Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

4684519284

MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2020**

1 hour 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

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

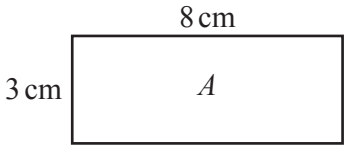
INFORMATION

- 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. Blank pages are indicated.

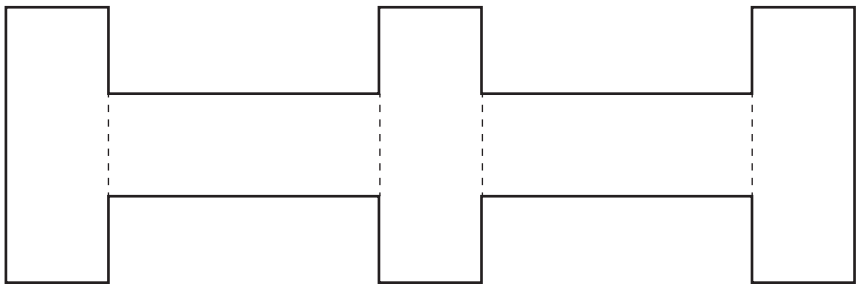
[Turn over

1 Rectangle A measures 3 cm by 8 cm.



NOT TO SCALE

Five rectangles congruent to A are joined to make a shape.



NOT TO SCALE

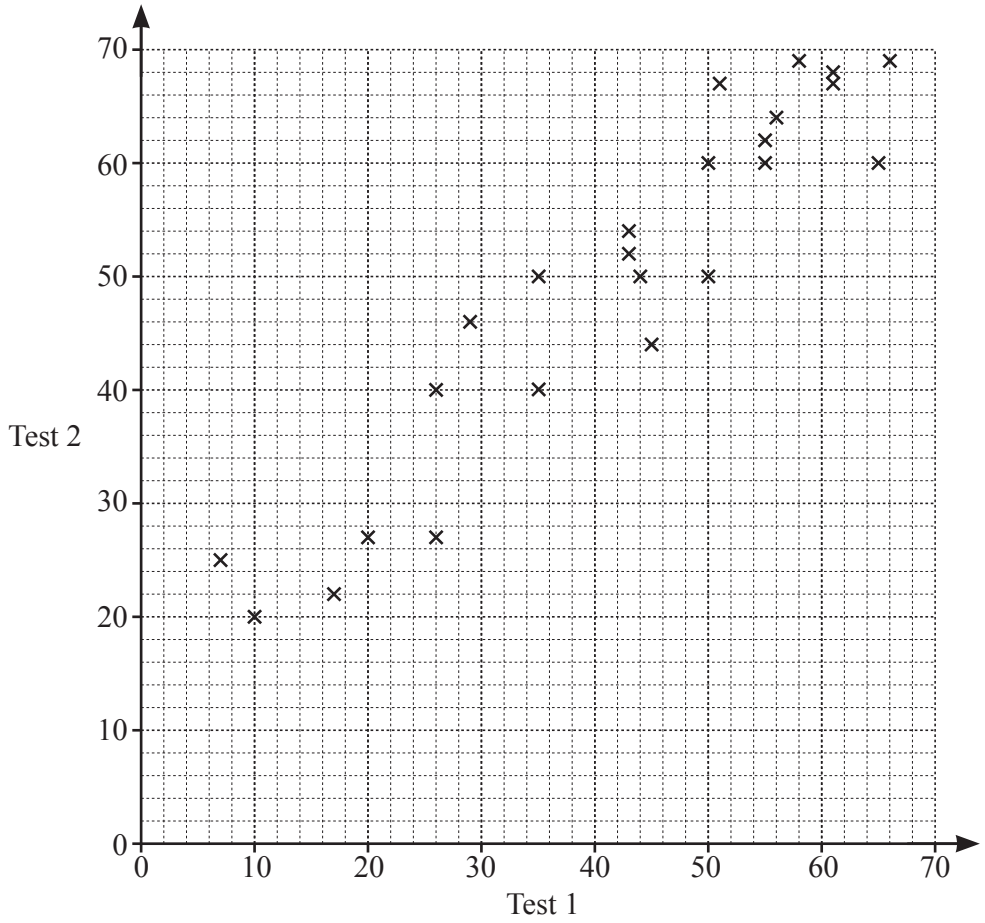
Work out the perimeter of this shape.

..... cm [2]

2 Find the highest **odd** number that is a factor of 60 and a factor of 90.

..... [1]

3 Mrs Salaman gives her class two mathematics tests.
The scatter diagram shows information about the marks each student scored.



(a) Write down the highest mark scored on test 1.

..... [1]

(b) Write down the type of correlation shown in the scatter diagram.

..... [1]

(c) Draw a line of best fit on the scatter diagram. [1]

(d) Hamish scored a mark of 40 on test 1.
He was absent for test 2.

Use your line of best fit to find an estimate for his mark on test 2.

..... [1]

[Turn over

4 A bag contains blue, red, yellow and green balls only.
A ball is taken from the bag at random.
The table shows some information about the probabilities.

Colour	Blue	Red	Yellow	Green
Probability	0.15	0.2		0.43

(a) Complete the table.

[2]

(b) Abdul takes a ball at random and replaces it in the bag.
He does this 200 times.

Find how many times he expects to take a red ball.

..... [1]

5 **(a)** The nth term of a sequence is $60 - 8n$.

Find the largest number in this sequence.

..... [1]

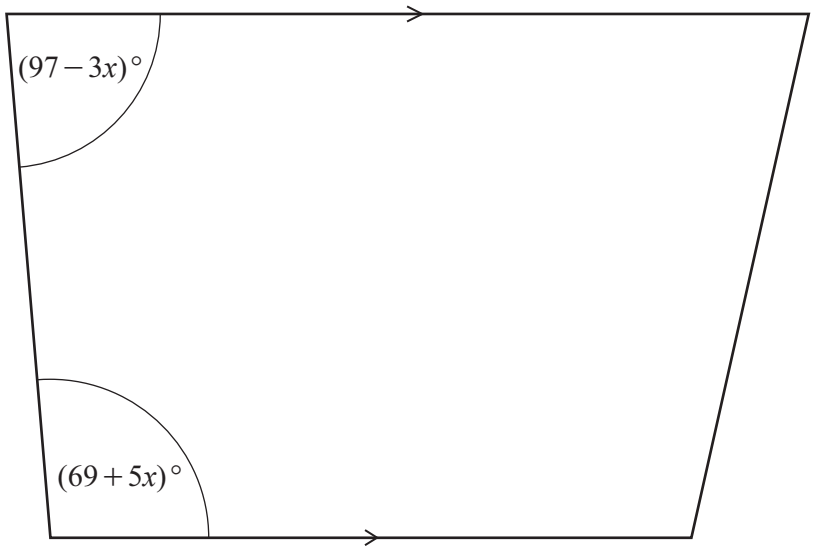
(b) Here are the first five terms of a different sequence.

12 19 26 33 40

Find an expression for the nth term of this sequence.

..... [2]

6 The diagram shows a trapezium.



NOT TO SCALE

Work out the value of x.

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

7 $234 = 2\times3^2\times13$ $1872 = 2^4\times3^2\times13$ $234\times1872 = 438\,048$

Use this information to write 438 048 as a product of its prime factors.

..... [1]

8 **Without using a calculator**, work out $\left(2\frac{1}{3}-\frac{7}{8}\right)\times\frac{6}{25}$.

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

..... [4]

9 Factorise completely.

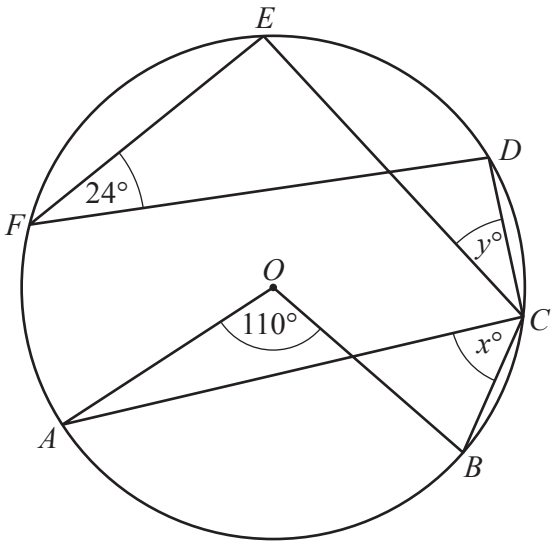
(a) $21a^2+28ab$

..... [2]

(b) $20x^2-45y^2$

..... [3]

10



NOT TO SCALE

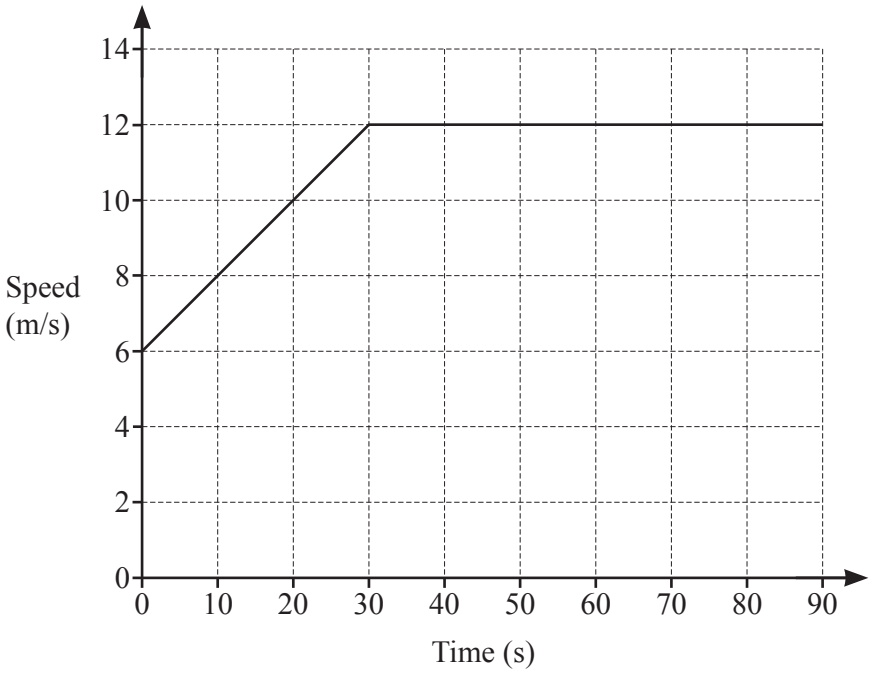
Points A, B, C, D, E and F lie on the circle, centre O.

Find the value of x and the value of y.

$x =$ .....

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

11

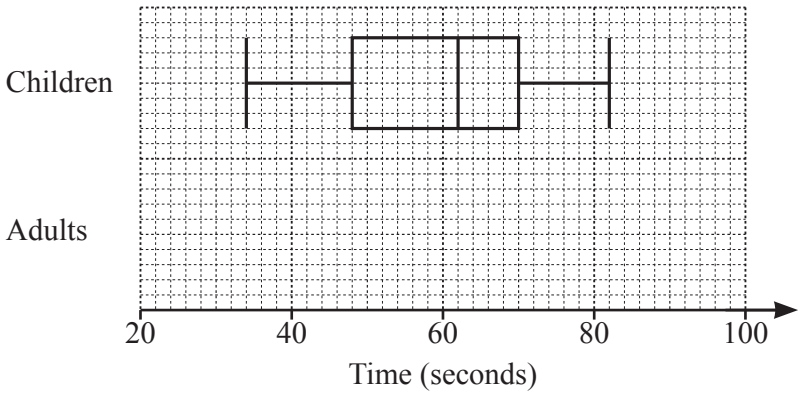


The diagram shows the speed–time graph for 90 seconds of a journey.

Calculate the total distance travelled during the 90 seconds.

..... m [3]

12 Gemma records the times, in seconds, taken for a group of children and a group of adults to complete a puzzle.
The box-and-whisker plot shows information about the times taken for the children to complete the puzzle.



(a) Find the interquartile range of the times taken for the children to complete the puzzle.

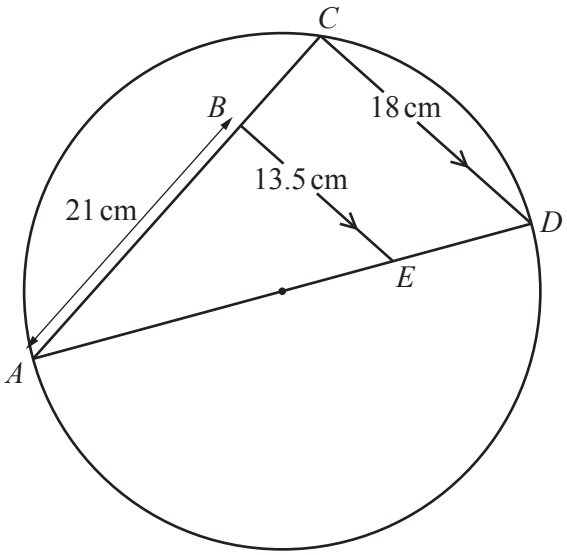
..... seconds [2]

(b) The table shows some information about the times, in seconds, taken for the adults to complete the puzzle.

Minimum	Lower quartile	Median	Upper quartile	Maximum
28	42	58	70	75

On the grid above, draw the box-and-whisker plot for the adults. [2]

13



NOT TO SCALE

C lies on a circle with diameter *AD*.
B lies on *AC* and *E* lies on *AD* such that *BE* is parallel to *CD*.
AB = 21 cm, *CD* = 18 cm and *BE* = 13.5 cm.

Work out the radius of the circle.

..... cm [5]

14 **(a)** $\mathrm{f}(x) = 4x + 3$ $\mathrm{g}(x) = 5x - 4$

$\mathrm{fg}(x) = 20x + p$

Find the value of p.

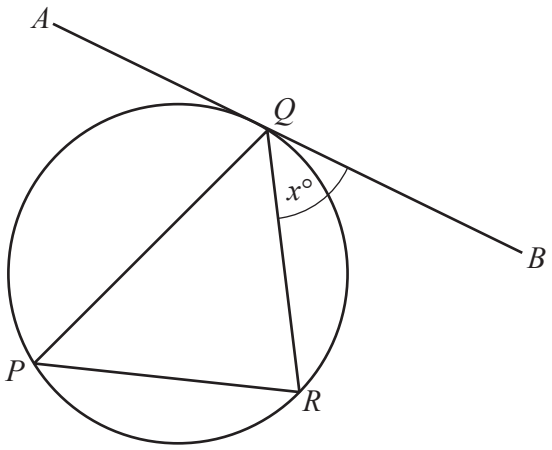
$p =$ ..... [2]

(b) $\mathrm{h}(x) = \dfrac{5x - 1}{3}$

Find $\mathrm{h}^{-1}(x)$.

$\mathrm{h}^{-1}(x) =$ ..... [3]

15



NOT TO SCALE

P, R and Q are points on the circle.
AB is a tangent to the circle at Q.
QR bisects angle PQB.
Angle $BQR = x°$ and $x < 60$.

Use this information to show that triangle PQR is an isosceles triangle.
Give a geometrical reason for each step of your work.

[3]

16 m is inversely proportional to the square of $(p - 1)$.
When $p = 4$, $m = 5$.

Find m when $p = 6$.

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

17 **(a)** **(i)** $\mathbf{m} = \begin{pmatrix} 5 \\ 7 \end{pmatrix}$

Find $3\mathbf{m}$.

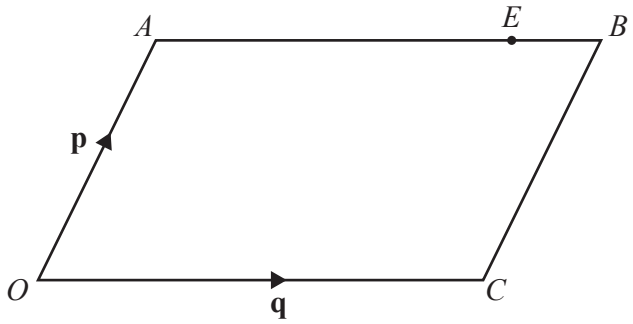
$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(ii) $\overrightarrow{VW} = \begin{pmatrix} 10 \\ -24 \end{pmatrix}$

Find $\left|\overrightarrow{VW}\right|$.

..... [2]

(b)



NOT TO SCALE

$OABC$ is a parallelogram.
$\overrightarrow{OA} = \mathbf{p}$ and $\overrightarrow{OC} = \mathbf{q}$.
E is the point on AB such that $AE : EB = 3 : 1$.

Find $\overrightarrow{OE}$, in terms of $\mathbf{p}$ and $\mathbf{q}$, in its simplest form.

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

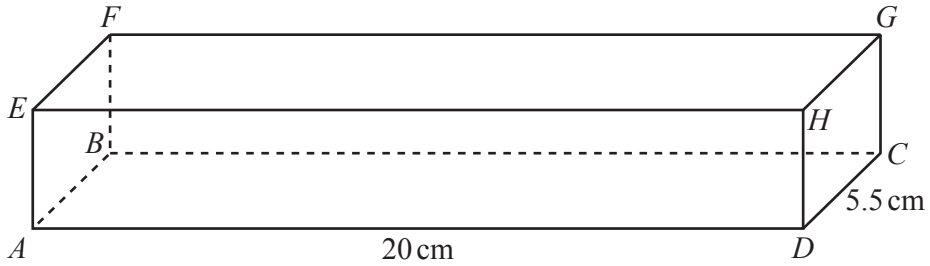
18 $P = 2(w + h)$

$w = 12$ correct to the nearest whole number.
$h = 4$ correct to the nearest whole number.

Work out the upper bound for the value of P.

..... [2]

19



NOT TO SCALE

The diagram shows cuboid $ABCDEFGH$ of length 20 cm and width 5.5 cm.
The volume of the cuboid is 495 cm^3.

Find the angle between the line AG and the base of the cuboid $ABCD$.

..... [5]

20 The curve $y = x^2 - 2x + 1$ is drawn on a grid.
A line is drawn on the same grid.
The points of intersection of the line and the curve are used to solve the equation $x^2 - 7x + 5 = 0$.

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

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

21 Expand and simplify $(x + 3)(x - 5)(3x - 1)$.

..... [3]

Question 22 is printed on the next page.

22 Find the area of a regular hexagon with side length 7.4 cm.

..... cm^2 [3]

Cambridge Assessment International Education

Cambridge IGCSE™

MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2020**

MARK SCHEME

Maximum Mark: 70

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

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

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

[Turn over

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors 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.

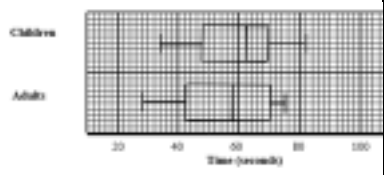
Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.

2	Unless specified in the question, 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 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 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	86	**2**	**M1** for correct method to find the perimeter e.g. $(8 + 3) \times 2 \times 5 - 3 \times 8$ If 0 scored, **SC1** for answer 98
2	15	**1**	
3(a)	66	**1**	
3(b)	Positive	**1**	
3(c)	Ruled line of best fit	**1**	
3(d)	46 to 50	**1**	**FT** *their* line of best fit if a positive gradient
4(a)	0.22 oe	**2**	**M1** for $0.15 + 0.2 + ? + 0.43 = 1$ or better
4(b)	40	**1**	
5(a)	52	**1**	
5(b)	$7n + 5$ oe final answer	**2**	**B1** for $7n + a$ or $bn + 5$ $b \neq 0$
6	7	**3**	**M2** for $166 + 2x = 180$ or better or **M1** for $97 - 3x + 69 + 5x = 180$ oe
7	$2^5 \times 3^4 \times 13^2$	**1**	
8	$\frac{56}{24} - \frac{21}{24}$	**M2**	**M2** for correct method for common denominator or **B1** for $\frac{7}{3}$
	their $\frac{35}{24} \times \frac{6}{25}$	**M1**	
	$\frac{7}{20}$	**A1**	
9(a)	$7a(3a + 4b)$ final answer	**2**	**B1** for partial factorisation $7(3a^2 + 4ab)$ or $a(21a + 28b)$

Question	Answer	Marks	Partial Marks
9(b)	$5(2x + 3y)(2x – 3y)$ final answer	**3**	**B2** for $(2x + 3y)(2x – 3y)$ or $(10x + 15y)(2x – 3y)$ or $(2x + 3y)(10x – 15y)$ or **B1** for $5(4x^2 – 9y^2)$
10	$[x =]$ 55 $[y =]$ 24	**2**	**B1** for each
11	990	**3**	**M2** for correct complete area statement e.g. $\frac{1}{2} \times 30 \times (6 + 12) + 60 \times 12$ oe or **M1** for one area calculation
12(a)	22	**2**	**B1** for 48 and 70
12(b)		**2**	**M1** for a box with two whiskers and at least two correct from Min 28, LQ 42, Med 58, UQ 70, Max 75
13	16.6 or 16.64…	**5**	**M2** for $21 \times \frac{18}{13.5} = [AC]$ oe or **M1** for scale factor $\frac{13.5}{18}$ or $\frac{18}{13.5}$ oe soi Then Pythagoras method: and **M2** for $\sqrt{28^2 + 18^2}$ $[\div 2]$ or $\sqrt{(theirAC)^2 + 18^2}$ $[\div 2]$ or **M1** for $AD^2 = 28^2 + 18^2$ or $AD^2 = (theirAC)^2 + 18^2$ OR alternative trigonometry method e.g. **M1** for $\tan E = \frac{21}{13.5}$ and **M1** for $AD = \frac{18}{\cos their\, 57.3}$
14(a)	$[p =] -13$	**2**	**M1** for $4(5x – 4) + 3$ or better
14(b)	$\frac{3x+1}{5}$	**3**	**M2** for $x = \frac{3y+1}{5}$, $5y = 3x + 1$ or $y - \frac{1}{5} = \frac{3x}{5}$ **M1** for $x = \frac{5y-1}{3}$, $3y = 5x - 1$ or $y + \frac{1}{3} = \frac{5x}{3}$

Question	Answer	Marks	Partial Marks
15	Complete explanation with geometrical reasons	**3**	**B1** for $RQP = x°$ QR bisects angle PQB **B1** for $RPQ = x°$ alternate segment theorem **B1** for triangle PQR has two equal angles both less than 60 (so can't be equilateral) so must be isosceles
16	1.8 or $1\frac{4}{5}$	**3**	**M2** for $m = \frac{k}{(p-1)^2}$ or **M1** for $m = \frac{theirk}{(6-1)^2}$ OR **M2** for $5(4-1)^2 = m(6-1)^2$ oe
17(a)(i)	$\begin{pmatrix}15\\21\end{pmatrix}$	**1**	
17(a)(ii)	26	**2**	**M1** for $10^2 + (-24)^2$ or better
17(b)	$\mathbf{p} + \frac{3}{4}\mathbf{q}$	**2**	**M1** for a correct route or for $\overrightarrow{AE} = \frac{3}{4}\mathbf{q}$
18	34	**2**	**M1** for 12 + 0.5 or 4 + 0.5 or better seen
19	12.2 or 12.24…	**5**	**M4** for tan = $\frac{4.5}{\sqrt{20^2+5.5^2}}$ oe or **M1** for recognising angle GAC **M1** for $\frac{495}{20\times5.5}$ **M1** for $\sqrt{20^2+5.5^2}$ or $\sqrt{20^2+5.5^2+(their4.5)^2}$ **M1** for tan = $\frac{their4.5}{\sqrt{20^2+5.5^2}}$ oe
20	[$y =$] $5x - 4$	**1**	
21	$3x^3 - 7x^2 - 43x + 15$	**3**	**B2** for correct expansion and simplification of two of the brackets or **B1** for correct expansion of two brackets with at least 3 terms correct

Question	Answer	Marks	Partial Marks
22	142 or 142.2 to 142.3	**3**	**M2** for $\frac{1}{2}\times 7.4\times 7.4\times \sin 60\times 6$ or $\tan 60\times \frac{7.4}{2}\times \frac{7.4}{2}\times 6$ or **M1** for $\frac{1}{2}\times 7.4\times 7.4\times \sin 60$ or $\tan 60\times \frac{7.4}{2}$

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CANDIDATE NAME

CENTRE NUMBER | | | | | |

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8231223107

MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2020**

1 hour 30 minutes

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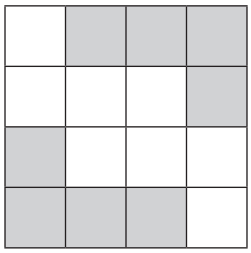
1



Write down the order of rotational symmetry of the diagram.

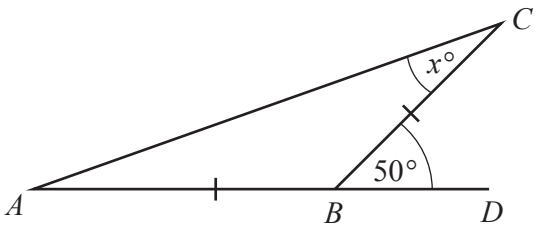
..... [1]

2 At noon the temperature in Maseru was 21 °C.
At midnight the temperature had fallen by 26 °C.

Work out the temperature at midnight.

..... °C [1]

3



NOT TO SCALE

$AB = BC$ and ABD is a straight line.

Find the value of x.

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

4 Write down

(a) a square number greater than 10,

..... [1]

(b) an irrational number.

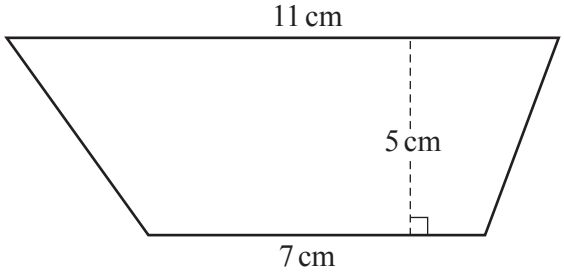
..... [1]

5 $y = mx + c$

Find the value of y when $m = -3$, $x = -2$ and $c = -8$.

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

6

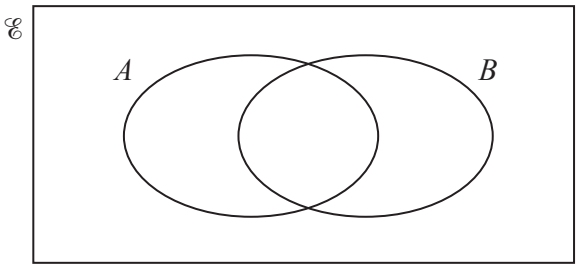


NOT TO SCALE

Calculate the area of the trapezium.

..... cm^2 [2]

7

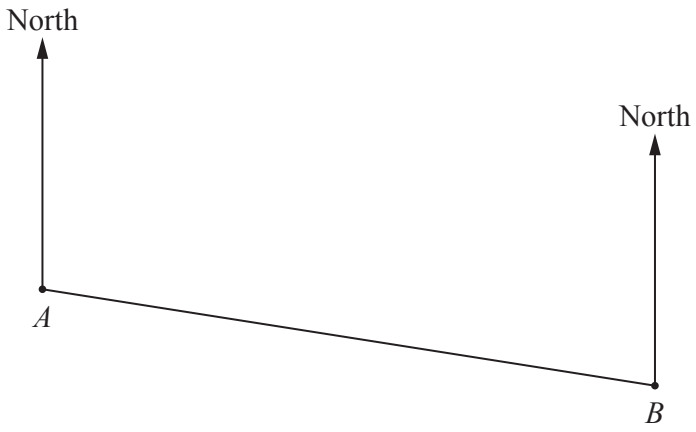


On the Venn diagram, shade the region $A \cap B$. [1]

8 Write 2^{-4} as a decimal.

..... [1]

9



The bearing of B from A is 105°.

Find the bearing of A from B.

..... [2]

10 Simplify.

$$\frac{p}{2q} \times \frac{4pq}{t}$$

..... [2]

11 **Without using a calculator**, work out $1\frac{3}{4} - \frac{11}{12}$.
You must show all your working and give your answer as a fraction in its simplest form.

..... [3]

12 Roberto buys a toy for \$5.00 .
He then sells it for \$4.60 .

Calculate his percentage loss.

..... % [2]

13 Simplify $8t^8 \div 4t^4$.

..... [2]

14 Solve the equation.

$$\frac{1-x}{3} = 5$$

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

15 Ella's height is 175 cm, correct to the nearest 5 cm.

Write down the upper bound of Ella's height.

..... cm [1]

16 Calculate $(3 \times 10^{-3})^3$.
Give your answer in standard form.

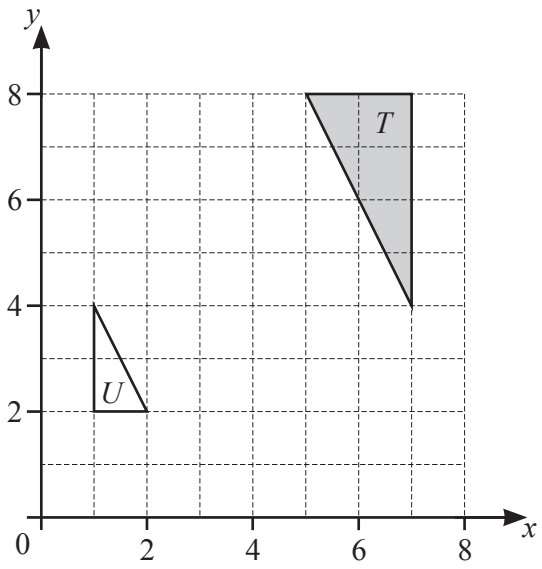
..... [1]

17 A train of length 105 m takes 11 seconds to pass completely through a station of length 225 m.

Calculate the speed of the train in km/h.

..... km/h [3]

18



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

.....

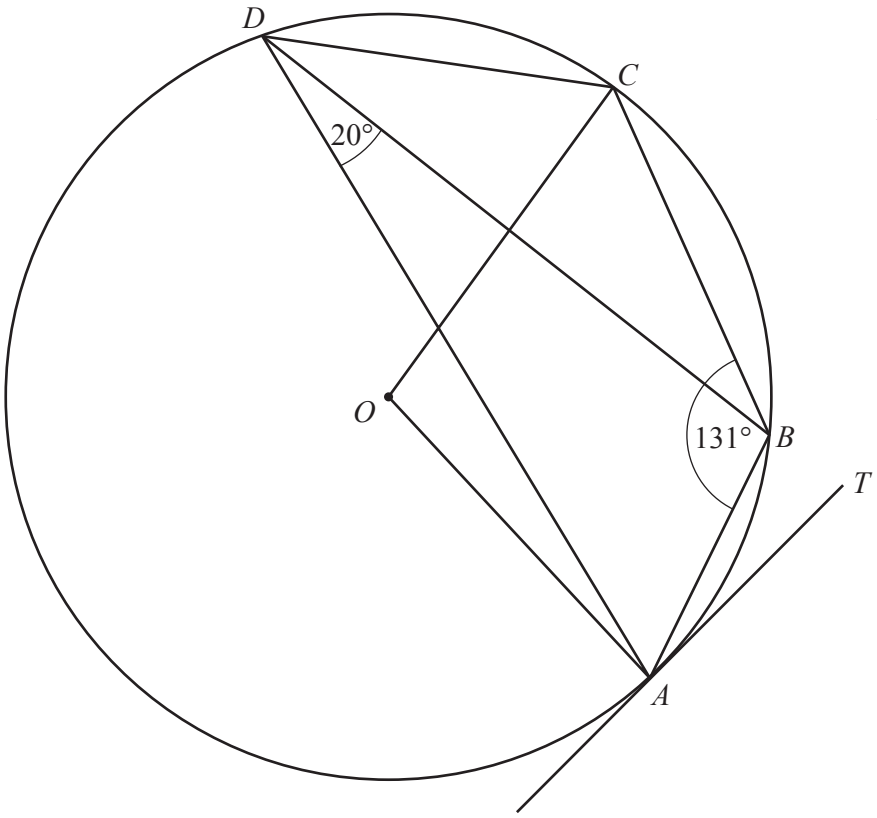
..... [3]

19 Make y the subject of the formula.

$$h^2 = x^2 + 2y^2$$

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

20



NOT TO SCALE

A, B, C and D lie on the circle, centre O.
TA is a tangent to the circle at A.
Angle $ABC = 131°$ and angle $ADB = 20°$.

Find

(a) angle ADC,

Angle $ADC =$ ..... [1]

(b) angle AOC,

Angle $AOC =$ ..... [1]

(c) angle BAT,

Angle $BAT =$ ..... [1]

(d) angle OAB.

Angle $OAB =$ ..... [1]

[Turn over

21 Simplify.

(a) $(5x^4)^3$

..... [2]

(b) $(256x^{256})^{\frac{3}{8}}$

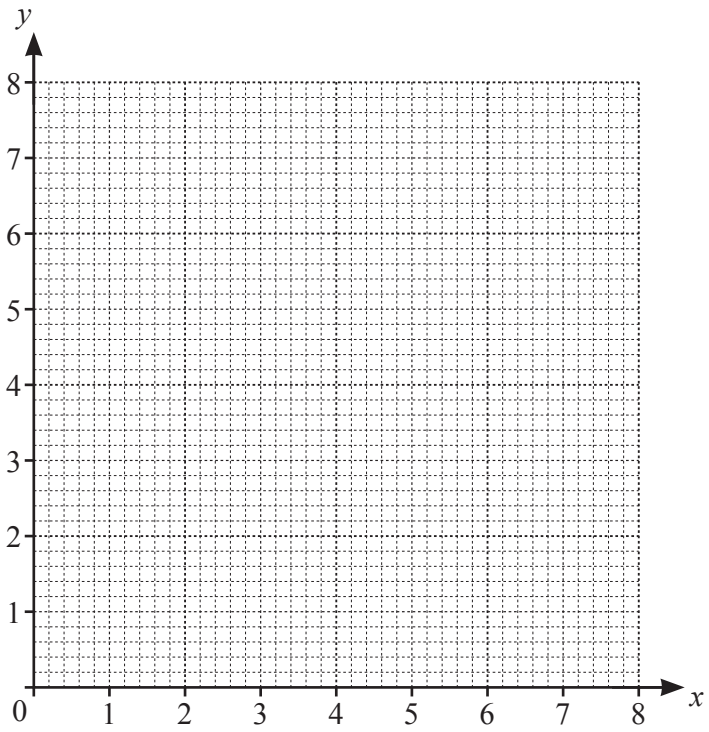
..... [2]

22 p is directly proportional to $(q+2)^2$.
When $q = 1$, $p = 1$.

Find p when $q = 10$.

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

23



(a) By drawing suitable lines and shading unwanted regions, find the region, R, where

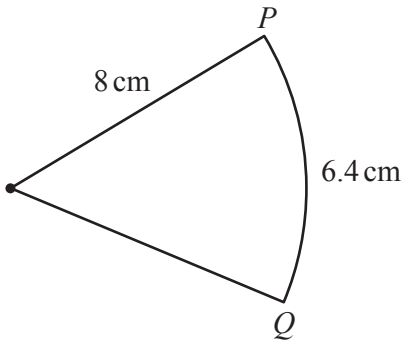
$$x \geqslant 2, \quad y \geqslant x \text{ and } 2x+y \leqslant 8.$$ [5]

(b) Find the largest value of $x+y$ in the region R.

..... [1]

[Turn over

24



NOT TO SCALE

The diagram shows a sector of a circle of radius 8 cm.
The length of the arc PQ is 6.4 cm.

Find the area of the sector.

..... cm^2 [4]

25 Simplify.

$$\frac{2x^2+x-15}{ax+3a-2bx-6b}$$

..... [5]

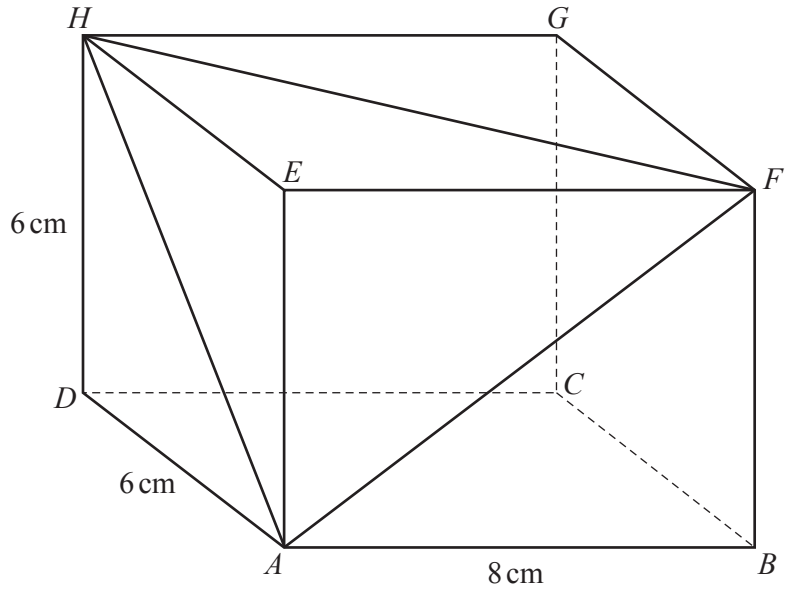
26 $\sqrt[3]{y^2} = \sqrt[6]{x}$ and $y = \sqrt[n]{x}$.

Find the value of n.

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

Question 27 is printed on the next page.

27



NOT TO SCALE

The diagram shows a cuboid.
$AB = 8\,\text{cm}$, $AD = 6\,\text{cm}$ and $DH = 6\,\text{cm}$.

Calculate angle HAF.

Angle HAF = ... [6]

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MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2020**

MARK SCHEME

Maximum Mark: 70

Published

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This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

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[Turn over

Generic Marking Principles

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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	**1**	
2	–5	**1**	
3	25	**2**	**B1** for 130 seen or **M1** for 50 ÷ 2
4(a)	Any square number greater than 10	**1**	
4(b)	Any irrational number	**1**	
5	–2	**2**	**M1** for (–3)(–2) + (–8)
6	45	**2**	**M1** for $\frac{11+7}{2}\times 5$ oe
7	Intersection shaded	**1**	
8	0.0625	**1**	
9	285	**2**	**M1** for 180 + 105 or 75 or 105 seen in correct position at *B*
10	$\frac{2p^2}{t}$	**2**	**B1** for correct unsimplified answer
11	$\frac{7}{4}$ $\frac{9}{12}$	**B1**	
	$\frac{21}{12}$ $1-\frac{2}{12}$	**M1**	
	$\frac{5}{6}$ $\frac{5}{6}$	**A1**	
12	8	**2**	**M1** for $\frac{5-4.60}{5}$ [×100] or $\frac{4.60}{5}\times 100$
13	$2t^4$	**2**	**B1** for $2t^n$ or kt^4 $(n,k\neq 0)$

Question	Answer	Marks	Partial Marks
14	–14	**2**	**M1** for $1 - x = 3 \times 5$ or better or $\frac{x}{3} = 5 - \frac{1}{3}$ or better
15	177.5	**1**	
16	2.7×10^{-8}	**1**	
17	108	**3**	**M1** for $(105 + 225) \div 11$ **M1** for *their* speed $\times \frac{60 \times 60}{1000}$
18	Enlargement [scale factor] $-\frac{1}{2}$ [centre] (3, 4)	**3**	**B1** for each
19	$[\pm]\sqrt{\frac{h^2 - x^2}{2}}$	**3**	**M1** for correct rearrangement for y or y^2 term **M1** for correct square root **M1** for correct division by 2 or $\sqrt{2}$
20(a)	49	**1**	
20(b)	98	**1**	**FT** $2 \times$ *their* **(a)**
20(c)	20	**1**	
20(d)	70	**1**	**FT** 90 – *their* **(c)**
21(a)	$125x^{12}$	**2**	**B1** for $125x^k$ or kx^{12}
21(b)	$8x^{96}$	**2**	**B1** for $8x^k$ or kx^{96}
22	16	**3**	**M1** for $p = k(q + 2)^2$ **M1** for $p = (their\ k)(10 + 2)^2$ OR **M2** for $\frac{p}{(10+2)^2} = \frac{1}{(1+2)^2}$ oe
23(a)	Correct lines and correct region clear 	**5**	**B2** for $2x + y = 8$ correctly ruled or **B1** for ruled line with negative gradient **B1** for $y = x$ correctly ruled **B1** for $x = 2$ correctly ruled
23(b)	6	**1**	

Question	Answer	Marks	Partial Marks
24	25.6 or 25.59 to 25.60…	**4**	**M3** for $\frac{6.4}{2\times\pi\times8}\times\pi\times8^2$ or **M2** for $\frac{x}{360}=\frac{6.4}{2\times\pi\times8}$ oe or **M1** for $\frac{x}{360}\times2\times\pi\times8=6.4$ oe
25	$\frac{2x-5}{a-2b}$ final answer	**5**	**B2** for $(2x-5)(x+3)$ or **B1** for $(2x+p)(x+q)$ where $pq=-15$ or $p+2q=1$ **B2** for $(x+3)(a-2b)$ or **B1** for $x(a-2b)+3(a-2b)$ or $a(x+3)-2b(x+3)$
26	4	**2**	**M1** for $y^{\frac{2}{3}}=x^{\frac{1}{6}}$ or $y^2=\sqrt{x}$ or $y^4=x$
27	64.9 or 64.89 to 64.90	**6**	**B5** for [cos =] $\frac{100+72-100}{2\times10\times\sqrt{72}}$ OR **M1** for 8^2+6^2 **M1** for 6^2+6^2 **M2** for $\frac{(theirAF)^2+(theirAH)^2-(theirHF)^2}{2\times(theirAF)\times(theirAH)}$ or **M1** for $(theirHF)^2=(theirAF)^2+(their\ AH)^2-2\times(theirAF)\times(their\ AH)\cos(HAF)$ *AF*, *AH* etc from correct method

Cambridge Assessment International Education

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2866325620

MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2020**

1 hour 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

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

INFORMATION

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

This document has **12** pages. Blank pages are indicated.

DC (CE/CB) 186457/2

[Turn over

1 32 33 34 35 36 37 38 39

From this list of numbers, write down

(a) a multiple of 8,

..... [1]

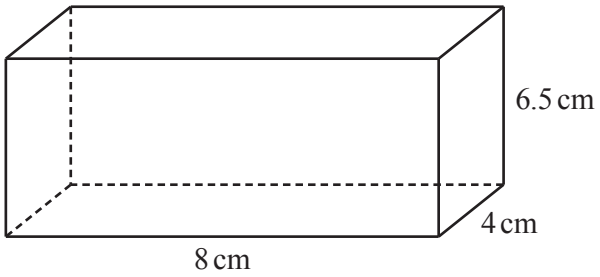
(b) a square number,

..... [1]

(c) a prime number.

..... [1]

2



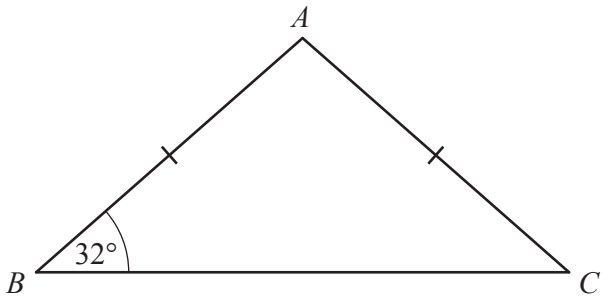
NOT TO SCALE

The diagram shows a cuboid.

Calculate the volume of the cuboid.

..... cm^3 [1]

3



NOT TO SCALE

Triangle ABC is isosceles.
Angle $ABC = 32°$ and $AB = AC$.

Find angle BAC.

Angle $BAC =$ ..... [2]

4 A train journey takes 5 hours 54 minutes.

(a) The journey starts at 09 15.

Find the time that the journey ends.

..... [1]

(b) The average speed of the train for this journey is 80 km/h.

Calculate the distance travelled.

..... km [2]

5 Sofia has a bag containing 8 blue beads and 7 red beads only.
She takes one bead out of the bag at random and replaces it.
She does this 90 times.

Find the number of times she expects to take a red bead.

..... [2]

6 Simplify.

(a) $p^2 \times p^4$

..... [1]

(b) $m^{15} \div m^5$

..... [1]

(c) $(k^3)^5$

..... [1]

7 **Without using a calculator**, work out $3\frac{1}{4} - 2\frac{2}{3}$.
You must show all your working and give your answer as a fraction in its simplest form.

..... [3]

8 The bearing of X from Y is 274°.

Calculate the bearing of Y from X.

..... [2]

9 Calculate the area of the sector of a circle with radius 65 mm and sector angle 42°.
Give your answer in square centimetres.

..... cm^2 [3]

10 A solid cylinder has radius 3 cm and height 4.5 cm.

Calculate the **total** surface area of the cylinder.

..... cm^2 [4]

11 y is directly proportional to the cube root of $(x+3)$.
When $x = 5$, $y = \frac{2}{3}$.

Find y when $x = 24$.

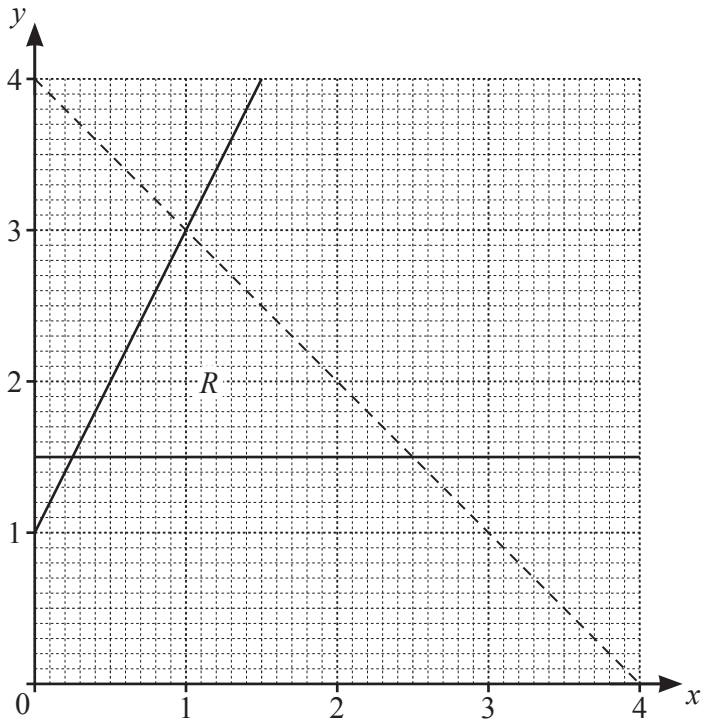
$y =$ ..... [3]

12 The total perimeter of a semicircle is 19.02 cm.

Calculate the radius of the semicircle.

..... cm [3]

13



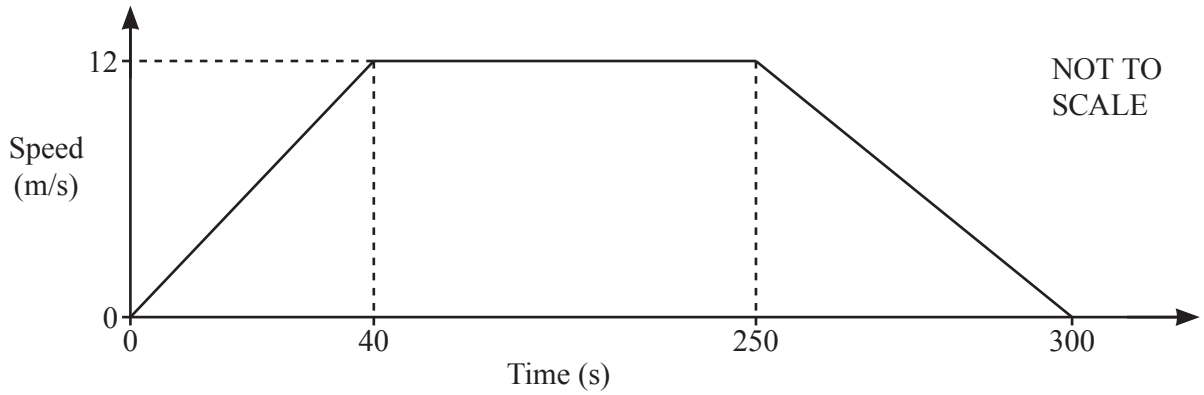
Write down the three inequalities that define the region R.

.....

.....

..... [4]

14 The diagram shows the speed–time graph of a train journey between two stations.



(a) Find the acceleration of the train during the first 40 seconds.

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

(b) Calculate the distance between the two stations.

..... m [3]

15 The table shows the amount of money, $\$x$, given to a charity by each of 60 people.

Amount ($\$x$)	$0 < x \leqslant 20$	$20 < x \leqslant 25$	$25 < x \leqslant 35$	$35 < x \leqslant 50$	$50 < x \leqslant 100$
Frequency	21	16	6	10	7

Calculate an estimate of the mean.

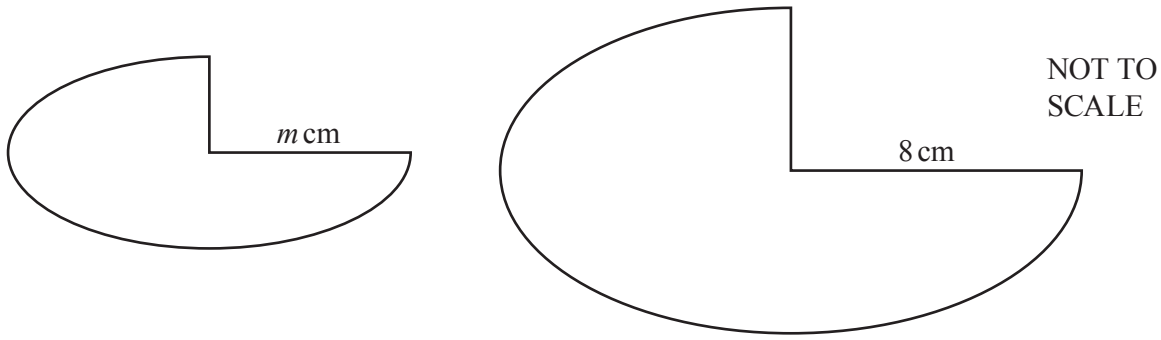
$ ..... [4]

16 Paddy and Anna each invest \$2000 for 5 years.
Paddy earns simple interest at a rate of 1.25% per year.
Anna earns compound interest at a rate of r% per year.
At the end of 5 years, Paddy's investment is worth the same as Anna's investment.

Calculate the value of r.

$r =$ ..... [5]

17



The diagram shows two shapes that are mathematically similar.
The smaller shape has area 52.5 cm^2 and the larger shape has area 134.4 cm^2.

Calculate the value of m.

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

18 **(a)** Write $x^2 - 18x - 27$ in the form $(x+k)^2 + h$.

..... [2]

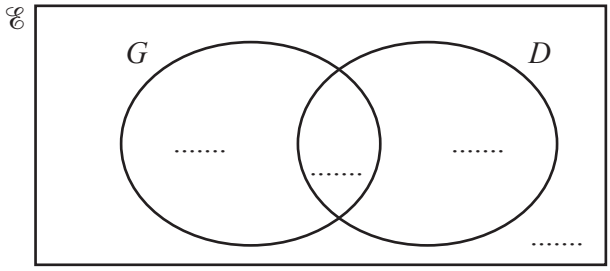
(b) Use your answer to **part (a)** to solve the equation $x^2 - 18x - 27 = 0$.

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

[Turn over

19 **(a)** In a class of 40 students:

- 28 wear glasses (G)
- 13 have driving lessons (D)
- 4 do not wear glasses and do not have driving lessons.

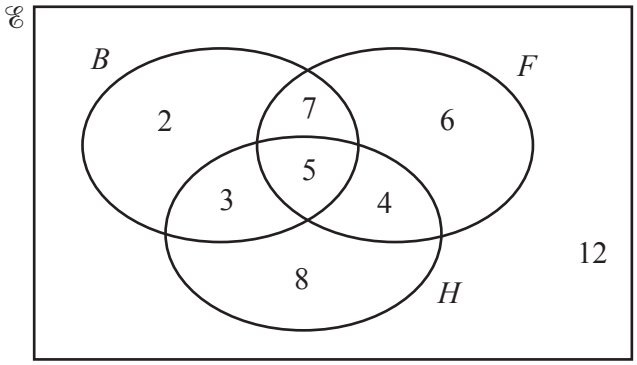


(i) Complete the Venn diagram. [2]

(ii) Use set notation to describe the region that contains a total of 32 students.

..... [1]

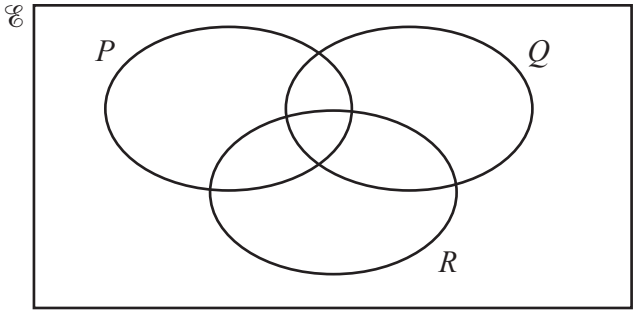
(b) This Venn diagram shows information about the number of students who play basketball (B), football (F) and hockey (H).



Find $\mathrm{n}((B \cup F) \cap H')$.

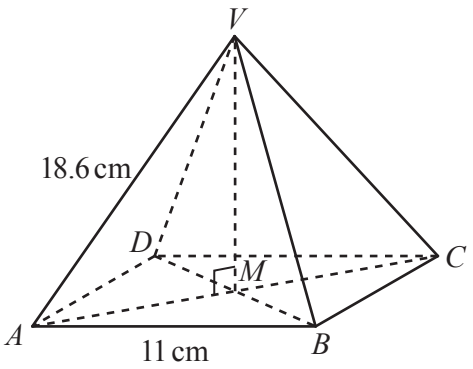
..... [1]

(c)



Shade the region $P \cup (Q \cap R)'$. [1]

20



NOT TO SCALE

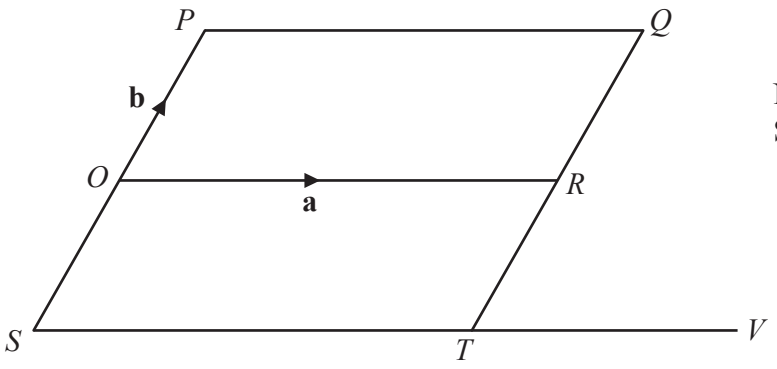
The diagram shows a pyramid with a square base $ABCD$.
The diagonals AC and BD intersect at M.
The vertex V is vertically above M.
$AB = 11$ cm and $AV = 18.6$ cm.

Calculate the angle that AV makes with the base.

..... [4]

Question 21 is printed on the next page.

21



NOT TO SCALE

O is the origin and $OPQR$ is a parallelogram.
SOP is a straight line with $SO = OP$.
TRQ is a straight line with $TR = RQ$.
STV is a straight line and $ST : TV = 2 : 1$.
$\overrightarrow{OR} = \mathbf{a}$ and $\overrightarrow{OP} = \mathbf{b}$.

(a) Find, in terms of **a** and **b**, in its simplest form,

(i) the position vector of T,

..... [2]

(ii) $\overrightarrow{RV}$.

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

(b) Show that PT is parallel to RV.

[2]

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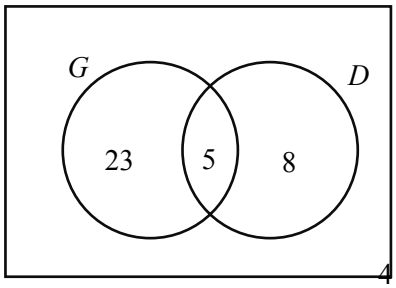
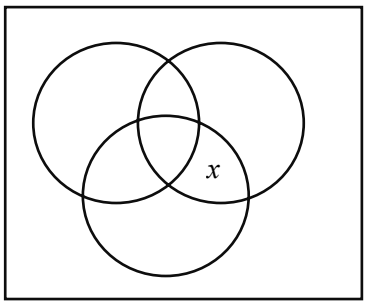
isw ignore subsequent working
oe or equivalent
SC Special Case
nfww not from wrong working
soi seen or implied

Question	Answer	Marks	Partial Marks
1(a)	32	**1**	
1(b)	36	**1**	
1(c)	37	**1**	
2	208	**1**	
3	116	**2**	**M1** for angle $ACB = 32$ soi
4(a)	15 09	**1**	Accept 3 09 pm
4(b)	472	**2**	**M1** for $80 \times$ *their* time oe or **B1** for time = 5.9
5	42	**2**	**M1** for $\frac{7}{15}$ [$\times 90$]
6(a)	p^6	**1**	
6(b)	m^{10}	**1**	
6(c)	k^{15}	**1**	
7	Correct common denominator	**M1**	
	Correct method	**M1**	e.g. $1\frac{3-8}{12}$ or $\frac{12+3-8}{12}$ or $\frac{((3\times4)+1)\times3-((2\times3)+2)\times4}{12}$ or $\frac{39-32}{12}$
	$\frac{7}{12}$ cao	**A1**	
8	[0]94	**2**	**M1** for 86 or 274 – 180 or for sketch with 274 marked correctly

Question	Answer	Marks	Partial Marks
9	15.5 or 15.48 to 15.49	**3**	**B2** for 1550 or 1548 to 1549 or **M2** for $\frac{42}{360}\times\pi\times6.5^2$ or **M1** for $\frac{42}{360}\times\pi\times65^2$
10	141 or 141.3 to 141.4	**4**	**M1** for[2 ×] $\pi\times3^2$ **M2** for $2\times\pi\times3\times4.5$ or **M1** for $2\times\pi\times3$ [$\times4.5$]
11	[y =] 1	**3**	**M1** for $y=k\times\sqrt[3]{x+3}$ **M1** for $y=$ *their* $k\times\sqrt[3]{24+3}$ OR **M2** for $\frac{y}{\sqrt[3]{24+3}}=\frac{2}{3}\times\frac{1}{\sqrt[3]{5+3}}$ oe
12	3.7[0] or 3.689 to 3.699…	**3**	**M2** for $\frac{19.02}{2+\pi}$ or **M1** for $2r+\pi r$ [=19.02] oe
13	$x+y<4$ $y\geqslant1.5$ $y\leqslant2x+1$	**4**	**B3** for any two correct or **B1** for $y\geqslant1.5$ **B2** for $x+y<4$ or $y\leqslant2x+1$ or $x+y=4$ and $y=2x+1$ or with incorrect inequality signs or **B1** for $x+y=4$ or $y=2x+1$ or **SC3** for > instead of $\geqslant$ etc.
14(a)	0.3 oe	**1**	
14(b)	3060	**3**	**M2** for $\frac{1}{2}(300+210)\times12$ oe or **M1** for one correct part area
15	28.33 or 28.3 or 28.33…	**4**	**M1** for midpoints soi **M1** for use of $\sum fx$ **M1 dep** for $\sum fx\div60$
16	1.22 or 1.219 to 1.22	**5**	**M1** for SI = $\frac{2000\times5\times1.25}{100}$ **M3** for $\sqrt[5]{\frac{2000+\textit{their}125}{2000}}$ or **M2** for $2000k^5=2000+$ *their* SI or **M1** for CI = $2000k^5$

Question	Answer	Marks	Partial Marks
17	5	**3**	**M2** for $8 \times \sqrt{\frac{52.5}{134.4}}$ oe or **M1** for $\sqrt{\frac{52.5}{134.4}}$ or $\sqrt{\frac{134.4}{52.5}}$ oe
18(a)	$(x-9)^2-108$	**2**	**B1** for $(x+h)^2-108$ or $(x-9)^2+h$ or $k=-9$
18(b)	19.4 or 19.39… -1.39 or -1.392…	**2**	**M1FT** $x - their 9 = \pm\sqrt{their 108}$ **A1** for $9 \pm \sqrt{108}$ or $9 \pm 6\sqrt{3}$
19(a)(i)		**2**	**B1** for two correct
19(a)(ii)	$G \cup D'$ oe	**1**	
19(b)	15	**1**	
19(c)		**1**	Shade whole rectangle except for region containing x
20	65.3 or 65.28..	**4**	**M3** for $\cos = \frac{\frac{1}{2}\sqrt{11^2+11^2}}{18.6}$ or better or **M2** for $AM = \frac{1}{2}\sqrt{11^2+11^2}$ oe or **M1** for $AC^2 = 11^2 + 11^2$ If 0 scored, **SC1** for identifying angle VAM

Question	Answer	Marks	Partial Marks
21(a)(i)	$\mathbf{a} - \mathbf{b}$ or $-\mathbf{b} + \mathbf{a}$	**2**	**B1** for a correct route or identifying $\overrightarrow{OT}$
21(a)(ii)	$\frac{1}{2}\mathbf{a} - \mathbf{b}$ or $-\mathbf{b} + \frac{1}{2}\mathbf{a}$	**1**	
21(b)	$\overrightarrow{PT} = \mathbf{a} - 2\mathbf{b}$ oe	**M1**	
	$\overrightarrow{PT} = 2\overrightarrow{RV}$ oe	**A1**	Dep on correct vector RV Accept in words

Cambridge Assessment International Education

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CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

4295575799

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2020**

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. Blank pages are indicated.

DC (LK/SW) 186481/3

[Turn over

1 **(a)** In 2018, Gretal earned $32 000.

(i) She paid tax of 24% on these earnings.

Work out the amount she paid in tax in 2018.

$ ..... [2]

(ii) In 2019, Gretal's earnings increased by 7%.

Work out her earnings in 2019.

$ ..... [2]

(b) Gretal invests $5000 at a rate of 2% per year compound interest.

Calculate the value of her investment at the end of 3 years.

$ ..... [2]

(c) One month, Gretal spent a total of $360 on presents.
She spent $\frac{1}{5}$ of this total on presents for her parents.
She spent $\frac{2}{3}$ of the remaining money on presents for her friends.
She spent the rest of the money on presents for her sisters.

Calculate the percentage of the $360 that she spent on presents for her sisters.

..... % [4]

(d) Arjun earned $36 515 in 2019.
This was an increase of 9% on his earnings in 2018.

Work out his earnings in 2018.

$ ..... [2]

(e) Arjun and Gretal each pay rent.

In 2018, the ratio of the amount each paid in rent was Arjun : Gretal = 5 : 7.
In 2019, the ratio of the amount each paid in rent was Arjun : Gretal = 9 : 13.

Arjun paid the same amount of rent in both 2018 and 2019.
Gretal paid $290 more rent in 2019 than she did in 2018.

Work out the amount Arjun paid in rent in 2019.

$ ..... [4]

2 The heights, h metres, of the 120 boys in an athletics club are recorded.
The table shows information about the heights of the boys.

Height (h metres)	$1.3 < h \leqslant 1.4$	$1.4 < h \leqslant 1.5$	$1.5 < h \leqslant 1.6$	$1.6 < h \leqslant 1.7$	$1.7 < h \leqslant 1.8$	$1.8 < h \leqslant 1.9$
Frequency	7	18	30	24	27	14

(a) (i) Write down the modal class.

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

(ii) Calculate an estimate of the mean height.

..... m [4]

(b) (i) One boy is chosen at random from the club.

Find the probability that this boy has a height greater than 1.8 m.

..... [1]

(ii) Three boys are chosen at random from the club.

Calculate the probability that one of the boys has a height greater than 1.8 m and the other two boys each have a height of 1.4 m or less.

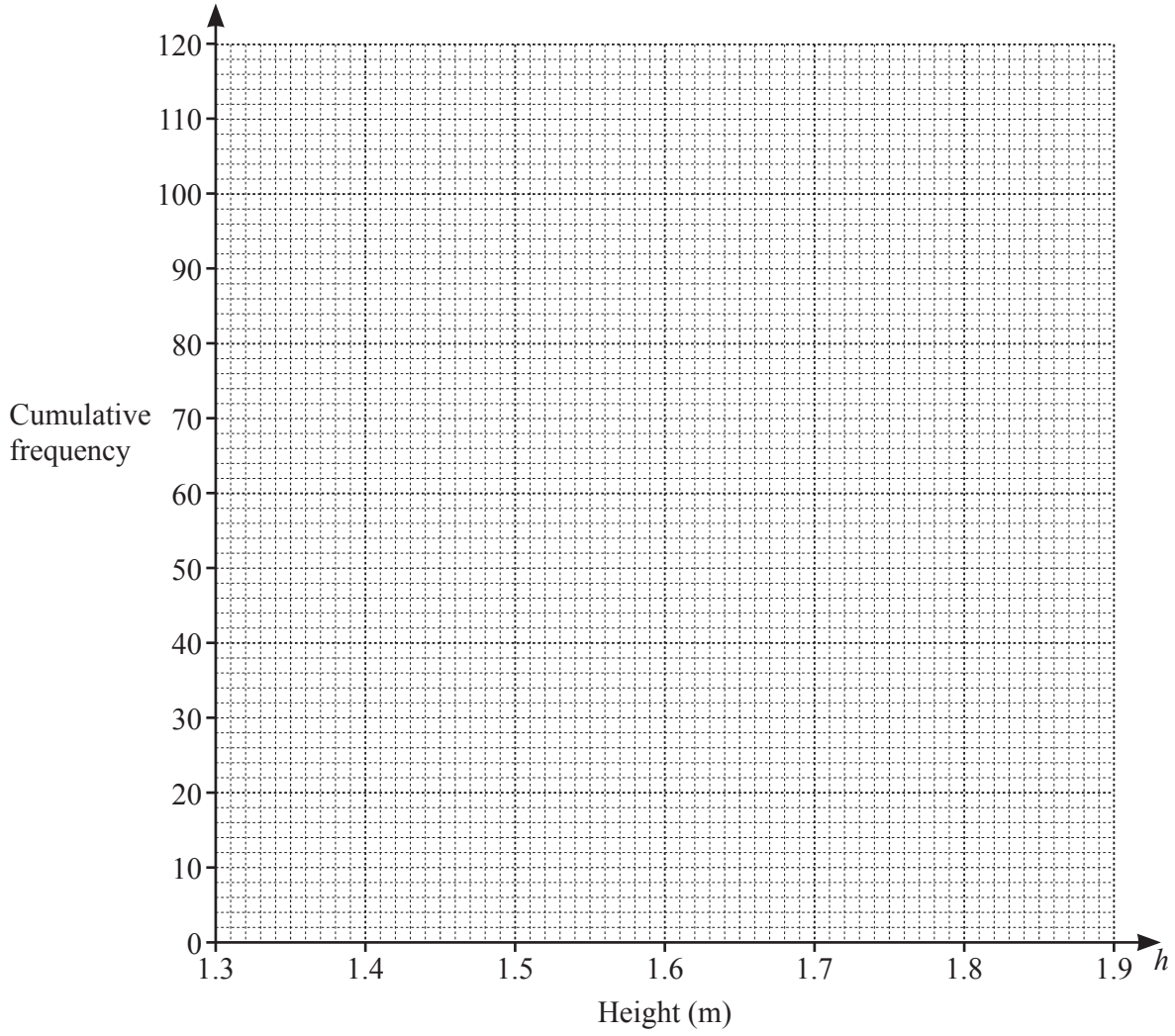
..... [4]

(c) **(i)** Use the frequency table on page 4 to complete the cumulative frequency table.

Height (h metres)	$h \leqslant 1.4$	$h \leqslant 1.5$	$h \leqslant 1.6$	$h \leqslant 1.7$	$h \leqslant 1.8$	$h \leqslant 1.9$
Cumulative frequency	7	25				

[2]

(ii) On the grid, draw a cumulative frequency diagram to show this information.



[3]

(d) Use your diagram to find an estimate for

(i) the median height,

..... m [1]

(ii) the 40th percentile.

..... m [2]

3 **(a)** $s = ut + \frac{1}{2}at^2$

Find the value of s when $u = 5.2$, $t = 7$ and $a = 1.6$.

$s =$ ..... [2]

(b) Simplify.

(i) $3a - 5b - a + 2b$

..... [2]

(ii) $\frac{5}{3x} \times \frac{9x}{20}$

..... [2]

(c) Solve.

(i) $\frac{15}{x} = -3$

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

(ii) $4(5 - 3x) = 23$

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

(d) Simplify.

$$(27x^9)^{\frac{2}{3}}$$

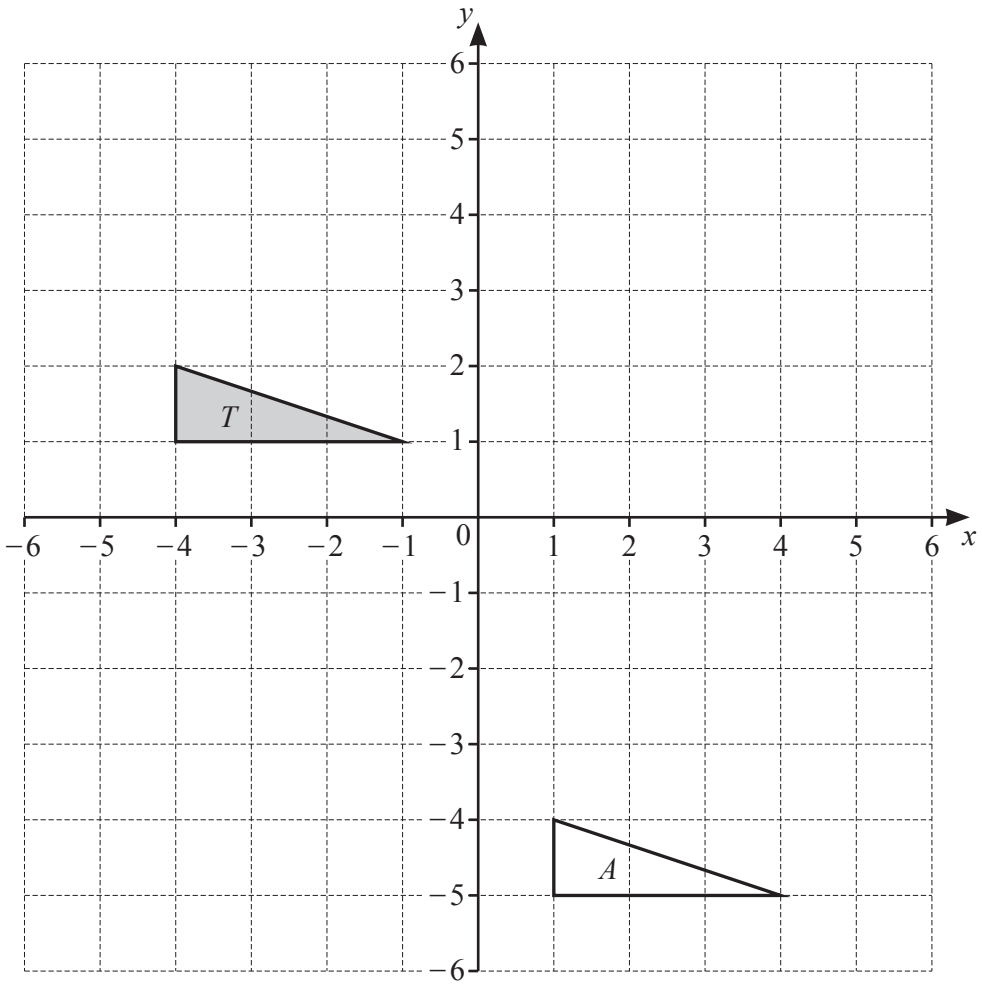
..... [2]

(e) Expand and simplify.

$$(3x - 5y)(2x + y)$$

..... [2]

4



(a) Draw the image of triangle T after a reflection in the line $y = -1$. [2]

(b) Draw the image of triangle T after a rotation through 90° clockwise about (0, 0). [2]

(c) Describe fully the **single** transformation that maps triangle T onto triangle A.

.....

..... [2]

5 x is an integer.

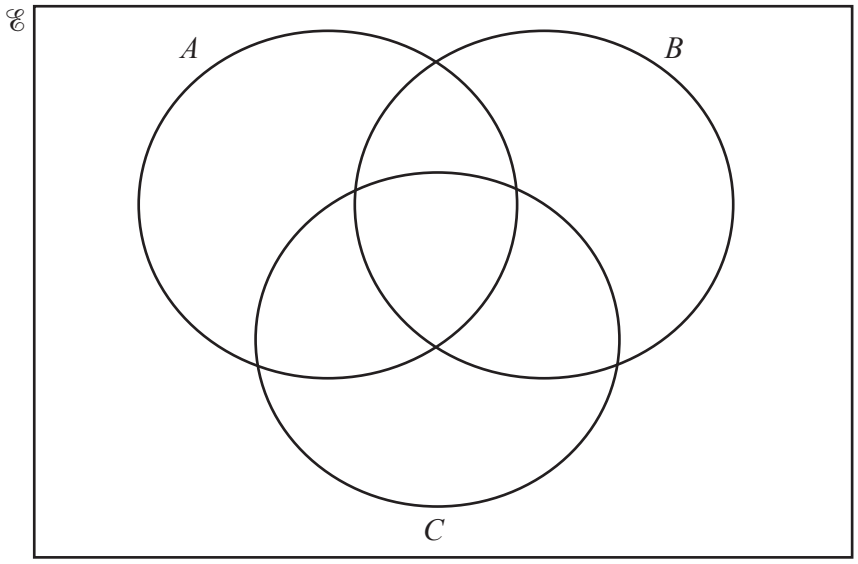
$\mathscr{E} = \{x : 41 \leqslant x \leqslant 50\}$

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

$B = \{x : x \text{ is a multiple of } 3\}$

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

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



[3]

(b) List the elements of

(i) $A \cap C$,

..... [1]

(ii) $(B \cup C)'$.

..... [1]

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

..... [1]

6 Raheem makes baskets and mats.
Each week he makes x baskets and y mats.

He makes fewer than 10 mats.
The number of mats he makes is greater than or equal to the number of baskets he makes.

(a) One of the inequalities that shows this information is $y < 10$.

Write down the other inequality.

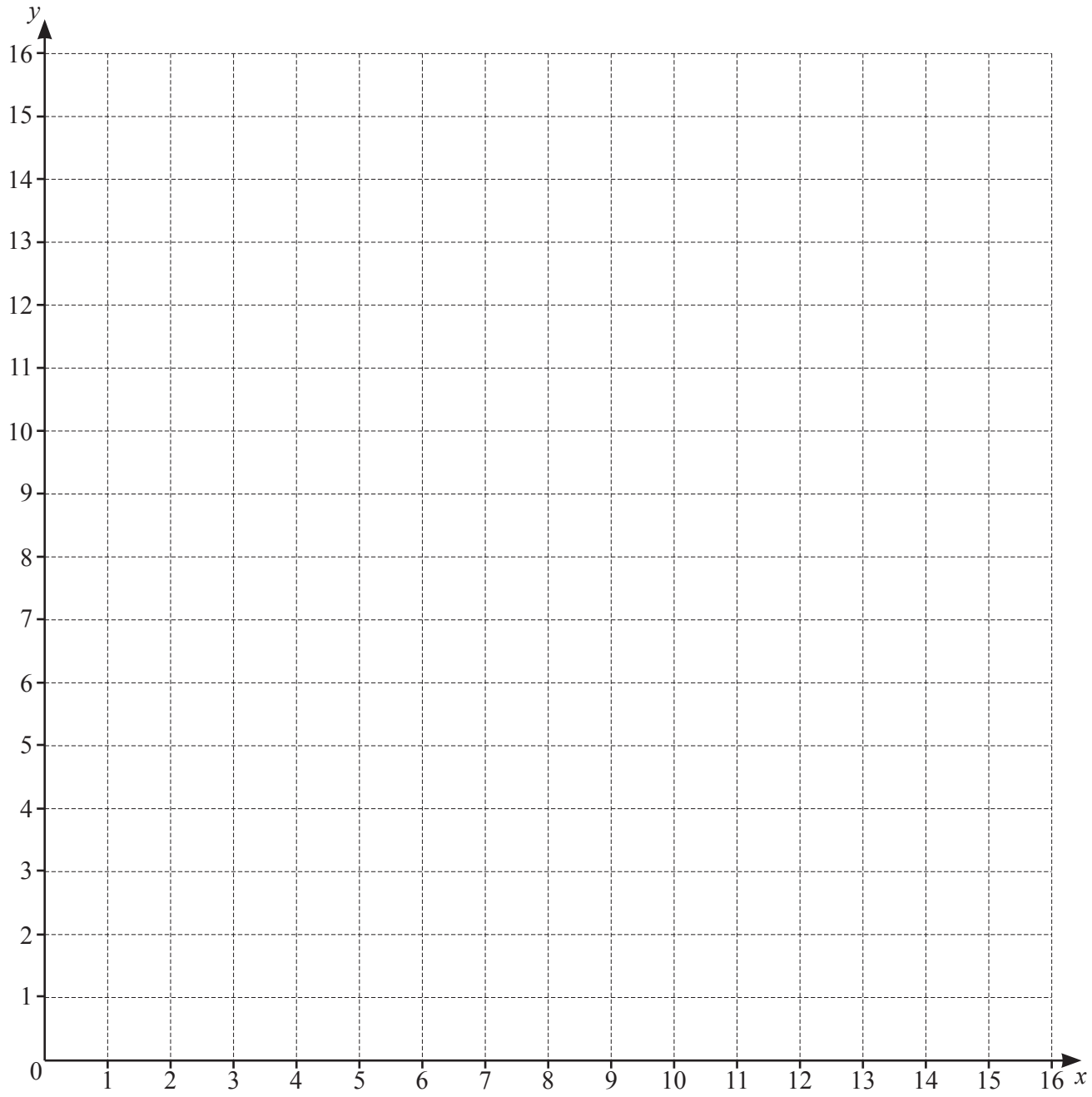
..... [1]

(b) He takes $2\frac{1}{4}$ hours to make a basket and $1\frac{1}{2}$ hours to make a mat.
Each week he works for a maximum of 22.5 hours.

Show that $3x + 2y \leqslant 30$.

[2]

(c) On the grid, draw three straight lines and shade the **unwanted** regions to show these inequalities.



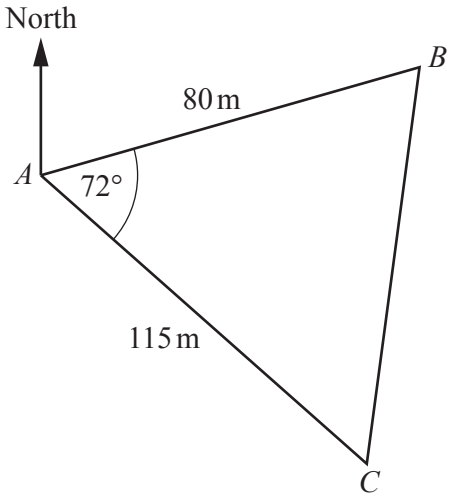
[5]

(d) He makes \$40 profit on each basket he sells and \$28 profit on each mat he sells.

Calculate the maximum profit he can make each week.

\$ ..... [2]

7



NOT TO SCALE

The diagram shows the positions of three points A, B and C in a field.

(a) Show that BC is 118.1 m, correct to 1 decimal place.

[3]

(b) Calculate angle ABC.

Angle ABC = ... [3]

(c) The bearing of C from A is 147°.

Find the bearing of

(i) A from B,

..... [3]

(ii) B from C.

..... [2]

(d) Mitchell takes 35 seconds to run from A to C.

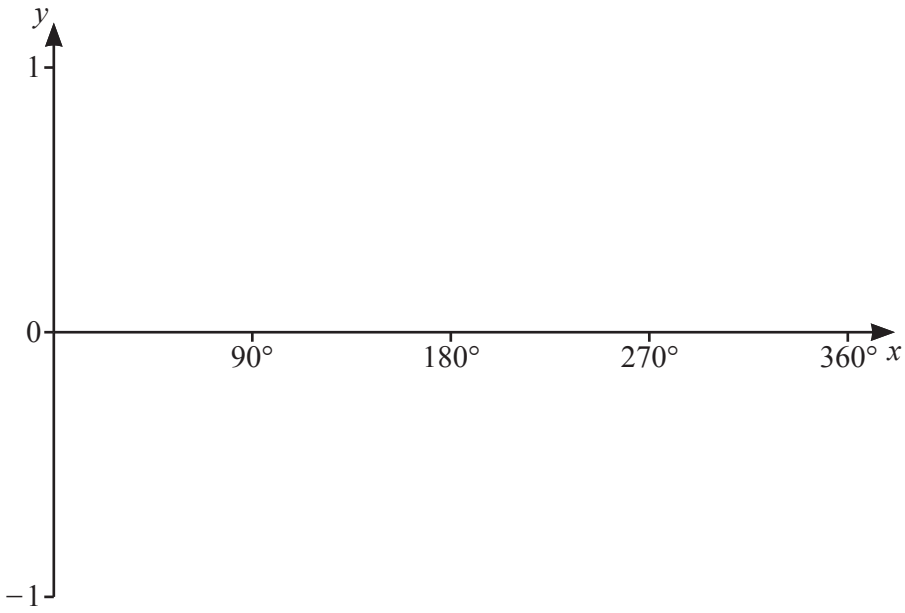
Calculate his average running speed in kilometres per hour.

..... km/h [3]

(e) Calculate the shortest distance from point B to AC.

..... m [3]

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



[2]

(ii) Describe fully the symmetry of the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.

.....

..... [2]

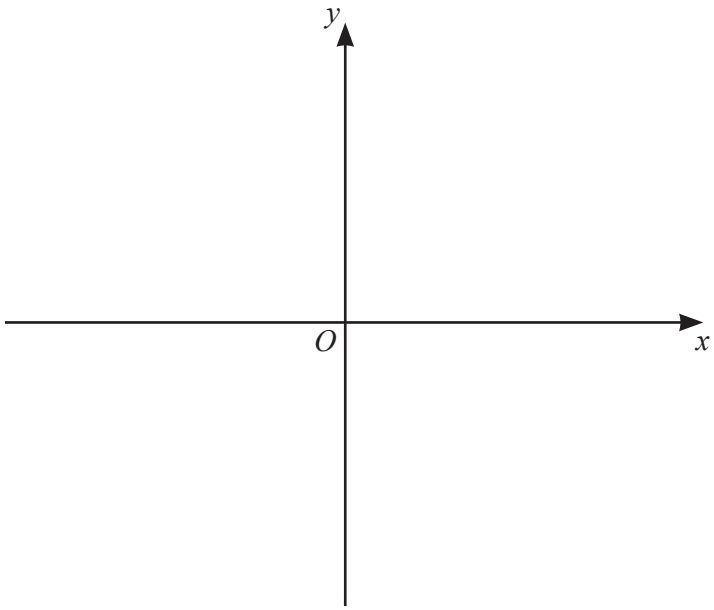
(b) Solve $4\sin x - 1 = 2$ for $0° \leqslant x \leqslant 360°$.

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

(c) **(i)** Write $x^2 + 10x + 14$ in the form $(x + a)^2 + b$.

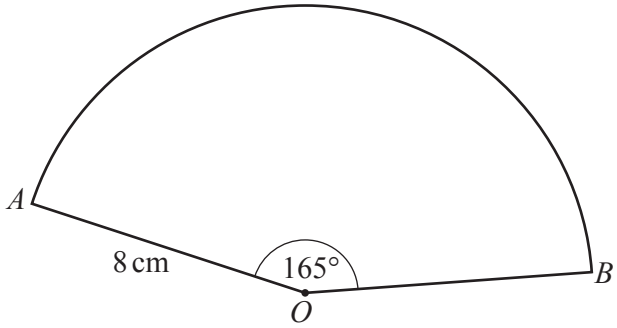
..... [2]

(ii) On the axes, sketch the graph of $y = x^2 + 10x + 14$, indicating the coordinates of the turning point.



[3]

9



NOT TO SCALE

The diagram shows a sector of a circle with centre O, radius 8 cm and sector angle 165°.

(a) Calculate the total perimeter of the sector.

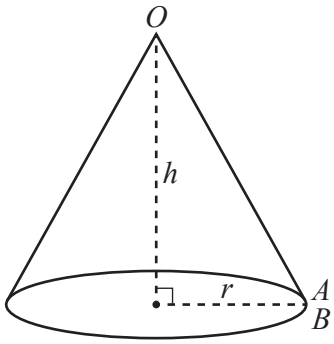
..... cm [3]

(b) The surface area of a sphere is the same as the area of the sector.

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

..... cm [4]

(c)



NOT TO SCALE

A cone is made from the sector by joining OA to OB.

(i) Calculate the radius, r, of the cone.

$r =$ ..... cm [2]

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

..... cm^3 [4]

10 **(a)** A rhombus $ABCD$ has a diagonal AC where A is the point $(-3, 10)$ and C is the point $(4, -4)$.

(i) Calculate the length AC.

..... [3]

(ii) Show that the equation of the line AC is $y = -2x + 4$.

[2]

(iii) Find the equation of the line BD.

..... [4]

(b) A curve has the equation $y = x^3 + 8x^2 + 5x$.

(i) Work out the coordinates of the two turning points.

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

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

[3]

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MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2020**

MARK SCHEME

Maximum Mark: 130

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

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

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

[Turn over

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors 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.

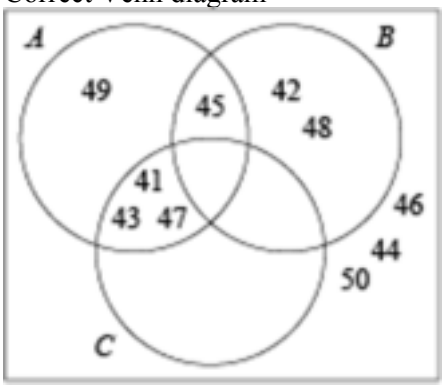
Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, 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 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 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)	7680	**2**	**M1** for $0.24 \times 32\,000$ oe
1(a)(ii)	34 240	**2**	**M1** for $32\,000 \times \frac{100+7}{100}$ oe
1(b)	5306.04	**2**	**M1** for $5000 \times \left(1+\frac{2}{100}\right)^3$ oe
1(c)	26.7 or 26.66... to 26.67	**4**	**B3** for 96 or $\frac{96}{360}$ oe OR **M3** for $(1-\frac{1}{5}) \times (1-\frac{2}{3}) \times 100$ oe or **M2** for $(1-\frac{1}{5})$ and $(1-\frac{2}{3})$ oe OR **M1** for $360 \div 5$ [$\times 4$] oe **M1** for *their* $288 \div 3$ [$\times 2$]
1(d)	33 500	**2**	**M1** for $36\,515 \div \frac{100+9}{100}$ oe
1(e)	6525	**4**	**M3** for $\left(\frac{65}{45}-\frac{63}{45}\right)[A]=290$ oe or **M2** for $\left(\frac{13}{9}-\frac{7}{5}\right)[A]=290$ oe or **M1** for correct attempt to convert to a common ratio value for Arjun or for $\frac{13}{9}-\frac{7}{5}$ oe
2(a)(i)	$1.5 < h \leqslant 1.6$	**1**	
2(a)(ii)	1.62 or 1.623… nfww	**4**	**M1** for 1.35, 1.45, 1.55, 1.65, 1.75 1.85 soi **M1** for Σfx **M1 dep** for *their* $\Sigma fx \div 120$

Question	Answer	Marks	Partial Marks
2(b)(i)	$\frac{14}{120}$ oe	**1**	
2(b)(ii)	$\frac{21}{20060}$ oe	**4**	**M3** for $3\left(\frac{14}{120}\times\frac{7}{119}\times\frac{6}{118}\right)$ or **M2** for $\frac{14}{120}\times\frac{7}{119}\times\frac{6}{118}$ isw or **M1** for $\frac{14}{120}, \frac{7}{119}, \frac{6}{118}$ After 0 scored, **SC1** for answer $\frac{343}{864000}$ or $\frac{343}{288000}$ oe
2(c)(i)	55, 79, 106, 120	**2**	**B1** for 2 or 3 correct
2(c)(ii)	Correct diagram	**3**	**B1** for correct horizontal plots **B1FT** for correct vertical plots **B1FT dep on at least B1** for reasonable increasing curve or polygon through *their* 6 points If 0 scored **SC1** for 5 out of 6 points correctly plotted
2(d)(i)	1.62 to 1.63	**1**	
2(d)(ii)	1.57 to 1.58	**2**	**B1** for 48 soi
3(a)	75.6	**2**	**M1** for $5.2\times 7+\frac{1}{2}\times 1.6\times 7^2$
3(b)(i)	$2a - 3b$ final answer	**2**	**B1** for answer $2a + kb$ or $ka - 3b$ or for $2a - 3b$ seen in working
3(b)(ii)	$\frac{3}{4}$	**2**	**B1** for $\frac{45x}{60x}$ oe single fraction
3(c)(i)	-5	**1**	
3(c)(ii)	-0.25 or $-\frac{1}{4}$	**3**	**M1** for $20 - 12x = 23$ or for $5 - 3x = \frac{23}{4}$ **M1** for correct completion to $ax = b$ FT *their* first step
3(d)	$9x^6$	**2**	**B1** for $9x^k$ or kx^6
3(e)	$6x^2 - 7xy - 5y^2$	**2**	**M1** for 3 terms out of 4 from $6x^2 - 10xy + 3xy - 5y^2$

Question	Answer	Marks	Partial Marks
4(a)	Triangle at (–4, –4) (–1, –3) (–4, –3)	**2**	**B1** for correct points not joined or for reflection in any $y = k$ or for reflection in $x = –1$
4(b)	Triangle at (1, 1) (1, 4) (2, 4)	**2**	**B1** for correct points not joined or rotation 90 clockwise around any point or rotation 90 anticlockwise around (0, 0)
4(c)	Translation $\begin{pmatrix} 5 \\ -6 \end{pmatrix}$	**2**	**B1** for translation or correct vector oe
5(a)	Correct Venn diagram 	**3**	**B2** for 8 or 9 numbers correct or **B1** for 6 or 7 numbers correct
5(b)(i)	41, 43, 47	**1**	**FT** *their* Venn diagram
5(b)(ii)	44, 46, 49, 50	**1**	**FT** *their* Venn diagram
5(c)	0	**1**	**FT** *their* Venn diagram
6(a)	$y \geqslant x$ oe	**1**	
6(b)	$2.25x + 1.5y \leqslant 22.5$ oe	**M1**	
	One step shown to $3x + 2y \leqslant 30$	**A1**	
6(c)	$y = 10$ ruled	**1**	Broken line
	$3x + 2y = 30$ ruled	**B2**	Solid line **B1** for line passing through (0, 15) or (10, 0)
	$y = x$ ruled	**B1**	Solid line
	Correct region indicated	**B1**	
6(d)	412	**2**	**M1** for (4, 9) identified or for evaluation $40x + 28y$ for an integer point in the region ($x > 0$ and $y > 0$)
7(a)	$[BC^2 =] 80^2 + 115^2 – 2 \times 80 \times 115 \cos 72$ oe	**M1**	
	118.06…	**A2**	**A1** for 13939…

Question	Answer	Marks	Partial Marks
7(b)	67.8 or 67.9 or 67.83 to 67.88	**3**	**M2** for [sin B =] $\frac{115\times\sin 72}{118.1}$ oe or **M1** for $\frac{115}{\sin B}=\frac{118.1}{\sin 72}$ oe
7(c)(i)	255	**3**	**B1** for bearing of B from A is 75 soi **M1** for 180 + 75 oe
7(c)(ii)	[00]7.2	**2**	**M1** for *their* **(c)(i)** – *their* **(b)** –180
7(d)	11.8 or 11.82 to 11.83	**3**	**M1** for 115 ÷ 35 oe **M1** for *their* speed in m/s × 60 × 60 ÷ 1000
7(e)	76.1 or 76.08 to 76.09	**3**	**M2** for $\frac{\text{distance}}{80}=\sin 72$ oe or **M1** for distance required is perpendicular to AC soi
8(a)(i)	Correct sketch	**2**	**B1** for correct shape but inaccurate
8(a)(ii)	Rotational [symmetry] order 2 [centre] (180, 0)	**2**	**B1** for rotational [symmetry]
8(b)	48.6 or 48.59 to 48.60 and 131.4 or 131.40 to 131.41	**3**	**B2** for 48.6 or 48.59 to 48.60 or 131.4 or 131.40 to 131.41 or **M1** for sin x = 0.75 or better If 0 scored, **SC1** for two answers adding to 180
8(c)(i)	$(x + 5)^2 – 11$	**2**	**M1** for $(x + 5)^2 + k$ or $(x + \textit{their}\ 5)^2 + 14 – (\textit{their}\ 5)^2$ or $a = 5$
8(c)(ii)	Sketch of U-shaped parabola with a minimum indicated at (–5, –11) with no part of graph in 4th quadrant	**3**	**FT** *their* $(x + 5)^2 – 11$ provided in that form **B1** for U shape curve **B1FT** for turning point at (–5, k) or (k, –11)
9(a)	39[.0] or 39.03 to 39.04…	**3**	**M2** for $\frac{165}{360}\times 2\times\pi\times 8 + 16$ or **M1** for $\frac{165}{360}\times 2\times\pi\times 8$
9(b)	2.71 or 2.708…	**4**	**M3** for $\sqrt{\frac{\frac{165}{360}[\times\pi]\times 8^2}{4[\times\pi]}}$ oe or **M2** for $r^2=\frac{\frac{165}{360}[\times\pi]\times 8^2}{4[\times\pi]}$ oe or **M1** for $\frac{165}{360}\times\pi\times 8^2$ oe seen

Question	Answer	Marks	Partial Marks
9(c)(i)	3.67 or 3.666 to 3.667	**2**	**M1** for $\frac{165}{360} \times 2[\times\pi] \times 8 = 2[\times\pi] \times r$ or better or for $\frac{165}{360}[\times\pi] \times 8^2 = [\pi\times]r \times 8$ or better
9(c)(ii)	100 or 100.0 to 100.1… final answer	**4**	**M3** for $\frac{1}{3}\pi \times their(c)(i)^2 \times \sqrt{8^2 - their\ \text{radius}^2}$ or **M2** for $\sqrt{8^2 - their\ \text{radius}^2}$ or **M1** for $(their\ (c)(i))^2 + h^2 = 8^2$
10(a)(i)	15.7 or 15.65...	**3**	**M2** for $\sqrt{(4-10)^2 + (4--3)^2}$ oe or **M1** for $(-4-10)^2 + (4--3)^2$ oe
10(a)(ii)	$\frac{-10-4}{4--3}$ [= –2] oe	**M1**	
	10 = –2(–3) + c Or –4 = –2(4) + c and correct completion to $y = -2x + 4$	**A1**	
10(a)(iii)	$y = \frac{1}{2}x + \frac{11}{4}$ oe	**4**	**M1** for grad = ½ soi **M1** for [midpoint =] (½, 3) **M1** for substitution of (1/2, 3) into *their* $y = mx + c$ oe
10(b)(i)	$\left(-\frac{1}{3}, -\frac{22}{27}\right)$ oe and (–5, 50)	**6**	**B2** for $3x^2 + 16x + 5$ Or **B1** for one correct **M1** for derivative = 0 or *their* derivative = 0 **M1** for $[x =] -\frac{1}{3}$ and $[x =] -5$ **B1** for $-\frac{22}{27}$ and 50
10(b)(ii)	$\left(-\frac{1}{3}, -\frac{22}{27}\right)$ minimum (–5, 50) maximum with correct reasons	**3**	**B2** for one correct with reason or **M1** for correct attempt e.g. 2nd derivatives, gradients or sketching

Cambridge Assessment International Education

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CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

3126875001

MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2020**

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. Blank pages are indicated.

DC (LK/SW) 186482/3

[Turn over

1 **(a)** **(i)** Divide \$24 in the ratio 7 : 5.

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

(ii) Write \$24.60 as a fraction of \$2870.
Give your answer in its lowest terms.

..... [2]

(iii) Write \$1.92 as a percentage of \$1.60 .

..... % [1]

(b) In a sale the original prices are reduced by 15%.

(i) Calculate the sale price of a book that has an original price of \$12.

\$ ..... [2]

(ii) Calculate the original price of a jacket that has a sale price of \$38.25 .

\$ ..... [2]

(c) **(i)** Dean invests \$500 for 10 years at a rate of 1.7% per year simple interest.

Calculate the total interest earned during the 10 years.

\$ ..... [2]

(ii) Ollie invests \$200 at a rate of 0.0035% **per day** compound interest.

Calculate the value of Ollie's investment at the end of 1 year.
[1 year = 365 days.]

\$ ..... [2]

(iii) Edna invests \$500 at a rate of r% per year compound interest.
At the end of 6 years, the value of Edna's investment is \$559.78 .

Find the value of r.

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

2 **(a)** $\mathbf{p} = \begin{pmatrix} 4 \\ 5 \end{pmatrix}$ $\mathbf{q} = \begin{pmatrix} -2 \\ 7 \end{pmatrix}$

(i) Find $2\mathbf{p} + \mathbf{q}$.

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

(ii) Find $|\mathbf{p}|$.

..... [2]

(b) A is the point (4, 1) and $\overrightarrow{AB} = \begin{pmatrix} -3 \\ 1 \end{pmatrix}$.

Find the coordinates of B.

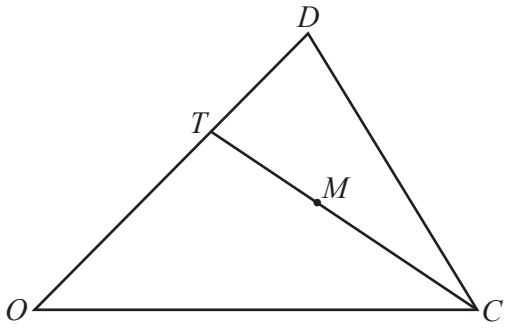
(..... , ...) [1]

(c) The line $y = 3x - 2$ crosses the y-axis at G.

Write down the coordinates of G.

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

(d)



NOT TO SCALE

In the diagram, O is the origin, $OT = 2TD$ and M is the midpoint of TC.
$\overrightarrow{OC} = \mathbf{c}$ and $\overrightarrow{OD} = \mathbf{d}$.

Find the position vector of M.
Give your answer in terms of **c** and **d** in its simplest form.

..... [3]

3 The speed, v km/h, of each of 200 cars passing a building is measured.
The table shows the results.

Speed (v km/h)	$0 < v \leqslant 20$	$20 < v \leqslant 40$	$40 < v \leqslant 45$	$45 < v \leqslant 50$	$50 < v \leqslant 60$	$60 < v \leqslant 80$
Frequency	16	34	62	58	26	4

(a) Calculate an estimate of the mean.

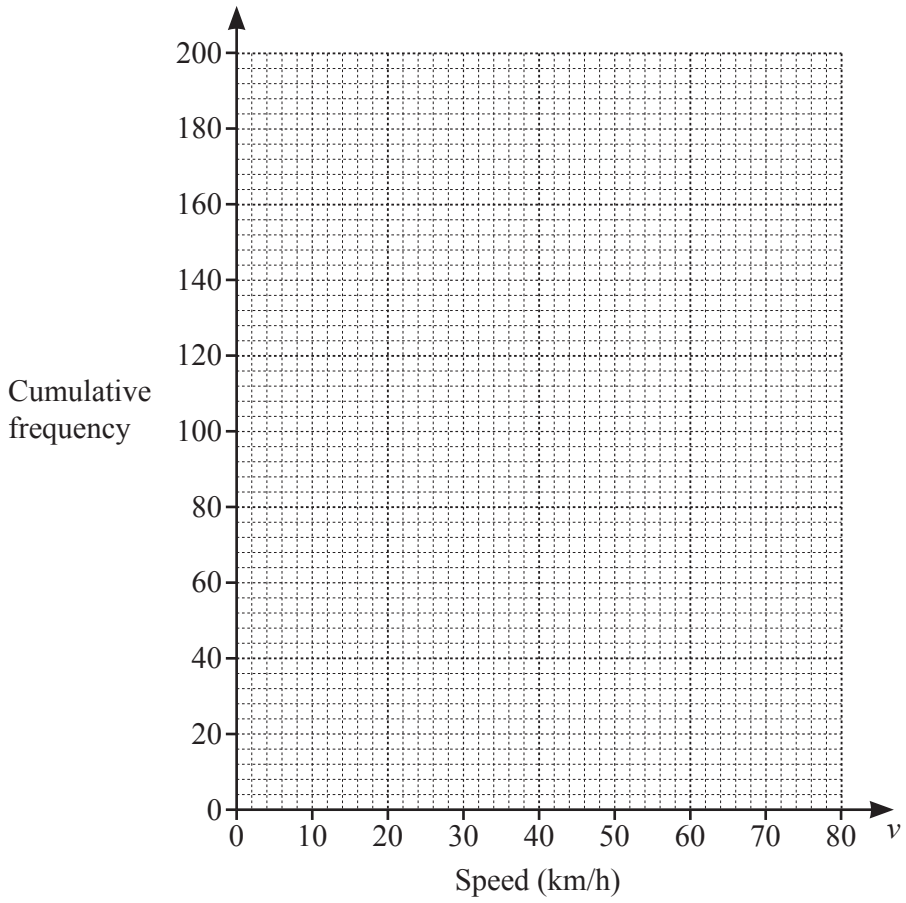
..... km/h [4]

(b) **(i)** Use the frequency table to complete the cumulative frequency table.

Speed (v km/h)	$v \leqslant 20$	$v \leqslant 40$	$v \leqslant 45$	$v \leqslant 50$	$v \leqslant 60$	$v \leqslant 80$
Cumulative frequency	16	50			196	200

[1]

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



[3]

(iii) Use your diagram to find an estimate of

(a) the upper quartile,

..... km/h [1]

(b) the number of cars with a speed greater than 35 km/h.

..... [2]

(c) Two of the 200 cars are chosen at random.

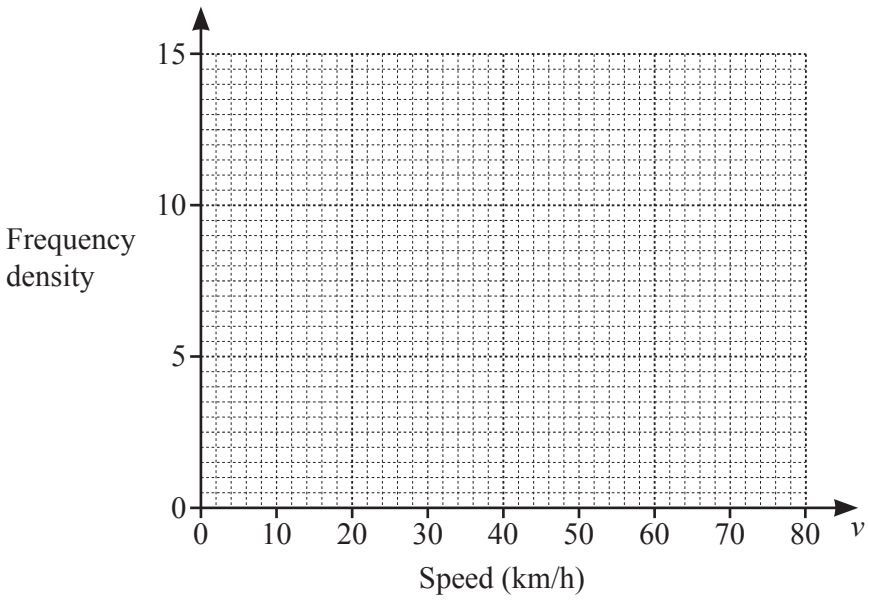
Find the probability that they both have a speed greater than 50 km/h.

..... [2]

(d) A new frequency table is made by combining intervals.

Speed (v km/h)	$0 < v \leqslant 40$	$40 < v \leqslant 50$	$50 < v \leqslant 80$
Frequency	50	120	30

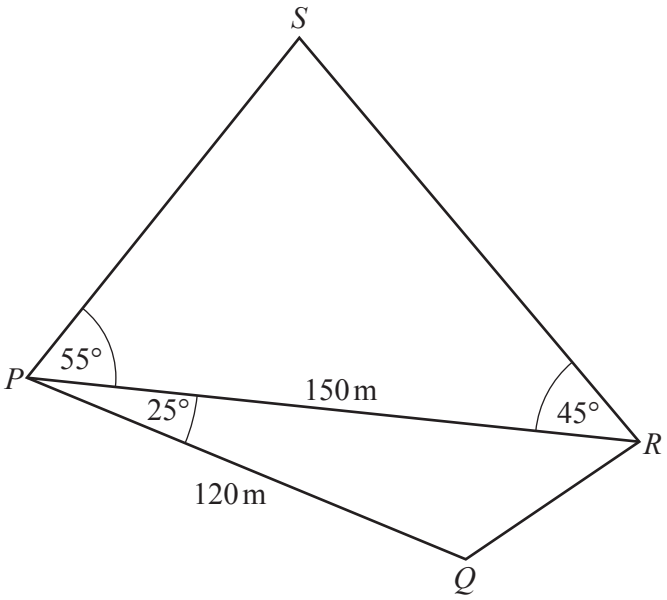
On the grid, draw a histogram to show the information in this table.



[3]

[Turn over

4



NOT TO SCALE

The diagram shows two triangles.

(a) Calculate QR.

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

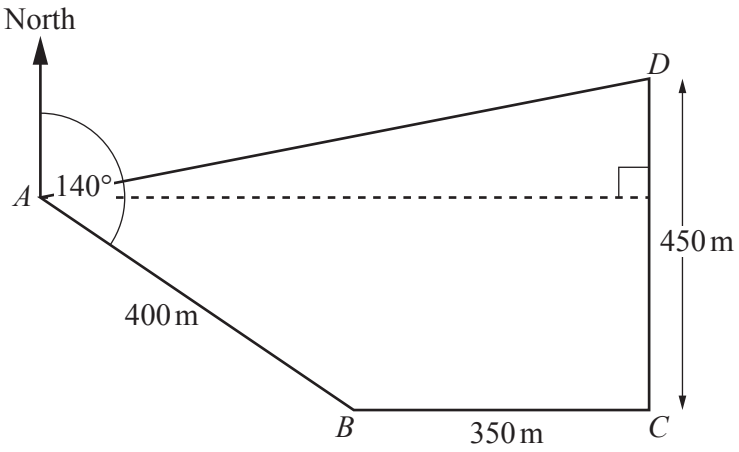
(b) Calculate RS.

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

(c) Calculate the total area of the two triangles.

..... m^2 [3]

5



NOT TO SCALE

The diagram shows a field $ABCD$.
The bearing of B from A is 140°.
C is due east of B and D is due north of C.
$AB = 400$ m, $BC = 350$ m and $CD = 450$ m.

(a) Find the bearing of D from B.

..... [2]

(b) Calculate the distance from D to A.

..... m [6]

(c) Jono runs around the field from A to B, B to C, C to D and D to A.
He runs at a speed of 3 m/s.

Calculate the total time Jono takes to run around the field.
Give your answer in minutes and seconds, correct to the nearest second.

..... min ..... s [4]

6 $f(x) = 3x + 2$ $g(x) = x^2 + 1$ $h(x) = 4^x$

(a) Find h(4).

..... [1]

(b) Find fg(1).

..... [2]

(c) Find gf(x) in the form $ax^2 + bx + c$.

..... [3]

(d) Find x when $f(x) = g(7)$.

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

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

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

(f) Find $\frac{g(x)}{f(x)} + x$.

Give your answer as a single fraction, in terms of x, in its simplest form.

..... [3]

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

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

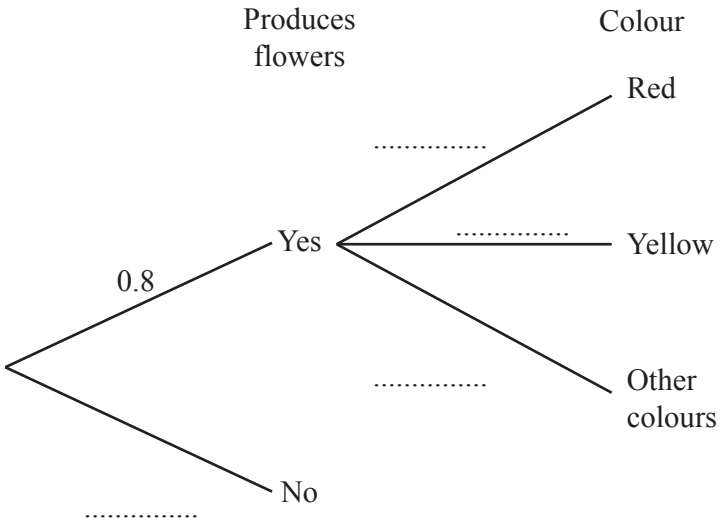
7 Tanya plants some seeds.
The probability that a seed will produce flowers is 0.8 .
When a seed produces flowers, the probability that the flowers are red is 0.6 and the probability that the flowers are yellow is 0.3 .

(a) Tanya has a seed that produces flowers.

Find the probability that the flowers are not red and not yellow.

..... [1]

(b) **(i)** Complete the tree diagram.



[2]

(ii) Find the probability that a seed chosen at random produces red flowers.

..... [2]

(iii) Tanya chooses a seed at random.

Find the probability that this seed does not produce red flowers and does not produce yellow flowers.

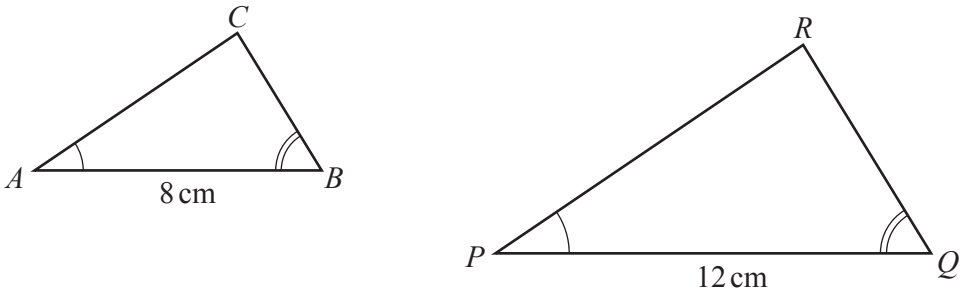
..... [3]

(c) Two of the seeds are chosen at random.

Find the probability that one produces flowers and one does not produce flowers.

..... [3]

8 (a)



NOT TO SCALE

Triangle ABC is mathematically similar to triangle PQR.
The area of triangle ABC is $16\,cm^2$.

(i) Calculate the area of triangle PQR.

..... cm^2 [2]

(ii) The triangles are the cross-sections of prisms which are also mathematically similar.
The volume of the smaller prism is $320\,cm^3$.

Calculate the length of the larger prism.

..... cm [3]

(b) A cylinder with radius 6 cm and height h cm has the same volume as a sphere with radius 4.5 cm.

Find the value of h.

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

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

(c) A solid metal cube of side 20 cm is melted down and made into 40 solid spheres, each of radius r cm.

Find the value of r.

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

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

(d) A solid cylinder has radius x cm and height $\frac{7x}{2}$ cm.

The surface area of a sphere with radius R cm is equal to the total surface area of the cylinder.

Find an expression for R in terms of x.

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

$R =$ ..... [3]

9 **(a)** **(i)** Write x^2+8x-9 in the form $(x+k)^2+h$.

..... [2]

(ii) Use your answer to **part (a)(i)** to solve the equation $x^2+8x-9=0$.

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

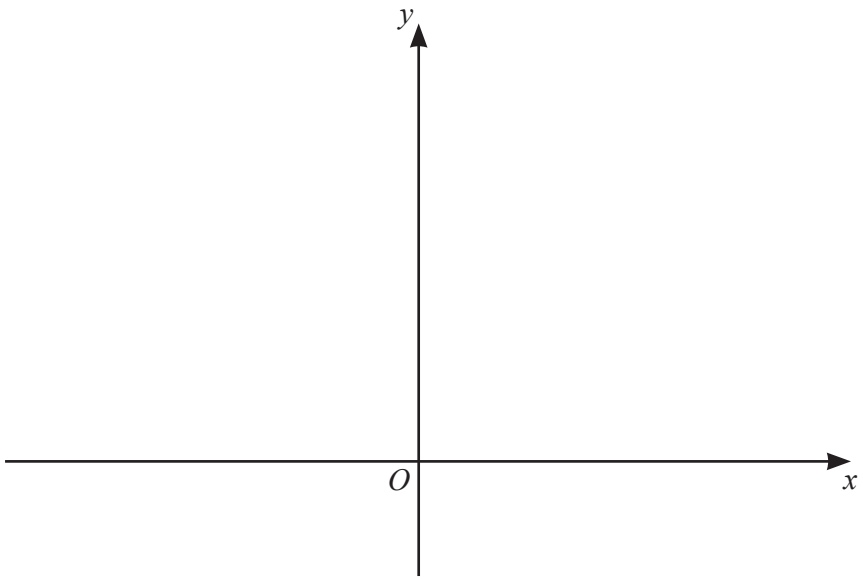
(b) The solutions of the equation $x^2+bx+c=0$ are $\frac{-7+\sqrt{61}}{2}$ and $\frac{-7-\sqrt{61}}{2}$.

Find the value of b and the value of c.

$b =$ .....

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

(c) (i)



On the diagram,

(a) sketch the graph of $y = (x-1)^2$, [2]

(b) sketch the graph of $y = \frac{1}{2}x + 1$. [2]

(ii) The graphs of $y = (x-1)^2$ and $y = \frac{1}{2}x + 1$ intersect at A and B.

Find the length of AB.

$AB =$ ..... [7]

Question 10 is printed on the next page.

10 (a) $y = x^4 - 4x^3$

(i) Find the value of y when $x = -1$.

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

(ii) Find the two stationary points on the graph of $y = x^4 - 4x^3$.

(..... , ...)

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

(b) $y = x^p + 2x^q$

$\frac{dy}{dx} = 11x^{10} + 10x^4$, where $\frac{dy}{dx}$ is the derived function.

Find the value of p and the value of q.

$p =$ .....

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

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MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2020**

MARK SCHEME

Maximum Mark: 130

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

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

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

[Turn over

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors 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.

Maths-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, 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 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 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.

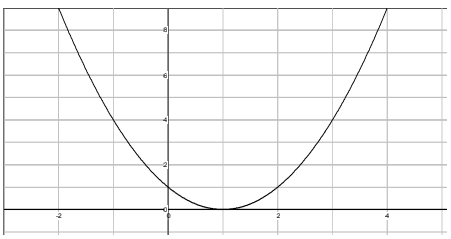
Abbreviations

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)	14, 10	**2**	**M1** for 24 ÷ (7 + 5)
1(a)(ii)	$\frac{3}{350}$	**2**	**B1** for correct fraction not in lowest terms
1(a)(iii)	120	**1**	
1(b)(i)	10.2[0]	**2**	**M1** for $\frac{15}{100}\times 12$ oe or better
1(b)(ii)	45	**2**	**M1** for $\frac{38.25}{1-\frac{15}{100}}$ oe
1(c)(i)	85	**2**	**M1** for $\frac{500\times 1.7\times 10}{100}$ oe
1(c)(ii)	203 or 202.5 to 202.6	**2**	**M1** for $200\times\left(1+\frac{0.0035}{100}\right)^{365}$
1(c)(iii)	1.9	**3**	**M2** for $\sqrt[6]{\frac{559.78}{500}}$ or **M1** for $500\left(1+\frac{r}{100}\right)^{6}=559.78$
2(a)(i)	$\begin{pmatrix}6\\17\end{pmatrix}$	**2**	**B1** for each
2(a)(ii)	6.4[0] or 6.403...	**2**	**M1** for $4^2 + 5^2$
2(b)	(1, 2)	**1**	
2(c)	(0, –2)	**1**	

Question	Answer	Marks	Partial Marks
2(d)	$\frac{1}{2}\mathbf{c} + \frac{1}{3}\mathbf{d}$	**3**	**B2** for correct unsimplified answer or **M1** for $\overrightarrow{CT} = -\mathbf{c} + \frac{2}{3}\mathbf{d}$ oe or $\overrightarrow{TC} = \mathbf{c} - \frac{2}{3}\mathbf{d}$ oe or for correct route
3(a)	41.4	**4**	**M1** for 10, 30, 42.5, 47.5, 55, 70 **M1** for Σfx where x lies in or on the boundary of each interval. **M1 dep** for $\frac{\Sigma fx}{200}$ dep on second M1
3(b)(i)	112, 170	**1**	
3(b)(ii)	Correct diagram	**3**	**B1** for correct horizontal plot **B1FT** for correct vertical plots **B1 FT** dep on at least B1 earned for reasonable increasing curve or polygon through their 6 points If 0 scored **SC1FT** for 5 out of 6 points plotted correctly
3(b)(iii)(a)	48	**1**	
3(b)(iii)(b)	160	**2**	**M1** for 40 seen
3(c)	$\frac{87}{3980}$ oe	**2**	**M1** for $\frac{30}{200}\times\frac{29}{199}$ oe
3(d)	Correct histogram	**3**	**B1** for each column If 0 scored **SC1** for correct frequency densities soi 1.25, 12, 1
4(a)	65.4 or 65.36 to 65.37	**3**	**M1** for $150^2 + 120^2 - 2 \times 150 \times 120 \cos 25$ **A1** for 4270 or 4272 to 4273
4(b)	125 or 124.7 to 124.8	**4**	**B1** for [angle S =] 80 **M2** for $\frac{150\sin 55}{\sin \textit{their} 80}$ or **M1** for $\frac{\sin \textit{their} 80}{150} = \frac{\sin 55}{RS}$ oe
4(c)	10 400 or 10 410 to 10 440 nfww	**3**	**M1** for $\frac{1}{2}\times 120\times 150\sin 25$ oe **M1** for $\frac{1}{2}\times 150\times \textit{their}$ **(b)** $\sin 45$ oe

Question	Answer	Marks	Partial Marks
5(a)	[0]38 or [0]37.9 or [0]37.87...	**2**	**M1** for tan = $\frac{350}{450}$ oe If 0 scored, **SC1** for answer [0]52 or [0]52.1 or [0]52.12 to [0]52.13
5(b)	624 or 623.8 to 623.9	**6**	**M2** for 450 – 400 sin 50 or **M1** for sin 50 = $\frac{...}{400}$ **M2** for 350 + 400 cos 50 or **M1** for cos 50 = $\frac{...}{400}$ **M1** for (*their* (450 – 400 sin 50))^2 + (*their* (350 + 400 cos 50))^2
5(c)	10 min 8 s	**4**	**B3** for 10.1 or 10.13… or **M2** for (400 + 350 + 450 + *their DA*) ÷ 3 [÷ 60] oe or **M1** for any distance ÷ 3 **M1** for rounding *their* minutes into minutes and seconds to nearest second if clearly seen
6(a)	256	**1**	
6(b)	8	**2**	**M1** for 3(x^2 + 1) + 2 or for 3(2) + 2
6(c)	$9x^2 + 12x + 5$	**3**	**M1** for (3x + 2)^2 + 1 **B1** for [(3x + 2)^2 =] $9x^2 + 6x + 6x + 4$ oe
6(d)	16	**2**	**M1** for 3x + 2 = 7^2 + 1 or better
6(e)	$\frac{x-2}{3}$ oe final answer	**2**	**M1** for x = 3y + 2 or for y – 2 = 3x or for $\frac{y}{3} = x + \frac{2}{3}$
6(f)	$\frac{4x^2 + 2x + 1}{3x + 2}$ final answer	**3**	**B1** for x^2 + 1 + x (3x + 2) or better seen **M1** for common denominator 3x + 2
6(g)	16	**1**	
7(a)	0.1	1	
7(b)(i)	0.2 oe 0.6, 0.3, 0.1 oe	**2**	**B1** for 0.2 **B1** for 0.6, 0.3, 0.1
7(b)(ii)	0.48 oe	**2**	**FT** *their* 0.6 from tree diagram **M1** for 0.8 × *their* 0.6

Question	Answer	Marks	Partial Marks
7(b)(iii)	0.28 oe	3	**M2** for $0.2 + 0.8 \times 0.1$ oe or **M1** for 0.2 or 0.8×0.1 or $0.8 \times (0.6 + 0.3)$
7(c)	0.32 oe	3	**M2** for $0.8 \times 0.2 + 0.2 \times 0.8$ oe **M1** for one of these products
8(a)(i)	36	2	**M1** for $\left(\frac{8}{12}\right)^2$ or $\left(\frac{12}{8}\right)^2$ oe
8(a)(ii)	30	3	**M2** for $320 \div 16 \times \frac{12}{8}$ oe or **M1** for $320 \div 16$
8(b)	3.375 cao	3	**M2** for $\frac{\frac{4}{3}\pi \times 4.5^3}{\pi \times 6^2}$ or better or **M1** for $\pi \times 6^2 \times h = \frac{4}{3} \times \pi \times 4.5^3$
8(c)	3.63 or 3.627 to 3.628	3	**M2** for $\frac{20^3}{40 \times \frac{4}{3}\pi}$ or **M1** for $40 \times \frac{4}{3} \times \pi \times r^3 = 20^3$
8(d)	$\frac{3x}{2}$ or $1.5x$ or $1\frac{1}{2}x$	3	**B2** for $4R^2 = 9x^2$ oe or better or **M1** for $4\pi R^2 = 2\pi x^2 + \pi \times 2x \times \frac{7x}{2}$
9(a)(i)	$(x+4)^2 - 25$	2	**B1** for $(x+k)^2 - 9 - (their\ k)^2$ or $(x+4)^2 - h$ or $k = 4$
9(a)(ii)	$x + 4 = [\pm]\ 5$	M1	**FT** *their* **(a)(i)**
	–9 and 1	A1	
9(b)	$[b =]\ 7$ $[c =]\ -3$	3	**B1** for $[b =]\ 7$ **M1** for $b^2 - 4c = 61$
9(c)(i)(a)	Correct sketch 	2	**B2** for correct quadratic curve with min touching x-axis or **B1** for parabola vertex downwards

Question	Answer	Marks	Partial Marks
9(c)(i)(b)	Correct sketch 	**2**	**B2** for correct straight line intersecting curve on y-axis or **B1** for straight line with positive gradient and positive y-intercept
9(c)(ii)	2.8[0] or 2.795...	**7**	**B3** for $x^2 - \frac{5}{2}x = 0$ oe or **M1** for $(x-1)^2 = \frac{1}{2}x + 1$ **B1** for $[(x-1)^2 =] \; x^2 - x - x + 1$ AND **B2** for (0, 1) and $\left(\frac{5}{2}, \frac{9}{4}\right)$ oe or **B1** $[x =] \; 0$ and $\frac{5}{2}$ oe AND **M1** for (difference in x)^2 + (difference in y)^2
10(a)(i)	5	**2**	**M1** for $(-1)^4 - 4(-1)^3$
10(a)(ii)	(0, 0) and (3, –27)	**6**	**B2** for $4x^3 - 12x^2$ [= 0] or **B1** for $4x^3$ or $12x^2$ AND **M1** for derivative = 0 or *their* derivative = 0 **M1** for $4x^2(x - 3)$[= 0] **B1** for [x =] 0 and [x =] 3 or [y =] 0 and [y =] –27 or for one correct coordinate pair
10(b)	[p =] 11 [q =] 5	**2**	**B1** for each or **M1** for $\frac{dy}{dx} = px^{p-1} + 2qx^{q-1}$

Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2071428902

MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2020**

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. Blank pages are indicated.

DC (LK/SW) 186483/2

1 **(a)**

Campsite fees (per day)	
Tent	$15.00
Caravan	$25.00

The sign shows the fees charged at a campsite.
Today there are 54 tents and 18 caravans on the site.

Calculate the fees charged today.

$ ..... [2]

(b) In September the total income at the campsite was $37 054.
This was a decrease of 4.5% on the total income in August.

Calculate the total income in August.

$ ..... [2]

(c) The visitors to the campsite today are in the ratio

men : women = 5 : 4 and women : children = 3 : 7.

(i) Calculate the ratio men : women : children in its simplest form.

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

(ii) Today there are 224 children at the campsite.

Calculate the total number of men and women.

..... [3]

(d) The space allowed for each tent is a rectangle measuring 8 m by 6 m, each correct to the nearest metre.

Calculate the upper bound for the area of the space allowed for each tent.

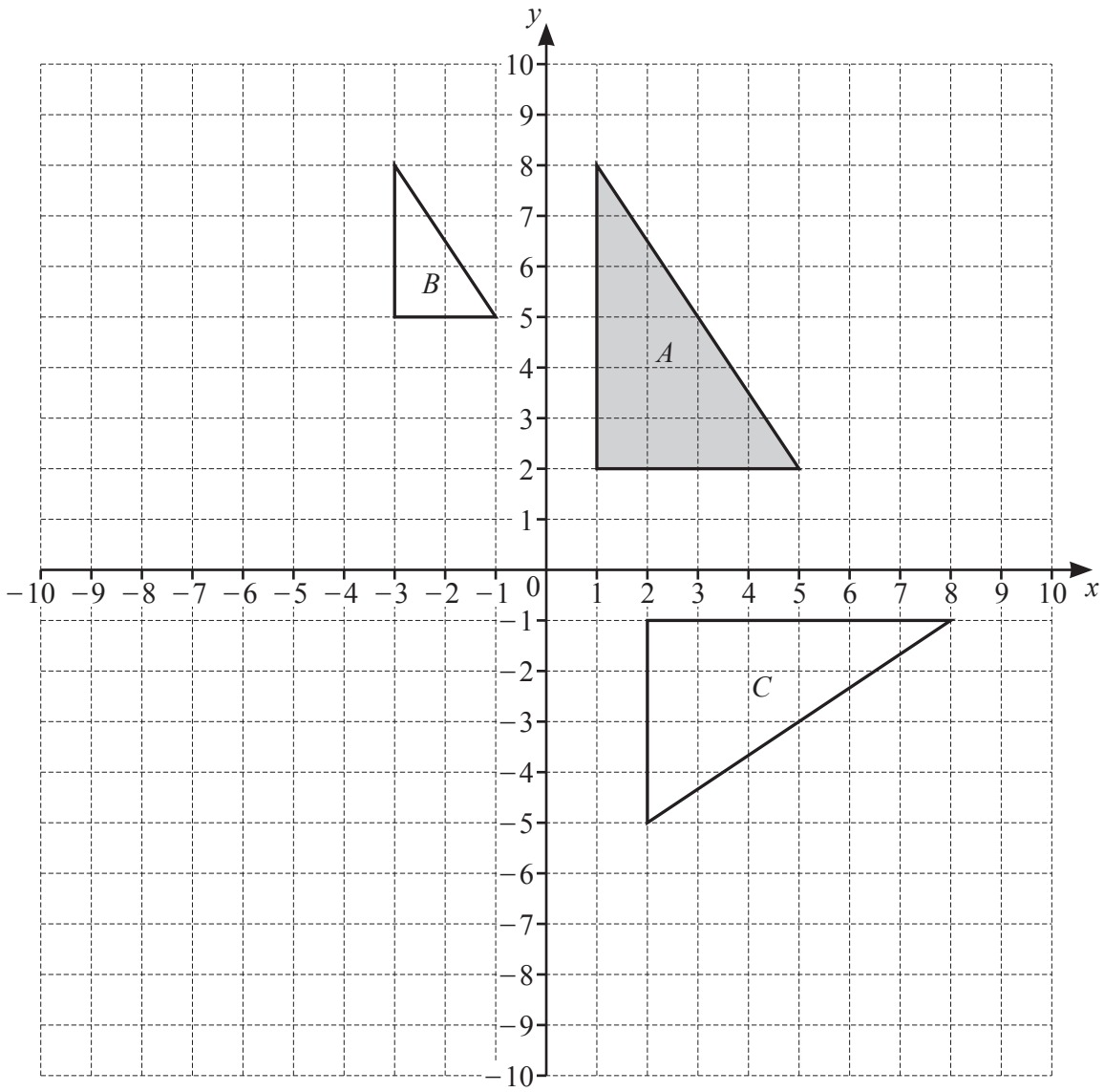
..... m^2 [2]

(e) The value of the campsite has increased exponentially by 1.5% every year since it opened 30 years ago.

Calculate the value of the campsite now as a percentage of its value 30 years ago.

..... % [2]

2



(a) **(i)** Draw the image of triangle A after a reflection in the line $y = -x$. [2]

(ii) Draw the image of triangle A after a translation by the vector $\begin{pmatrix} -2 \\ -9 \end{pmatrix}$. [2]

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

(i) triangle A onto triangle B,

.....

..... [3]

(ii) triangle A onto triangle C.

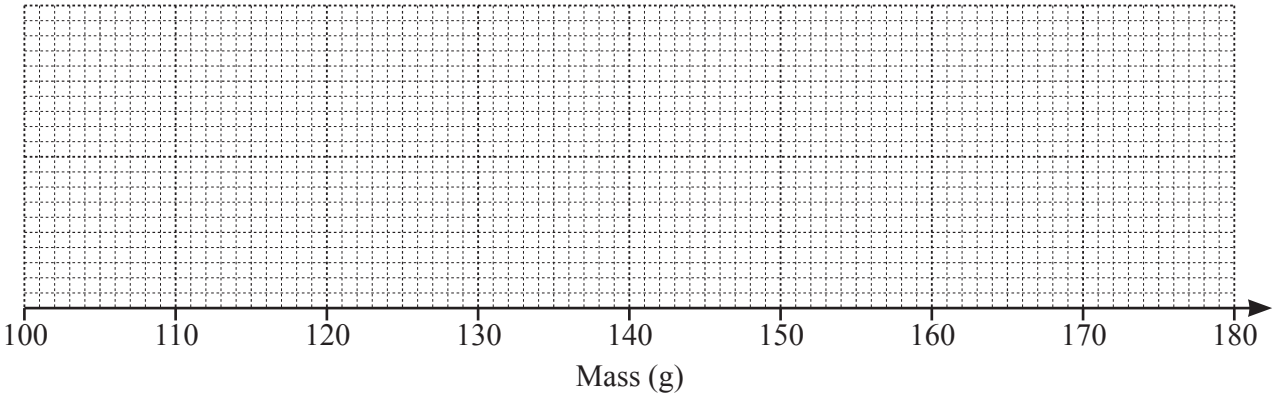
.....

..... [3]

3 **(a)** Here is some information about the masses of potatoes in a sack:

- The largest potato has a mass of 174 g.
- The range is 69 g.
- The median is 148 g.
- The lower quartile is 121 g.
- The interquartile range is 38 g.

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



[4]

(b) The table shows the marks scored by some students in a test.

Mark	5	6	7	8	9	10
Frequency	8	2	12	2	0	1

Calculate the mean mark.

..... [3]

4 **(a)** Solve the inequality.

$$3m + 12 \leqslant 8m - 5$$

..... [2]

(b) Solve the equation.

$$\frac{2x+5}{3-x} = \frac{14}{15}$$

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

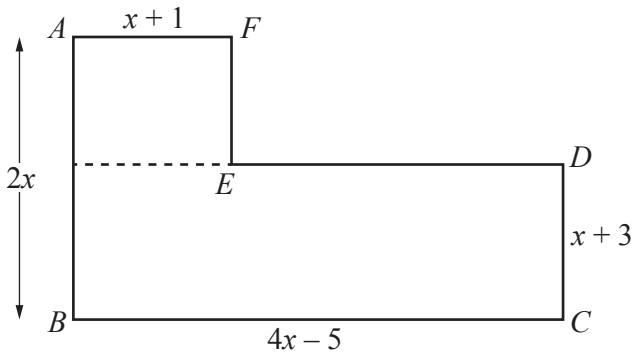
(c) Solve the simultaneous equations.
You must show all your working.

$$y = 4 - x$$
$$x^2 + 2y^2 = 67$$

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

$x =$ ..... , $y =$ ..... [6]

5 All the lengths in this question are in centimetres.



NOT TO SCALE

The diagram shows a shape $ABCDEF$ made from two rectangles.
The total area of the shape is $342\,\text{cm}^2$.

(a) Show that $x^2 + x - 72 = 0$.

[5]

(b) Solve by factorisation.

$$x^2 + x - 72 = 0$$

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

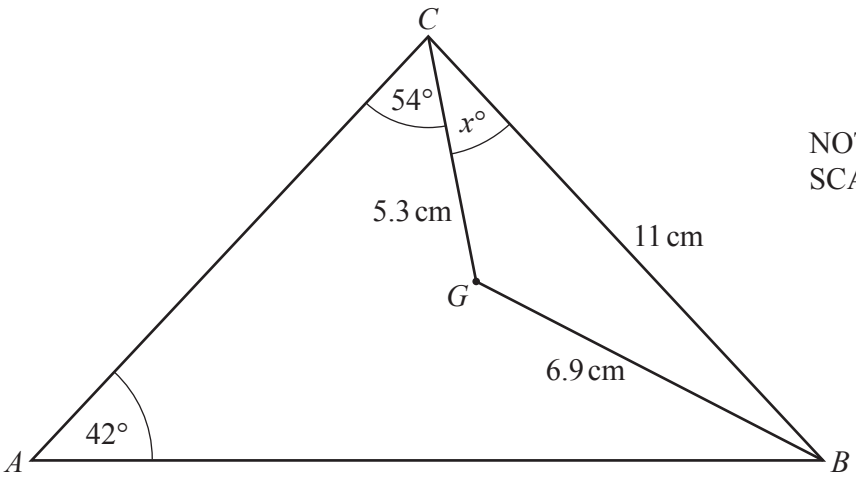
(c) Work out the perimeter of the shape *ABCDEF*.

..... cm [2]

(d) Calculate angle *DBC*.

Angle *DBC* = ... [2]

6 (a)



The diagram shows triangle ABC with point G inside.
$CB = 11$ cm, $CG = 5.3$ cm and $BG = 6.9$ cm.
Angle $CAB = 42°$ and angle $ACG = 54°$.

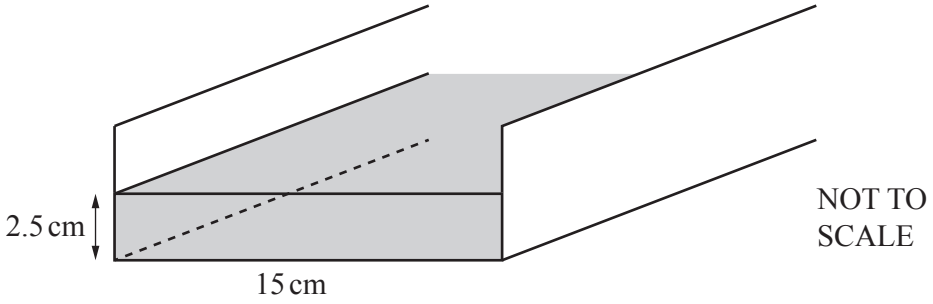
(i) Calculate the value of x.

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

(ii) Calculate AC.

$AC =$ ..... cm [4]

(b)



Water flows at a speed of 20 cm/s along a rectangular channel into a lake.
The width of the channel is 15 cm.
The depth of the water is 2.5 cm.

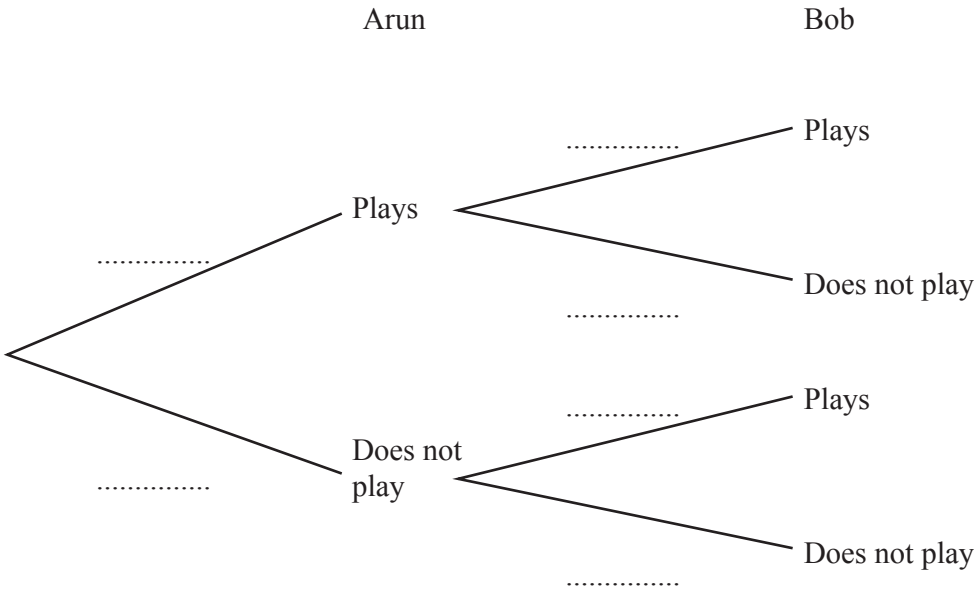
Calculate the amount of water that flows from the channel into the lake in 1 hour.
Give your answer in litres.

..... litres [4]

7 On any Saturday, the probability that Arun plays football is $\frac{3}{4}$.

On any Saturday, the probability that Bob plays football is $\frac{2}{5}$.

(a) (i) Complete the tree diagram.



[2]

(ii) Calculate the probability that, one Saturday, Arun and Bob both play football.

..... [2]

(iii) Calculate the probability that, one Saturday, either Arun plays football or Bob plays football, but not both.

..... [3]

(b) Calculate the probability that Bob plays football for 2 of the next 3 Saturdays.

..... [3]

(c) When Arun plays football, the probability that he scores the winning goal is $\frac{1}{7}$.

Calculate the probability that Arun scores the winning goal one Saturday.

..... [2]

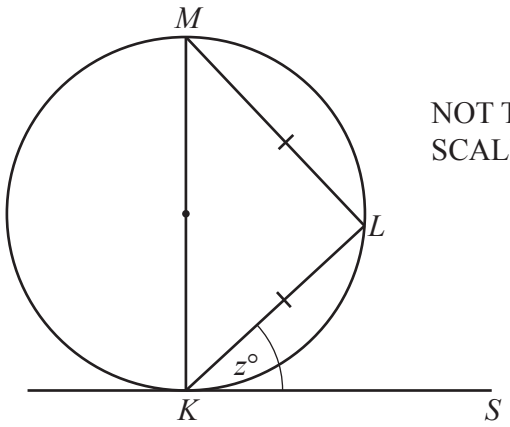
8 **(a)** The interior angle of a regular polygon with n sides is 150°.

Calculate the value of n.

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

(b) **(i)** K, L and M are points on the circle.
KS is a tangent to the circle at K.
KM is a diameter and
triangle KLM is isosceles.

Find the value of z.

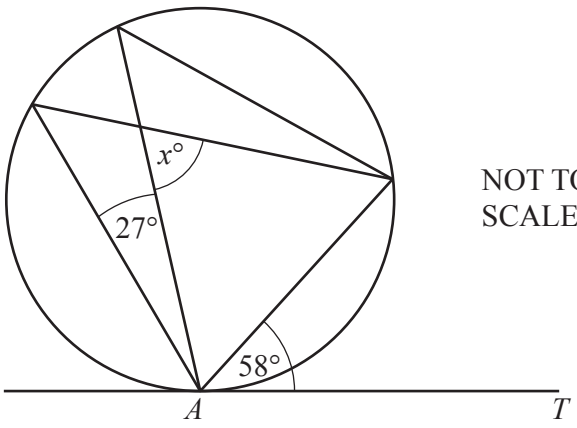


NOT TO SCALE

$z =$ ..... [2]

(ii) AT is a tangent to the circle at A.

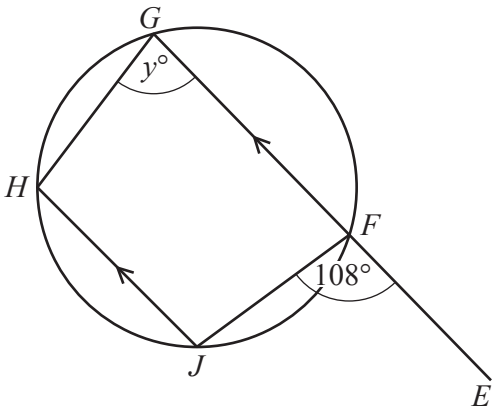
Find the value of x.



NOT TO SCALE

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

(iii)



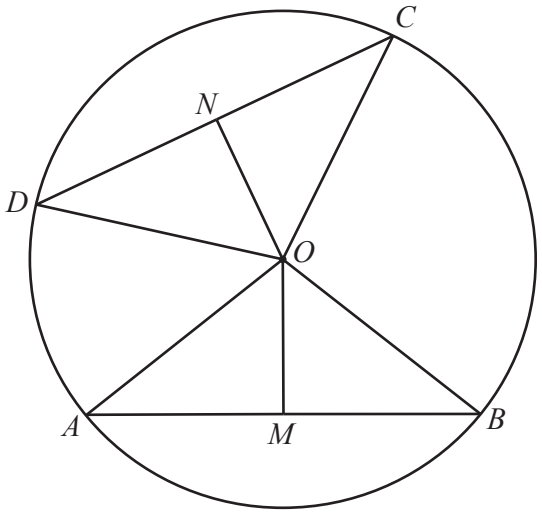
NOT TO SCALE

F, G, H and J are points on the circle.
EFG is a straight line parallel to JH.

Find the value of y.

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

(c)



NOT TO SCALE

A, B, C and D are points on the circle, centre O.
M is the midpoint of AB and N is the midpoint of CD.
$OM = ON$

Explain, giving reasons, why triangle OAB is congruent to triangle OCD.

.....

.....

.....

..... [3]

9 **(a)** The equation of line L is $3x - 8y + 20 = 0$.

(i) Find the gradient of line L.

..... [2]

(ii) Find the coordinates of the point where line L cuts the y-axis.

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

(b) The coordinates of P are $(-3, 8)$ and the coordinates of Q are $(9, -2)$.

(i) Calculate the length PQ.

..... [3]

(ii) Find the equation of the line parallel to PQ that passes through the point $(6, -1)$.

..... [3]

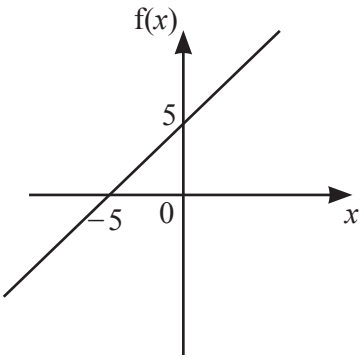
(iii) Find the equation of the perpendicular bisector of PQ.

..... [4]

10 **(a)** The diagrams show the graphs of two functions.

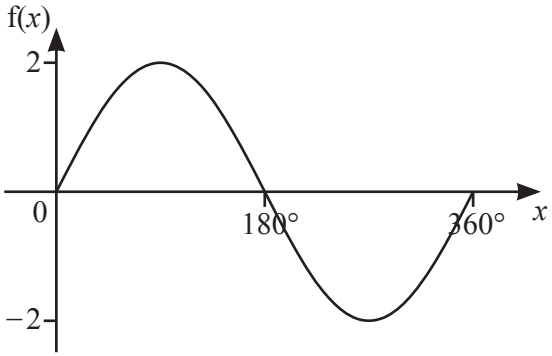
Write down each function.

(i)



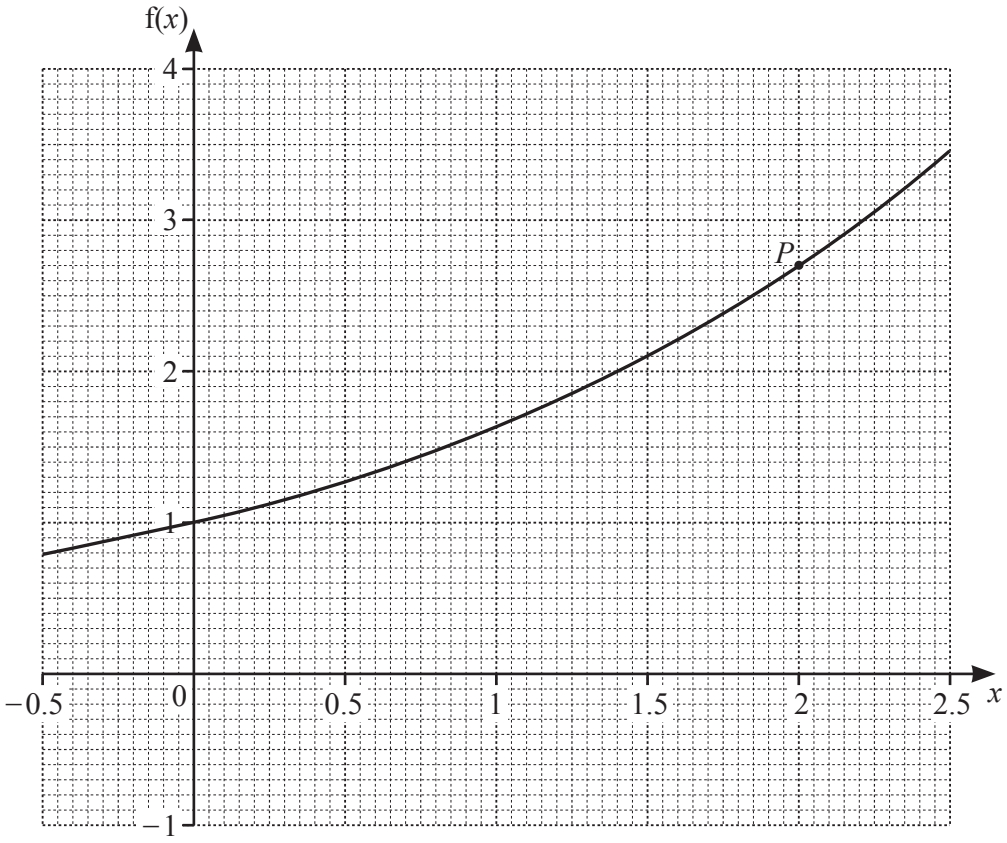
f(x) = ... [2]

(ii)



f(x) = ... [2]

(b)



The diagram shows the graph of another function.

By drawing a suitable tangent, find an estimate for the gradient of the function at the point P.

..... [3]

11 $f(x) = 7x - 4$ $\quad g(x) = \dfrac{2x}{x-3}, x \neq 3$ $\quad h(x) = x^2$

(a) Find $g(6)$.

..... [1]

(b) Find $fg(4)$.

..... [2]

(c) Find $fh(x)$.

..... [1]

(d) Find $\dfrac{f(x)}{2} + g(x)$.

Give your answer as a single fraction, in terms of x, in its simplest form.

..... [3]

(e) Find the value of x when $f(x+2) = -11$.

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

(f) Find the values of p that satisfy $h(p) = p$.

..... [2]

12 **(a)** A curve has equation $y = 4x^3 - 3x + 3$.

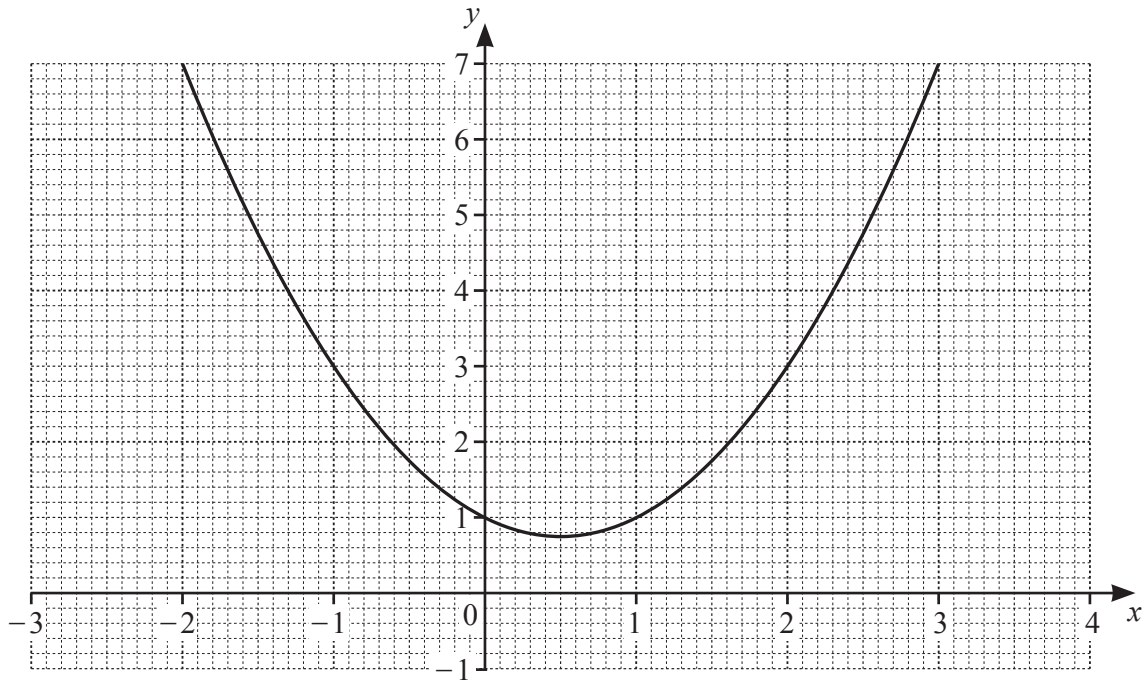
(i) Find the coordinates of the two stationary points.

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

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

[3]

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



By drawing a suitable line on the grid, solve the equation $x^2 - 2x - 2 = 0$.

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

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MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2020**

MARK SCHEME

Maximum Mark: 130

Published

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

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

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

[Turn over

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors 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.

Maths-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, 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 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 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)	1260	**2**	**M1** for $15 \times 54 + 25 \times 18$
1(b)	38 800	**2**	**M1** for $37054 \div \left(1 - \frac{4.5}{100}\right)$ oe
1(c)(i)	15 : 12 : 28	**2**	**M1** for correct attempt to find a common multiple for the women oe
1(c)(ii)	216	**3**	**M2** for 224 ÷ *their* 28 × *their* (15 + 12) or **M1** for 224 ÷ *their* 28
1(d)	55.25	**2**	**M1** for 8 + 0.5 or 6 + 0.5 seen
1(e)	156 or 156.3…	**2**	**M1** for $\left(1 + \frac{1.5}{100}\right)^{30}$
2(a)(i)	triangle with vertices at (–2, –1) (–8, –1) (–2, –5)	**2**	**B1** for correct reflection in $y = x$
2(a)(ii)	triangle with vertices at (–1, –1) (–1, –7) (3, –7)	**2**	**B1** for translation by $\begin{pmatrix} k \\ -9 \end{pmatrix}$ or $\begin{pmatrix} -2 \\ k \end{pmatrix}$
2(b)(i)	Enlargement [centre] (–7, 8) [sf] ½	**3**	**B1** for each
2(b)(ii)	Rotation [centre] (0, 0) 90° clockwise oe	**3**	**B1** for each
3(a)	correct diagram	**4**	**B1** for median line correctly drawn at 148 **B1** for 105 soi **B1** for whisker at 159 soi
3(b)	6.48	**3**	**M1** for (5 × 8) + (6 × 2) + (12 × 7) + … **M1dep** for *their* ∑fx ÷ *their* (8 + 2 + 12 + 2 + 0 + 1)
4(a)	$m \geq 3.4$ oe final answer	**2**	**M1** for $12 + 5 \leq 8m - 3m$ or better or $3m - 8m \leq -5 - 12$ or better

Question	Answer	Marks	Partial Marks
4(b)	$x = -0.75$ oe	**3**	**M1** for $15(2x+5) = 14(3-x)$ **B1** for $30x + 75 = 42 - 14x$ or better
4(c)	$3x^2 - 16x - 35[= 0]$ or $3y^2 - 8y - 51[= 0]$	**M3**	**M1** for $x^2 + 2(4-x)^2 = 67$ or $(4-y)^2 + 2y^2 = 67$ seen **B1** for $16 - 8x + x^2$ or $16 - 8y + y^2$
	$(3x + 5)(x - 7)$ [= 0] or $(3y - 17)(y + 3)$[= 0]	**M1**	or for correct factors for *their* equation or for correct use of quadratic formula or completing the square for *their* equation
	$x = 7,\ y = -3$ $x = -\frac{5}{3},\ y = 5\frac{2}{3}$	**B2**	**B1** for $x = 7,\ x = -\frac{5}{3}$ or for $y = -3,\ y = 5\frac{2}{3}$ or for a correct pair of x and y values
5(a)	$(4x-5)(x+3) + (x+1)(x-3) = 342$ or $2x(4x-5) - (3x-6)(x-3) = 342$	**M2**	**M1** for $(4x-5)(x+3)$ or $(x+1)(x-3)$ or for $2x(4x-5)$ or $(3x-6)(x-3)$
	$4x^2 + 12x - 5x - 15$ oe and $x^2 + x - 3x - 3$ oe seen OR $8x^2 - 10x$ and $3x^2 - 15x + 18$ seen	**M2**	**M1** for each
	$5x^2 + 5x - 18 = 342$ leading to $x^2 + x - 72 = 0$	**A1**	no errors or omission
5(b)	$(x+9)(x-8)$	**M2**	**B1** for $(x + a)(x + b)$ where $ab = -72$ or $a + b = 1$ and $a,\ b$ are integers
	8, –9	**B1**	
5(c)	86	**2**	**FT** for $12 \times$ *their* $x - 10$ (x positive) **B1** for any one of 27, 11, 16 seen or for $2x + 2x + 4x - 5 + 4x - 5$ oe or better soi
5(d)	22.2 or 22.16 to 22.17	**2**	**M1** for tan = $\frac{11}{27}$ or $\frac{\textit{their } x + 3}{4 \times \textit{their } x - 5}$
6(a)(i)	29.5 or 29.50…	**4**	**M2** for $\frac{11^2 + 5.3^2 - 6.9^2}{2 \times 11 \times 5.3}$ or **M1** for $6.9^2 = 11^2 + 5.3^2 - 2 \times 11 \times 5.3 \cos x$ **A1** for 0.87[0…] oe

Question	Answer	Marks	Partial Marks
6(a)(ii)	13.4 or 13.38…	**4**	**B1FT** 84 – *their* **(*a*)(i)** **M2** for $\frac{11}{\sin 42}\times \sin \textit{their}\, 54.5$ or **M1** for implicit form
6(b)	2700	**4**	**M2** for $15\times 2.5\times 20\times 60\times 60$ or **M1** for $15\times 2.5\times 20$ **M1** for *their* volume ÷ 1000 If 0 scored, **SC1** for figs 27 with no working
7(a)(i)	$\frac{3}{4}, \frac{1}{4}$ $\frac{2}{5}, \frac{3}{5}$ $\frac{2}{5}, \frac{3}{5}$	**2**	**B1** for one correct pair
7(a)(ii)	$\frac{3}{10}$ oe	**2**	**FT** *their* tree diagram **M1** for $\frac{3}{4}\times\frac{2}{5}$
7(a)(iii)	$\frac{11}{20}$ oe	**3**	**M2** for $\frac{3}{4}\times\frac{3}{5}+\frac{1}{4}\times\frac{2}{5}$ or **M1** for $\frac{3}{4}\times\frac{3}{5}$ or $\frac{1}{4}\times\frac{2}{5}$
7(b)	$\frac{36}{125}$ oe	**3**	**M2** for $\left(\frac{2}{5}\right)^2\times\frac{3}{5}\times 3$ oe or **M1** for $\left(\frac{2}{5}\right)^2\times\frac{3}{5}$
7(c)	$\frac{3}{28}$ oe	**2**	**M1** for $\frac{3}{4}\times\frac{1}{7}$
8(a)	12	**2**	**M1** for $150=\frac{(n-2)\times 180}{n}$ or $\frac{360}{180-150}$ oe
8(b)(i)	45	**2**	**B1** for angles at M or K = 45 or angle at L = 90
8(b)(ii)	85	**2**	**B1** for either angle in alt segment = 58
8(b)(iii)	72	**2**	**B1** for either angle at J or H=108 or angle at F=72
8(c)	$OA = OB = OC = OD$ Radii	**B1**	
	$AB = CD$ chords equidistant from centre are equal	**B1**	
	SSS implies congruent	**B1**	

Question	Answer	Marks	Partial Marks
9(a)(i)	$\frac{3}{8}$	**2**	**M1** for $8y = 3x + 20$ or better
9(a)(ii)	(0, 2.5) oe	**1**	
(b)(i)	15.6 or 15.62…	**3**	**M2** for $\sqrt{(9--3)^2 + (-2-8)^2}$ oe seen or **M1** for $(9--3)^2$ or $(-2-8)^2$ oe seen
9(b)(ii)	$y = -\frac{5}{6}x + 4$ oe	**3**	**M1** for gradient $\frac{-2-8}{9--3}$ oe **M1** for substituting (6, –1) into a linear equation oe
9(b)(iii)	$y = \frac{6}{5}x - \frac{3}{5}$ oe	**4**	**M1** for gradient -1 / *their* $\left(-\frac{5}{6}\right)$ **B1** for midpoint at (3, 3) **M1** for *their* midpoint substituted into $y = \textit{their}\ m \times x + c$ oe
10(a)(i)	$x + 5$	**2**	**B1** for linear equation with positive gradient or intercept 5
10(a)(ii)	2 sin x oe	**2**	**B1** for recognition of sin or cos(x – 90)
10(b)	tangent ruled at P	**B1**	
	1.3 to 1.4	**B2**	**dep** on tangent drawn **M1** for rise/run
11(a)	4	**1**	
11(b)	52	**2**	**M1** for $f(8)$ seen or $7 \times \frac{2x}{x-3} - 4$
11(c)	$7x^2 - 4$	**1**	
11(d)	$\frac{7x^2 - 21x + 12}{2(x-3)}$ or $\frac{7x^2 - 21x + 12}{2x - 6}$ final answer	**3**	**M1** for $(7x-4)(x-3) + 2 \times 2x$ **B1** for denominator $2(x-3)$ or $2x - 6$
11(e)	–3	**2**	**M1** for $7x + 14 - 4 = -11$
11(f)	[p =] 0 and [p =] 1	**2**	**B1** for each
12(a)(i)	$\left(-\frac{1}{2}, 4\right)$ and $\left(\frac{1}{2}, 2\right)$	**5**	**B2** for $12x^2 - 3$[= 0] or **B1** for $12x^2$ or – 3 **M1** for their derivative = 0 or dy/dx = 0 **B1** for [x =] – ½ and ½ or one coordinate pair correct

Question	Answer	Marks	Partial Marks
12(a)(ii)	$\left(-\frac{1}{2}, 4\right)$ Max with reason $\left(\frac{1}{2}, 2\right)$ Min with reason	**3**	**B2** for one correct with reason or **M1** for correct attempt to find e.g. 2nd derivative/gradients/sketch
12(b)	line $y = x + 3$ ruled	**M2**	**B1** for $[y =]x + 3$ identified or rules $y = x + k$ or $y = px + 3$
	–0.7 to –0.8 2.7 to 2.8	**A1**	