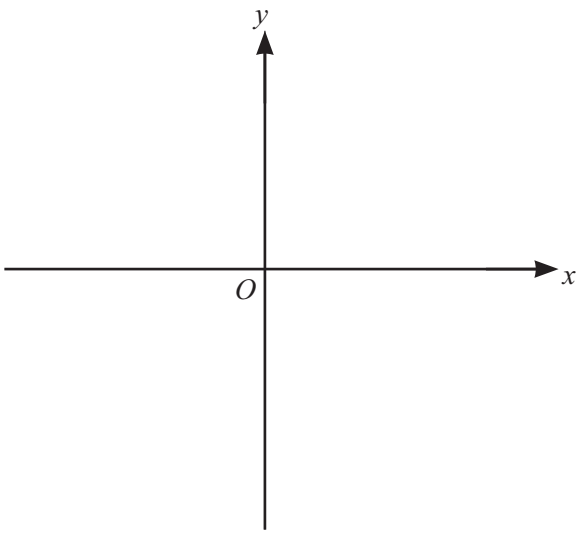
[4]

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

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

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

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

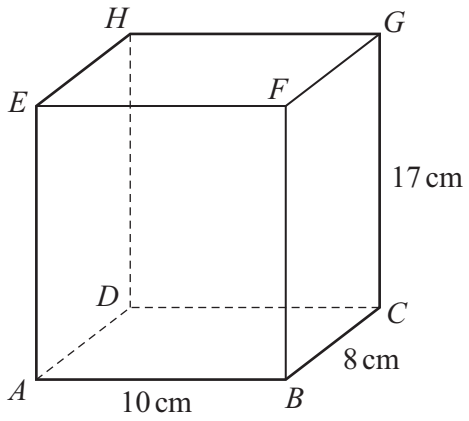


[2]

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

..... [1]

9



NOT TO SCALE

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

(a) Work out the volume of the cuboid.

..... cm^3 [1]

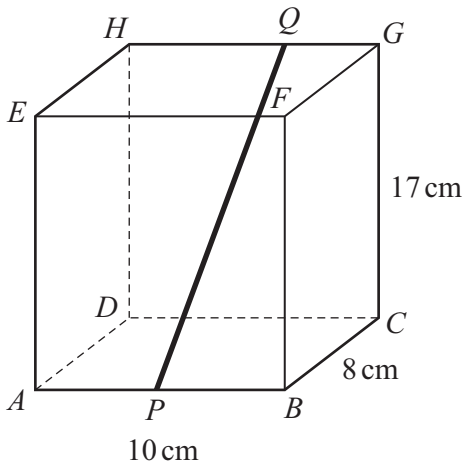
(b) Work out the total surface area of the cuboid.

..... cm^2 [3]

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

..... [4]

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



NOT TO SCALE

Calculate the length of the rod PQ.

..... cm [4]

10 (a)

NOT TO SCALE

This rectangle has area 190 cm^2.

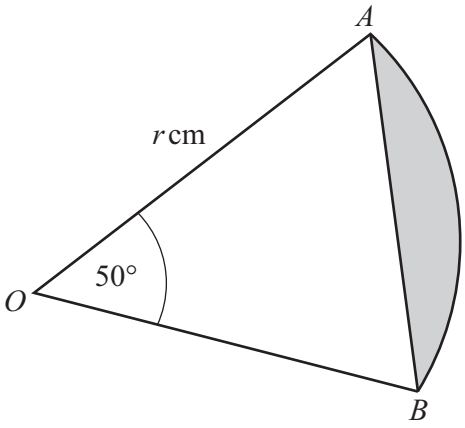
(i) By forming and solving an equation, show that $x = 8.5$.

[4]

(ii) Work out the perimeter of the rectangle.

..... cm [2]

(b)



NOT TO SCALE

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

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

[4]

(ii) Calculate the perimeter of the shaded segment.

..... cm [4]

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MATHEMATICS **0580/41**

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

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

 [Turn over

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Mathematics-Specific Marking Principles

1 Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.

2 Unless specified in the question, non-integer answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.

3 Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.

4 Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).

5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.

6 Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

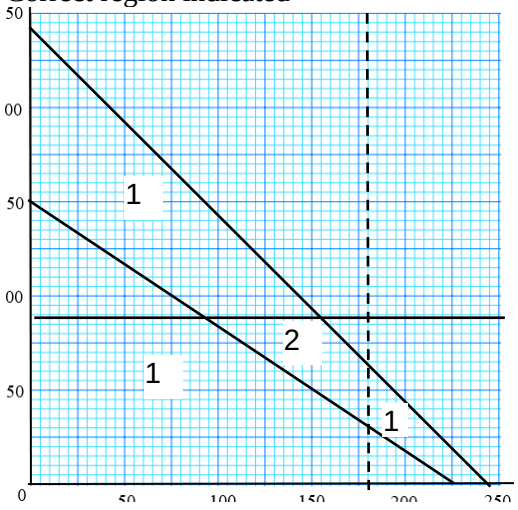
cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

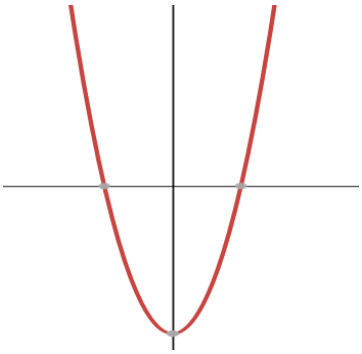
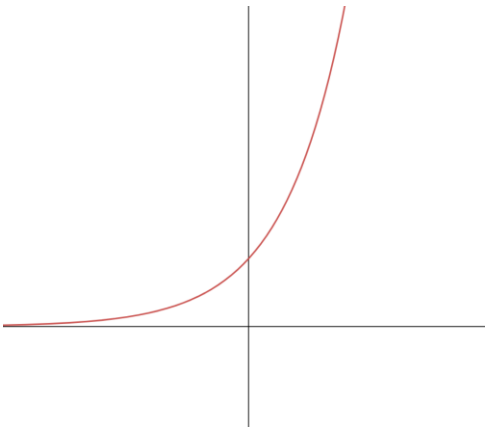
Question	Answer	Marks	Partial Marks
1(a)(i)	$2 \times 5 \times 7$ [=70]	**2**	**B1** for 2, 5, 7
1(a)(ii)	14	**2**	**M1** for [112 =] $2^4 \times 7$ oe or for answer 2×7
1(a)(iii)	$560x^4y^5$	**2**	**B1** for answer kx^4y^5 or for answer $560x^ay^b$ or for correct answer seen then spoiled
1(b)(i)	a^8	**1**	
1(b)(ii)	$\frac{c}{8}$ final answer	**2**	**M1** for $\frac{5bc}{40b}$ or better
1(c)	5.5 or $\frac{11}{2}$ or 5½	**2**	**M1** for $2x = 15 - 4$ oe or $2 + x = \frac{15}{2}$ oe
1(d)	–2	**3**	**M1** for $34 + 2x = 5(4 - x)$ oe or better **M1** dep for reaching $ax = b$ FT *their* first step
1(e)(i)	11	**2**	**M1** for $7 + \sqrt[3]{(-8)^2}$ oe
1(e)(ii)	$[\pm]\sqrt{(P-d)^3}$ oe final answer	**3**	**B1** for $P - d = \sqrt[3]{m^2}$ oe **M1** for cube both sides **M1** for square root leading to final answer
2(a)(i)	Triangle at (1, –1) (1, –3) (–3, –3)	**2**	**B1** for reflection in $x = k$ or for reflection in $y = 1$
2(a)(ii)	Triangle at (3, –1) (5, –1) (3, 0)	**2**	**B1** for correct size and orientation but wrong position
2(b)	Rotation 90 clockwise oe [centre] (2, 4) oe	**3**	**B1** for each
2(c)	$(a, 2k - b)$ oe isw	**2**	**B1** for each coordinate
3(a)	30.875	**4**	**M1** for 5, 15, 30, 45, 65 soi **M1** for Σfx **M1 dep** for *their* $\Sigma fx \div 120$ dep on 2nd M1

Question	Answer	Marks	Partial Marks
3(b)	Draws correct bar to height 1.75	**4**	**B3** for [height =] 1.75 OR **M2** for [90 –](10 × 1.3 + 20 × 1.5 + 30 × 0.4) oe or **M1** for 10 × 1.3 or 20 × 1.5 or 30 × 0.4 **M1dep** for *their* frequency ÷ 20 dep on at least M1 After 0 scored **SC1** for bar of correct width and height between 1.7 and 1.8
4(a)(i)	22.5	**2**	**M1** for $\frac{11.25}{11.25+18.75+20}[\times 100]$ oe
4(a)(ii)	9 : 15 : 16	**2**	**M1** for 1125 : 1850 : 2000 or better
4(a)(iii)(a)	$\frac{5}{9}$ or 0.556 or 0.5555 to 0.5556	**3**	**M2** for $\frac{20\times 25}{15[\times 60]}$ oe or **M1** for 20 × 25 or for *their* distance ÷ (15 [× 60]) oe

Question	Answer	Marks	Partial Marks
4(a)(iii)(b)	2 h 40 mins	**4**	**Approach 1** **B3** for $\frac{8}{3}$ [h]oe or 160 [mins] or 9600[s] Or **M3** for 5000 ÷ (18.75 × 25 × 4)[h] oe or 5000 ÷ (18.75 × 25 ÷ 15)[mins] oe or 5000 ÷ ((18.75 × 25 × 4) ÷ (60 × 60))[secs] oe Or **M2** for (18.75 × 25 × 4)[m/h] oe or (18.75 × 25 ÷ 15)[m/min] oe or (18.75 × 25 × 4) ÷ (60 × 60))[m/sec] oe Or **B1** for 200 or 1 km =1000m soi After 0 scored **SC1** for time *Figs* 267 or *figs* 2666 to 2667 or *figs* 16 or *figs* 96 **Approach 2** **B3** for 160 [mins] Or **M3** for 15 × 5000 ÷ (18.75 × 25) [mins] oe Or **M2** for 5000 ÷ (18.75 × 25) oe Or **B1** for 200 or 1 km =1000m soi After 0 scored **SC1** for time *figs* 16
4(a)(iv)	17.1 or 17.14 to 17.15	**3**	**M2** for $20 \times \left(\frac{100-5}{100}\right)^3$ oe or **M1** for $20 \times \left(\frac{100-5}{100}\right)^k$ where k is 2, or 4 or for $20 \times \left(\frac{100-5}{100}\right)^3$ oe seen and spoiled
4(b)	2500	**3**	**M2** for $\frac{425 \text{ to } 450}{10+0.5}$ or $\frac{450-12.5}{10 \text{ to } 11}$ or $\frac{425 \text{ to } 450}{630}$ or $\frac{450-12.5}{600 \text{ to } 660}$ or **M1** for 10.5 or 9.5 or 437.5 or 462.5 or 630[s] or 570[s]

Question	Answer	Marks	Partial Marks
5(a)	$\frac{5}{8}$ oe	**1**	
5(b)(i)	Tree diagram correct probabilities on 3 pairs of branches $\frac{3}{8}$ $\frac{5}{8}$	**2**	**B1FT** for one pair of branches of first stage or second stage correct
5(b)(ii)	$\frac{17}{32}$ oe	**3**	**M2FT** for *their* $\left(\frac{3}{8}\times\frac{3}{8}\right)+\left(\frac{5}{8}\times\frac{5}{8}\right)$ oe or **M1FT** for one correct product seen
5(c)	$\frac{15}{56}$ oe	**3**	**M2 FT** for $\frac{3}{8}\times\frac{2}{7}\times\frac{5}{6}\times k$ where k is 1, 2 or 3 or **M1FT** for $\frac{3}{8}$ and $\frac{2}{7}$ and $\frac{5}{6}$ seen oe or for showing the 3 possible combinations If 0 scored, **SC1** for answer $\frac{135}{512}$ oe
6(a)	$\sqrt{420^2+830^2-2\times420\times830\times\cos106}$ oe	**M2**	or **M1** for $420^2+830^2-2\times420\times830\times\cos106$ oe **A1** for 1 057 474 ….
	1028.3...	**A1**	
6(b)	99[.0] or 98.98 to 99.1[0…]	**4**	**B3** for 80.89 to 81.02 or **M2** for $\sin[ACB=]\frac{1150\sin 62}{1028}$ oe or **M1** for $\frac{1028}{\sin 62}=\frac{1150}{\sin ACB}$ oe

Question	Answer	Marks	Partial Marks
6(c)	2477 cao nfww	**4**	**B3** for answer 2476.9… or **M2** for $\frac{1}{2}\times 420\times 830\times \sin 106\times \frac{P}{10\,000}=41\,500$ oe or **M1** for $\frac{1}{2}\times 420\times 830\times \sin 106$ oe
7(a)	180 and 240	**2**	**B1** for 180 or for 240
7(b)	$12x + 18y \geq 2700$ and completion to $2x + 3y \geq 450$	**1**	with no errors seen
7(c)	$x = 180$ broken straight line and $y = 90$ solid ruled line and $x + y = 240$ solid ruled line and $2x + 3y = 450$ solid ruled line	**B5**	**B1** for $x = 180$ broken straight line **B1** for $y = 90$ solid ruled line **B1** for $x + y = 240$ solid ruled line **B2** for $2x + 3y = 450$ solid ruled line or **B1** for line with a negative gradient passing through (0, 150) or (225, 0)
	Correct region indicated  	**B2**	**B1** for region satisfying 3 of the inequalities
7(d)	4200	**2**	**B1** for 150 and 90 or **M1** for *their* 150 × 10 + *their* 90 × 30
8(a)(i)	6 and –6	**2**	**M1** for $x^2 = 20 + 16$ or better Or **B1** for 6 or -6

Question	Answer	Marks	Partial Marks
8(a)(ii)	$\frac{7-x}{3}$ oe final answer	**2**	**M1** for $x = 7 - 3y$ or $\frac{y}{3} = \frac{7}{3} - x$ or $y - 7 = -3x$ oe or better
8(a)(iii)	$9x^2 - 42x + 34$ final answer	**3**	**M1** for $(7 - 3x)^2 - 16$ [+ 1] oe **B1** for $49 - 21x - 21x + 9x^2 + k$
8(a)(iv)	Correct sketch with roots marked at –4 and 4 and y – intercept and turning point at $y = -16$ 	**4**	**B1** for correct parabola shape **B2** for roots at –4 and 4 on graph and no extras or **B1** for $(x - 4)(x + 4)$ [= 0] or for one correct root on graph or for -4 and 4 seen **B1** for turning point at (0, –16)
8(a)(v)	[$y =$] $-6x - 25$	**5**	**M1** for derivative = $2x$ **M1** for x = -3 substituted into *their* derivative **B1** for (– 3, –7) soi **M1** substitution of (– 3, *their* –7) into $y =$ *their* $-6x + c$ oe dep on 2nd M1
8(b)(i)	Correct sketch with y – intercept above x – axis 	**2**	**B1** for correct shape
8(b)(ii)	$y = 0$	**1**	
9(a)	1360	**1**	

Question	Answer	Marks	Partial Marks
9(b)	772	**3**	**M2** for **[**2 ×] (10 × 8 + 10 × 17 + 8 × 17) oe or **M1** for 10 × 8 oe or 10 × 17 oe or 8 × 17 oe
9(c)	53 or 53.0 to 53.01	**4**	**M3** for tan [*GAC*] = $\frac{17}{\sqrt{10^2+8^2}}$ oe or **M2** for $10^2 + 8^2$ oe or for $10^2 + 8^2 + 17^2$ oe or **M1** for recognising angle *GAC* is required
9(d)	19[.0] or 19.02 to 19.03	**4**	**M3** for $3^2 + 8^2 + 17^2$ oe **OR** **B1** for *QG* = 2 soi or *HQ* = 8 **M1** for $(5 – 2)^2 + 8^2$ or $(5 – 2)^2 + 17^2$
10(a)(i)	$2x^2 + 5x –187$ [= 0]	**M2**	**M1** for $(2x + 3)(x + 1) = 190$
	$(2x –17)(x + 11)$ [= 0] oe	**M1**	
	Leading to $x = 8.5$ with no errors	**A1**	
10(a)(ii)	59	**2**	**M1** for 6 × 8.5 + 8 oe or $6x + 8$ oe or **B1** for 9.5 and 20
10(b)(i)	$\frac{50}{360}\pi \times r^2 – \frac{1}{2}r^2 \times \sin 50 = 30$ oe	**M3**	**M1** for $\frac{50}{360}\pi \times r^2$ **M1** for $\frac{1}{2}r^2 \times \sin 50$ oe
	23.70[9] to 23.72…	**A1**	must see at least 4 sig figs

Question	Answer	Marks	Partial Marks
10(b)(ii)	40.7 or 40.8 or 40.71 to 40.75…	**4**	**M2** for $2 \times 23.7 \times \sin 25$ oe or $\sqrt{23.7^2 + 23.7^2 - 2 \times 23.7 \times 23.7 \cos 50}$ oe or $\frac{23.7 sin 50}{\sin\left(\frac{180-50}{2}\right)}$ oe or **M1** for $\frac{x}{23.7} = \sin 25$ oe or for $23.7^2 + 23.7^2 - 2 \times 23.7 \times 23.7 \cos 50$ oe or $\frac{AB}{sin 50} = \frac{23.7}{\sin\left(\frac{180-50}{2}\right)}$ oe **AND** **M1** for $\frac{50}{360} \times 2 \times \pi \times 23.7$ oe

Cambridge Assessment International Education

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CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS **0580/42**

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

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

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

INFORMATION

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

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

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

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

Calculate the amount she pays.

$ ..... [2]

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

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

..... litres [2]

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

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

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

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

..... % [4]

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

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

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

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

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

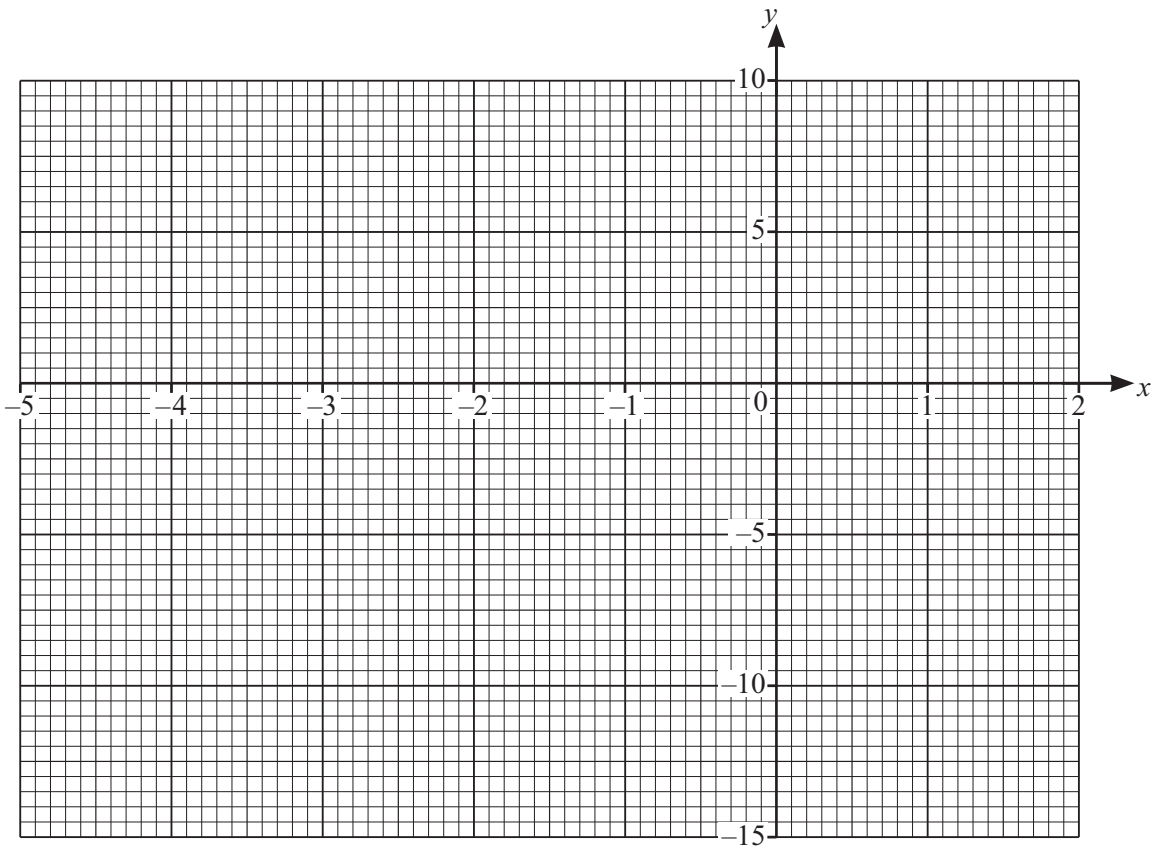
$ ..... [2]

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

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

(a) Complete the table. [2]

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



[4]

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

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

..... [2]

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

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

3 **(a)** Simplify.

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

..... [2]

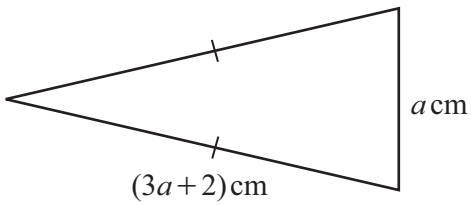
(ii) $(3a^2c^3)^4$

..... [2]

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

..... [2]

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



NOT TO SCALE

Find the value of a.

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

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

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

(d) Solve these simultaneous equations.

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

You must show all your working.

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

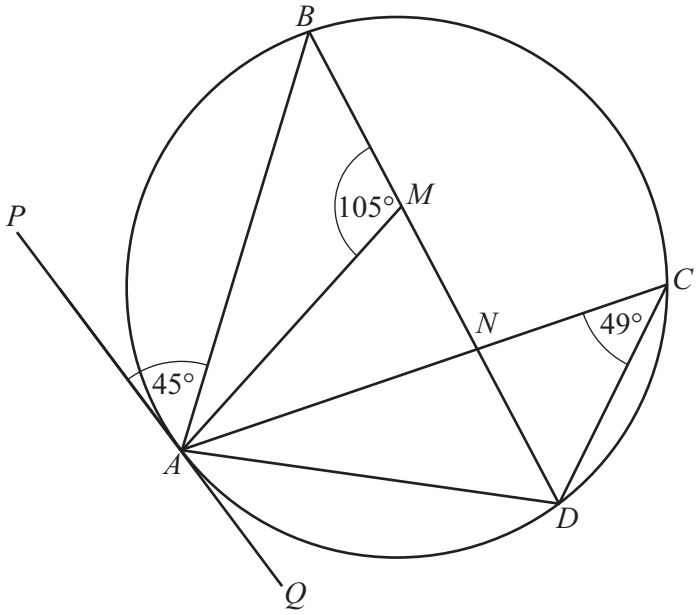
$x =$ ..... $y =$ ..... [5]

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

Find the value of w.

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

(b)



NOT TO SCALE

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

(i) Find angle BAM.

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

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

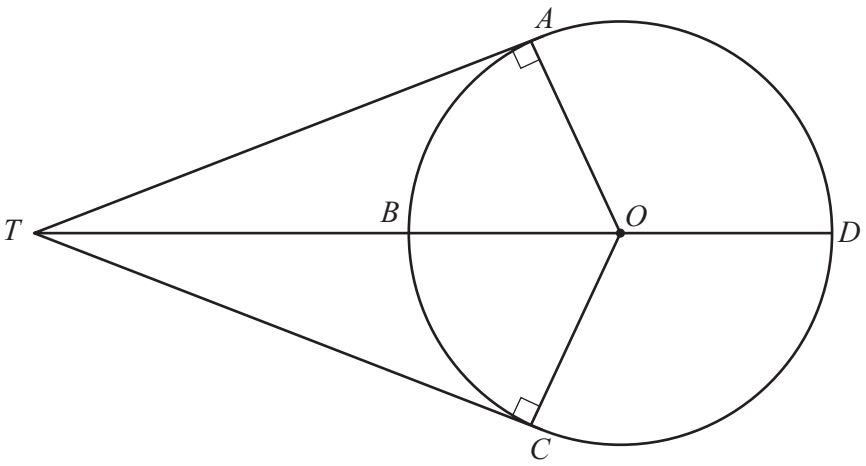
Angle $BAD =$ ..... [2]

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

.....

..... [1]

(c)



NOT TO SCALE

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

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

[3]

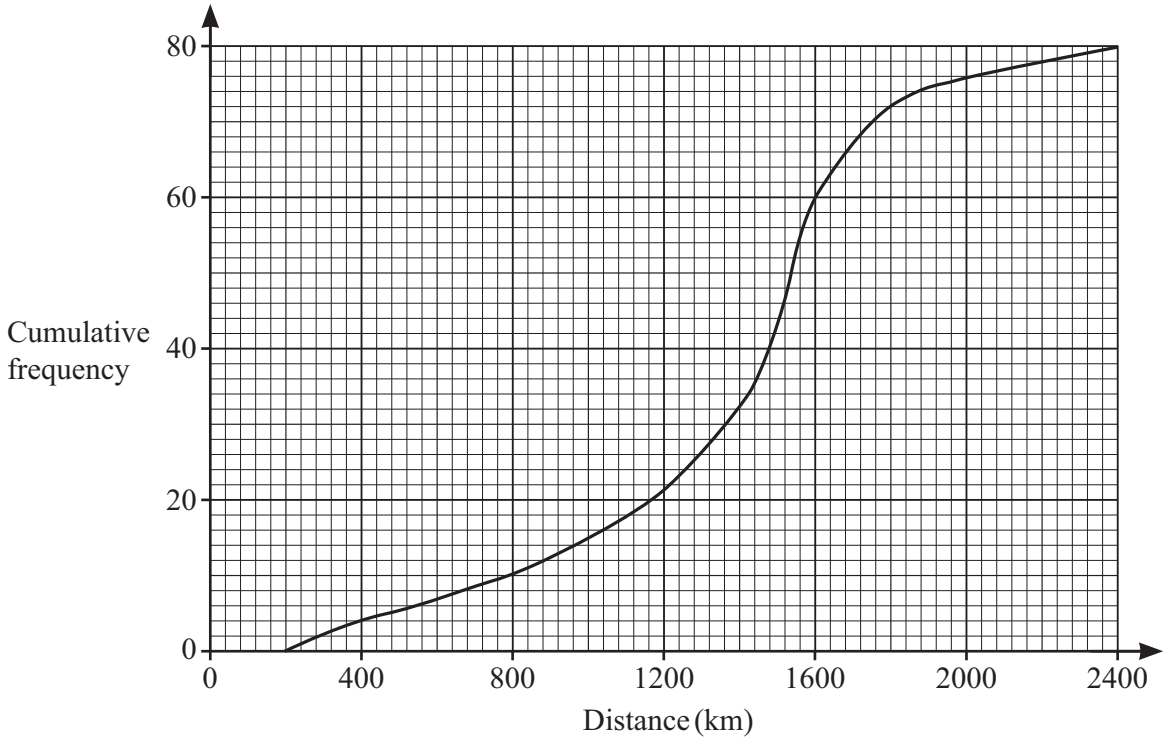
(ii) Calculate the length of the **minor** arc ABC.

..... cm [2]

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

..... cm^2 [3]

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



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

(a) the median

..... km [1]

(b) the interquartile range

..... km [2]

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

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

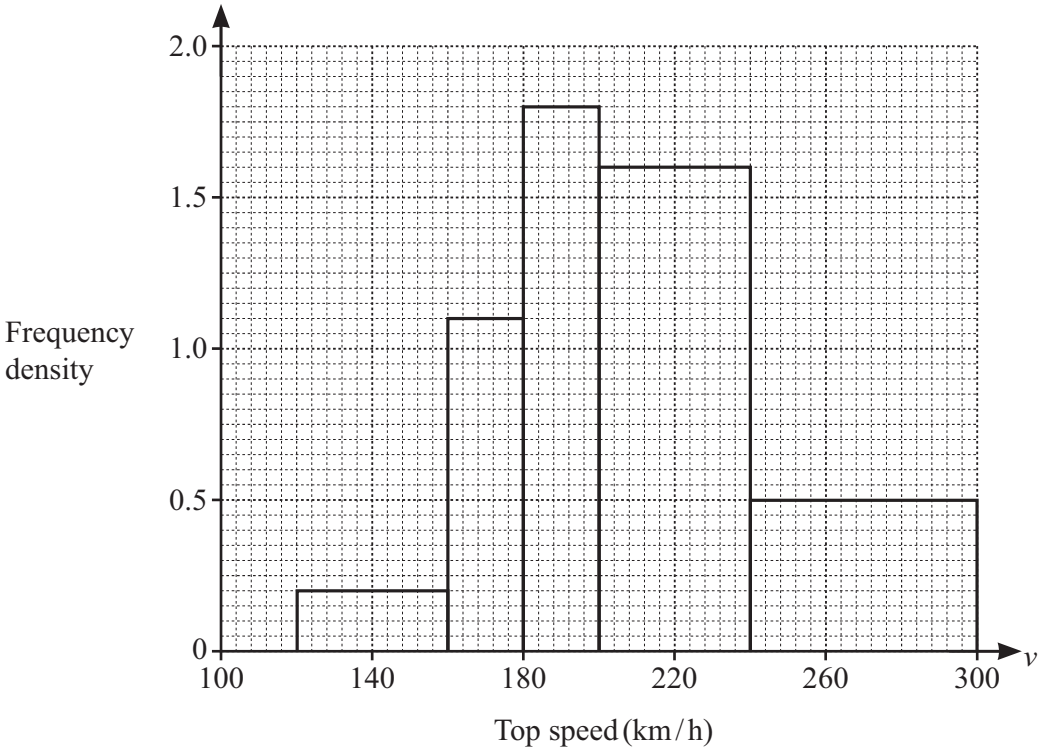
..... [2]

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

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

..... km/h [3]

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



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

[1]

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

..... km/h [6]

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

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

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

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

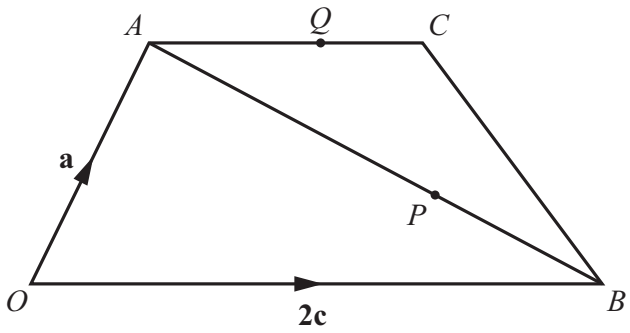
Find the coordinates of N.

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

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

..... [2]

(c)



NOT TO SCALE

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

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

(a) $\overrightarrow{AB}$

..... [1]

(b) $\overrightarrow{CB}$

..... [1]

(c) $\overrightarrow{OP}$

..... [2]

(d) $\overrightarrow{QP}$

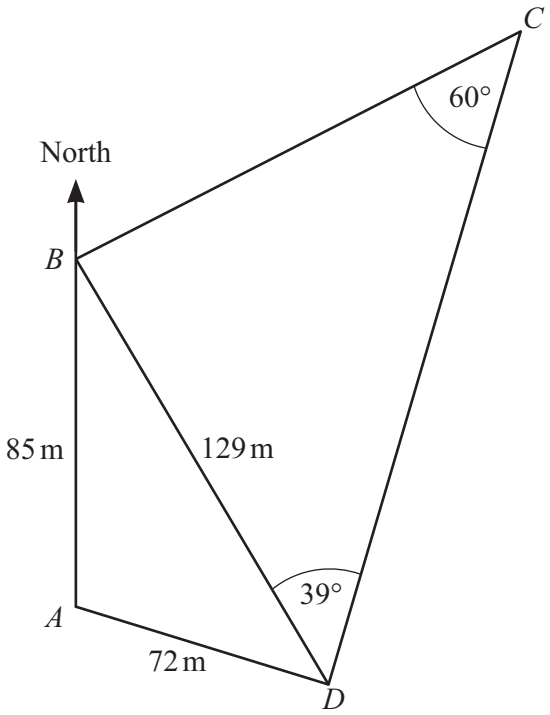
..... [2]

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

.....

..... [2]

7 (a)



NOT TO SCALE

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

(i) Show that angle $CBD = 81°$.

[1]

(ii) Calculate CD.

..... m [3]

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

[4]

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

..... m [3]

(v) Find the bearing of B from C.

..... [2]

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

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

..... [4]

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

Calculate the upper bound of the width of the rectangle.

..... cm [3]

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

Find the probability that

(i) the bead is yellow

..... [1]

(ii) the bead is not yellow.

..... [1]

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

Find the probability that

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

..... [2]

(ii) both marbles have different colours.

..... [4]

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

(a) Find

(i) $f(7)$

..... [1]

(ii) $gf(7)$

..... [1]

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

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

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

..... [4]

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

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

..... [2]

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

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

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

[3]

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MATHEMATICS **0580/42**

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

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

 [Turn over

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Mathematics-Specific Marking Principles

1 Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.

2 Unless specified in the question, non-integer answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.

3 Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.

4 Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).

5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.

6 Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	26 122 cao	**2**	**M1** for $28\,240 \times \left(1-\frac{7.5}{100}\right)$ oe or **B1** for answer 2118
1(a)(ii)	62.5	**2**	**M1** for $C \times \frac{72}{100} = 45$ oe or better
1(b)	17.5	**4**	**M3** for $\frac{31900 - 11490 - (47\times330)}{28000}$ [× 100] or **M2** for 31 900 – 11 490 – (47 × 330) or **M1** for 47 × 330 or for 31 900 – 11 490
1(c)	4.43 or 4.427…	**2**	**M1** for $\frac{2.5+6}{64+128}$ [× 100] oe
1(d)	31 620	**2**	**M1** for $46\,500 \times \left(1-\frac{20}{100}\right)\left[\times\left(1-\frac{15}{100}\right)\right]$ or $46\,500 \times \left(1-\frac{15}{100}\right)\left[\times\left(1-\frac{20}{100}\right)\right]$ or for $\left(1-\frac{20}{100}\right)\times\left(1-\frac{15}{100}\right)$
2(a)	–4, –1	**2**	**B1** for each correct value
2(b)	Correct graph	**4**	**B3FT** for 7 or 8 correct points or **B2FT** for 5 or 6 correct points or **B1FT** for 3 or 4 correct points
2(c)(i)	Ruled tangent at $x = 1$	**1**	
2(c)(ii)	6 to 14 nfww	**2**	**dep** on correct tangent or a close attempt at the tangent at $x = 1$ **M1** for rise/run for *their* tangent, or close attempt at tangent at any point. Must see correct or implied calculation from a drawn tangent.
2(d)	$y = x + 2$ ruled	**M2**	**M1** for [$y =$] $x + 2$ soi or $y = x + k$ ruled or $y = kx + 2$ ruled, but not $y = 2$
	$x = -3.95$ to -3.75 $x = -1.4$ to -1.25 $x = 1.1$ to 1.25	**A2**	**A1** for any two values If A0, **SC1** for three correct values

Question	Answer	Marks	Partial Marks
3(a)(i)	$-m + 3n$ final answer	**2**	**B1** for $-m$ or [+] $3n$ in final answer or for $-m + 3n$ seen and then spoiled
3(a)(ii)	$81a^8c^{12}$ final answer	**2**	**B1** for final answer in correct form with any two of 81, a^8, c^{12} correct or for $81a^8c^{12}$ seen and then spoiled
3(a)(iii)	$\frac{19x}{30}$ final answer	**2**	**M1** for $\frac{6\times4x-3\times3x+2\times2x}{30}$ oe
3(b)	4.5 oe	**3**	**M1** for $a + 2(3a + 2) = 35.5$ oe **M1** for correct $ka = b$ for *their* linear equation
3(c)	$\frac{-(-4)\pm\sqrt{(-4)^2-4\times5\times(-3)}}{2\times5}$ oe	**M2**	**M1** for $\sqrt{(-4)^2-4\times5\times(-3)}$ or better or for $\frac{-(-4)+\sqrt{q}}{2\times5}$ or $\frac{-(-4)-\sqrt{q}}{2\times5}$ or better
	-0.472 or -0.4718 to -0.4717 **and** 1.27 or 1.271 to 1.272	**B1**	
3(d)	$x^2 - 6x + 8$ [= 0] or $y^2 - 6y + 5$ [= 0]	**M2**	**M1** for $x^2 - 4x + 5 = 2x - 3$ or $y = \left(\frac{y+3}{2}\right)^2 - 4\left(\frac{y+3}{2}\right)+5$
	$(x - 4)(x - 2)$ [= 0] or $(y - 1)(y - 5)$ [=0] OR [x =] $\frac{-(-6)\pm\sqrt{(-6)^2-4[\times1]\times8}}{2[\times1]}$ or [y =] $\frac{-(-6)\pm\sqrt{(-6)^2-4[\times1]\times5}}{2[\times1]}$ OR [x =] $3\pm\sqrt{-8+9}$ or [y =] $3\pm\sqrt{-5+9}$	**M1**	FT *their* 3-term quadratic but not if $x^2 - 4x + 5$[= 0]

Question	Answer	Marks	Partial Marks
	[x =] 2 , [y =] 1 [x =] 4 , [y =] 5	**B2**	**B1** for one correct pair or two correct x-values or two correct y-values If B0 scored **and** at least 2 method marks scored, **SC1** for correct substitution of both of *their* x values or *their* y values into $y = x^2 - 4x + 5$ or $y = 2x - 3$
4(a)	135	**2**	**M1** for $\frac{360}{5+3} \times k$, where k = 1, 3 or 5 oe
4(b)(i)	26	**2**	**B1** for $\angle ABD = 49$
4(b)(ii)(a)	86	**2**	**B1** for $\angle QAD = 49$ or for $\angle BDA = 45$ or for $\angle BCA = 45$
4(b)(ii)(b)	Angle in a semicircle = 90	**1**	
4(c)(i)	[2 ×] $\cos^{-1}\left(\frac{6.75}{11.5}\right)$ oe	**M2**	**M1** for $\cos(\ldots) = \frac{6.75}{11.5}$ oe
	108.117…	**A1**	
4(c)(ii)	12.7 or 12.73 to 12.74	**2**	**M1** for $\frac{108.12}{360} \times 2 \times \pi \times 6.75$
4(c)(iii)	100 or 100.1 to 100.2	**3**	**M2** for $\frac{360-108.12}{360} \times \pi \times 6.75^2$ oe or **M1** for $\frac{108.12}{360} \times \pi \times 6.75^2$ If 0 scored, **SC1** for $\frac{360-108.12}{360} \times \pi \times k$
5(a)(i)(a)	1480	**1**	
5(a)(i)(b)	440	**2**	**M1** for [UQ =] 1600 soi or [LQ =] 1160 soi
5(a)(ii)	$\frac{8}{80}$ oe	**2**	**M1** for 72 or 8 written
5(b)	236 or 235.5 to 235.6	**3**	**M2** for $\frac{5.104}{1.3} \times 60$ oe or **M1** for $\frac{5.104}{\textit{their}\ \text{time}}$

Question	Answer	Marks	Partial Marks
5(c)(i)	(160 – 120) × 0.2 [= 8]	**1**	with no errors seen
5(c)(ii)	22, 36, 64, 30 seen	**B2**	**B1** for 2 or 3 correct frequencies or **M1** for three of 1.1 × (180 – 160), 1.8 × (200 – 180), 1.6 × (240 – 200) and 0.5 × (300 – 240) oe
	(8 × 140 + *their*22 × 170 + *their*36 × 190 + *their*64 × 220 + *their*30 × 270) ÷ 160	**M3**	**M1** for midpoints soi **M1** for Σfx , x in interval or boundary of interval **M1 dep on second M1** for $\Sigma fx \div 160$
	211.75	**B1**	
6(a)	$\begin{pmatrix} 4 \\ -3 \end{pmatrix}$	**2**	**B1** for $\begin{pmatrix} 6 \\ -10 \end{pmatrix}$ or answer $\begin{pmatrix} 4 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -3 \end{pmatrix}$
6(b)(i)	(–4, –1)	**1**	
6(b)(ii)	7.21 or 7.211…	**2**	**M1** for $(-6)^2 + 4^2$
6(c)(i)(a)	2**c** – **a**	**1**	
6(c)(i)(b)	**c** – **a**	**1**	
6(c)(i)(c)	$\frac{1}{5}$ (**a** + 8**c**) final answer	**2**	**M1** for [$\overrightarrow{AP}$ =] $\frac{4}{5}$ × *their*(2**c** – **a**) or [$\overrightarrow{BP}$ =] $\frac{1}{5}$ × – *their* (2**c** – **a**) or for a correct vector route using the lines on the diagram
6(c)(i)(d)	$\frac{4}{5}$ (– **a** + **c**) final answer	**2**	**M1** for [$\overrightarrow{QP}$ =] $-\frac{4}{5}$**c** + $\frac{4}{5}$ × *their*(2**c** – **a**) or for a correct vector route
6(c)(ii)	[*QP* is] parallel [to *CB*] $QP = \frac{4}{5} CB$ oe	**2**	**Dep both statements** consistent with *their* **(c)(i)(b)** and *their* **(c)(i)(d)** and both vectors in terms of **a** and **c** **B1** for each dep on statement consistent with *their* **(c)(i)(b)** and *their* **(c)(i)(d)** and both vectors in terms of **a** and **c**
7(a)(i)	180 – 60 – 39 [= 81]	**1**	
7(a)(ii)	147 or 147.1…	**3**	**M2** for $\frac{129\sin(81)}{\sin 60}$ oe or **M1** for $\frac{\sin(81)}{CD} = \frac{\sin 60}{129}$ oe

Question	Answer	Marks	Partial Marks
7(a)(iii)	[cos =] $\frac{85^2+129^2-72^2}{2\times85\times129}$	**M2**	**M1** for $72^2 = 85^2 + 129^2 - 2\times85\times129\cos ABD$
	31.58…	**A2**	**A1** for 0.851 to 0.852 or $\frac{9341}{10965}$ or equivalent fraction
7(a)(iv)	44.5 or 44.51 to 44.54	**3**	**M2** for implicit correct method e.g. $\frac{d}{85} = \sin 31.6$ oe or **M1** for recognition that the line from *A* is perpendicular to *BD*
7(a)(v)	247 or 247.4…	**2**	**M1** for 180 + (180 – 81 – 31.6) oe or for ∠*NBC* = 180 – 81 – 31.6 oe or for ∠*NCB* = 81 + 31.6 oe
7(a)(vi)	972 or 973	**4**	**M1** for [△*ABD*] $\frac{1}{2}$ × 85 × 129sin31.6 oe or $\frac{1}{2}$ × 129 × *their* 44.5 oe **M1** for [△*BCD*] $\frac{1}{2}$ × 129 × *their*147×sin39 oe **M1** for $\frac{\textit{their}\text{ total area}}{10000} \times 1100$
7(b)	126 nfww	**3**	**M2** for $\frac{9400+50}{70\text{ to }80}$ or $\frac{9400\text{ to }9500}{80-5}$ or **M1** for 9350 or 9450 or 75 or 85 seen
8(a)(i)	$\frac{5}{12}$ oe	**1**	
8(a)(ii)	$\frac{7}{12}$ oe	**1**	**FT** 1 – *their* **(a)(i)**
8(b)(i)	$\frac{4}{35}$ oe	**2**	**M1** for $\frac{4}{15}\times\frac{6}{14}$

Question	Answer	Marks	Partial Marks
8(b)(ii)	$\frac{74}{105}$ oe	**4**	**M3** for $1-\left(\frac{5}{15}\times\frac{4}{14}+\frac{6}{15}\times\frac{5}{14}+\frac{4}{15}\times\frac{3}{14}\right)$ oe or **M2** for $\frac{5}{15}\times\frac{4}{14}+\frac{6}{15}\times\frac{5}{14}+\frac{4}{15}\times\frac{3}{14}$ oe or **M1** for $\frac{k}{15}\times\frac{k-1}{14}$ where k is 4, 5 or 6 oe If 0 scored, **SC1** for $\frac{148}{225}$ ALTERNATIVE 1 **M3** for $\frac{5}{15}\times\frac{10}{14}+\frac{6}{15}\times\frac{9}{14}+\frac{4}{15}\times\frac{11}{14}$ oe or **M2** for two of these products added oe or **M1** for $\frac{k}{15}\times\frac{15-k}{14}$ where k is 4, 5 or 6 oe If 0 scored, **SC1** for $\frac{148}{225}$ ALTERNATIVE 2 **M3** for $\frac{5}{15}\times\frac{6}{14}\times2+\frac{5}{15}\times\frac{4}{14}\times2+\frac{6}{15}\times\frac{4}{14}\times2$ oe or **M2** for at least two of these different products added oe or **M1** for one correct product If 0 scored, **SC1** for $\frac{148}{225}$
9(a)(i)	9	**1**	
9(a)(ii)	63	**1**	**FT** (*their* **(a)(i)**)^2 – 2 × *their* **(a)(i)**
9(a)(iii)	$\frac{x+5}{2}$ oe final answer	**2**	**M1** for $x = 2y - 5$ or $y + 5 = 2x$ or $\frac{y}{2} = x - \frac{5}{2}$
9(b)	$x^2 - 18x + 35$ final answer	**4**	**M1** for $(2x - 5)^2 - 2(2x - 5) - 3(x^2 - 2x)$ **B1** for $4x^2 - 10x - 10x + 25$ **B1** for $-4x + 10 - 3x^2 + 6x$
10(a)	$3x^2 - 18x - 48$ final answer	**2**	**B1** for two correct terms or for correct answer seen then spoiled

Question	Answer	Marks	Partial Marks
10(b)	*their* $\frac{dy}{dx} = 0$ soi	**M1**	
	[3]$(x - 8)(x + 2)$ oe or $\frac{-(-18) \pm \sqrt{(-18)^2 - 4(3)(-48)}}{2 \times 3}$ oe or $3 \pm \sqrt{16 + 3^2}$	**M1**	oe $\frac{18 \pm \sqrt{900}}{6}$
	(–2, 52) (8, –448)	**B2**	**B1** for one correct pair of coordinates or for two correct values of x
10(c)	(–2, 52) maximum with reason and $(8, -448)$ minimum with reason and no incorrect statement	**3**	Reasons could be e.g. 1. A reasonable sketch of a positive cubic 2. Correct evaluation and use of 2nd derivative $6x - 18 = -30$, $-30 < 0$, so (–2, 52) is a maximum oe. $6x - 18 = 30$, $30 > 0$, so $(8, -448)$ is a minimum oe. 3. Evaluates correctly values of y on both sides of both correct stationary points 4. Finds gradient on each side of both correct stationary points. Any incorrect statement MAX B2 **B2** for 1 correct with correct reason for that stationary point or for **both** x-values correct and reasonable sketch of a positive cubic or for correct substitution and evaluation of **both** of *their* x-values into *their* second derivative or substitution and evaluation for one x-value on both sides of **both** of *their* stationary points to find the gradients soi or **M1** for showing [2nd derivative =] $6x - 18$ or correct FT *their* 2nd derivative from part **(a)** or substitution and evaluation shown for one x-value on both sides of **one** of *their* stationary points to find the gradients soi or for sketch of any positive cubic.

Cambridge Assessment International Education

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CANDIDATE NAME

CENTRE NUMBER

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MATHEMATICS **0580/43**

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

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

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

INFORMATION

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

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

[Turn over

1 Dinari sells fruit and vegetables.

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

Find the mass of the fruit he sells.

..... kg [2]

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

Find the amount he receives from selling the fruit.

\$ ..... [3]

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

Calculate his percentage profit.

..... % [2]

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

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

\$ ..... [2]

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

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

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

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

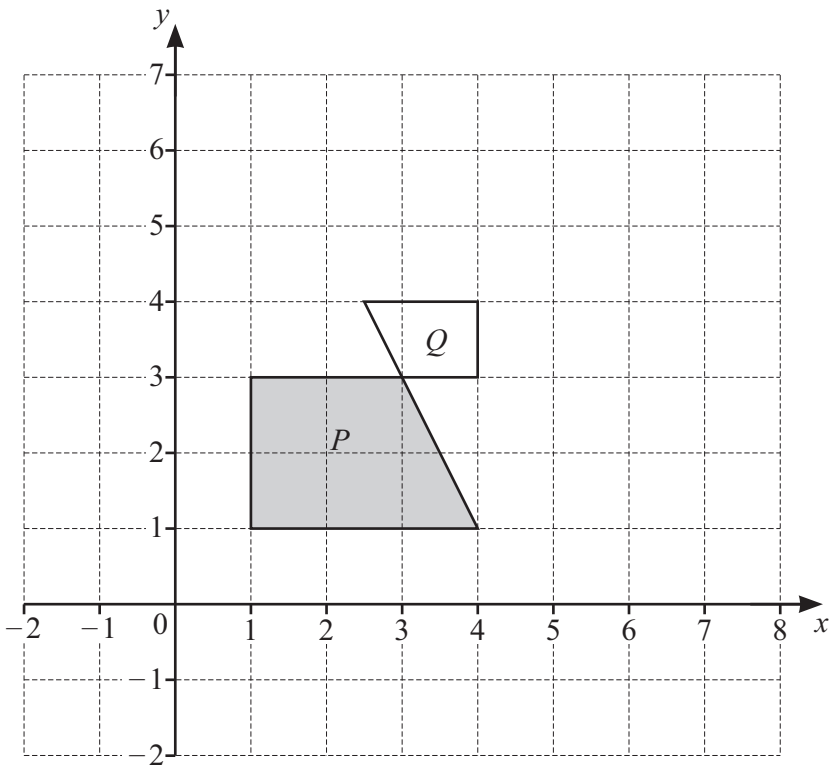
$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

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

Find the coordinates of C.

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

(b)



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

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

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

.....

..... [3]

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

Find the value of r.

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

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

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

\$ ..... [3]

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

Calculate the value of p.

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

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

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

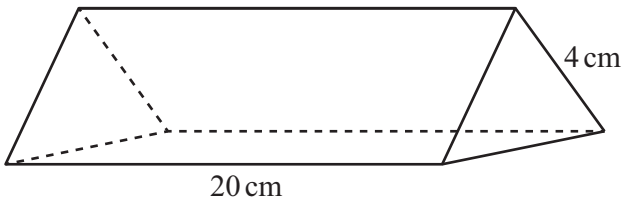
..... g [2]

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

Calculate the amount of water poured into the larger cube.

..... cm^3 [2]

(c)



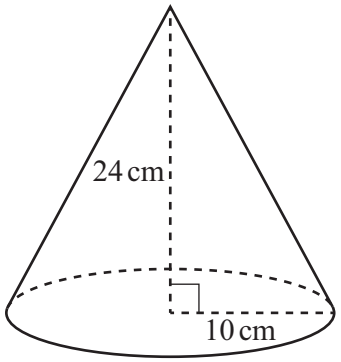
NOT TO SCALE

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

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

..... g [4]

(d)



NOT TO SCALE

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

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

[4]

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

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

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

..... cents [1]

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

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

..... [2]

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

Calculate Naomi's average speed in kilometres per hour.

..... km/h [2]

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

Calculate Olav's average speed for the whole run.

..... km/h [3]

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

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

..... s [3]

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

..... [2]

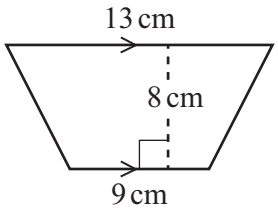
(b) Expand and simplify $(x-1)(x+2)(x+3)$.

..... [3]

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

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

7 (a) (i)

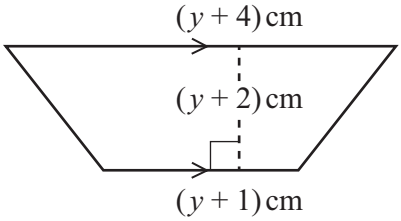


NOT TO SCALE

Calculate the area of the trapezium.

..... cm^2 [2]

(ii)



NOT TO SCALE

The area of this trapezium is 264 cm^2.

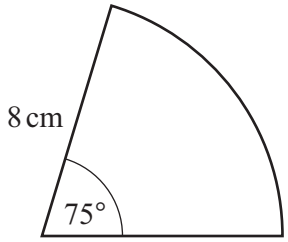
(a) Show that $2y^2 + 9y - 518 = 0$.

[3]

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

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

(b)



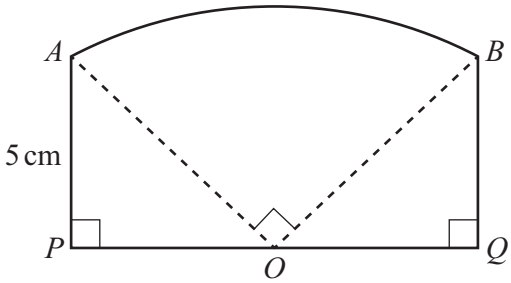
NOT TO SCALE

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

Find the perimeter of the sector.

..... cm [3]

(c)



NOT TO SCALE

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

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

..... cm^2 [4]

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

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

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

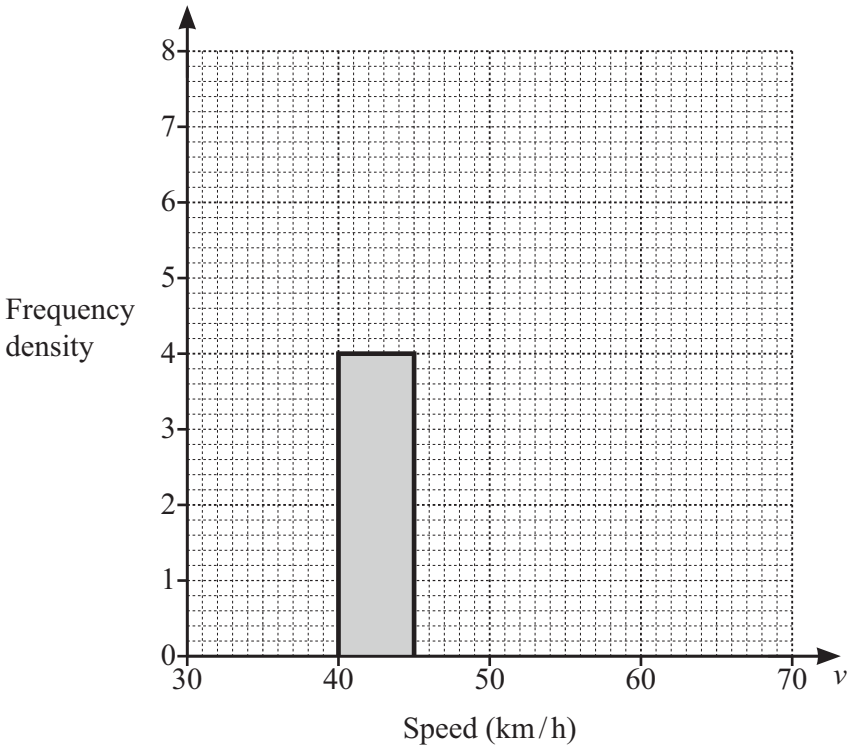
Calculate the angle for the interval $45 < v \leqslant 50$.

..... [2]

(b) Calculate an estimate of the mean speed.

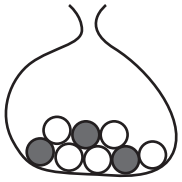
..... km/h [4]

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



[3]

9



A bag contains 5 white balls and 3 black balls.

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

Find the probability that the ball is white.

..... [1]

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

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

..... [1]

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

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

..... [3]

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

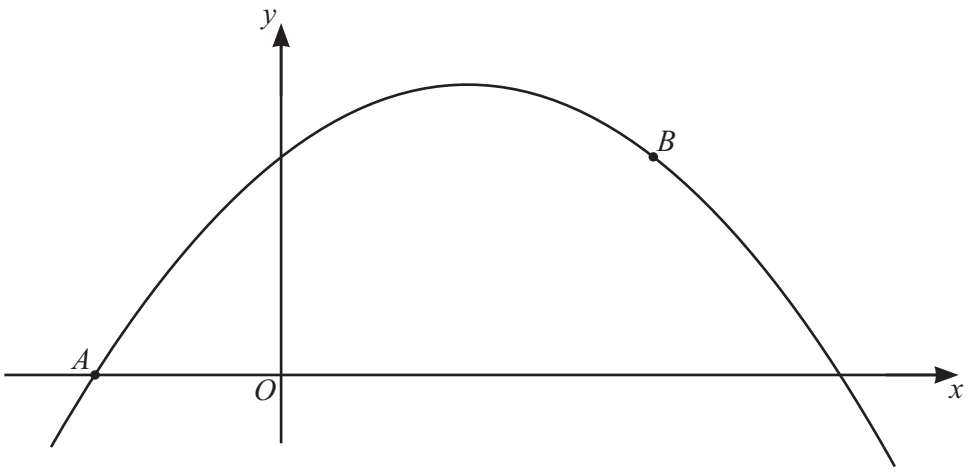
..... [1]

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

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

..... [3]

10



NOT TO SCALE

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

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

..... [2]

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

[3]

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

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

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

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

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

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

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

..... [1]

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

..... [4]

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

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

(d) Find $hh(1)$.

..... [2]

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

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

..... [3]

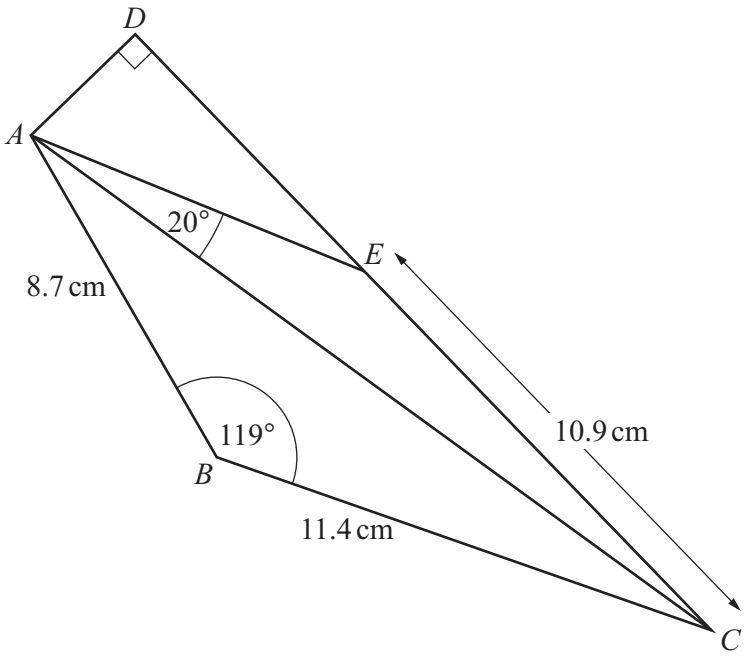
(f) Find x when $\mathrm{j}(x) = \frac{1}{32}$.

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

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

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

12



NOT TO SCALE

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

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

[3]

(b) Angle AEC is obtuse.

Calculate angle ACE.

Angle ACE = ... [4]

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

..... cm [3]

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CAMBRIDGE
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MATHEMATICS **0580/43**

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

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Mathematics-Specific Marking Principles

1 Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.

2 Unless specified in the question, non-integer answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros, provided that the degree of accuracy is not affected.

3 Allow alternative conventions for notation if used consistently throughout the paper, e.g. commas being used as decimal points.

4 Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).

5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.

6 Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

Abbreviations

awrt answers which round to
cao correct answer only
dep dependent
FT follow through after error
isw ignore subsequent working
nfww not from wrong working
oe or equivalent
rot rounded or truncated
SC Special Case
soi seen or implied

Question	Answer	Marks	Partial Marks
1(a)	54	**2**	**M1** for $\frac{48}{8}$
1(b)	142	**3**	**B2** for $2c = 278$ or better or **M1** for $c + 3 + c - 1 = 280$ OR **B2** for $2x = 276$ or better or **M1** for $c + 3 - (c - 1) = 4$
1(c)	8.02 or 8.024 to 8.025	**2**	**M1** for $\frac{1750-1620}{1620}$ [×100] or for $\frac{1750}{1620} \times 100$[−100]
1(d)	1580	**2**	**M1** for $[...] \times \frac{100+10}{100} = 1738$ oe or better
2(a)(i)	(1, 6)	**2**	**B1** for each
2(a)(ii)	$\begin{pmatrix}-4\\-2\end{pmatrix}$	**1**	
2(a)(iii)	(15, 13)	**2**	**FT** *their* (a)(ii) **M1** for $\begin{pmatrix}12\\6\end{pmatrix}$ or $\begin{pmatrix}-12\\-6\end{pmatrix}$ seen or for –1 + 16 and 5 + 8 seen
2(b)(i)	Image at (4, 1), (5, –1), (7, –1), (7, 1)	**2**	**B1** for rotation 180° but incorrect position
2(b)(ii)	Image at (1, 3), (–1, 3), (–1, 6), (1, 5)	**2**	**B1** for correct orientation but incorrect position or for drawing line $y = x + 2$

Question	Answer	Marks	Partial Marks
2(b)(iii)	Enlargement [centre] (3, 3) [factor] $-\frac{1}{2}$	**3**	**B1** for each
3(a)	2.5	**3**	**M2** for $\frac{500\times r\times 14}{100}=675-500$ oe or **M1** for $\frac{500\times r\times 14}{100}$ or for 675 – 500
3(b)	108.18	**3**	**B2** for 508.18... or 508.2 or 508 or **M1** for $400\times\left(\frac{100+2.2}{100}\right)^{11}$ oe or better
3(c)	0.17[0] or 0.1700...	**3**	**M2** for either $\sqrt[(12\times 21)]{\frac{1074}{700}}$ or $\sqrt[252]{\frac{1074}{700}}$ or better or **M1** for 700 × [...]$^{(12\times 21}$ = 1074 oe If 0 scored **SC1** answer 2.06 or 2.059...
4(a)	250	**2**	**B1** for 6750 or **M1** for 7000 – 50 × 135 or for 7 – 50 × 0.135
4(b)	80	**2**	**M1** for 6 × 6 × 4 or for 4^3 oe OR **M1** for (6 × 6) – (4 × 4) oe
4(c)	118 or 117.7 to 117.8	**4**	**M3** for $\frac{1}{2}\times 4\times 4\times\sin 60$ × 20 × 0.85 oe OR **M1** for $\frac{1}{2}\times 4\times 4\times\sin 60$ or $\frac{1}{2}\times 4\times\sqrt{4^2-2^2}$ oe **M1** for 20 × *their* area of triangle **M1 dep** for 0.85 × *their* volume, dependent on previous M1 If 0 scored **SC1** for height = 3.46...

Question	Answer	Marks	Partial Marks
4(d)(i)	$\pi\times\sqrt{24^2+10^2}\times10+\pi\times10^2$ or $\pi\times\left(\sqrt{24^2+10^2}\right)^2\times\frac{2\times\pi\times10}{2\times\pi\times26}+\pi\times10^2$	**M3**	**M2** for $\pi\times\sqrt{24^2+10^2}\times10$ or $\pi\times\left(\sqrt{24^2+10^2}\right)^2\times\frac{2\times\pi\times10}{2\times\pi\times26}$ or **M1** for 24^2+10^2 or $\pi\times10^2$
	1130.9 to 1131.1...	**A1**	Must see at least 5 sf
4(d)(ii)(a)	0.151 or 0.1511 to 0.1512...	**1**	
4(d)(ii)(b)	22	**2**	**B1** for figs 22[1…] or **M1** for $\frac{2.5\times100^2}{1131}$
5(a)	24	**2**	**M1** for $\frac{100\text{ or }0.1}{\text{time}}$ or **B1** for figs 24
5(b)	8.32 or 8.319 to 8.320	**3**	**M1** for $9.5\times\frac{45}{60}$ oe **M1** for $\frac{8.1}{7.5}$
5(c)	$\frac{18(p+q)}{5v}$ oe final answer	**3**	**M1** for $[k\times]\ \frac{(p+q)}{v}$ for some $k\neq0$ **M1** for $v\times\frac{1000}{3600}$ oe soi
6(a)	$\frac{16}{y}$ final answer	**2**	**M1** for $\frac{240u}{15uy}$ or better
6(b)	x^3+4x^2+x-6 final answer	**3**	**B2** for correct unsimplified expansion of three brackets or for simplified four-term expression of correct form with 3 terms correct in final answer or **B1** for correct expansion of two given brackets with at least 3 terms out of 4 correct

Question	Answer	Marks	Partial Marks
6(c)	$\frac{-1\pm\sqrt{1^2-4(2)(-5)}}{2(2)}$	**M2**	**M1** for $\sqrt{1^2-4(2)(-5)}$ or better or for $\frac{-1+\sqrt{p}}{2(2)}$ or $\frac{-1-\sqrt{p}}{2(2)}$
	–1.85, 1.35	**A2**	**A1** for each or –1.851 to –1.850 and 1.350 to 1.351 or –1.9 and 1.4 or –1.35 and 1.85
7(a)(i)	88	**2**	**M1** for $\frac{1}{2}(9+13)\times 8$ oe
7(a)(ii)(a)	$\frac{1}{2}(y+4+y+1)\times(y+2)$ [=264] or $\frac{1}{2}\times 3\times(y+2)+(y+1)\times(y+2)$ [=264]	**M1**	
	$2y^2+5y+4y+10$	**B1**	
	Leading to $2y^2+9y-518=0$	**A1**	No errors or omissions
7(a)(ii)(b)	$(2y+37)(y-14)$	**B2**	**B1** for $(2y+a)(y+b)$ where $ab = -518$ or $a + 2b = 9$ or $2y(y-14)+37(y-14)$ or $y(2y+37)-14(2y+37)$
	14	**B1**	
7(b)	26.5 or 26.47...	**3**	**B2** for 10.5 or 10.47… or $\frac{10\pi}{3}$ OR **M2** for $8 + 8 + \frac{75}{360}\times 2\pi 8$ or **M1** for $\frac{75}{360}\times 2\pi 8$
7(c)	$25 + \frac{25}{2}\pi$	**4**	**M2** for $\frac{90}{360}\times\pi\times(\sqrt{(5^2+5^2)})^2$ or **M1** for [radius ^{2} =] 5^2+5^2 **M1** for [triangle area =] [2×] $\frac{1}{2}\times 5\times 5$ oe

Question	Answer	Marks	Partial Marks
8(a)	126	**2**	**M1** for $\frac{35}{100}\times 360$
8(b)	48.375	**4**	**M1** for mid-values 35, 42.5, 47.5, 60 soi **M1** for 15 × 35 + 20 × 42.5 + 35 × 47.5 + 30 × 60 **M1 dep** $\frac{\Sigma fx}{100}$ **dep** on second **M1**
8(c)	Correct histogram with correct widths and heights 1.5, ... 7, 1.5	**3**	**B1** for each column If 0 scored, **SC1** for freq. densities 1.5, ...7, 1.5 seen or $\frac{15}{10}$, $\frac{35}{5}$, $\frac{30}{20}$
9(a)(i)	$\frac{5}{8}$ oe	**1**	
9(a)(ii)	75	**1**	**FT** *their* **(a)(i)**
9(b)(i)	$\frac{17}{32}$ oe	**3**	**M2** for $\frac{5}{8}\times\frac{5}{8}+\frac{3}{8}\times\frac{3}{8}$ or **M1** for $\frac{5}{8}\times\frac{5}{8}$ or $\frac{3}{8}\times\frac{3}{8}$
9(b)(ii)	$\frac{15}{32}$ oe	**1**	**FT** *their* **(b)(i)**
9(c)	$\frac{15}{28}$ oe	**3**	**M2** for $\frac{5}{8}\times\frac{4}{7}\times\frac{3}{6}\times k$, k = 1 or 2 or 3 oe **M1** for $\frac{5}{8}$ and $\frac{4}{7}$ and $\frac{3}{6}$ or showing the three possible combinations oe If 0 scored **SC1** for $\frac{225}{512}$ oe
10(a)	$2 - 2x$	**2**	**B1** for $k - 2x$ or $2 - kx$ or $3 + 2 - 2x$
10(b)(i)	Gradient (m) = correct substitution of –1 into *their* (a) 2 – 2(–1)	**M1**	
	0 = *their* m × –1 + c or y [– 0] = *their* $m(x - -1)$ oe	**M1**	Dep on previous M1
	c = 4 and leading to $y = 4x + 4$	**A1**	

Question	Answer	Marks	Partial Marks
10(b)(ii)	$-\frac{1}{4}x+\frac{7}{2}$ oe	**3**	**M1** for $-\frac{1}{4}$ **M1** for 3 = *their m* × 2 + *c* or better or $y - 3$ = *their m*$(x - 2)$ or better
10(c)	(1, 4)	**3**	**B2** for $x = 1$ or **M1** for *their* **(a)** = 0 **M1** for substituting *their* 1 into $y = 3 + 2x - x^2$ OR **B2** for $x = 1$ or **M2** for $4 - (x - 1)^2$ or **M1** for $(x - 1)^2$
11(a)	7	**1**	
11(b)	$-4x^2-12x+13$ final answer	**4**	**B1** for $(2x + 5)(1 - 2x)$ **B1** for $2x - 4x^2 + 5 - 10x$ oe **B1** for $2(1 - 2x) + 5$
11(c)	$\frac{1-x}{2}$ oe final answer	**2**	**M1** for $x=1-2y$ or $2x=1-y$ or $\frac{y}{2}=\frac{1}{2}-x$
11(d)	$\frac{2}{3}$ oe	**2**	**M1** for $h\left(\frac{1}{2}\right)$ or $\frac{1}{\frac{1}{x+1}+1}$ oe
11(e)	$\frac{-x-4}{(2x+5)(x+1)}$ or $\frac{-x-4}{2x^2+7x+5}$ or $-\frac{x+4}{2x^2+7x+5}$ final answer	**3**	**M1** for $x+1-(2x+5)$ oe **M1** for common denominator $(2x+5)(x+1)$ seen
11(f)	–5	**1**	
11(g)	1	**1**	
12(a)	$\sqrt{8.7^2+11.4^2-2\times8.7\times11.4\cos119}$	**M2**	**M1** for $8.7^2+11.4^2-2\times8.7\times11.4\cos119$ **A1** for 301.8...
	17.372 to 17.373	**A1**	

Question	Answer	Marks	Partial Marks
12(b)	13.[0] or 13.02 to 13.03	**4**	**M2** for $\sin E = \frac{17.37\sin 20}{10.9}$ or **M1** for $\frac{10.9}{\sin 20} = \frac{17.37}{\sin E}$ oe **M1** for $\angle ACE = 180 - 20 - \textit{their}$ obtuse AEC oe
12(c)	40.9 or 40.91 to 40.94	**3**	**M1** for a correct implicit trig statement for AD e.g. $\sin(\textit{their acute } ACE) = \frac{AD}{17.37}$ oe **M1** for a correct implicit statement for CD e.g. $\cos(\textit{their acute } ACE) = \frac{CD}{17.37}$ oe or $CD^2 = 17.37^2 - (\textit{their}AD)^2$ or for a correct statement for ED eg $\tan(180 - \textit{their}$ obtuse $\angle AEC) = \frac{\textit{their}AD}{ED}$