Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

3232846062

MATHEMATICS **0580/21**

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

1 hour 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

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

INFORMATION

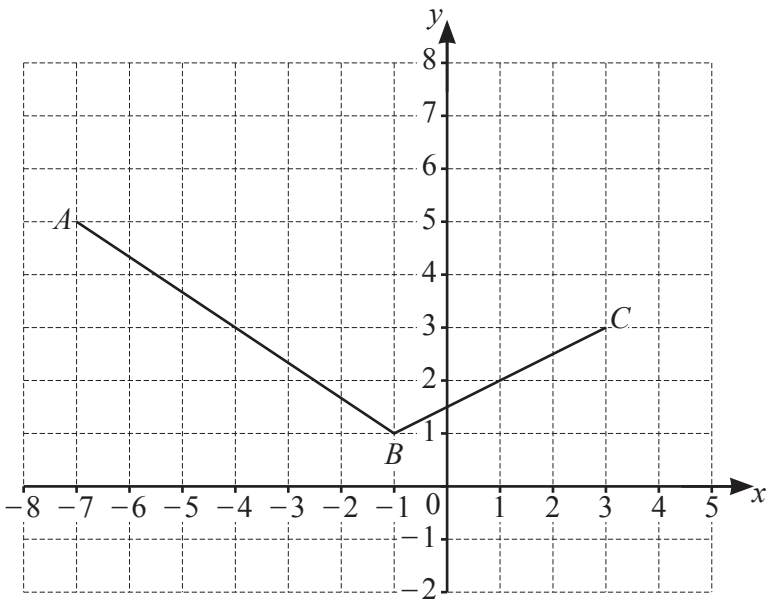
- The total mark for this paper is 70.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages. Any blank pages are indicated.

DC (DE/CT) 329229/1

[Turn over

1



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

Find the coordinates of point D.

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

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

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

..... [1]

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

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

Complete the table.

[2]

3 The table shows some information about two sequences.

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

(a) Complete the table.

[2]

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

..... [2]

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

..... [2]

5 Calculate.

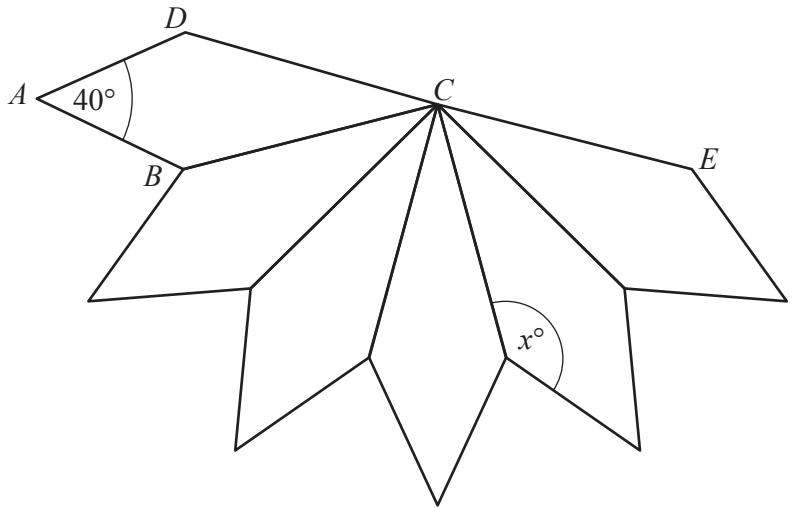
(a) $\sqrt[3]{343} - \sqrt{40.96}$

..... [1]

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

..... [1]

6



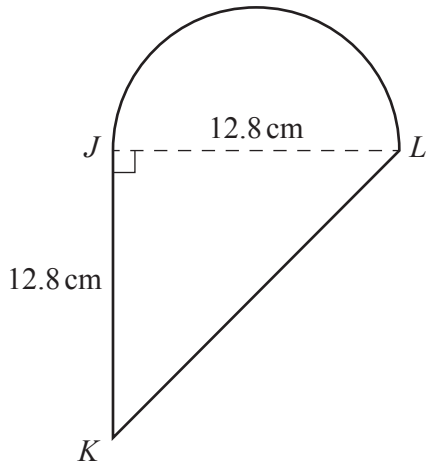
NOT TO SCALE

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

Find the value of x.

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

7



NOT TO SCALE

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

(a) Calculate the area of this shape.

..... cm^2 [3]

(b) Calculate the perimeter of this shape.

..... cm [4]

[Turn over

8 These are the first five terms of a sequence.

11 18 25 32 39

Find an expression for the nth term of the sequence.

..... [2]

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

Calculate the value of this car after 3 years.

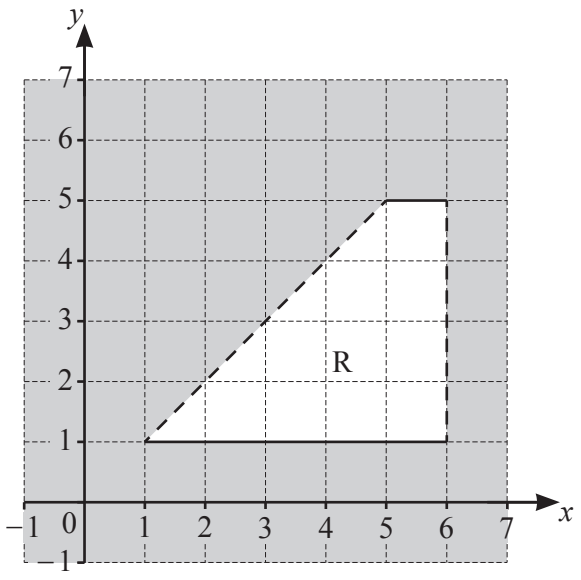
\$ ..... [2]

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

Find the value of r.

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

11



Find the inequalities that define the unshaded region, R.

..... [4]

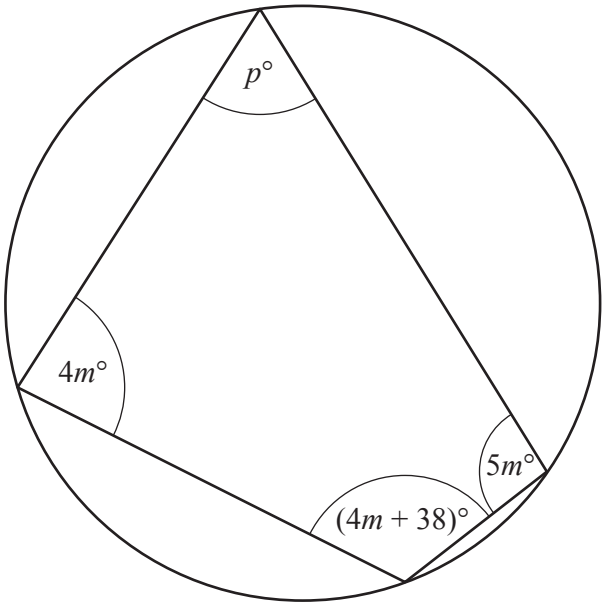
12 Solve the simultaneous equations.
You must show all your working.

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

$x =$ .....

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

13



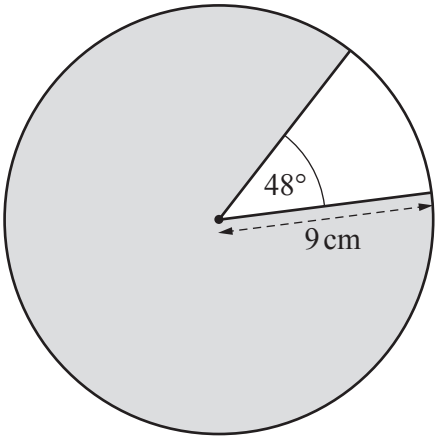
NOT TO SCALE

The diagram shows a cyclic quadrilateral.

Find the value of p.

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

14



NOT TO SCALE

The diagram shows a circle with radius 9 cm.

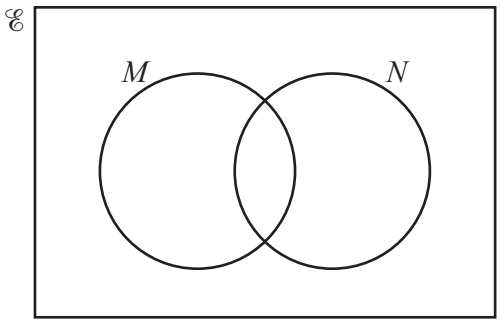
Calculate the area of the shaded major sector.

..... cm^2 [3]

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

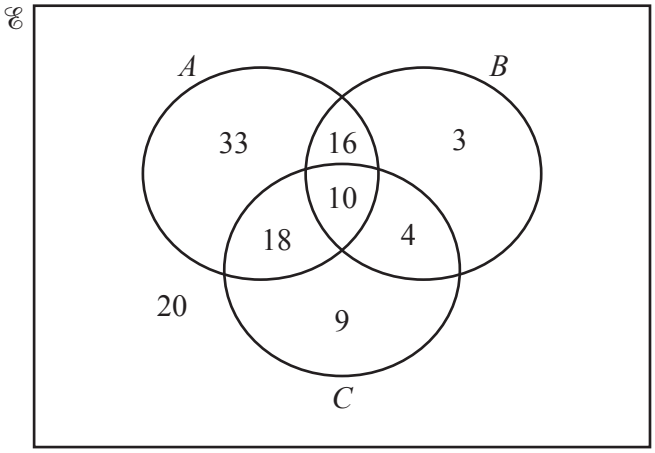
..... [3]

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



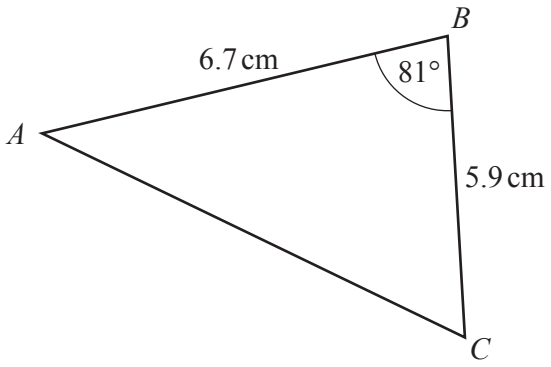
[1]

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



..... [1]

17

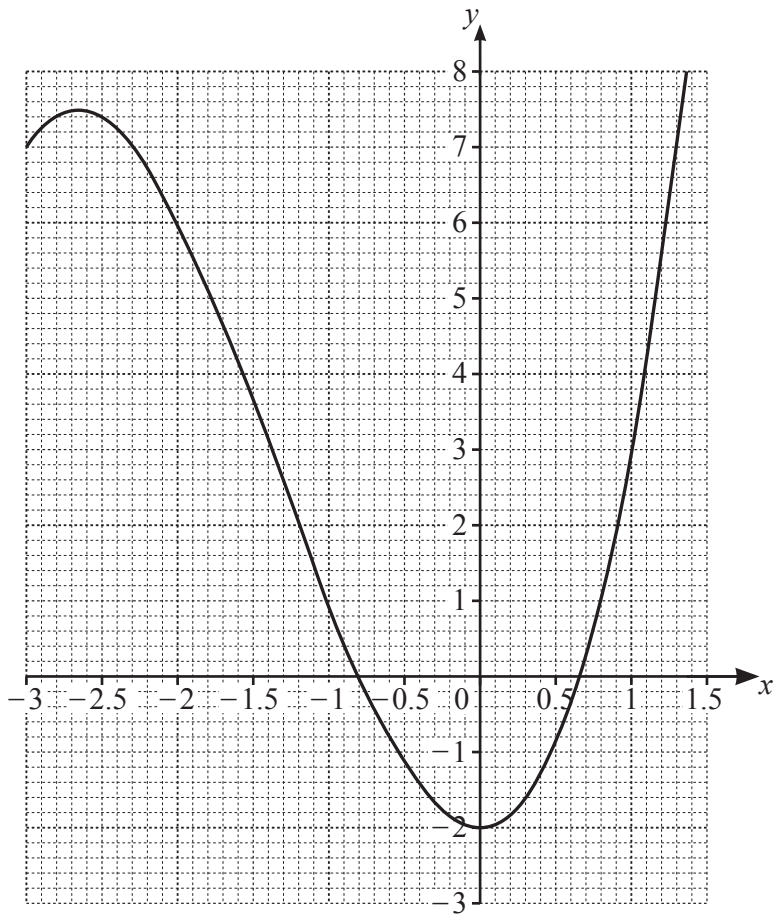


NOT TO SCALE

Calculate the area of triangle ABC.

..... cm^2 [2]

18



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

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

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

19 Factorise completely.

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

..... [3]

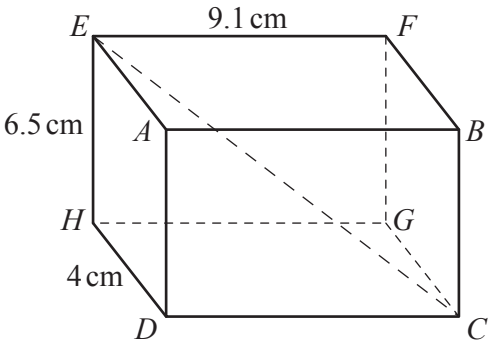
(b) $xy + 15 + 3y + 5x$

..... [2]

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

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

21



NOT TO SCALE

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

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

..... [4]

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

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

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

..... [4]

BLANK PAGE

CAMBRIDGE
International Education

Cambridge IGCSE™

MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 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 May/June 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U 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.

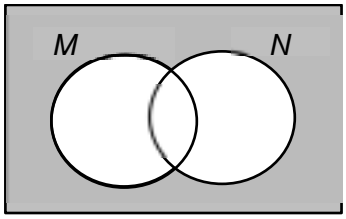
6 Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

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	(–3, 7)	**2**	**B1** for correct diagram or correct coordinates for *their* point *D* or for $(-3,k)$ or $(k,7)$
2(a)	0.4 oe	**1**	
2(b)	42 0.2 0.2	**2**	**B1** for 42 **B1** for 0.2 and 0.2 If B0 scored **SC1** for *their* two probabilities being half *their* **(a)**
3(a)	40 –275	**2**	**B1** for each
3(b)	24	**2**	**B1** for 324 or 289 or $\sqrt{300}$ or 17.3…
4	35	**2**	**B1** for answer 5, 7 or 70 or **M1** for 2 × 2 × 5 × 7 and 2 × 3 × 5 × 7 or two correct factor trees or tables or 5 × 7 × *k* seen
5(a)	0.6 or $\frac{3}{5}$	**1**	
5(b)	1024	**1**	
6	145	**3**	**M1** for 180 ÷ 6 or any angle congruent to *BCD* = 30 **M1** for (360 – 40 – *their* 30) ÷ 2 oe
7(a)	146 or 146.2 to 146.3	**3**	**M1** for $\frac{1}{2}\times 12.8\times 12.8$ **M1** for $\left[\frac{1}{2}\times\right]\pi\times\left(\frac{12.8}{2}\right)^2$

Question	Answer	Marks	Partial Marks
7(b)	51[.0] or 51.00 to 51.01…	**4**	**M1** for $\frac{1}{2}\times\pi\times12.8$ **M2** for $\sqrt{12.8^2+12.8^2}$ or $\frac{12.8}{\sin 45}$ oe or **M1** for $12.8^2+12.8^2$ oe or $\sin 45=\frac{12.8}{KL}$ oe
8	$7n + 4$ oe final answer	**2**	**B1** for $7n + j$ or $kn + 4$ $k \neq 0$, or $7n + 4$ seen then spoilt
9	3375	**2**	**M1** for $8000\times\left(1-\frac{25}{100}\right)^3$ oe
10	1.25 or 1.250…	**3**	**M2** for $\sqrt[8]{\frac{1656.73}{1500}}$ oe or **M1** for $1656.73 = 1500(k)^8$ oe for any k
11	$y < x$ $x < 6$ $1 \leqslant y \leqslant 5$ oe	**4**	**B1** for $y < x$ **B1** for $x < 6$ **B2** for $1 \leqslant y \leqslant 5$ or **B1** for $y \geqslant 1$ or $y \leqslant 5$ If B0 scored, **SC2** for $y \leqslant x$, $x \leqslant 6$ and $1 < y < 5$ oe or **SC1** for three correct from $y = x$, $x = 6$, $y = 1$ and $y = 5$
12	Correctly equating one set of coefficients	**M1**	
	Correct method to eliminate one variable	**M1**	
	$x = 10$, $y = –2$	**A2**	**A1** for $x = 10$ **A1** for $y = –2$ If M0 scored **SC1** for 2 values satisfying one of the original equations.
13	62	**3**	**B2** for $m = 20$ or **M1** for $5m + 4m = 180$ soi or $p + 4m + 38 = 180$ soi

Question	Answer	Marks	Partial Marks
14	221 or 220.5 to 220.6	**3**	**M2** for $\frac{360-48}{360}\times\pi\times9^2$ or **M1** for $\frac{k}{360}\times\pi\times9^2$ where $k<360$ or **B1** for 312
15	$146.\dot{4}\dot{6}-1.\dot{4}\dot{6}$ oe	**M1**	
	$\frac{29}{198}$ cao	**A2**	**Al** for $\frac{145}{990}$ oe If M0 scored **SC1** for $\frac{k}{990}$ with insufficient working.
16(a)		**1**	
16(b)	17	**1**	
17	19.5 or 19.52…	**2**	**M1** for $\frac{1}{2}\times6.7\times5.9\times\sin81$ oe
18	$y = 2x$ ruled	**B1**	
	$x = -0.5$ to -0.55 $x = 0.85$ to 0.9	**B2**	**B1** for -0.5 to -0.55 **B1** for 0.85 to 0.9
19(a)	$3(2m + 5t)(2m - 5t)$ final answer	**3**	**B2** for $(6m + 15t)(2m - 5t)$ or $(2m + 5t)(6m - 15t)$ or **B1** for $3(4m^2 - 25t^2)$ or $(2m + 5t)(2m - 5t)$
19(b)	$(x + 3)(y + 5)$ final answer	**2**	**B1** for $x(y + 5) + 3(y + 5)$ or $y(x + 3) + 5(x + 3)$
20	218.7, 321.3	**3**	**B2** for one correct or **M1** for $\sin x = -\frac{5}{8}$ oe If M1 or 0 scored, **SC1** for two reflex angles with a sum of 540 or two non-reflex angles with a sum of 180

Question	Answer	Marks	Partial Marks
21	33.2 or 33.18…	**4**	**M3** for $\tan = \frac{6.5}{\sqrt{4^2 + 9.1^2}}$ oe or **M2** for $4^2 + 9.1^2$ oe or $4^2 + 9.1^2 + 6.5^2$ oe or **M1** for recognising the angle *ECH*
22	0.225 oe	**4**	**M3** for $\left(1 - \frac{0.25}{0.4}\right) \times (1 - 0.4)$ oe OR **M2** for $\frac{0.25}{0.4}$ or **M1** for $0.4 \times p = 0.25$ oe **M1** for (1 –*their*P(Jen red))×(1 – 0.4) oe

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

9927811861

MATHEMATICS **0580/22**

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

1 hour 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

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

INFORMATION

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

This document has **12** pages.

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

Work out the difference between these two temperatures.

..... °C [1]

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

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

$ ..... [2]

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

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

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

2	
3	
4	
5	

Key: 4 | 8 represents 48 pizzas

[2]

(b) Find the median.

..... [1]

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

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

..... [3]

5 The table shows part of a tram timetable.

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

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

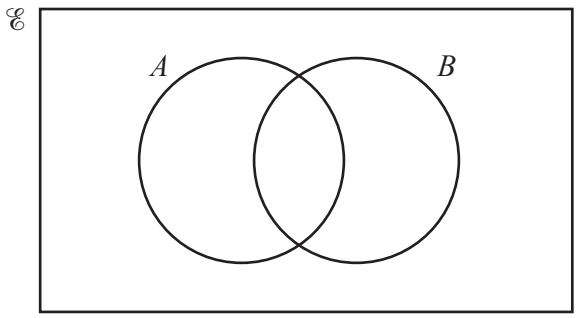
Complete the table.

[2]

6 Write 0.04628 correct to 2 significant figures.

..... [1]

7



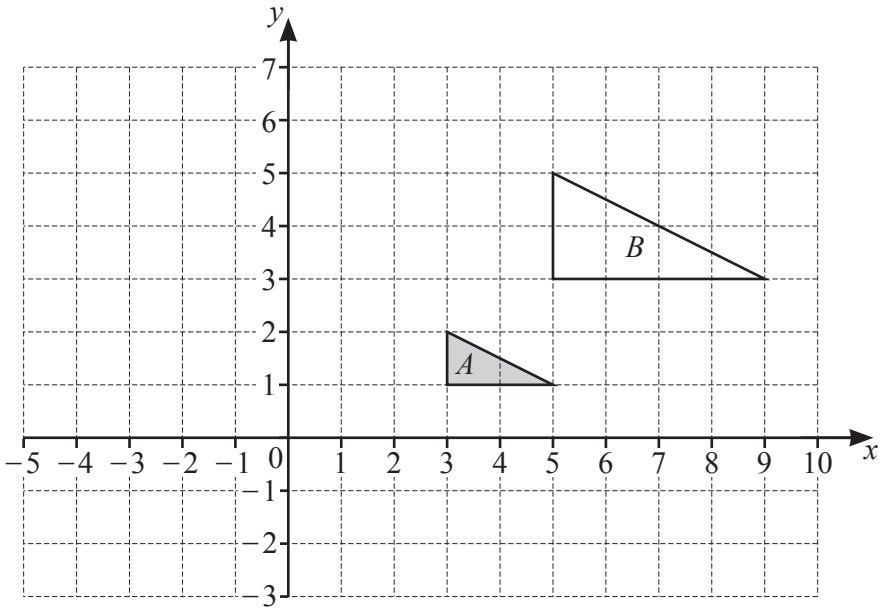
On the Venn diagram, shade the region $A \cup B$. [1]

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

Find the value of r.

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

9



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

.....

..... [3]

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

10 Write 174 000 in standard form.

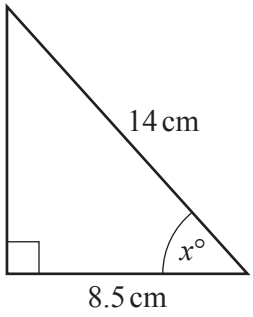
..... [1]

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

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

..... [2]

12



NOT TO SCALE

The diagram shows a right-angled triangle.

Calculate the value of x.

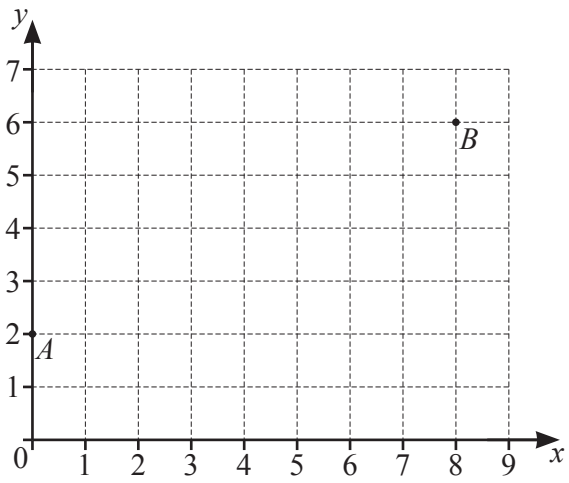
$x =$ ..... [2]

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

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

..... [3]

14



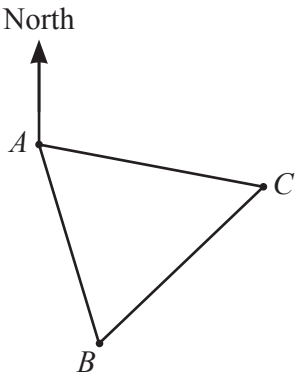
A is the point (0, 2) and B is the point (8, 6).

Find the equation of line AB.

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

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

15



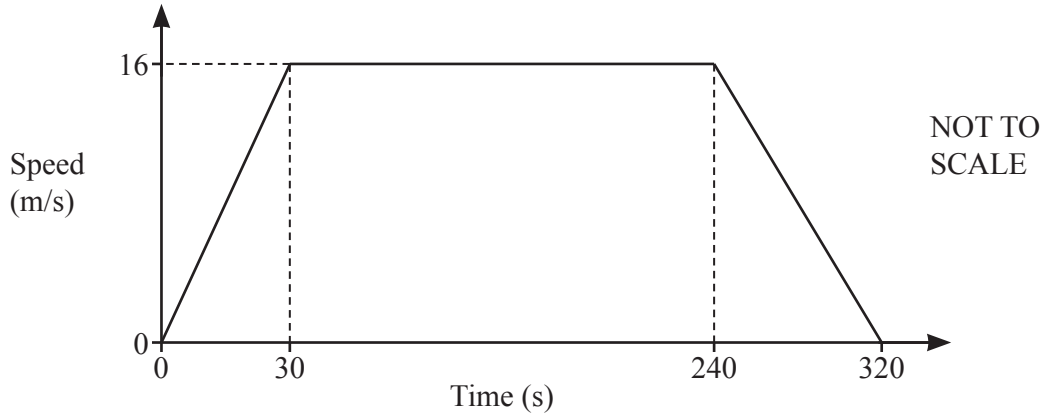
NOT TO SCALE

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

Calculate the bearing of B from C.

..... [3]

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



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

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

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

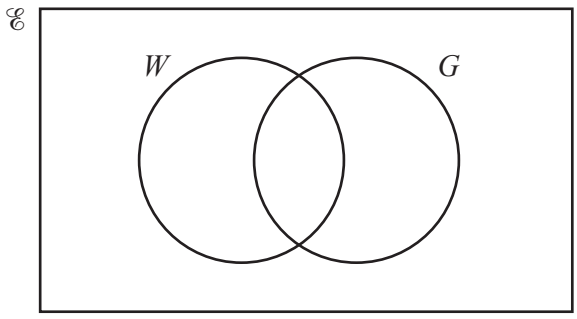
..... m [3]

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

There are 20 students in a class.

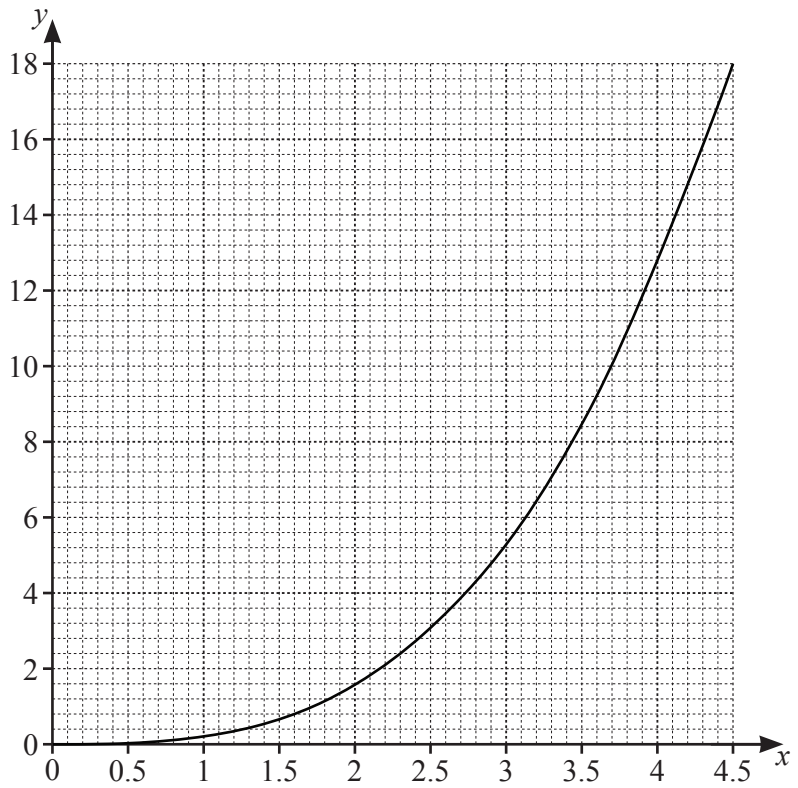
- 8 walk to school
- 3 wear glasses and walk to school
- 2 do not wear glasses and do not walk to school.

Complete the Venn diagram.



[2]

18



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

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

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

..... [2]

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

Find y when $x = 7$.

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

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

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

..... [1]

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

Calculate the height of the smaller parcel.

..... cm [3]

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

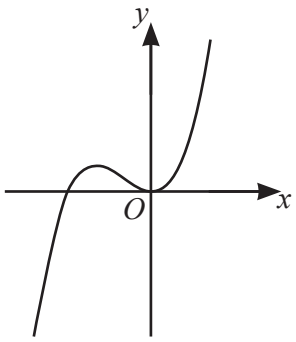
$$4y + 3x = 13$$
$$y = x^2 - 18$$

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

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

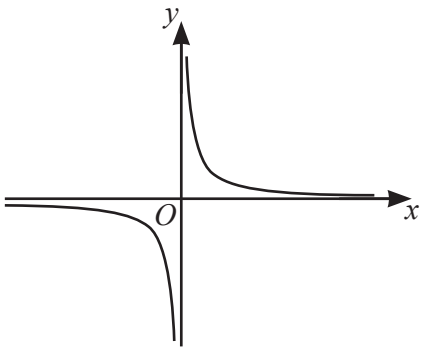
22 **(a)** For each sketch, put a ring around the correct type of function shown.

(i)



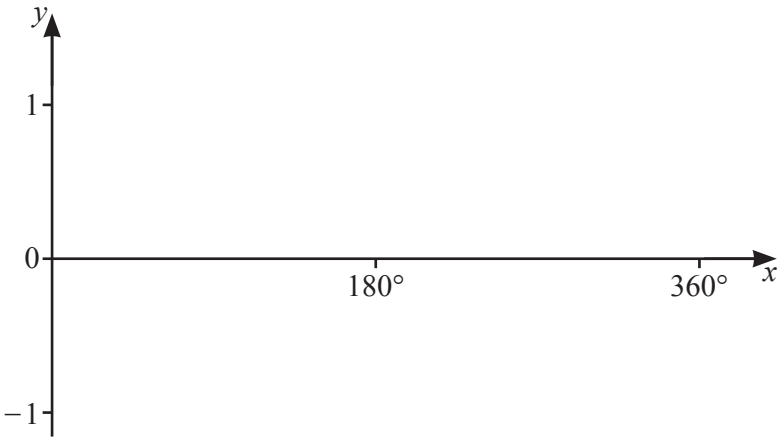
linear cubic quadratic reciprocal exponential [1]

(ii)



linear cubic quadratic reciprocal exponential [1]

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

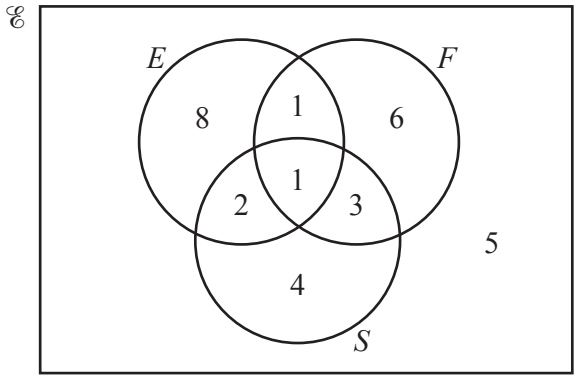


[2]

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

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

23



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

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

..... [1]

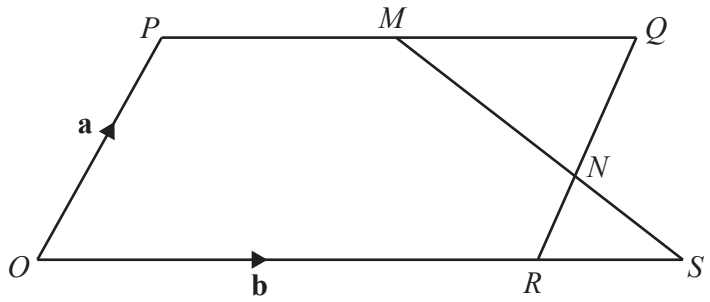
(b) One student is picked at random from those who study Spanish.

Find the probability that this student studies exactly two languages.

..... [2]

Question 24 is printed on the next page.

24



NOT TO SCALE

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

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

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

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

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

..... [3]

CAMBRIDGE
International Education

Cambridge IGCSE™

MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 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 May/June 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **8** printed pages.

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).

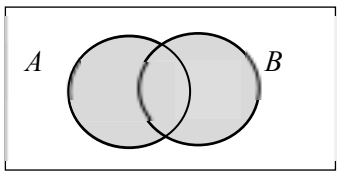
5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.

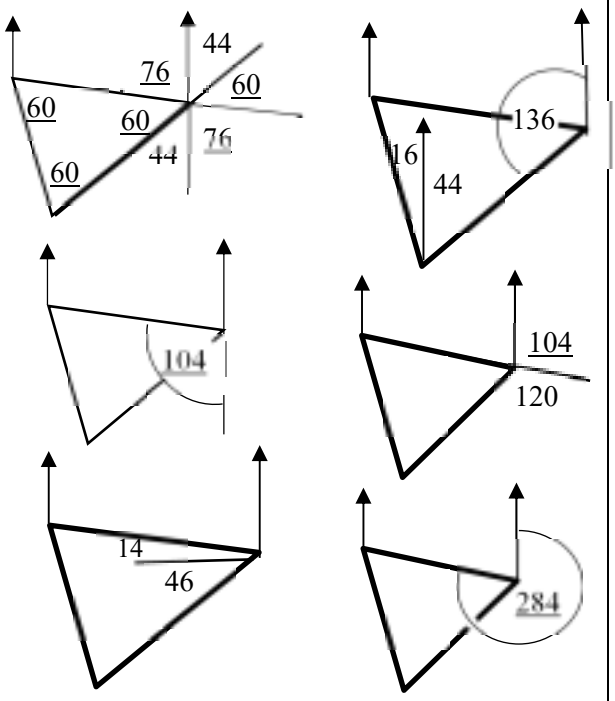
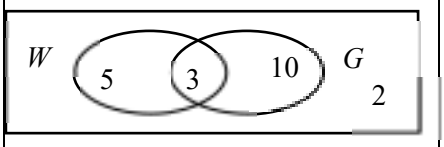
6 Recovery within working is allowed, e.g. a notation error in the working where the following line of working makes the candidate's intent clear.

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	Mark	Partial Marks
1	29	**1**	
2	41.7[0]	**2**	**M1** for $6.55 \times 4 + 15.5$
3(a)	Correct table **2 | 2 8** **3 | 6 9** **4 | 1 4 8 9** **5 | 2 4 7 7**	**2**	**B1** for two rows correct or for fully correct unordered stem-and-leaf diagram
3(b)	46	**1**	
4	$\frac{1}{6}$ or equivalent fraction	**3**	**B2** for $\frac{625}{750}$ oe or **M2** for $750 - \frac{750}{4} - 437.5$ oe or **M1** for $750 - \frac{750}{4}$ oe or $\frac{750}{4} + 437.5$ oe or $\frac{437.5}{750}$ oe
5	13 05 or 1 05pm	**2**	**M1** for 47 [minutes]
6	0.046 cao	**1**	

Question	Answer	Mark	Partial Marks
7		**1**	
8	1.75	**3**	**M2** for $\frac{(5700-5000)[\times 100]}{5000\times 8}$ oe or $\frac{(5700-5000)\times 100}{5000[\times 8]}$ oe or **M1** for $[5700-5000]=\frac{5000\times 8\times r}{100}$ oe or **B1** for 87.5 or 0.14 or 1.14 If 0 scored **SC1** for answer 14.25
9(a)	Enlargement [s f] 2 [centre] $(1,-1)$	**3**	**B1** for each
9(b)	image at $(-1,\ 4)(-1,\ 5)(1,\ 4)$	**2**	**B1** for translation by $\begin{pmatrix}-4\\k\end{pmatrix}$ **or** $\begin{pmatrix}k\\3\end{pmatrix}$
10	1.74×10^{5}	**1**	
11	93	**2**	**M1** for $\frac{3}{40}[\times 1240]$ oe or $\frac{1240}{40}[\times 3]$ oe or $\frac{40}{3}=\frac{1240}{x}$ oe
12	52.6 or 52.61 to 52.62	**2**	**M1** for $\cos[\ldots=]\frac{8.5}{14}$ oe
13	$\frac{9}{4}\times\frac{8}{15}$ oe or $\frac{18}{8}\div\frac{15}{8}$ oe with common denominator	**M2**	**B1** for $\frac{9}{4}$ oe or $\frac{15}{8}$ oe or **M1** for $\frac{their\,9}{4}\times\frac{8}{their\,15}$ oe
	$1\frac{1}{5}$ cao	**A1**	dep on M2

Question	Answer	Mark	Partial Marks
14	$y = \frac{1}{2}x + 2$ oe	**2**	**M1** for $\frac{6-2}{8-0}$ oe or for $y = kx + 2$
15	224	**3**	**M2** for a fully correct method e.g. 360 – (180 – 104 + 60) oe or **B2** for 120, 136, 44, 46, 14, or 16 in the correct position or **B1** for 60, 76, 104 or 284 in the correct position or for interior angle of triangle = 60 i.e. these positions for B2 or B1: 
16(a)	0.2 oe	**1**	
16(b)	4240	**3**	**M2** for $\frac{1}{2} \times (210 + 320) \times 16$ oe or **M1** for one area correct
17		**2**	**B1** for 2 sections out of 4 correct
18(a)	tangent ruled at $x = 3$	**1**	

Question	Answer	Mark	Partial Marks
18(b)	4.8 to 5.8	**2**	dep on a close attempt at a tangent **M1** for $\frac{\text{rise}}{\text{run}}$ also dep on close attempt at tangent
19(a)	12	**3**	**M1** for $y = k(x-1)^2$ oe **M1** for $y = \textit{their}\ k(7-1)^2$ oe
19(b)	divided by 3 oe	**1**	
20	3.9	**3**	**M2** for $5.2 \times \sqrt[3]{\frac{33.75}{80}}$ oe or **M1** for $\frac{\sqrt[3]{33.75}}{\sqrt[3]{80}}$ oe or $\frac{\sqrt[3]{80}}{\sqrt[3]{33.75}}$ oe or $\frac{h^3}{5.2^3} = \frac{33.75}{80}$ oe
21	$4x^2 + 3x - 85[= 0]$ or $16y^2 - 113y + 7[= 0]$ oe simplified	**M2**	**M1** for $4(x^2 - 18) + 3x = 13$ or $x^2 - 18 = \frac{13-3x}{4}$ or $y = \left(\frac{13-4y}{3}\right)^2 - 18$ oe or better
	correct method to solve *their* quadratic equation e.g. factors, quadratic formula, completing the square	**M1**	$\frac{-3 \pm \sqrt{3^2 - 4\times4\times-85}}{2\times4}$ oe, $(4x - 17)(x + 5)$ $\frac{-(-113) \pm \sqrt{(-113)^2 - 4\times16\times7}}{2\times16}$ oe, $(16y - 1)(y - 7)$
	$x = -5$ $y = 7$ $x = \frac{17}{4}$ oe $y = \frac{1}{16}$ oe	**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 $4y + 3x = 13$ or $y = x^2 - 18$
22(a)(i)	cubic	**1**	
22(a)(ii)	reciprocal	**1**	

Question	Answer	Mark	Partial Marks
22(b)(i)	correct sine curve sketch through (0, 0), (180, 0) and (360, 0) 	**2**	**M1** for correct sine curve shape through the origin
22(b)(ii)	203.6 and 336.4	**3**	**B2** for one correct or **M1** for $\sin x = -0.4$ oe If 0 or M1 scored, **SC1** for two reflex angles with a sum of 540 or two non-reflex angles with a sum of 180
23(a)	15	**1**	
23(b)	$\frac{1}{2}$ oe nfww	**2**	**M1** for $\frac{2+3}{2+1+3+4}$ oe or $1-\frac{4+1}{2+1+3+4}$ oe with either the numerator or denominator correct
24(a)	$\frac{1}{2}\mathbf{b}-\frac{2}{3}\mathbf{a}$	**2**	**B**1 for answer $\frac{1}{2}\mathbf{b}+k\mathbf{a}$ or $j\mathbf{b}-\frac{2}{3}\mathbf{a}$ or correct unsimplified in terms of **a** and **b**
24(b)	$\frac{5}{4}\mathbf{b}$	**3**	**M2** for $\overrightarrow{RS}=\frac{1}{4}\mathbf{b}$ oe or $\overrightarrow{MS}=\frac{3}{2}\left(\frac{1}{2}\mathbf{b}-\frac{2}{3}\boldsymbol{a}\right)$ oe or $\overrightarrow{NS}=\frac{1}{2}\left(\frac{1}{2}\mathbf{b}-\frac{2}{3}\boldsymbol{a}\right)$ oe or **M1** for a correct route in terms of vertices and/or **a** and/or **b** or **B**1 for answer $j\mathbf{b}$ where $j > 1$ or $\overrightarrow{RS}=\frac{1}{2}\overrightarrow{MQ}$, $\overrightarrow{RS}=\frac{1}{4}\overrightarrow{OR}$, oe $\overrightarrow{NS}=\frac{1}{2}\overrightarrow{MN}$, $\overrightarrow{MS}=\frac{3}{2}\overrightarrow{MN}$ $\overrightarrow{NS}=\frac{1}{3}\overrightarrow{MS}$

* 0019655329601 *

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 6 3 3 3 9 9 6 6 1 9 *

MATHEMATICS **0580/23**

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

1 hour 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

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

INFORMATION

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

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

DC (PQ/SG) 329287/2

[Turn over

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

..... [1]

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

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

[1]

3 Simplify.

$7x - 8y - x - y$

..... [2]

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

Calculate the height of the cuboid.

..... cm [2]

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

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

..... [1]

6 Factorise completely.

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

..... [2]

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

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

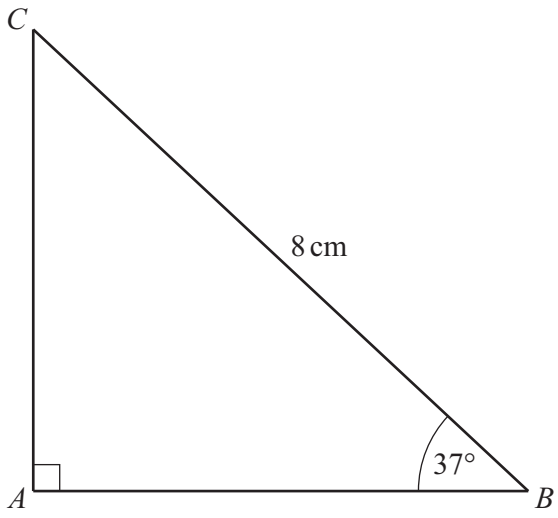
..... km [2]

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

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

..... [2]

9



NOT TO SCALE

The diagram shows a right-angled triangle.

Calculate AB.

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

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

..... [2]

11 Solve the simultaneous equations.

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

$t =$ .....

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

12 Simplify.

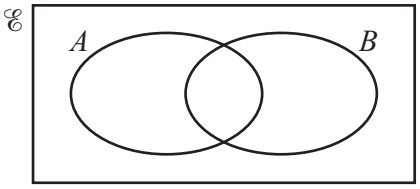
(a) $\dfrac{32g^{16}}{16g^{8}}$

..... [2]

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

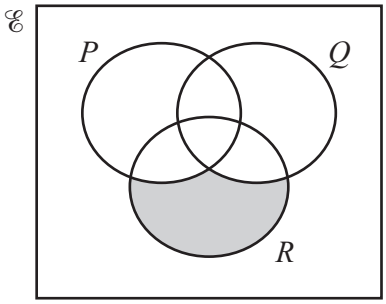
..... [2]

13 **(a)**



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

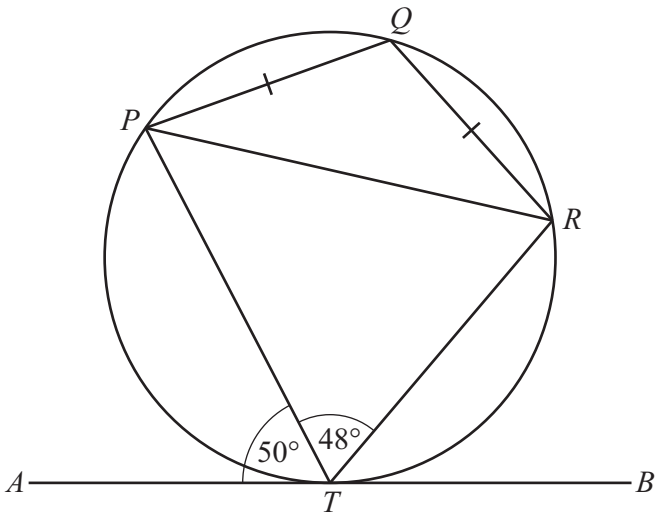
(b)



Use set notation to describe the shaded region.

..... [1]

14



NOT TO SCALE

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

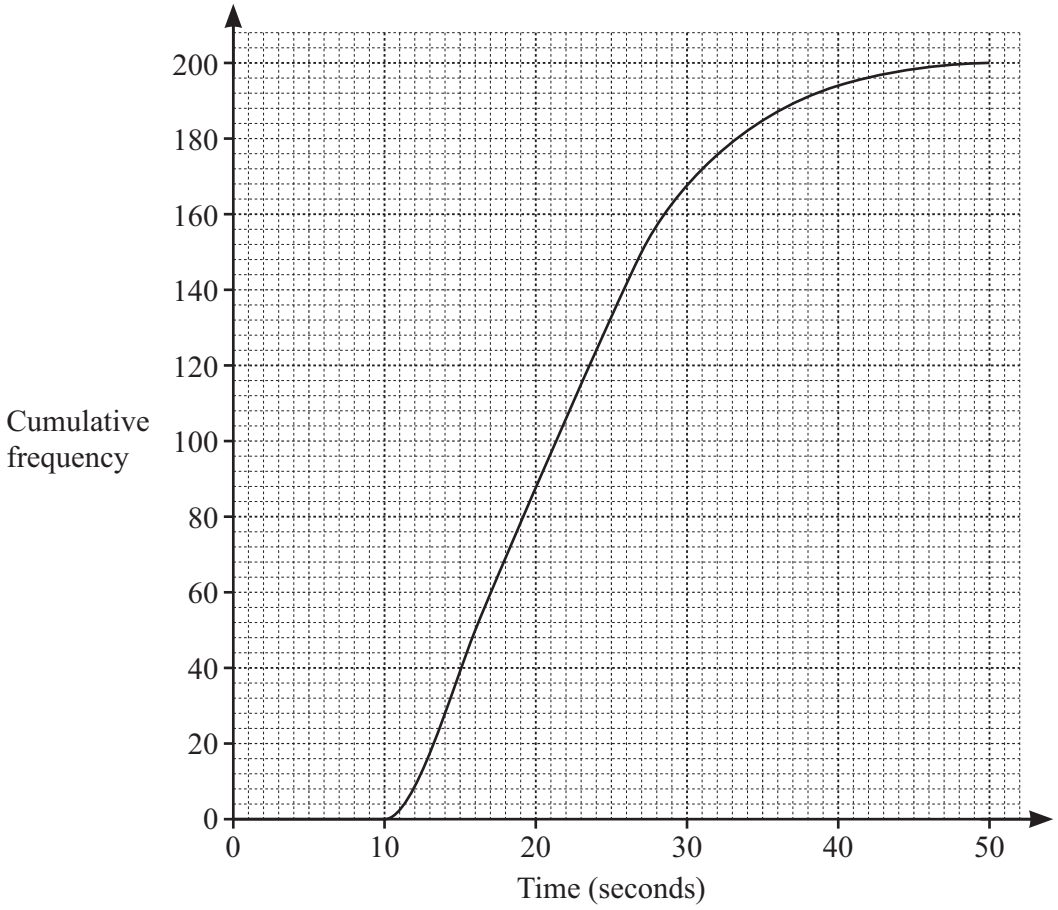
(a) Find angle PRT.

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

(b) Find angle QPR.

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

15



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

Use the diagram to find an estimate for

(a) the interquartile range

..... s [2]

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

..... [2]

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

Rearrange the formula to make h the subject.

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

17 Work out, giving each answer in standard form.

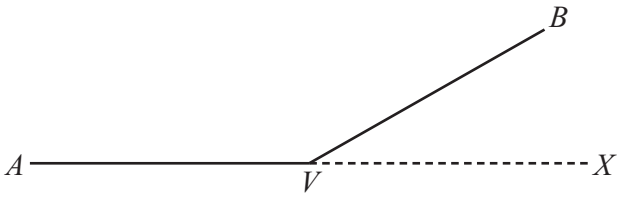
(a) $\left(2.1 \times 10^{101}\right) \times \left(8 \times 10^{101}\right)$

..... [2]

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

..... [2]

18



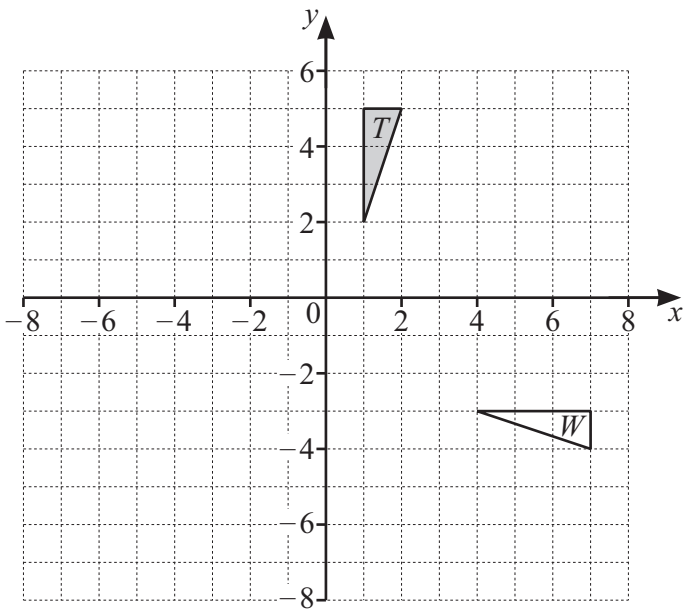
NOT TO SCALE

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

Find the number of sides of this polygon.

..... [3]

19



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

.....

..... [3]

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

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

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

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

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

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

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

..... [2]

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

..... [3]

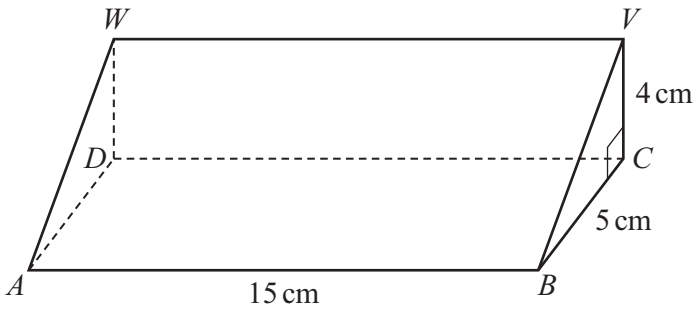
23 Simplify.

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

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

..... [3]

24



NOT TO SCALE

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

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

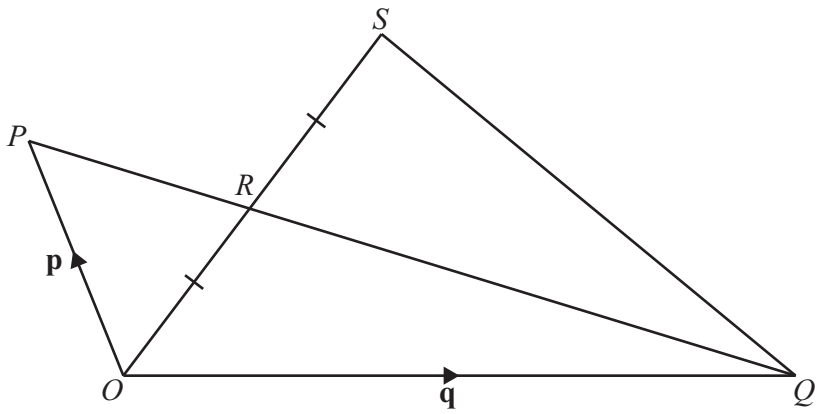
..... [4]

25 Simplify.

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

..... [4]

26



NOT TO SCALE

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

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

..... [4]

BLANK PAGE

CAMBRIDGE
International Education

Cambridge IGCSE™

MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 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 May/June 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U 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).

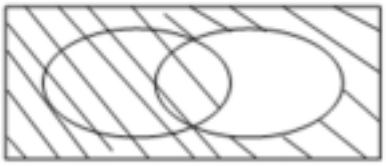
5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.

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	2 002 002	**1**	
2	$5 – (4 \times 3 – 9) – 2$	**1**	
3	$6x – 9y$ or $3(2x – 3y)$ final answer	**2**	**B1** for $6x$ or $– 9y$ in final answer or $6x – 9y$ seen then spoilt
4	4	**2**	**M1** for $10 \times 7 \times [...] = 280$ oe or better
5	0.85 oe	**1**	
6	$xy(4x – 5y)$ final answer	**2**	**B1** for $y(4x^2 – 5xy)$ or $x(4xy – 5y^2)$ or $xy(4x – 5y)$ seen then spoilt
7	14.8	**2**	**M1** for 1 cm represents 0.4 km soi or **B1** for figs 148 as answer
8	$\frac{6}{14}$ and $\frac{1}{14}$ oe	**M1**	Allow any correct denominator $14k$
	$\frac{5}{14}$ cao	**A1**	
9	6.39 or 6.389...	**2**	**M1** for $\cos 37 = \frac{AB}{8}$ oe
10	$-\frac{6}{5}$ oe	**2**	**M1** for $\frac{1-7}{3--2}$ oe
11	$[t =] 3$ $[w =] –2$	**2**	**B1** for each
12(a)	$2g^8$ final answer	**2**	**B1** for final answer kg^8 or $2g^k$ or correct answer seen then spoilt
12(b)	$125k^6$ final answer	**2**	**B1** for final answer ck^6 or $125k^c$ or correct answer seen then spoilt

Question	Answer	Marks	Partial Marks
13(a)		**1**	
13(b)	$R \cap (P \cup Q)'$ or $R \cap P' \cap Q'$ oe	**1**	
14(a)	50	**1**	
14(b)	24	**2**	**B1** for angle $PQR = 132$ soi or **M1** for $\frac{180-(180-48)}{2}$
15(a)	11	**2**	**B1** for 16 or 27 seen
15(b)	6	**2**	**M1** for 194 seen
16	$\frac{A-\pi r^2}{\pi d}$ oe final answer	**2**	**M1** for $A-\pi r^2 = \pi dh$ or $\frac{A}{\pi d} = \frac{\pi r^2}{\pi d} + h$ or $\frac{A}{\pi} - r^2 = dh$
17(a)	1.68×10^{203}	**2**	**B1** for 16.8×10^{202}
17(b)	2.31×10^{101}	**2**	**B1** for figs 231
18	25	**3**	**B2** for [y =] 14.4 oe or **M1** for $y + 11.5y = 180$ or for 360 ÷ *their* y
19(a)	Rotation 90° clockwise oe (0, –2)	**3**	**B1** for each
19(b)	Triangle at (–5, –1), (–5, –7), (–7, –7)	**2**	**B1** for enlargement s.f. –2 in wrong position
20(a)	5	**2**	**M1** for $3^x + 2 = 245$
20(b)	2189	**2**	**M1** for x = f(7) or $3^7 + 2$
21	41.11...– 4.11... oe	**M1**	
	$\frac{37}{90}$ cao	**A1**	If **M0** scored **SC1** for answer $\frac{37}{90}$ with insufficient working.

Question	Answer	Marks	Partial Marks
22	120, 300	**3**	**B2** for one correct or **M1** for tan $x = -\sqrt{3}$ oe If 0 or M1 scored **SC1** for answers with difference of 180
23	$\frac{-y-3}{y(y+1)}$ or $\frac{-y-3}{y^2+y}$ or $-\frac{y+3}{y(y+1)}$ or $-\frac{y+3}{y^2+y}$ final answer	**3**	**B1** for $2y-3(y+1)$ oe **B1** for common denominator $y(y+1)$ or y^2+y isw
24	14.2 or 14.19 to 14.20	**4**	**M3** for tan = $\frac{4}{\sqrt{15^2+5^2}}$ oe or **M2** for 15^2+5^2 or $15^2+5^2+4^2$ or **M1** for recognition of angle VAC
25	$\frac{1-p}{1+t}$ oe final answer	**4**	**B2** for $(p-1)(t-1)$ oe or **B1** for $p(t-1)-(t-1)$ or $t(p-1)-(p-1)$ **B1** for $(1-t)(1+t)$ oe
26	$\frac{4}{3}\mathbf{p}+\frac{2}{3}\mathbf{q}$ oe	**4**	**B3** for correct unsimplified answer or for $\overrightarrow{OR}=\mathbf{p}+\frac{1}{3}\mathbf{q}-\frac{1}{3}\mathbf{p}$ oe or **M2** for $\overrightarrow{PR}=\frac{1}{3}(-\mathbf{p}+\mathbf{q})$ oe or $\overrightarrow{QR}=\frac{2}{3}(-\mathbf{q}+\mathbf{p})$ oe or **M1** for $\overrightarrow{PQ}=-\mathbf{p}+\mathbf{q}$ oe or $\overrightarrow{QP}=-\mathbf{q}+\mathbf{p}$ oe or a correct route from O to S.

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2743470414

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 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/CGW) 329211/3

1 **(a)** The table shows the areas, in km^2, of the four largest rainforests in the world.

Rainforest	Area (km^2)
Amazon	5 500 000
Congo	2 000 000
Atlantic	1 315 000
Valdivian	250 000

(i) Find the area of the Valdivian rainforest as a percentage of the area of the Amazon rainforest.

..... % [1]

(ii) Write, in its simplest form, the ratio of the areas of the rainforests Valdivian : Atlantic : Congo.

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

(iii) The Amazon rainforest has 60% of its area in Brazil and 10% of its area in Colombia.
$43\frac{1}{3}$% of the **remaining area** of the rainforest is in Peru.

Find the percentage of the Amazon rainforest that is in Brazil, Colombia and Peru.

..... % [3]

(iv) The area of the Amazon rainforest represents $\frac{27}{50}$ of the total area of rainforest in the world.

Calculate the total area of rainforest in the world.
Give your answer correct to the nearest 100 000 km^2.

..... km^2 [3]

(v) In the world, 60.7 hectares of rainforest are lost every minute.

Calculate the total area, in hectares, of rainforest that is lost in 365 days.
Give your answer in standard form.

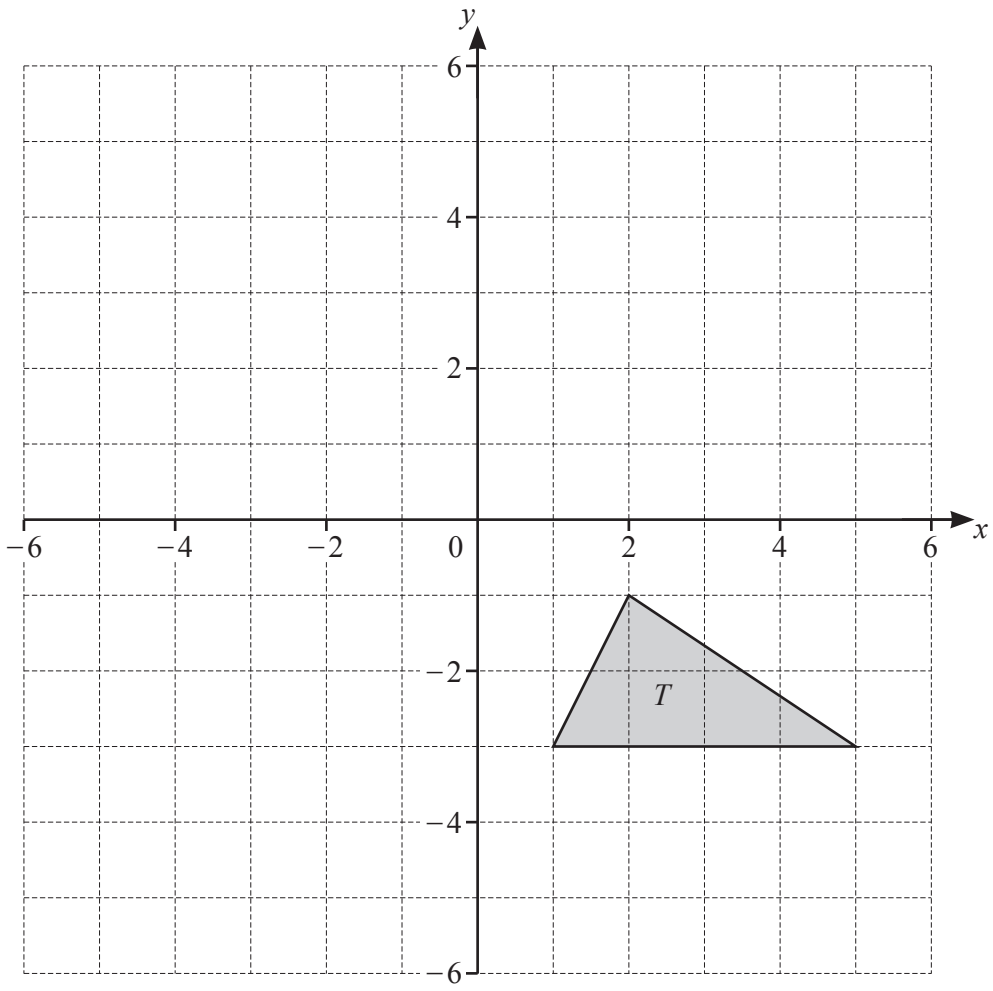
..... hectares [3]

(b) The Amazon river has a length of 6440 km, correct to the nearest 10 km.
The Congo river has a length of 4400 km, correct to the nearest 100 km.

Calculate the upper bound of the difference between the lengths of the Amazon river and the Congo river.

..... km [3]

2 (a)



On the grid, draw the image of

(i) triangle T after a reflection in the x-axis [1]

(ii) triangle T after a translation by the vector $\begin{pmatrix}-5\\-2\end{pmatrix}$ [2]

(iii) triangle T after an enlargement by scale factor $-\frac{1}{2}$ with centre $(-1, 1)$. [2]

(b) A shape P is enlarged by scale factor 3 to give shape Q.
Shape Q is then enlarged by scale factor $\frac{2}{5}$ to give shape R.

The area of shape P is $10\,\text{cm}^2$.

Calculate the area of shape R.

..... cm^2 [3]

3 **(a)** $C = \frac{1}{4}xy^2$

(i) Find C when $x = 5$ and $y = 8$.

$C =$ ..... [2]

(ii) Find the positive value of y when $C = 15$ and $x = 2.4$.

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

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

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

..... [3]

(c) Expand and simplify.

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

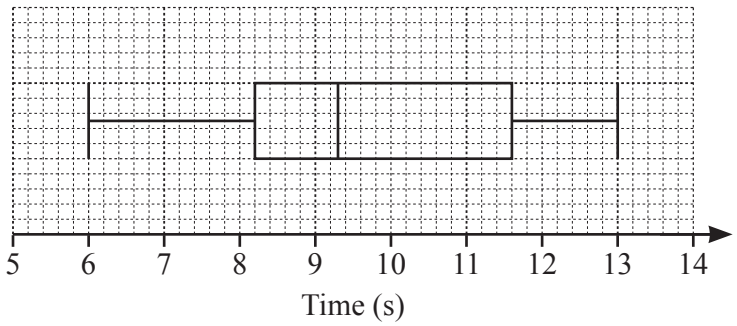
..... [3]

(d) Simplify.

$$\left(\frac{y^8}{16x^{16}}\right)^{-\frac{3}{4}}$$

..... [3]

4 **(a)** Jianyu records the time, in seconds, that some cars take to travel 195 m.
The box and whisker plot shows this information.



(i) Find the median time.

..... s [1]

(ii) Find the interquartile range.

..... s [1]

(iii) Find the difference between the average speed of the fastest car and the average speed of the slowest car.
Give your answer in **kilometres per hour**.

..... km/h [5]

(b) Matilda records the distances that 80 different cars can travel with a full tank of fuel. The table shows this information.

Distance (d km)	$250 < d \leqslant 300$	$300 < d \leqslant 400$	$400 < d \leqslant 420$	$420 < d \leqslant 450$	$450 < d \leqslant 500$
Frequency	7	13	19	21	20

(i) Write down the class interval that contains the median.

..... $< d \leqslant$ ..... [1]

(ii) Calculate an estimate of the mean.

..... km [4]

(iii) A histogram is drawn to show the information in the table.
The height of the bar for the interval $250 < d \leqslant 300$ is 2.8 cm.

Calculate the height of the bar for each of the following intervals.

$300 < d \leqslant 400$ ..... cm

$400 < d \leqslant 420$ ..... cm

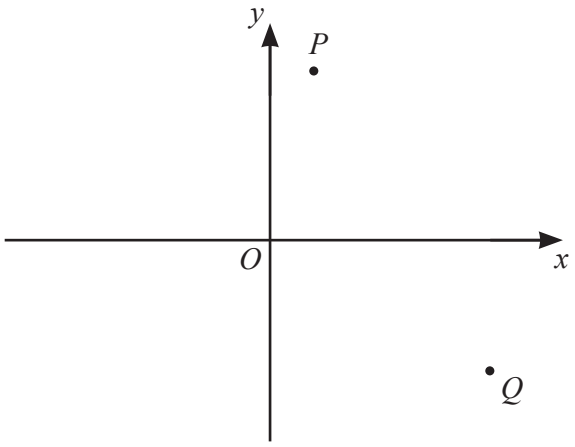
$420 < d \leqslant 450$ ..... cm [3]

(iv) Two of the 80 cars are chosen at random.

Find the probability that, with a full tank of fuel, one of the cars can travel more than 450 km and the other car can travel **not** more than 300 km.

..... [3]

5 **(a)** P is the point (1, 7).
Q is the point (5, –5).



NOT TO SCALE

(i) Find $\overrightarrow{PQ}$.

$\overrightarrow{PQ} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(ii) Show that $|\overrightarrow{OP}| = |\overrightarrow{OQ}|$.

[3]

(iii) PQ is a chord of a circle with centre O.

Calculate the circumference of this circle.

..... [2]

(iv) PQ is the diameter of a different circle with centre R.

Find the coordinates of R.

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

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

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

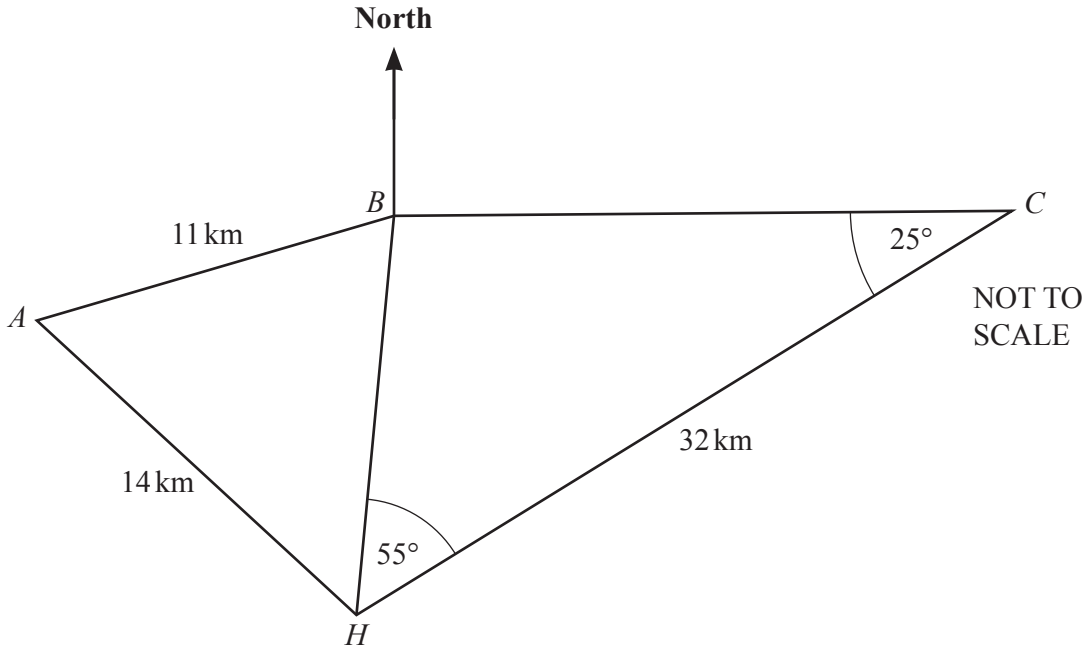
(b) The position vector of A is **a**.
The position vector of B is **b**.

M is a point on AB such that $AM : MB = 2 : 3$.

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

..... [4]

6



The diagram shows the positions of two lighthouses A and B, a boat C and a harbour H.
C is due east of B.

(a) Find the bearing of the harbour from boat C.

..... [1]

(b) **(i)** Show that angle $CBH = 100°$.

[1]

(ii) Show that $BH = 13.7$ km, correct to 1 decimal place.

[3]

(c) Calculate the bearing of A from B.

..... [5]

(d) At 1 pm boat C sails 32 km directly to the harbour at a speed of 10 knots.

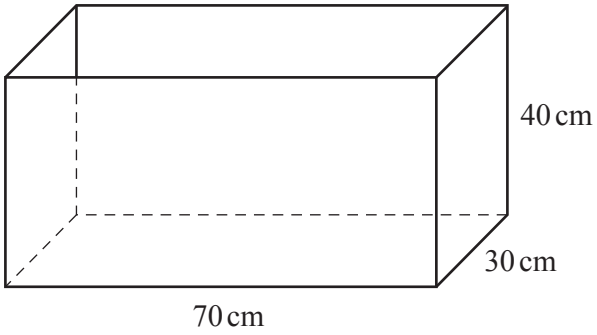
(i) Calculate the time when boat C arrives at the harbour.
Give this time correct to the nearest minute.
[1 knot = 1.852 km/h]

..... [4]

(ii) Calculate the distance of boat C to the harbour when boat C is at the shortest distance from lighthouse B.

..... km [3]

7 **(a)**



NOT TO SCALE

The diagram shows a box in the shape of a cuboid.
The box is open at the top.

(i) Work out the surface area of the inside of the open box.

..... cm^2 [3]

(ii) Cylinders with height 20 cm and diameter 15 cm are placed in the box.

Work out the maximum number of these cylinders that can completely fit inside the box.

..... [3]

(b) A solid bronze cone has a mass 750 g.
The density of the bronze is 8.9 g/cm^3.

The ratio radius of cone : height of cone = 1 : 3.

(i) Show that the radius of the cone is 2.99 cm, correct to 3 significant figures.
[Density = mass ÷ volume]

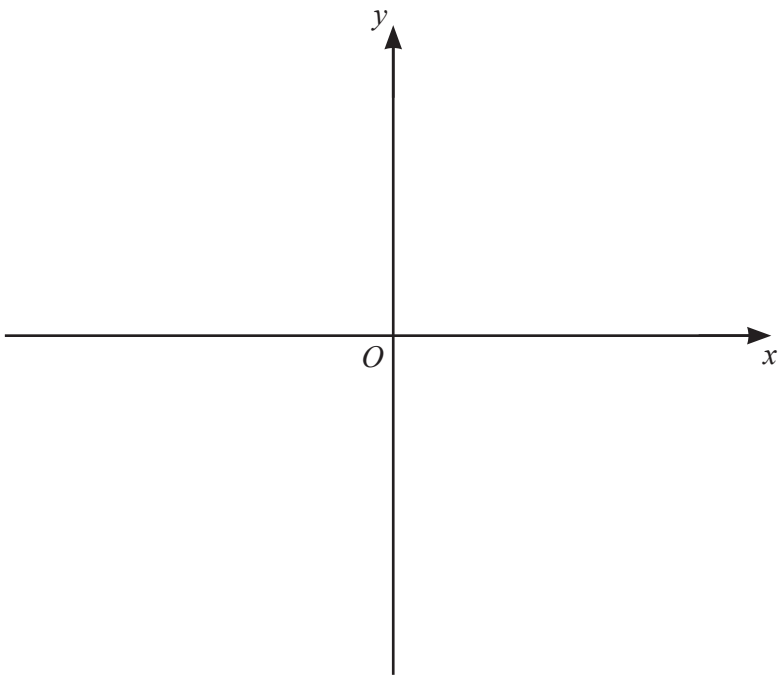
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

[4]

(ii) Calculate the total surface area of the cone.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi r l$.]

..... cm^2 [5]

8 **(a)** On the axes, sketch the graph of $y = x^2 + 7x - 18$.
On your sketch, write the values where the graph meets the x-axis and the y-axis.



[4]

(b) **(i)** Find the derivative of $y = x^2 - 3x - 28$.

..... [2]

(ii) Find the coordinates of the turning point of $y = x^2 - 3x - 28$.

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

(c) The line $y = 5 - 2x$ intersects the graph of $y = x^2 - 3x - 28$ at point P and point Q.

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

(..... , ...)

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

9 $f(x) = 4x + 1$ $g(x) = 6 - 2x$ $h(x) = 3^{x-2}$

(a) Find

(i) $f(3)$

..... [1]

(ii) $gf(3)$.

..... [1]

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

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

(c) Find x when $f(x) = g(2x - 7)$.

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

(d) Find the value of hh(2).

..... [2]

(e) Find x when $h^{-1}(x) = 10$.

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

BLANK PAGE

CAMBRIDGE
International Education

Cambridge IGCSE™

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 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 May/June 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U 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)	4.55 or 4.545…	**1**	
1(a)(ii)	50 : 263 : 400 cao	**2**	**M1**for a correct simplification from 250 000 : 1 315 000 : 2 000 000
1(a)(iii)	83 cao	**3**	**M2** for $\frac{43\frac{1}{3}}{100}\times(100-60-10)$ oe or **M1** for 100 – 60 – 10 seen
1(a)(iv)	10 200 000 cao	**3**	**B2** for 10 185 185 to 10 185 200 or **M1** for 5 500 000 ÷ 27 [× 50]
1(a)(v)	3.19×10^7 or $3.190\ldots \times 10^7$	**3**	**B2** for 31903920 or **M1** for 60.7 × 60 × 24 × 365 If B0 scored **SC1** for correctly converting *their* number seen to standard form to 3sf or better
1(b)	2095 nfww	**3**	**M2** for 6445 – C where $4300 \leqslant C < 4400$ oe or A – 4350 where $6440 < A \leqslant 6450$ oe or **M1** for 6440 +5 or 6440 –5 or 4400 + 50 or 4400 – 50 seen oe
2(a)(i)	Triangle at (2, 1) (1, 3) (5, 3)	**1**	
2(a)(ii)	Triangle at (–4, –5) (–3, –3) (0, –5)	**2**	**B1** for translation by $\begin{pmatrix}-5\\k\end{pmatrix}$ or $\begin{pmatrix}k\\-2\end{pmatrix}$
2(a)(iii)	Triangle at (–2.5, 2) (–4, 3) (–2, 3)	**2**	**B1** for enlargement by sf $-\frac{1}{2}$ with any centre
2(b)	14.4	**3**	**M2** for [10 ×] $3^2 \times \left(\frac{2}{5}\right)^2$ oe or **M1** for 3^2 or $\left(\frac{2}{5}\right)^2$ soi
3(a)(i)	80	**2**	**M1** for $\frac{1}{4}\times 5\times 8^2$
3(a)(ii)	5	**2**	**M1** for $[y^2 =]\frac{15\times 4}{2.4}$ oe

Question	Answer	Marks	Partial Marks
3(b)	$\frac{5x+23}{(x-1)(2x+5)}$ or $\frac{5x+23}{2x^2+3x-5}$ final answer	**3**	**B1** for $4(2x + 5) -3(x – 1)$ oe isw **B1** for common denominator = $(x – 1)(2x + 5)$ oe isw
3(c)	$2x^3 -13x^2 + 8x + 48$ final answer	**3**	**B2** for correct expansion of 3 brackets but unsimplified or for simplified four-term expression of correct form with 3 terms correct or **B1** for correct expansion of two brackets with at least 3 terms out of 4 correct
3(d)	$\frac{8x^{12}}{y^6}$ or $8x^{12}y^{-6}$ final answer	**3**	**B2** for two elements correct in final answer or for correct answer seen then spoiled or for correct expression where all parts of the power have been dealt with or for $(\,)^{-1}$ or $\left(\frac{2x^4}{y^2}\right)^3$ or **B1** for 8 or y^6 or y^{-6} or x^{12} correct in final answer or for $\left(\frac{16x^{16}}{y^8}\right)^{\frac{3}{4}}$ or $\left(\frac{y^2}{2x^4}\right)^{-3}$
4(a)(i)	9.3	**1**	
4(a)(ii)	3.4	**1**	
4(a)(iii)	63	**5**	**M4** for $\frac{195}{6}\times\frac{3600}{1000}-\frac{195}{13}\times\frac{3600}{1000}$ oe or **M3** for $\frac{195}{6}\times\frac{3600}{1000}$ oe or $\frac{195}{13}\times\frac{3600}{1000}$ oe or for $\left(\frac{195}{6}-\frac{195}{13}\right)[\times k]$ oe OR **M1** for $\frac{195}{6}$ or $\frac{195}{13}$ or *their* speed $\times\frac{3600}{1000}$ seen **M1** for selecting 6 and 13

Question	Answer	Marks	Partial Marks
4(b)(i)	$420 < d \leqslant 450$	**1**	
4(b)(ii)	411.25	**4**	**M1** for 275, 350, 410, 435, 475 soi **M1** for Σfx **M1 dep** for *their* $\Sigma fx \div 80$
4(b)(iii)	2.6 19 14	**3**	**B1** for each If 0 scored, **SC1** for 3 of 0.14, 0.13, 0.95 or 0.7 oe
4(b)(iv)	$\frac{7}{158}$ oe	**3**	**M2** for $[2\times]\frac{20}{80}\times\frac{7}{79}$ oe or **M1** for $\frac{20}{80}$ or $\frac{7}{79}$ or $\frac{7}{80}$ or $\frac{20}{79}$ oe seen After 0 scored, **SC1** for $\frac{7}{160}$ oe
5(a)(i)	$\begin{pmatrix} 4 \\ -12 \end{pmatrix}$	**2**	**B1** for each
5(a)(ii)	$1^2 + 7^2$	**M1**	
	$5^2 + ([-]5)^2$	**M1**	
	Both $\sqrt{50}$ oe	**A1**	With no errors seen If M0M0A0 scored SC1 for $\sqrt{50}$ oe for each
5(a)(iii)	44.4 or 44.42[8…] to 44.435	**2**	FT *their* **(a)(ii)** correct to 3sf or better **M1** for $2 \times \pi \times$ *their* $\sqrt{50}$ oe
5(a)(iv)	(3, 1)	**2**	**B1** for each

Question	Answer	Marks	Partial Marks
5(a)(v)	[$y =$] $\frac{1}{3}x$	**4**	**B3** for a correct equation in the wrong form as final answer Or **B2** for 1/3 stated or used as perpendicular gradient OR **M1** for [grad PQ] = $\frac{7--5}{1-5}$ oe **M1** for $\frac{-1}{\textit{their}\ \text{grad}\ PQ}$ **M1dep** for substituting *their*(a)(iv) or (0,0) into $y = mx + c$ oe dep on the 2nd M1 or B2
5(b)	$\frac{3}{5}$ **a** + $\frac{2}{5}$ **b** final answer	**4**	**B3** for an unsimplified correct answer or **B2** for $AM = \frac{2}{5}(\boldsymbol{b}-\boldsymbol{a})$ soi or $BM = \frac{3}{5}(\boldsymbol{a}-\boldsymbol{b})$ soi or **B1** for AB = **b** – **a** or BA = **a** – **b** or for a correct route for OM or for correct diagram
6(a)	245	**1**	
6(b)(i)	180 – (55 + 25) [=100]	**M1**	
6(b)(ii)	$\frac{32\times\sin 25}{\sin 100}$ oe	**M2**	**M1** for $\frac{\sin 25}{BH} = \frac{\sin 100}{32}$ oe
	13.73…	**A1**	

Question	Answer	Marks	Partial Marks
6(c)	258 or 257.9 to 258.0…	**5**	**B4** for 67.9 to 68.0… OR **M2** for [cos =] $\left(\frac{11^2+13.7^2-14^2}{2\times13.7\times11}\right)$ **A1** for 0.3738 to 0.376 or **M1** for $14^2 = 11^2 + 13.7^2 - 2\times 11 \times 13.7 \times \cos B$ **M1dep** on at least M1 for 190 + *their* angle *B*
6(d)(i)	2 44 pm or 14 44 cao	**4**	**B3** for 1 hour 44 or 1 hour 43.6 to 1 hour 43.8 or 104 or 103.6 to 103.8 or **B2** for 1.727 to 1.73 or **M2** for $\frac{32}{10\times1.852}\times60$ or **M1** for 32 ÷ (10 × 1.852)
6(d)(ii)	7.857 to 7.88	**3**	**M2** for $\frac{x}{13.7} = \cos 55$ oe or **M1** for dist to *H* occurs when perpendicular from *B* meets *CH* soi
7(a)(i)	10 100	**3**	**M2** for $30\times70+2\times30\times40+2\times40\times70$ or **M1** for 30 × 40 or 30 × 70 or 40 × 70
7(a)(ii)	16	**3**	**M2** for 2 fit width, 2 fit height and 4 fit length soi or **M1** for 70, 30 or 40 ÷ 15 or 20
7(b)(i)	$\frac{1}{3}\pi r^2 \times 3r =$ *their* (750 ÷ 8.9) oe	**M2**	**M1** for using 750 and 8.9 correctly in $v = m / d$ oe or 750 ÷ 8.9
	$r^3 = \frac{\text{their}(750\div 8.9)}{\pi}$ oe	**M1dep**	
	$r = 2.993\ldots$	**A1**	

Question	Answer	Marks	Partial Marks
7(b)(ii)	117 or 116.9 to 117.2	**5**	**M4** for $\pi \times 2.99^2 + \pi \times 2.99 \times \sqrt{2.99^2 + (3 \times 2.99)^2}$ oe or **M3** for $\pi \times 2.99 \times \sqrt{2.99^2 + (3 \times 2.99)^2}$ or **M2** for $\sqrt{2.99^2 + (3 \times 2.99)^2}$ or **M1** for $2.99^2 + (3 \times 2.99)^2$ or for $\pi \times 2.99^2$
8(a)	Correct sketch with roots indicated at $x = –9$ and $x = 2$ and y intercept = –18 Minimum should be in 3rd quadrant	**4**	**B1** for U shaped parabola **B2** for roots at –9 and 2 on diagram or **M1** for $(x + 9)(x – 2)$ [= 0] **B1** for y – intercept at –18 on diagram Maximum 3 marks if sketch not fully correct
8(b)(i)	$2x – 3$	**2**	**B1** for $2x + k$ or $kx^{[p]} – 3$
8(b)(ii)	(1.5, –30.25) oe	**3**	**B2** for $x = 1.5$ or **M1** for *their* **(b)(i)** = 0 or for $(x – 1.5)^2$
8(c)	$x^2 – x – 33$ [= 0] seen	**B1**	
	$\frac{[--]1 \pm \sqrt{([-]1)^2 - 4(1)(-33)}}{2 \times 1}$ oe	**B2FT**	**FT** *their* quadratic dep on no factors **B1** for $\sqrt{([-]1)^2 - 4(1)(-33)}$ or better or **B1** for $\frac{[--]1 + \sqrt{q}}{2(1)}$ oe or $\frac{[--]1 - \sqrt{q}}{2(1)}$ oe
	–5.27 or –5.267 to –5.266 **and** 6.27 or 6.266 to 6.267	**B2**	**B1** for each If 0 scored, **SC1** for –6.27 and 5.27
	(–5.27, 15.53 or 15.54) **and** (6.27, –7.53 or – 7.54)	**B1**	
9(a)(i)	13	**1**	
9(a)(ii)	–20	**1**	**FT** 6 – 2(*their* **(a)(i)**)

Question	Answer	Marks	Partial Marks
9(b)	$\frac{6-x}{2}$ oe final answer	**2**	**M1** for correct first step $x = 6 - 2y$, $y - 6 = -2x$, $\frac{y}{2} = 3 - x$
9(c)	2.375 oe	**4**	**B1** for $6 - 2(2x - 7)$ oe **B1** for $4x + 1 = 6 - 4x + 14$ **M1** for $8x = 19$ FT *their* linear equation rearranged correctly from $ax + b = cx + d$ to form $ex = f$
9(d)	$\frac{1}{3}$ or 0.333…	**2**	**M1** for h(1) or 3^($3^{x-2} - 2$) or 3^($3^{2-2} - 2$) or better
9(e)	6561	**2**	**M1** for 3^{10-2} or x = h(10)

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

6406182559

MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 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 **(a)** A fruit drink is made using 1.5 litres of apple juice and 450 millilitres of mango juice.

Write the ratio apple juice : mango juice in its simplest form.

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

(b) One litre of fruit drink is shared between three cups.
The amount in the cups is in the ratio 9 : 6 : 10.

Calculate the number of millilitres in each cup.

..... ml , ... ml , ... ml [3]

(c) A shop buys bottles of the fruit drink for $3.20 each.
It sells them at a profit of 15%.

Calculate the selling price of each bottle of fruit drink.

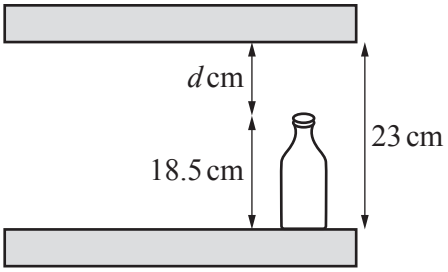
$ ..... [2]

(d) The number of bottles of fruit drink sold has grown exponentially at a constant rate of 2.5% per year.
5 years ago, the shop sold 16 620 bottles.

Calculate the number of bottles sold this year.

..... [2]

(e)



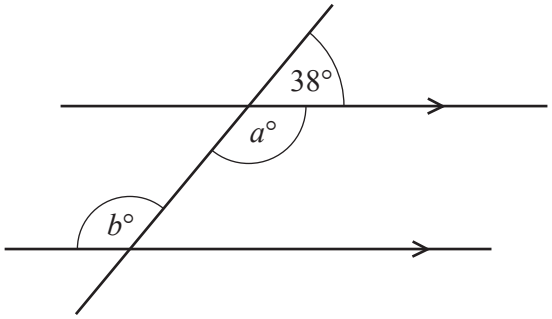
NOT TO SCALE

The bottles of juice are 18.5 cm tall, correct to the nearest millimetre.
They are stored on shelves.
The distance between the shelves is 23 cm, correct to the nearest centimetre.

Calculate the lower bound for the distance, d cm, between the top of a bottle and the shelf above it.

..... cm [3]

2 **(a)**



NOT TO SCALE

The diagram shows a straight line intersecting two parallel lines.

Find the value of a and the value of b.

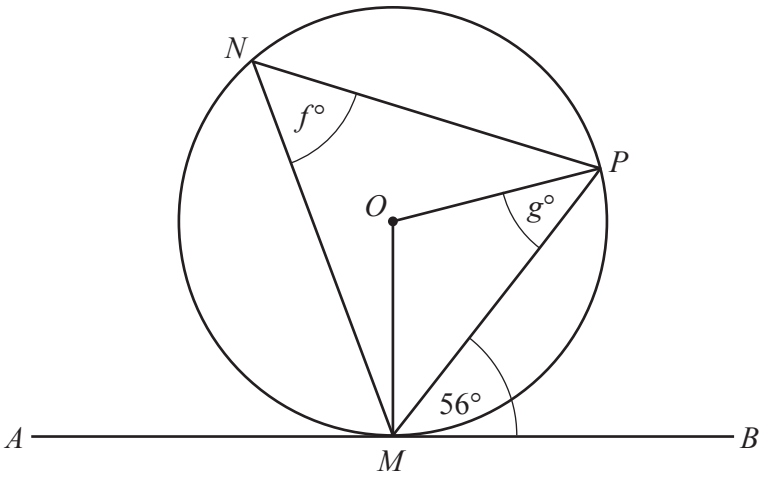
$a =$ .....

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

(b) Calculate the interior angle of a regular 12-sided polygon.

..... [2]

(c)



NOT TO SCALE

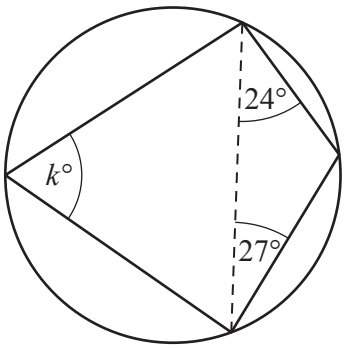
The diagram shows a circle, centre O.
The points M, N and P lie on the circumference of the circle.
AMB is a tangent to the circle at M.

Find the value of f and the value of g.

$f =$ .....

$g =$ ..... [3]

(d)



NOT TO SCALE

The diagram shows a cyclic quadrilateral.

Find the value of k.

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

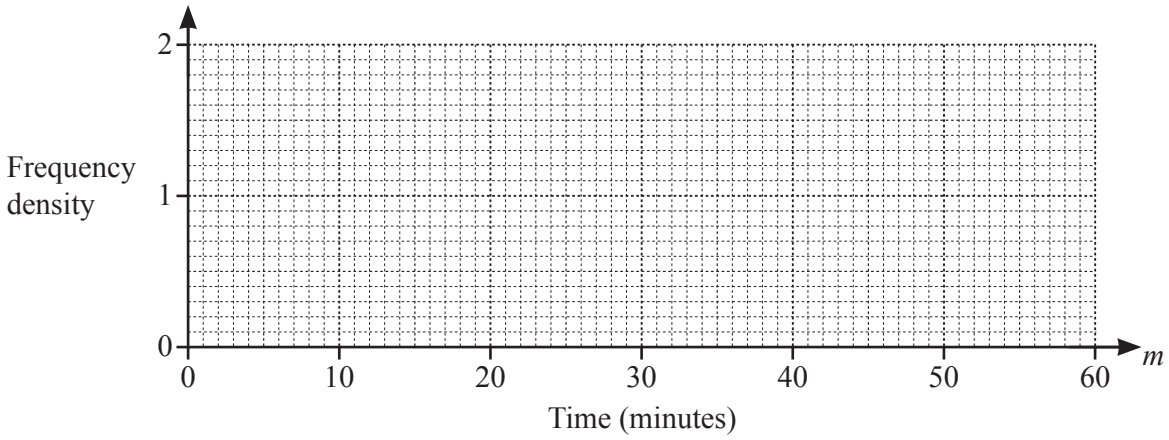
3 **(a)** The table shows the time that each of 40 students takes to travel to school.

Time (m minutes)	$0 < m \leqslant 10$	$10 < m \leqslant 25$	$25 < m \leqslant 40$	$40 < m \leqslant 60$
Frequency	3	18	15	4

(i) Calculate an estimate of the mean.

..... min [4]

(ii) On the grid, draw a histogram to show the information in the table.



[3]

(iii) Two students are selected at random from the 40 students.

Calculate the probability that one student takes more than 25 minutes and the other student takes 10 minutes or less to travel to school.

..... [3]

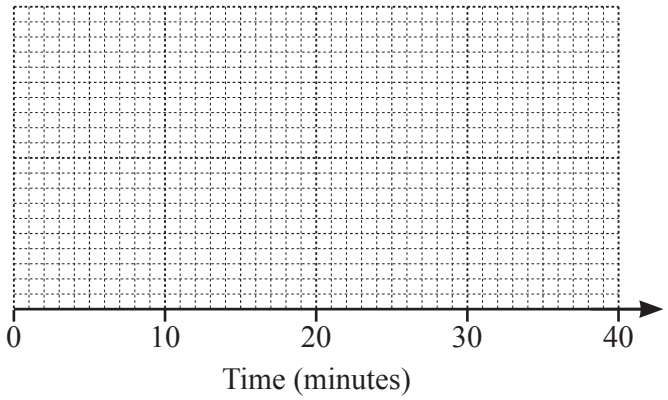
(b) This is some information about the time that 200 people took to fill in a questionnaire:

- The longest time taken was 30 minutes.
- The median time was 22 minutes.
- The lower quartile was 8 minutes.
- The interquartile range was 19 minutes.
- The range was 25 minutes.

(i) Write down the shortest time taken.

..... minutes [1]

(ii) On the grid, draw a box-and-whisker plot to show this information.



[3]

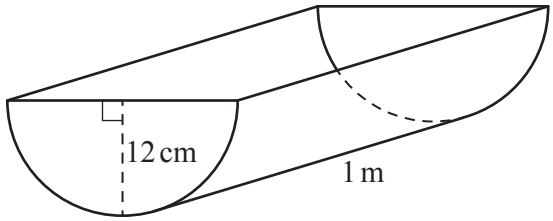
(iii) George says that 101 of the 200 people took more than 22 minutes to fill in the questionnaire.

Explain why he is wrong.

..... [1]

[Turn over

4 **(a)**



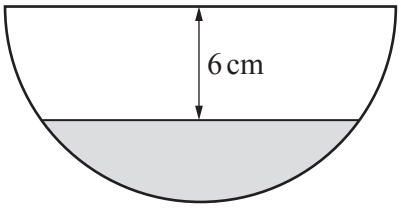
NOT TO SCALE

The diagram shows a tank in the shape of a half-cylinder of radius 12 cm and length 1 metre. The tank is fixed horizontally and is completely filled with water.

(i) Calculate the volume of water in the tank.
Give your answer correct to the nearest 10 cm^3.

..... cm^3 [3]

(ii)



NOT TO SCALE

Water is removed from the tank until the level of water is 6 cm below the top of the tank. The diagram shows the cross-section of the tank.

Calculate the volume of water that is now in the tank.

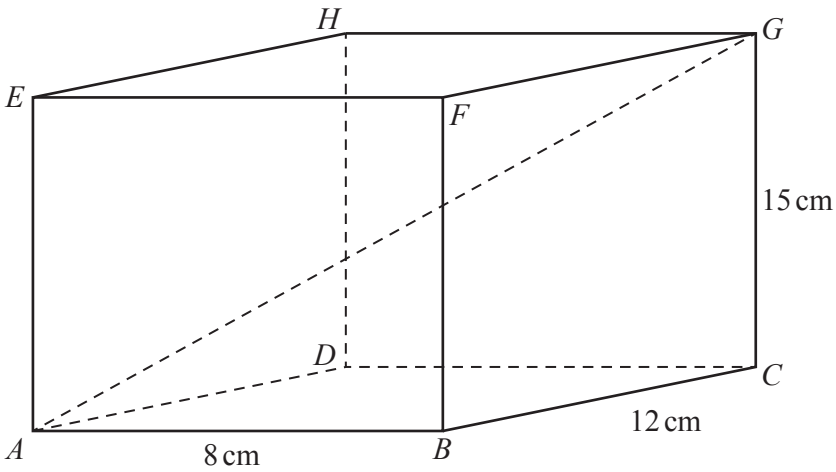
..... cm^3 [5]

(b) A rectangular fish tank with length 42 cm and width 35 cm is full of water.
A stone lies at the bottom of the tank.
When the stone is removed from the tank, the depth of the water decreases by 0.2 cm.
The density of the stone is 2.2 g/cm^3.

Calculate the mass of the stone in grams.
[Density = mass ÷ volume]

..... g [3]

(c)



NOT TO SCALE

The diagram shows a cuboid, *ABCDEFGH*.

Calculate the angle that *AG* makes with the base of the cuboid.

..... [4]

5 **(a)** Simplify $\left(25x^6\right)^{\frac{3}{2}}$.

..... [2]

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

$$\frac{1}{6} \qquad 1 \qquad 6 \qquad 36 \qquad 216$$

Find the nth term of the sequence.

..... [2]

(c) Expand and simplify.

$$(x+4)(x-3)(3x-1)$$

..... [3]

(d) **(i)** Show that $(3x+5)+\frac{7}{x-2}=x$ simplifies to $2x^2+x-3=0$.

[4]

(ii) Solve by factorisation $2x^2+x-3=0$.

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

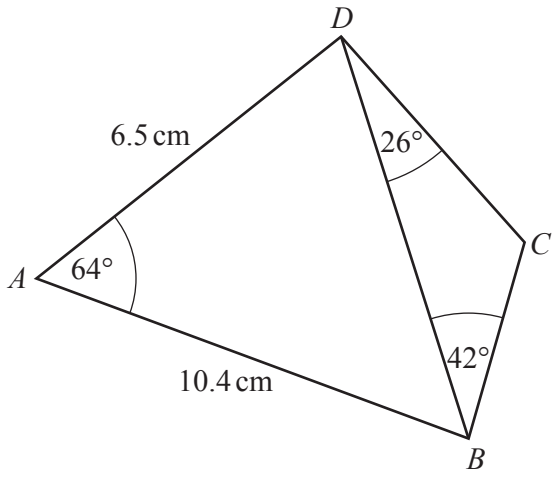
(e) A solid cylinder has base radius x and height $3x$.
The **total** surface area of the cylinder is the same as the **total** surface area of a solid hemisphere of radius $5y$.

Show that $x^2=\frac{75y^2}{8}$.

[The surface area, A, of a sphere with radius r is $A=4\pi r^2$.]

[4]

6



NOT TO SCALE

$ABCD$ is a quadrilateral with $AB = 10.4$ cm and $AD = 6.5$ cm.
Angle $DAB = 64°$, angle $BDC = 26°$ and angle $DBC = 42°$.

(a) Show that $BD = 9.55$ cm, correct to 2 decimal places.

[3]

(b) (i) Show that angle $BCD = 112°$.

[1]

(ii) Calculate CD.

$CD =$ ..... [3]

(c) Find the shortest distance from D to AB.

..... cm [3]

7 **(a)** Solve $3x-8=6-4x$.

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

(b) Factorise fully $10a^2+5a$.

..... [2]

(c) Factorise fully $(2x-3)^2-9$.

..... [2]

(d) $\mathrm{f}(x)=\frac{1}{4x-1}$, $x \neq \frac{1}{4}$ $\mathrm{g}(x)=3^x$

(i) Find $\mathrm{f}(4)$.

..... [1]

(ii) Find $\mathrm{gg}(2)$.

..... [2]

(iii) Find k when $\mathrm{g}(k)=\mathrm{f}(7)$.

..... [2]

[Turn over

8 A baker decorates x small cakes and y large cakes.
In one day, he decorates:

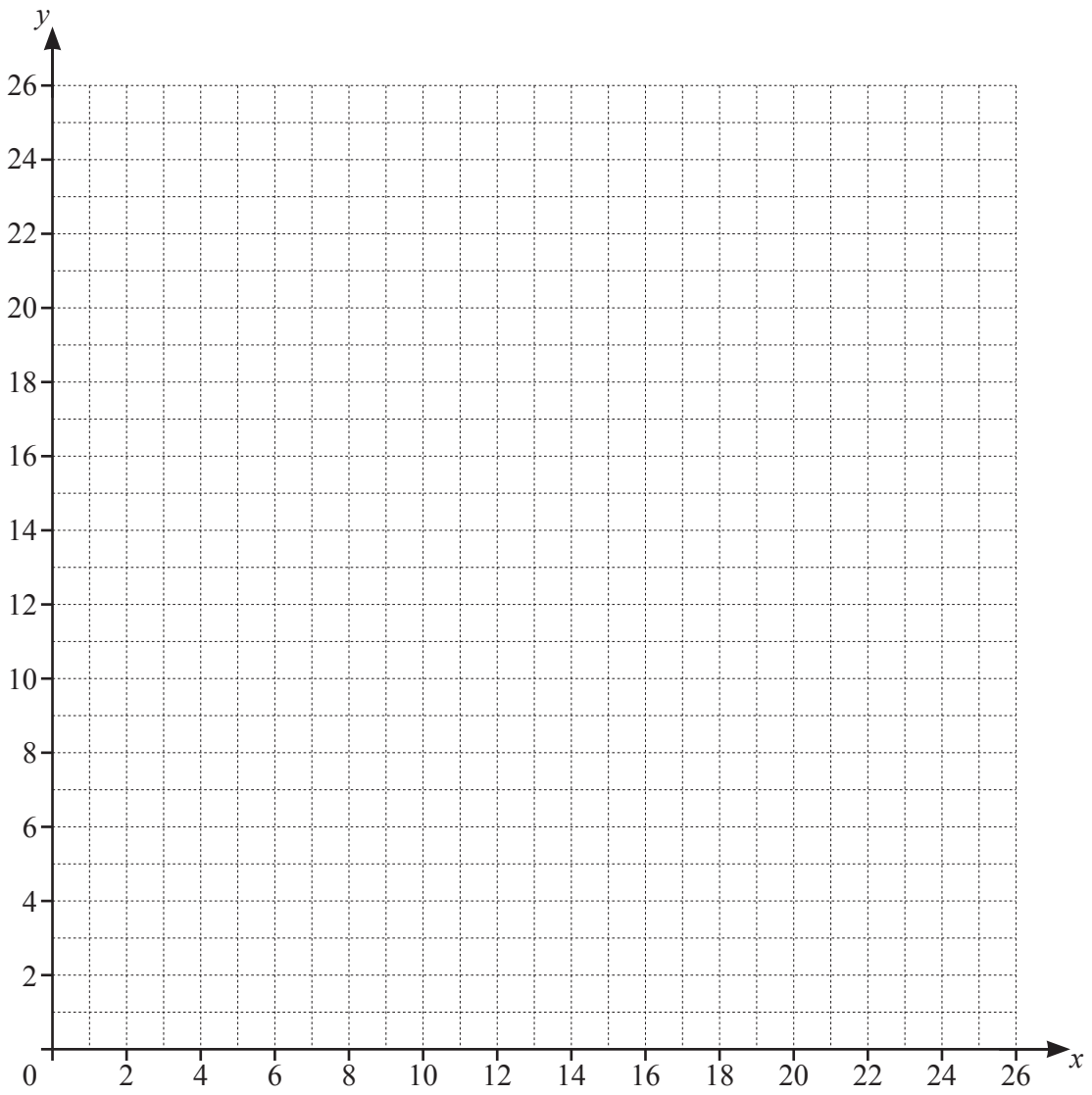
- not more than 16 small cakes
- less than 10 large cakes
- more small cakes than large cakes
- a total of not more than 24 cakes.

One of the inequalities that shows this information is $x \leqslant 16$.

(a) Write down the other three inequalities in x and/or y.

.... [3]

(b) On the grid, draw four straight lines and shade the unwanted regions to show these inequalities.
Label the region, R, which satisfies the four inequalities.



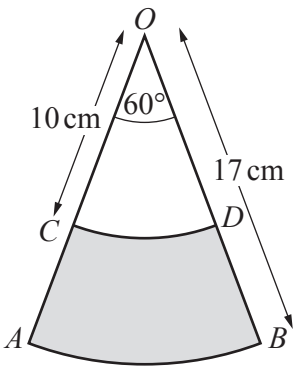
[6]

(c) The baker earns $8 for decorating a small cake and $12 for decorating a large cake.

Use your diagram to find the largest amount the baker can earn in one day by decorating cakes.

$ ..... [2]

9 (a)



NOT TO SCALE

OAB is a sector of a circle, centre *O*, radius 17 cm.
OCD is a sector of a circle, centre *O*, radius 10 cm.
OCA and *ODB* are straight lines and angle $AOB = 60°$.

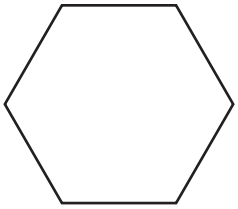
The perimeter of the shaded shape *ABDC* can be written in the form $(a\pi + b)$ cm.

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

$a =$ .....

$b =$ ..... [3]

(b)



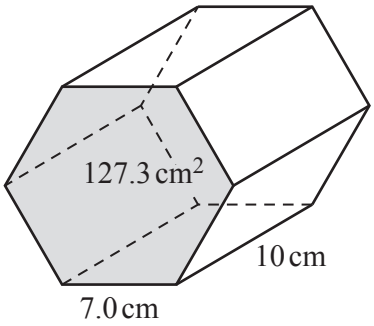
NOT TO SCALE

The diagram shows a regular hexagon.
The area of the hexagon is 127.3 cm^2.

(i) Show that the length of one side of the hexagon is 7.0 cm, correct to 1 decimal place.

[4]

(ii) The hexagon is the cross-section of a prism of length 10 cm.



NOT TO SCALE

(a) Find the volume of the prism.

..... cm^3 [1]

(b) Calculate the surface area of the prism.

..... cm^2 [2]

10 **(a)** A is the point (6, 2) and B is the point (3, −4).

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

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

(ii) Calculate the length AB.

..... [3]

(b) The equation of line l is $4x + 3y - 12 = 0$.

(i) Find the gradient of l.

..... [2]

(ii) Find the coordinates of the point where l crosses the y-axis.

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

(iii) Line p is perpendicular to l and passes through (6, 5).

Find the equation of p in the form $y = mx + c$.

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

11 **(a)** The point $(-1, 6)$ lies on a curve.

This curve has the derived function $\frac{dy}{dx} = -4x^3 - 9x^2 + 5$.

Show that $(-1, 6)$ is a stationary point of the curve.

[2]

(b) A different curve has equation $y = 2x^3 - 6x + 8$.

(i) Calculate the gradient of the tangent to this curve at the point $(-2, 2)$.

..... [3]

(ii) Find the x-coordinates of the stationary points of this curve.

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

BLANK PAGE

CAMBRIDGE
International Education

Cambridge IGCSE™

MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 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 May/June 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U 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.

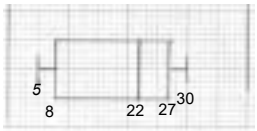
4 Unless otherwise indicated, marks once gained cannot subsequently be lost, e.g. wrong working following a correct form of answer is ignored (isw).

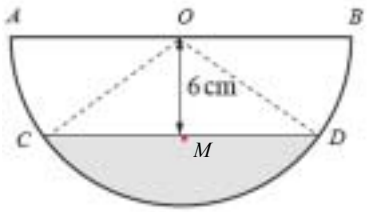
5 Where a candidate has misread a number or sign in the question and used that value consistently throughout, provided that number does not alter the difficulty or the method required, award all marks earned and deduct just 1 A or B mark for the misread.

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

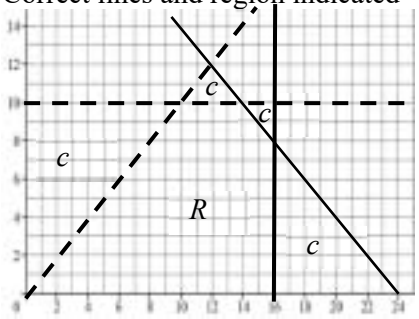
Question	Answer	Marks	Partial Marks
1(a)	10 : 3 final answer	**2**	**M1** for 1500 : 450 oe in ratio form If 0 scored **SC1** for answer 3 : 10
1(b)	360 240 400	**3**	**B2** for answer 0.36 0.24 0.4 or for answer two of 360 240 400 or **M1** for $\frac{1000}{9+6+10}[\times k]$ where $k = 1, 9, 6$ or 10 If 0 scored, **SC1** for answer with 3 values in ratio 9 : 6 : 10 in that order
1(c)	3.68 cao	**2**	**M1** for $\left(1+\frac{15}{100}\right)\times 3.2$ oe or **B1** for answer 0.48
1(d)	18 804[.0...]	**2**	**1** for $16\,620\times\left(1+\frac{2.5}{100}\right)^5$ oe
1(e)	3.95	**3**	**M2** for 22.5 – (18.5 to 18.6) or (22 to 23) −18.55 or **M1** for 23 – 0.5 oe seen or 23 + 0.5 oe seen or 18.5– 0.05 oe seen or 18.5 + 0.05 oe seen
2(a)	142 142	**2**	**B1** for each **FT** angle *b* = *their* angle *a*
2(b)	150	**2**	**M1** for $\frac{360}{12}$ oe isw or $180\times(12-2)$ oe isw

Question	Answer	Marks	Partial Marks
2(c)	56	**B1**	
	34	**B2**	**M1** for angle at centre = 2 × *their* 56 oe soi or for angle *OMB* = 90 oe soi
2(d)	51	**2**	**B1** for opp angle = 129 soi
3(a)(i)	25.4375	**4**	**M1** for mid-points soi (5, 17.5, 32.5, 50) **M1** for use of Σfm with m in correct interval including both boundaries **M1** for (dep on 2nd M1) for $\Sigma fm \div 40$
3(a)(ii)	correct histogram	**3**	**B2** for 3 correct blocks or **B1** for 2 correct blocks If 0 scored **SC1** for 4 correct frequency densities 0.3, 1.2, 1, 0.2 oe soi
3(a)(iii)	$\frac{19}{260}$ oe	**3**	**M2** for $\frac{19}{40} \times \frac{3}{39}[\times 2]$ oe or **M1** for any of $\frac{19}{40}$, $\frac{3}{40}$, $\frac{19}{39}$, $\frac{3}{39}$ oe seen If 0 scored, **SC1** for $\frac{57}{800}$ oe
3(b)(i)	5	**1**	
3(b)(ii)	 Correct box plot	**3**	**B2** for with LQ at 8 and median at 22 and UQ at 27 and boxed or **M1** for LQ at 8 and median at 22 or for UQ at 27 **B1** for lowest = 5 and highest = 30 Max **B1** if not box and whisker diagram

Question	Answer	Marks	Partial Marks
3(b)(iii)	Correct explanation which states the median is 22 and correct reference to 100 or 101 e.g. • Median is 22 which is 50% of the people and 101 is more than 50% oe • The median is 22 which is the 100th number (accept 100.5th number)	**1**	
4(a)(i)	22 620 cao	**3**	**B2** for 7200π or 22 608 to 22 629 or **M1** for $\frac{1}{2}\times\pi\times12^2$[×figs 1] oe
4(a)(ii)	8840 or 8850 or 8836 to 8850. 	**5**	**M1** for cos $COM = \frac{6}{12}$ oe or sin $AOC = \frac{6}{12}$ oe **M1** for $\left(\frac{their\,COD}{360}\times\pi\times12^2\right)$ oe **M1** for $\left(\frac{1}{2}\times12^2\times\sin(their\,COD)\right)$ oe **M1dep** for (*their* area of sector *COD*–*their* area of triangle *COD*) ×100 **dep** on at least M1M1 oe
4(b)	647 or 646.8	**3**	**M2** for $2.2 = \frac{m}{42\times35\times0.2}$ oe or **M1** for [vol of stone =] 42×35×0.2 oe If 0 scored **SC1** for answer figs 647 or figs 6468
4(c)	46.1 or 46.12 to 46.14	**4**	**M3** for $\tan = \frac{15}{\sqrt{8^2+12^2}}$ oe or **M2** for $8^2 + 12^2$ oe or $8^2 + 12^2 + 15^2$ oe or **M1** for identifying the angle *GAC*
5(a)	$125x^9$ final answer	**2**	**B1** for answer $125x^k$ or mx^9 or for correct answer seen then spoilt

Question	Answer	Marks	Partial Marks
5(b)	6^{n-2} oe final answer	**2**	**B1** for answer of form 6^k oe or answer of the form $\left(\frac{1}{6}\right)^{-k}$ oe or for correct answer seen
5(c)	$3x^3 + 2x^2 - 37x + 12$ final answer	**3**	**B2** for correct expansion of three brackets unsimplified or for simplified four-term expression of correct form with 3 terms correct or **B1** for correct expansion of two brackets with at least 3 terms out of 4 correct
5(d)(i)	eliminates the fraction correctly eg $(3x + 5)(x - 2) + 7 = x(x - 2)$	**M1**	
	$3x^2 + 5x - 6x - 10 + 7 = x^2 - 2x$ oe	**B2**	**B1** for $3x^2 + 5x - 6x - 10$ [+ 7] oe seen with at least 3 terms correct
	leading to $2x^2 + x - 3 = 0$	**A1**	**dep** on M1 B2 with no errors or omissions
5(d)(ii)	$(2x+3)(x-1)$	**M2**	or **M1** for $(2x + a)(x + b)$ where $ab = -3$ or $2b + a = [+]1$ or for partial factors $2x(x - 1) + 3(x - 1)$ or $x(2x + 3) - [1](2x + 3)$
	-1.5 oe and $+1$	**B1**	
5(e)	[TSA cylinder =] $2\pi x^2 + 2\pi x \times 3x$	**M1**	
	[TSA hemisphere=] $\pi(5y)^2 + \frac{4\pi(5y)^2}{2}$	**M1**	
	Leading to $2\pi x^2 + 6\pi x^2 = 50\pi y^2 + 25\pi y^2$ oe	**M1**	dep **M1M1**
	$x^2 = \frac{75y^2}{8}$	**A1**	dep on **M1M1M1**
6(a)	$\sqrt{10.4^2 + 6.5^2 - 2 \times 10.4 \times 6.5 \times \cos 64}$	**M2**	**M1** for $10.4^2 + 6.5^2 - 2\times 10.4 \times 6.5 \times \cos 64$ **A1** for 91.1 to 91.2
	9.546 to 9.547	**A1**	

Question	Answer	Marks	Partial Marks
6(b)(i)	$180-(26+42)$	**B1**	
6(b)(ii)	6.89 or 6.888 to 6.892...	**3**	**M2** for $\frac{9.55}{\sin 112}\times\sin 42$ oe or **M1** for $\frac{\sin 112}{9.55}=\frac{\sin 42}{CD}$ oe
6(c)	5.84[2…]	**3**	**M2** for $\frac{x}{6.5}=\sin 64$ oe or **M1** for identifying shortest distance from D is perpendicular to AB
7(a)	2	**2**	**M1** for $3x+4x=6+8$ or better
7(b)	$5a(2a+1)$ final answer	**2**	**B1** for $a(10a+5)$ or $5(2a^2+a)$ or $5a(2a+1)$ then spoilt
7(c)	$4x(x-3)$ final answer	**2**	**M1** for $((2x-3)-3)((2x-3)+3)$ or better or for $4x^2-6x-6x+9$ [–9] oe or better
7(d)(i)	$\frac{1}{15}$ oe	**1**	
7(d)(ii)	19 683	**2**	**B1** for g(9), 3^9 or 3^{3^x} seen
7(d)(iii)	–3	**2**	**M1** for $3^k=\frac{1}{27}$ or $3^k=3^{-3}$ or answer g(–3)
8(a)	$y<10$ $y<x$ oe $x+y\leqslant 24$ oe	**3**	**B1** for each If 0 scored, **SC1** for $y\leqslant 10$ and $y\leqslant x$ and $x+y<24$

Question	Answer	Marks	Partial Marks
8(b)	Correct lines and region indicated 	**6**	**B1** for each correct line and **B2** for R in correct region for all 4 correct lines or **B1** for R in any one of the regions marked *c* or **B1** for R that satisfies 3 of the correct inequalities
8(c)	228 nfww	**2**	**M1** for $8x + 12y$ for any (x, y) in *their* R, x, y both integer or $x = 15, y = 9$
9(a)	[a =] 9 [b =] 14	**3**	**B2** for a =9 OR **M2** for $\frac{60}{360}\times 2\times\pi\times 17+\frac{60}{360}\times 2\times\pi\times 10+7+7$ oe or **M1** for $\frac{60}{360}\times 2\times\pi\times 17$ oe **or** $\frac{60}{360}\times 2\times\pi\times 10$ oe If 0 scored **SC1** for b =14
9(b)(i)	60° at centre or interior angle = 120°	**B1**	
	$[6\times]\frac{1}{2}\times d^2\times\sin 60$ oe	**M1**	
	$[d^2 =]\frac{127.3}{6\times\frac{1}{2}\times\sin 60}$	**M1**	
	6.99[9…] to 7.00[…]	**A1**	Dep on M1M1
9(b)(ii)(a)	1273	**1**	
9(b)(ii)(b)	675 or 674.5 to 674.6	**2**	**M1** for 2 ×127.3 oe or 6 × 7 × 10 oe
10(a)(i)	(4.5, −1)	**2**	**B1** for each

Question	Answer	Marks	Partial Marks
10(a)(ii)	6.71 or 6.708...	**3**	**M2** for $(6-3)^2 + (2--4)^2$ oe or better or **M1** for [–]$(6-3)$ and [–]$(2--4)$ oe or for ([–]3)^2 and ([–]6)^2 oe
10(b)(i)	$-\frac{4}{3}$	**2**	**M1** for $3y = -4x + 12$ or $\frac{4}{3}x + y - \frac{12}{3}$ [= 0] or better seen
10(b)(ii)	(0, 4)	**2**	**B1** for each or for $y = 4$ not in coordinate form
10(b)(iii)	[y =]$\frac{3}{4}x + \frac{1}{2}$ final answer	**3**	**M1** for gradient $\frac{3}{4}$ or $\frac{-1}{\textit{their}\textbf{(b)(i)}}$ oe or better **M1** for (6, 5) substituted into $y = \frac{3}{4}x + c$ or y = *their* $mx + c$ oe
11(a)	–4 (–1)^3 – 9 (–1)^2 + 5 or better	**M1**	
	= 0 [so stationary point]	**A1**	with no errors
11(b)(i)	18	**3**	**B2** for $6x^2 - 6$ isw OR **B1** for $6x^2 + k$ (any k) isw or $px^2 - 6$ isw ($p \neq 0$) or $6x^2 - 6 + 8$ **M1**dep on B1 for $x = -2$ substituted into *their* $\frac{dy}{dx}$
11(b)(ii)	1 and –1	**2**	**M1** for $6x^2 - 6 = 0$ oe seen or for *their* $\frac{dy}{dx} = 0$ if B1 scored in part **(b)(i)**

* 0019655323301 *

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 5 8 1 4 1 3 4 1 0 4 *

MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 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 **24** pages. Any blank pages are indicated.

DC (CJ/SG) 329214/4

[Turn over

1 **(a)** In 2023 a football club had 50 adult members and 70 child members.
The membership fee for an adult was $40 and the membership fee for a child was $15.

(i) Calculate the total of the membership fees received by the club in 2023.

$ ..... [2]

(ii) The cost of running the club in 2023 was $2780.

Calculate $2780 as a percentage of the total of the membership fees received by the club.

..... % [1]

(iii) In 2023 there were 120 members.
This was a decrease by 4% of the number of members in 2022.

Calculate the number of members in 2022.

..... [2]

(iv) In 2024 the total number of members increased from the 120 members in 2023.
The number of adult members and the number of child members each increased by the same number.
The ratio number of adult members : number of child members changed to 14 : 19.

(a) Find the total number of members in 2024.

..... [2]

(b) Calculate the percentage increase in the total number of members from 2023 to 2024.

..... % [2]

(b) The population of a village is 2500.
The population is decreasing exponentially at a rate of 3% per year.

(i) Calculate the population at the end of 3 years.

..... [2]

(ii) Find the number of complete years it takes for the population to first fall below 2000.

..... years [2]

2 **(a)** The nth term of a sequence is $120 - n^3$.

(i) Find the 4th term of this sequence.

..... [1]

(ii) Find the value of n when the nth term is -1211.

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

(b) The nth term of a different sequence is $3 \times (0.2)^{n-1}$.

Find the 5th term of this sequence.

..... [1]

(c) The table shows the first four terms of sequences A, B and C.

Sequence	1st term	2nd term	3rd term	4th term	5th term		nth term
A	7	4	1	-2			
B	$\frac{1}{4}$	$\frac{2}{5}$	$\frac{3}{6}$	$\frac{4}{7}$			
C	0	2	6	12			

Complete the table for each sequence.

[8]

3 **(a)** Rahul rolls a dice 60 times.
The results are shown in the table.

Score	1	2	3	4	5	6
Frequency	10	6	11	13	14	6

Find the mode, the median and the mean.

mode = ...

median = ...

mean = ... [5]

(b) Sangita measures the speed of each of 100 cars.
The results are shown in the table.

Speed (v km/h)	$20 < v \leqslant 30$	$30 < v \leqslant 50$	$50 < v \leqslant 75$
Frequency	10	72	18

(i) Calculate an estimate of the mean speed.

..... km/h [4]

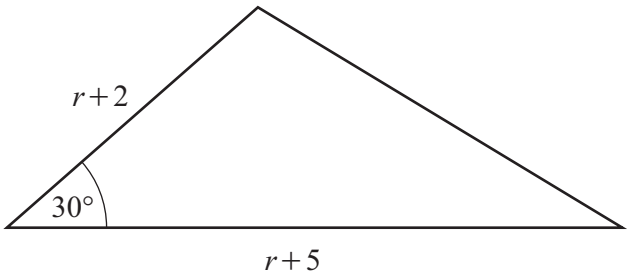
(ii) Sangita draws a histogram to show the information in the table.
The height of the bar that represents $20 < v \leqslant 30$ is 3 cm.

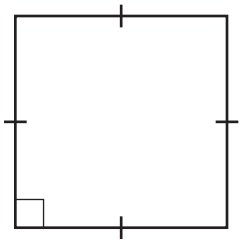
Calculate the height of each of the other two bars on this histogram.

height of bar for $30 < v \leqslant 50$ ..... cm

height of bar for $50 < v \leqslant 75$ ..... cm [2]

4 In this question all the measurements are in centimetres.





NOT TO SCALE

The area of the triangle is equal to the area of the square.

(a) Show that $3r^2 + r - 6 = 0$.

[4]

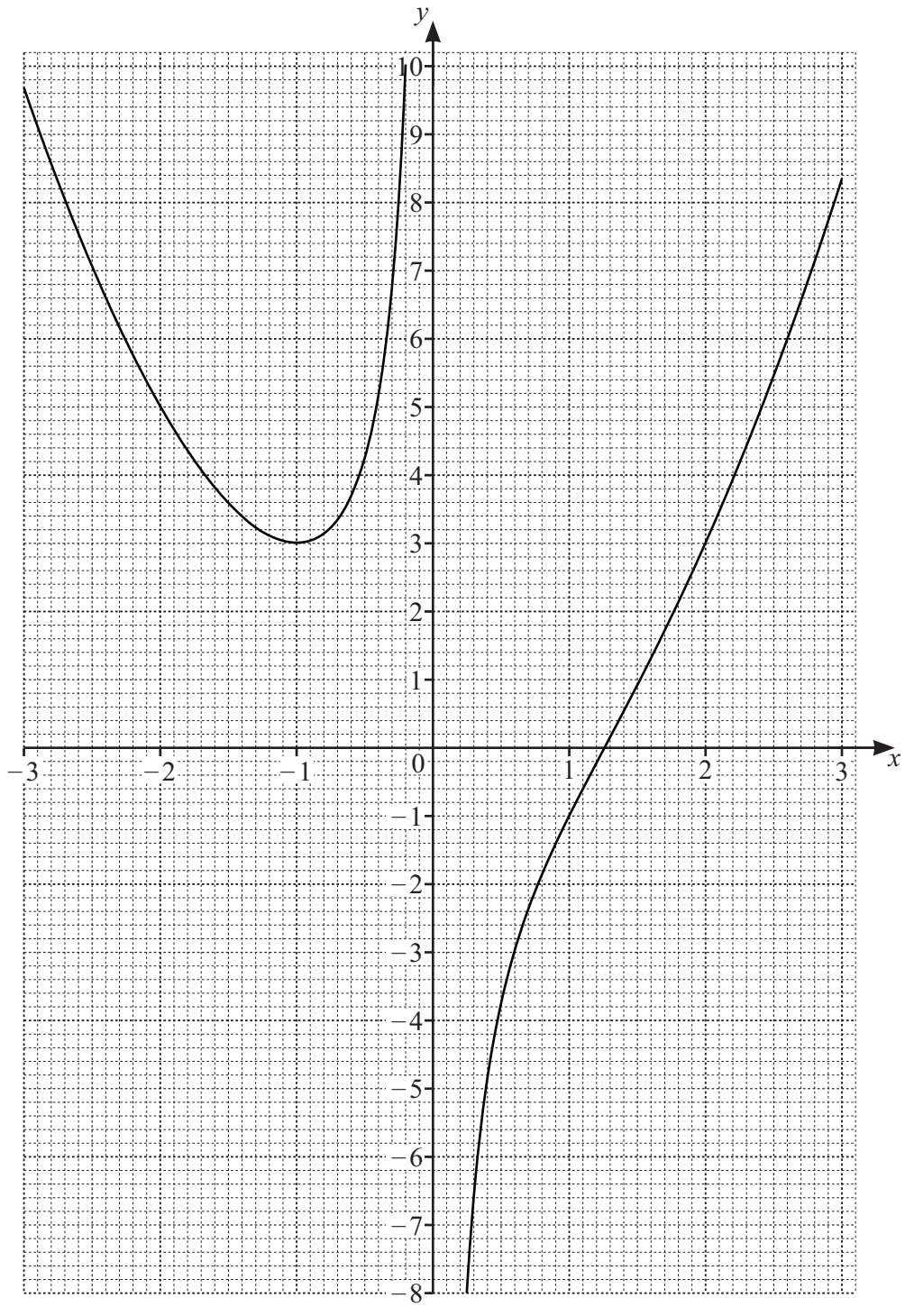
(b) Solve the equation $3r^2 + r - 6 = 0$.
Give your answer to 2 decimal places.
You must show all your working.

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

(c) Find the perimeter of the square.

..... cm [2]

5



The diagram shows the graph of $y = f(x)$ for values of x from -3 to 3.

(a) (i) Use the graph to find $f(2)$.

..... [1]

(ii) Use the graph to solve the equation $f(x) = 5$.

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

(iii) The equation $f(x) = k$ has exactly two solutions.

Write down the value of k.

$k =$ ..... [1]

(iv)

tangent	asymptote	root	perpendicular

Choose the correct word from the box to complete the statement.

The line $x = 0$ is the ..... to the graph of $y = f(x)$. [1]

(b) (i) On the grid, draw the graph of $y = x - 2$ for values of x from -3 to 3. [2]

(ii) Find x when $f(x) = x - 2$.

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

(c) $f(x) = x^2 - \frac{c}{x}, x \neq 0$

Use the graph to show that $c = 2$.

[2]

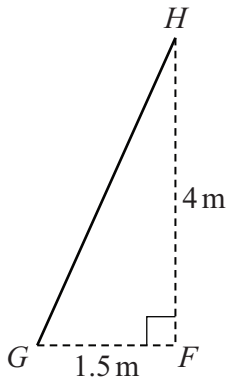
(d) The equation $f(x) = x - 2$ can be written as $x^3 + px^2 + qx = 2$.

Find the value of p and the value of q.

$p =$ .....

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

6 (a)



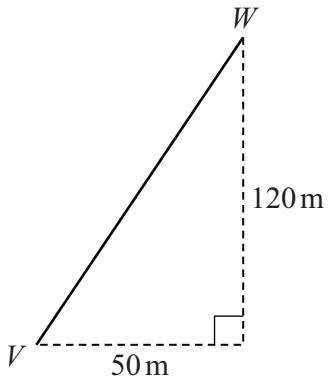
NOT TO SCALE

The diagram shows a ladder, GH, on horizontal ground, leaning against a vertical wall, HF. $GF = 1.5$ m and $HF = 4$ m.

Calculate the length of the ladder, GH.

..... m [2]

(b)



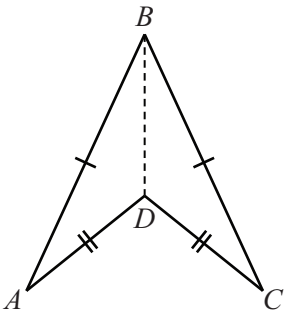
NOT TO SCALE

W is 120 m north of V and 50 m east of V.

Calculate the bearing of V from W.

..... [3]

(c)



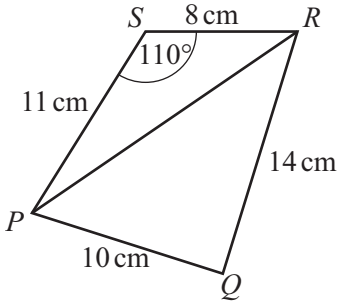
NOT TO SCALE

In the quadrilateral $ABCD$, $AD = DC = 5$ cm and $AB = BC$.
Angle $ABD = 25°$ and angle $BAD = 15°$.

Calculate the perimeter of the quadrilateral $ABCD$.

..... cm [5]

(d)



NOT TO SCALE

$PQRS$ is a quadrilateral.

Calculate angle PQR.

Angle PQR = ... [5]

7 **(a)** **(i)** A car travels 50 km at an average speed of 75 km/h.

Find the time taken.
Give your answer in minutes.

..... min [2]

(ii) Another car travels 47 km, correct to the nearest kilometre.
The average speed of this car is 75 km/h, correct to the nearest 5 km/h.

Calculate the lower bound of the time taken.
Give your answer in minutes.

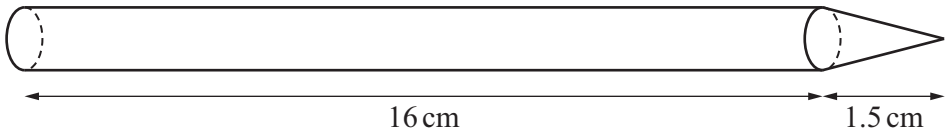
..... min [3]

(b) A train travels a total of 240 km.
The train travels for t **minutes** at an average speed of 100 km/h.
It then travels for $(t+60)$ **minutes** at an average speed of 110 km/h.

Find the average speed for the whole journey.

..... km/h [6]

8 (a)



NOT TO SCALE

The diagram shows a solid made from a cylinder and a cone.
The height of the cylinder is 16 cm and the height of the cone is 1.5 cm.
The radius of the cylinder and the base radius of the cone are each 0.35 cm.

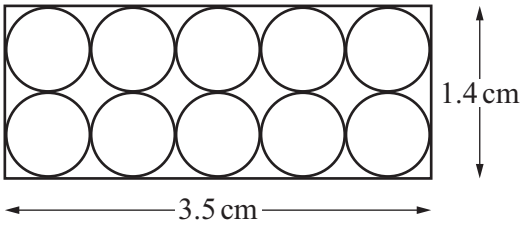
(i) Calculate the total surface area of the solid.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]

..... cm^2 [5]

(ii) Calculate the volume of the solid.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [3]

(iii)



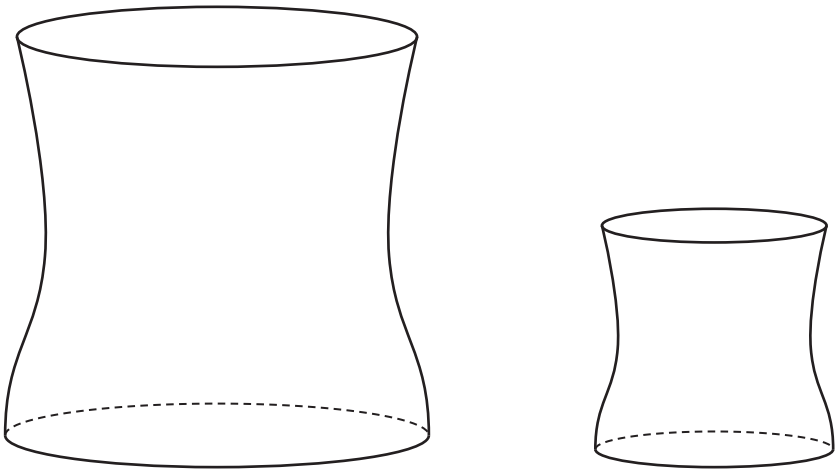
NOT TO SCALE

10 of the solids are placed in a box in the shape of a cuboid of length 17.5 cm.
The diagram shows one end of the box.

Calculate the volume of the empty space in the box.

..... cm^3 [3]

(b)



NOT TO SCALE

The diagram shows two mathematically similar solids.
The surface area of the larger solid is $200\,cm^2$ and the surface area of the smaller solid is $98\,cm^2$.
The volume of the larger solid is $450\,cm^3$.

Calculate the volume of the smaller solid.

..... cm^3 [3]

9

N	A	M	I	B	I	A

The diagram shows 7 cards.

(a) Amir picks a card at random.

Find the probability that the card shows

(i) the letter H

..... [1]

(ii) the letter B.

..... [1]

(b) Fumika picks one of the 7 cards at random.
She replaces it and picks a second card at random.

Find the probability that both cards show the letter I.

..... [2]

(c) Marcos picks two of the 7 cards at random, **without** replacement.

(i) Find the probability that one card shows the letter I and the other card shows the letter N.

..... [3]

(ii) Find the probability that the two cards show different letters.

..... [3]

(d) Nina picks one of the 7 cards at random without replacement.
She continues picking cards at random without replacement until she picks a card that shows the letter A.

The probability that this occurs when she picks the nth card is $\frac{4}{21}$.

Find the value of n.

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

10 $y = x^7 - 7x^6$

(a) Find the derivative of y with respect to x.

..... [2]

(b) Find the equation of the tangent to the graph of $y = x^7 - 7x^6$ at the point where $x = -1$.
Give your answer in the form $y = mx + c$.

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

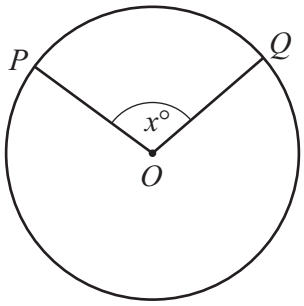
(c) The graph of $y = x^7 - 7x^6$ has two turning points.

Find the coordinates of these points.
You must show all your working.

(..... , ...)

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

11 (a)

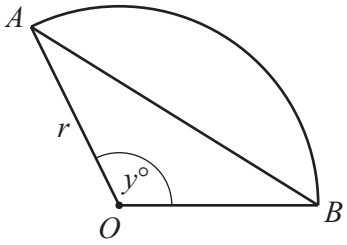


NOT TO SCALE

In the circle, centre O, the length of the minor arc PQ is $\frac{3}{7}$ of the length of the major arc PQ.
Show that $x = 108$.

[3]

(b)



NOT TO SCALE

The diagram shows a sector, OAB, of a circle with centre O and radius r.
The area of triangle OAB is half the area of the sector.
Angle $AOB = y°$ and is obtuse.

(i) Show that $360 \sin y = \pi y$.

[2]

(ii) Complete the table, giving your answers correct to two decimal places.

y	$360 \sin y$	πy
108.4	341.60	340.55
108.5	341.40	340.86
108.6	341.20	
108.7		

[3]

(iii) Complete the statement.

The value of y, correct to one decimal place, that satisfies the equation $360 \sin y = \pi y$ is ..... .

[1]

BLANK PAGE

CAMBRIDGE
International Education

Cambridge IGCSE™

MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 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 May/June 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U 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.

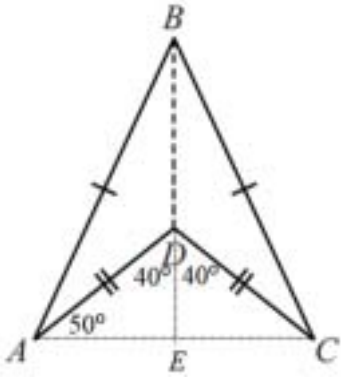
Abbreviations

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)	3050	**2**	**M1** for $50 \times 40 + 70 \times 15$ or better
1(a)(ii)	91.1 or 91.14 to 91.15	**1**	**FT** $\frac{2780}{their\ 3050} \times 100$
1(a)(iii)	125 nfww	**2**	**M1** for [...] × $\frac{100-4}{100}$ =120 oe
1(a)(iv)(a)	132	**2**	**B1** for increase of 6 in adult or junior or **M1** for 56 : 76 or for multiples of 33 seen 33, 66, 99, 132, … or $50 + x : 70 + x = 14 : 19$ oe or $(70 - 50) \times \frac{19+14}{19-14}$ oe or $50 + x = (120 + 2x) \times \frac{14}{19+14}$ oe
1(a)(iv)(b)	10	**2**	**FT** $\frac{their\textbf{(a)} - 120}{120} \times 100$ dep on *their* **(a)** > 120 **M1** for $\frac{their\textbf{(a)} - 120}{120}[\times 100]$ or $\frac{their\textbf{(a)}}{120} \times 100\ [-100]$
1(b)(i)	2280 or 2281 to 2282 nfww	**2**	**M1** for $2500 \times \left(1 - \frac{3}{100}\right)^3$ oe
1(b)(ii)	8	**2**	**M1** for $2500 \times \left(1 - \frac{3}{100}\right)^n$ or 0.97^n evaluated with $n > 3$
2(a)(i)	56	**1**	
2(a)(ii)	11	**2**	**M1** for $120 - n^3 = -1211$ or $120 - 11^3 = -1211$
2(b)	0.0048 or $\frac{3}{625}$ oe	**1**	

Question	Answer	Marks	Partial Marks
2(c)	A: –5: $10 - 3n$ B: $\frac{5}{8}$: $\frac{n}{n+3}$ C: 20: $n^2 - n$	**8**	**B1** for –5 **B2** for $10 - 3n$ oe or **B1** for $k - 3n$ or for $10 - kn$ **B1** for $\frac{5}{8}$ **B1** for $\frac{n}{n+3}$ oe **B1** for 20 **B2** for $n^2 - n$ oe or **B1** for any quadratic or for at least two second differences of 2
3(a)	5	**B1**	
	4	**B1**	
	3.55	**3**	**M2** for $(10 \times 1 + 6 \times 2 + 11 \times 3 + 13 \times 4 + 14 \times 5 + 6 \times 6) \div 60$ oe or **M1** for $10 \times 1 + 6 \times 2 + 11 \times 3 + 13 \times 4 + 14 \times 5 + 6 \times 6$ oe
3(b)(i)	42.55 or 42.6	**4**	**M1** for 25, 40, 62.5 soi **M1** for Σfx with x values in correct intervals, including boundaries **M1 dep** on second M1 for $\frac{\Sigma fx}{100}$
3(b)(ii)	10.8 2.16	**2**	**B1** for each or for frequency densities 3.6 and 0.72 seen
4(a)	$\frac{1}{2}(r+5)(r+2)\sin 30 = (r+1)^2$	**M2**	**M1** for $\frac{1}{2}(r+5)(r+2)\sin 30$ oe
	$r^2 + 5r + 2r + 10$ or $r^2 + r + r + 1$ soi	**B1**	
	Leading to $3r^2 + r - 6 = 0$ with no errors or omissions	**A1**	Dependent on both expansions seen

Question	Answer	Marks	Partial Marks
4(b)	$\frac{-1\pm\sqrt{1^2-4(3)(-6)}}{2(3)}$ Or $-\frac{1}{6}\pm\sqrt{2+\left(\frac{1}{6}\right)^2}$ oe or $\frac{1}{3}\left(-\frac{1}{2}\pm\sqrt{18+\left(\frac{1}{2}\right)^2}\right)$ oe	**B2**	**B1** for $\sqrt{1^2-4(3)(-6)}$ or for $\frac{-1+\sqrt{p}}{2(3)}$ or $\frac{-1-\sqrt{p}}{2(3)}$ or $\left(r+\frac{1}{6}\right)^2$ or $\left(3r+\frac{1}{2}\right)^2$
	–1.59 and 1.26	**B1**	
4(c)	9.028 to 9.040	**2**	**M1** for (*their* root (greater than –1) + 1) × 4
5(a)(i)	3 cao	**1**	
5(a)(ii)	–2, –0.45 to –0.4, 2.40 to 2.45	**3**	**B1** each
5(a)(iii)	3 cao	**1**	
5(a)(iv)	Asymptote	**1**	
5(b)(i)	Correct ruled line	**2**	**B1** for ruled line through (0, –2) but not $y = -2$ or for ruled line with gradient 1
5(b)(ii)	1 cao	**1**	
5(c)	Substituting values of x and y into $y = x^2 - \frac{c}{x}$ for an exact point on graph of $y = f(x)$ or substituting *their* value of x from 5b(ii) into $x^2 - \frac{c}{x} = x - 2$	**M1**	
	leading to $c = 2$ with no errors	**A1**	
5(d)	[p =] –1 and [q =] 2 nfww	**2**	**M1** for $x^3 - x^2 + 2x = 2$ seen or **B1** for each nfww
6(a)	4.27 or 4.272...	**2**	**M1** for $4^2 + 1.5^2$ oe

Question	Answer	Marks	Partial Marks
6(b)	203 or 202.6…	**3**	**B2** for [angle at W =] 22.6... or for [angle at V =] 67.4 or 67.38… or **M1** for tan = $\frac{5}{12}$ or $\frac{12}{5}$ oe
6(c)	25.2 or 25.20 to 25.21[0] 	**5**	**B4** for [BC or AB =] 7.6[0] or 7.604 to 7.605 OR **M3** for a complete explicit method leading to AB or BC, e.g. $\frac{5\sin 140}{\sin 25}$ OR **M2** for a complete implicit method leading to AB or BC, e.g. $\frac{\sin 25}{5} = \frac{\sin 140}{BC \text{ or } AB}$ oe and **M1** (dep on AB from trig) for 2 × *their* AB + 10 OR **B1** for any relevant angle E.g. $\angle BDA$ or $\angle BDC$ = 140, $\angle DAE$ or $\angle DCE$ = 50 or $\angle ADE$ or $\angle CDE$ = 40 or $\angle ADC$ = 80
6(d)	79.5 or 79.6 or 79.54 to 79.55...	**5**	**B2** for [PR^2 =] 245 or 245.1 to 245.2 or [PR =] 15.65 to 15.66 or 15.7 or **M1** for [PR^2 =] $11^2 + 8^2 - 2 \times 11 \times 8 \times \cos 110$ **M2** for [cosPQR =] $\frac{10^2 + 14^2 - (\textit{their } PR)^2}{2 \times 10 \times 14}$ oe or **M1** for (*their* PR)^2 = $10^2 + 14^2 - 2 \times 10 \times 14\cos PQR$ oe
7(a)(i)	40	**2**	**M1** for $\frac{50}{75}$ [× 60] oe
7(a)(ii)	36 nfww	**3**	**M2** for $\frac{47 - 0.5}{75 \text{ to } 80}$ [× 60] or $\frac{46 \text{ to } 47}{75 + 2.5}$ [× 60] or **M1** for 47+0.5 or 47 – 0.5 or 75 + 2.5 or 75– 2.5

Question	Answer	Marks	Partial Marks
7(b)	107 or 107.2...	**6**	**M5** for [speed =] $\frac{240}{\left(2\times\frac{260}{7}+60\right)}\times 60$ oe OR **B5** for [total time =] 134 or 134.2 to 134.3 or 2.24 or 2.238... or **B4** for (t =) 37.1 or 37.14... OR **M2** for $\frac{t}{60}\times 100+\frac{t+60}{60}\times 110=240$ oe or **M1** for $\frac{t}{60}\times 100$ or $\frac{t+60}{60}\times 110$ oe **M1** for correct equation of form $at = b$ from *their* equation containing two terms in t and involving the speeds. **M1** for $\frac{240}{2\times \textit{their}\, t+60}$ [× 60]
8(a)(i)	37.3 or 37.26 to 37.27	**5**	**M2** for $\pi\times 0.35\times\sqrt{0.35^2+1.5^2}$ oe or **M1** for $0.35^2+1.5^2$ or better **M1** for $\pi\times 0.35^2$ **M1** for $2\times\pi\times 0.35\times 16$
8(a)(ii)	6.35 or 6.349 to 6.351	**3**	**M1** for $\pi\times 0.35^2\times 16$ **M1** for $\frac{1}{3}\times\pi\times 0.35^2\times 1.5$
8(a)(iii)	22.2 or 22.3 or 22.24 to 22.26	**3**	**M2** for 17.5 × 3.5 × 1.4 – 10 × *their***(a)(ii)** or **M1** for 17.5 × 3.5 × 1.4

Question	Answer	Marks	Partial Marks
8(b)	154 or 154.3 to 154.4	**3**	**M2** for $450 \times \left(\sqrt{\frac{98}{200}}\right)^3$ oe or **M1** for $\left(\sqrt{\frac{98}{200}}\right)^3$ or $\left(\sqrt{\frac{200}{98}}\right)^3$ oe or for $\left(\frac{450}{V}\right)^2 = \left(\frac{200}{98}\right)^3$ oe
9(a)(i)	0	**1**	
9(a)(ii)	$\frac{1}{7}$ oe	**1**	
9(b)	$\frac{4}{49}$ oe	**2**	**M1** for $\frac{2}{7} \times \frac{2}{7}$
9(c)(i)	$\frac{2}{21}$ oe	**3**	**M2** for $\frac{2}{7} \times \frac{1}{6} + \frac{1}{7} \times \frac{2}{6}$ oe or **M1** for $\frac{2}{7} \times \frac{1}{6}$ or $\frac{1}{7} \times \frac{2}{6}$ oe seen If 0 scored SC1 for $\frac{4}{49}$
9(c)(ii)	$\frac{19}{21}$ oe	**3**	**M2** for $1 - \left(\frac{2}{7} \times \frac{1}{6}\right) - \left(\frac{2}{7} \times \frac{1}{6}\right)$ oe or **M1** for $\left(\frac{2}{7} \times \frac{1}{6}\right) + \left(\frac{2}{7} \times \frac{1}{6}\right)$ oe ALTERNATIVE **M2** for $\frac{1}{7}$ [× 1] × 3 + $\frac{2}{7} \times \frac{5}{6} \times 2$ or **M1** for $\frac{2}{7} \times \frac{5}{6}$ or $\frac{1}{7}$ [× 1] × 3 If 0 scored SC1 for $\frac{38}{49}$
9(d)	3	**2**	**M1** for $\frac{5}{7} \times \frac{4}{6} \times \frac{2 \text{or} 3}{5}$
10(a)	$7x^6 - 42x^5$ final answer	**2**	**B1** for one correct term $7x^6$ or $42x^5$ or for $7x^6 - 42x^5$ seen and spoiled

Question	Answer	Marks	Partial Marks
10(b)	$49x + 41$	**4**	**M1** for substituting $x = -1$ into $[y =] x^7 - 7x^6$ **M1** for $x = -1$ substituted in *their* (a) or the correct derivative to give *their m* **M1** for *their* $-8 = (\text{their } m)(-1) + c$ oe
10(c)	(0, 0) (6, –46 656)	**5**	**B4** for (6, –46 656) or **B3** for $x = 0$ and 6 **OR** **M1** for *their* $\frac{dy}{dx} = 0$ or stating $\frac{dy}{dx} = 0$ and **M1** for a correct method to solve *their* $7x^6 - 42x^5$
11(a)	$\frac{3}{10} \times 360$ oe	**M2**	**M1** for $\frac{3}{3+7} = \frac{x}{360}$ or for $\frac{x}{360}$ $[\times 2\pi r] = \frac{3}{7} \times \frac{360 - x}{360}$ $[\times 2\pi r]$ oe or better or 1 $[\times 2\pi r] = \frac{10}{7} \times \frac{360 - x}{360}$ $[\times 2\pi r]$ oe or better or $\frac{360}{7+3} \times k$ ($k = 1$ or 7)
	108	**A1**	
11(b)(i)	$\frac{1}{2} r^2 \sin y = \frac{1}{2} \times \frac{y}{360} \times \pi r^2$ or $\frac{y}{360} \times \pi r^2 = [2 \times \frac{1}{2}]\, r^2 \sin y$ and one further step leading to $360\sin y = \pi y$ with no errors	**2**	**M1** for $\frac{y}{360} \times \pi r^2$ or for $\frac{1}{2} r^2 \sin y$
11(b)(ii)	341.18 or 341.22 341.00 341.49 or 341.54	**3**	**B1** for each
11(b)(iii)	108.6 cao	**1**	