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MATHEMATICS**0580/22**

Paper 2 (Extended)

February/March 2022**1 hour 30 minutes**

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

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

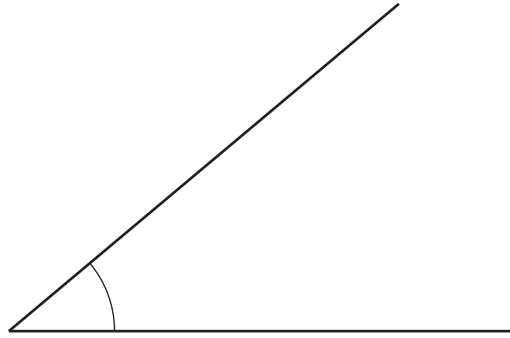
INFORMATION

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

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

2

1



Measure the marked angle.

..... [1]

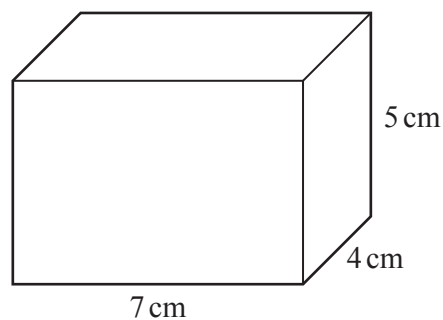
- 2 Work out $\sqrt{5} \times 6^2$.
Give your answer correct to 2 decimal places.

..... [2]

- 3 A journey starts at 21 15 one day and ends at 04 33 the next day.
Calculate the time taken, in hours and minutes.

..... h min [1]

4



NOT TO
SCALE

Calculate the **total** surface area of this cuboid.

..... cm^2 [3]

3

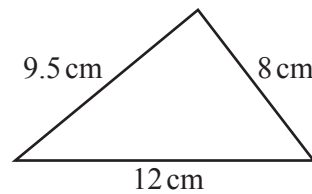
- 5 (a) Write down the gradient of the line $y = 5x + 7$.

..... [1]

- (b) Find the coordinates of the point where the line $y = 5x + 7$ crosses the y -axis.

(.....,) [1]

6



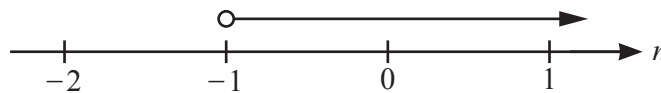
NOT TO
SCALE

Using a ruler and compasses only, construct this triangle.
Leave in your construction arcs.
The side of length 12 cm has been drawn for you.

.....

[2]

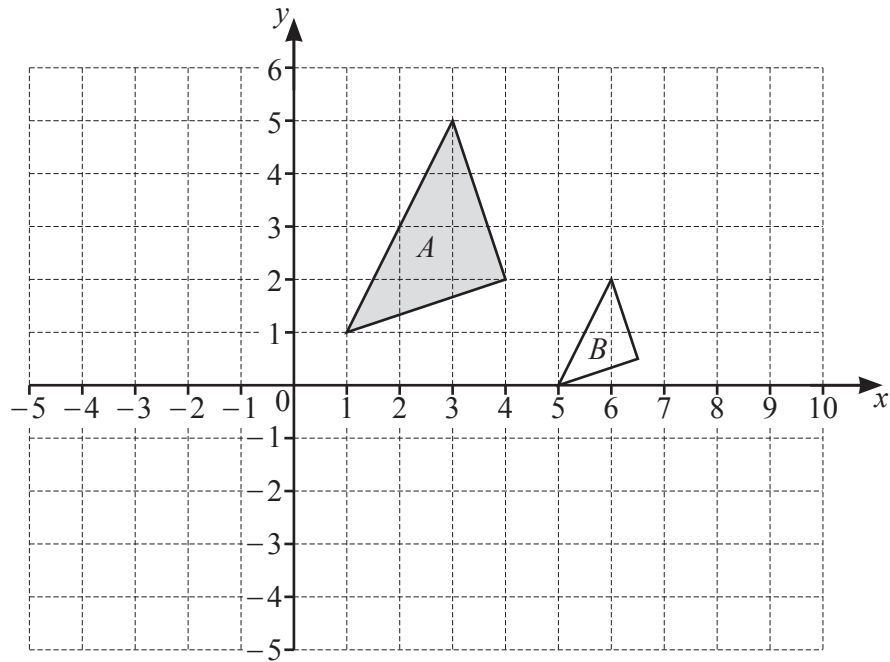
7



Write down the inequality, in terms of n , shown by the number line.

..... [1]

8



(a) On the grid, draw the image of

(i) triangle A after a reflection in the y -axis, [1]

(ii) triangle A after a translation by the vector $\begin{pmatrix} -3 \\ -4 \end{pmatrix}$. [2]

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

..... [3]

9 Factorise completely.

$$12a^3 - 21a$$

..... [2]

- 10 (a) The n th term of a sequence is $n^2 + 7$.

Find the first three terms of this sequence.

.....,, [2]

- (b) These are the first four terms of a different sequence.

15 7 - 1 -9

Find the n th term of this sequence.

..... [2]

- 11 As the temperature increases, people eat more ice cream.

What type of correlation does this statement describe?

..... [1]

- 12 (a) Sanjay invests \$700 in an account paying simple interest at a rate of 2.5% per year.

Calculate the value of his investment at the end of 6 years.

\$ [3]

- (b) Meera invests \$700 in an account paying compound interest at a rate of $r\%$ per year.
At the end of 17 years the value of her investment is \$1030.35 .

Find the value of r .

$r =$ [3]

13 (a) Simplify $h^2 \times h^5$.

..... [1]

(b) Simplify $\left(\frac{7}{x}\right)^{-3}$.

..... [1]

(c) $a^8 \div a^p = a^2$

Find the value of p .

$p =$ [1]

14 Calculate the circumference of a circle with radius 4.7 cm.

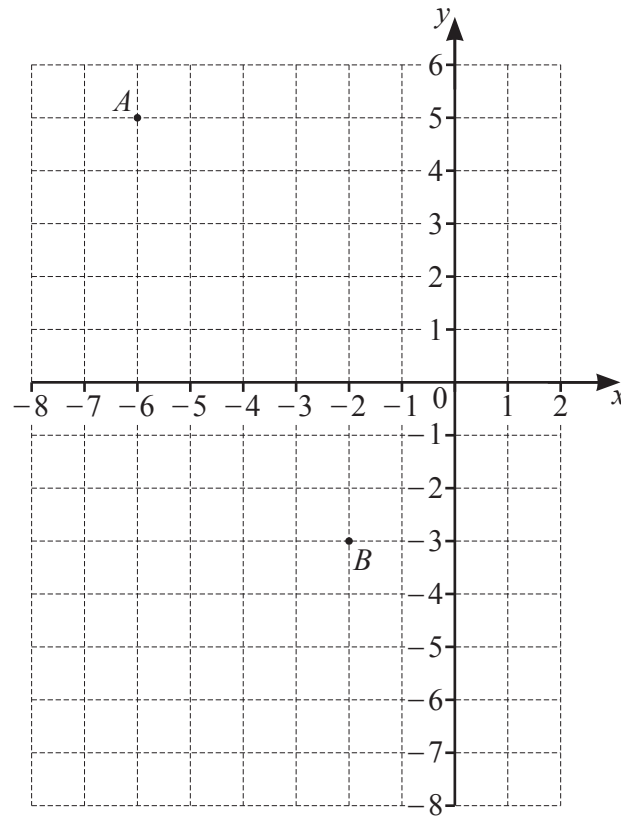
..... cm [2]

15 **Without using a calculator**, work out $2\frac{1}{3} \times \frac{11}{14}$.

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

..... [3]

16



A is the point $(-6, 5)$ and B is the point $(-2, -3)$.

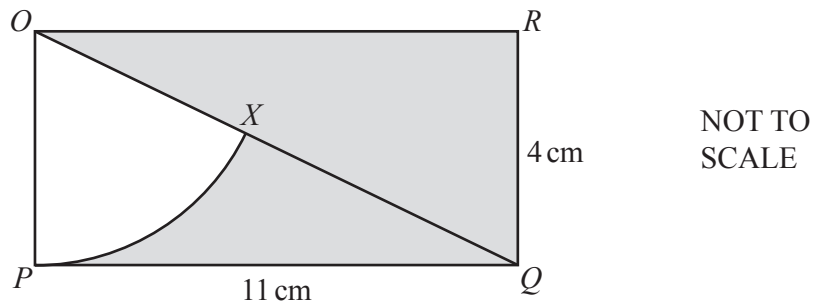
- (a) Find the equation of the straight line, l , that passes through point A and point B .
Give your answer in the form $y = mx + c$.

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

- (b) Find the equation of the line that is perpendicular to l and passes through the origin.

$\dots\dots\dots$ [2]

17



The diagram shows a rectangle $OPQR$ with length 11 cm and width 4 cm. OQ is a diagonal and OPX is a sector of a circle, centre O .

Calculate the percentage of the rectangle that is shaded.

..... % [5]

- 18** Mrs Kohli buys a jacket, 2 shirts and a hat.

The jacket costs \$ x .

The shirts each cost \$24 less than the jacket and the hat costs \$16 less than the jacket.

Mrs Kohli spends exactly \$100.

Write down an equation in terms of x .

Solve this equation to find the cost of the jacket.

\$ [3]

- 19 y is inversely proportional to the square root of $(x + 4)$.
When $x = 5$, $y = 2$.

Find y when $x = 77$.

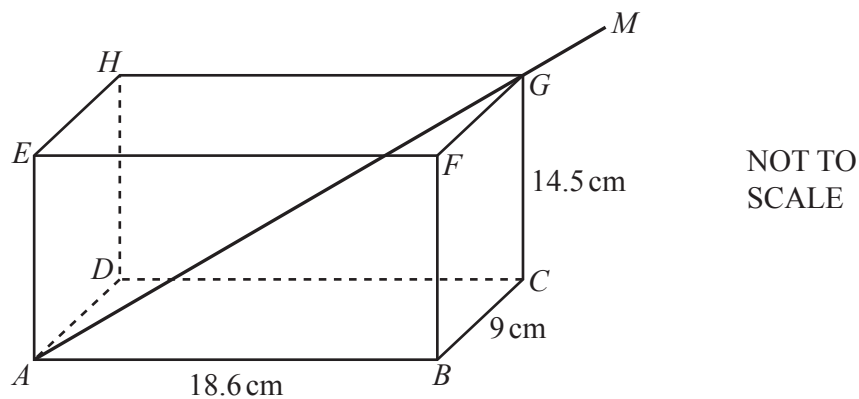
$$y = \dots\dots\dots [3]$$

- 20 Solve the simultaneous equations.
You must show all your working.

$$\begin{aligned} 3x + y &= 11 \\ x^2 - 2y &= 18 \end{aligned}$$

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

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



The diagram shows an open rectangular box $ABCDEFGH$.

$AB = 18.6$ cm, $BC = 9$ cm and $CG = 14.5$ cm.

A straight stick AGM rests against A and G and extends outside the box to M .

(a) Calculate the angle between the stick and the base of the box.

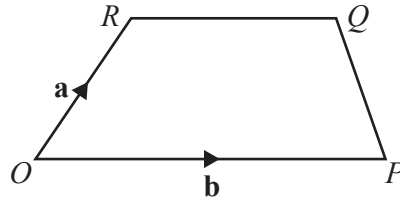
..... [4]

(b) $AM = 30$ cm.

Show that $GM = 4.8$ cm, correct to 1 decimal place.

[3]

22

NOT TO
SCALE

The diagram shows a trapezium $OPQR$.

O is the origin, $\overrightarrow{OR} = \mathbf{a}$ and $\overrightarrow{OP} = \mathbf{b}$.

$$|\overrightarrow{RQ}| = \frac{3}{5} |\overrightarrow{OP}|$$

- (a) Find \overrightarrow{PQ} in terms of \mathbf{a} and \mathbf{b} in its simplest form.

$$\overrightarrow{PQ} = \dots\dots\dots [2]$$

- (b) When PQ and OR are extended, they intersect at W .

Find the position vector of W .

$$\dots\dots\dots [2]$$

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Cambridge IGCSE™

MATHEMATICS

0580/22

Paper 2 (Extended)

February/March 2022

MARK SCHEME

Maximum Mark: 70

Published

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

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

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

Cambridge International is publishing the mark schemes for the February/March 2022 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

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

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level 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
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	40°	1	
2	80.50 cao	2	B1 for 80.498... or 80.5 or correctly rounding their more accurate decimal to 2 dp
3	7 [h] 18 [min]	1	
4	166	3	M2 for $[2 \times] (7 \times 4 + 4 \times 5 + 5 \times 7)$ or M1 for 7×4 or 4×5 or 5×7
5(a)	5	1	
5(b)	(0, 7)	1	
6	correct triangle with arcs	2	B1 for correct triangle with incorrect or no arcs or for two correct arcs. or a triangle with arcs but one side not in range
7	$n > -1$ oe	1	
8(a)(i)	triangle at $(-1, 1)$ $(-4, 2)$ $(-3, 5)$	1	
8(a)(ii)	triangle at $(-2, -3)$ $(1, -2)$ $(0, 1)$	2	B1 for translation by $\begin{pmatrix} -3 \\ k \end{pmatrix}$ or by $\begin{pmatrix} k \\ -4 \end{pmatrix}$
8(b)	enlargement [sf] $\frac{1}{2}$ [centre] $(9, -1)$	3	B1 for each
9	$3a(4a^2 - 7)$ final answer	2	B1 for $3(4a^3 - 7a)$ or $a(12a^2 - 21)$ or for $3a(4a^2 - 7)$ seen then spoilt
10(a)	8 11 16	2	B1 for two correct
10(b)	$23 - 8n$ oe final answer	2	B1 for $j - 8n$ or $23 - kn$ $k \neq 0$ or $23 - 8n$ seen then spoilt
11	Positive	1	

Question	Answer	Marks	Partial Marks
12(a)	805	3	B2 for 105 or M2 for $\frac{700 \times 2.5 \times 6}{100} + 700$ oe or M1 for $\frac{700 \times 2.5 [\times 6]}{100}$ oe
12(b)	2.3[0...]	3	M2 for $\sqrt[17]{\frac{1030.35}{700}}$ oe or M1 for $1030.35 = 700(k)^{17}$ oe for any k
13(a)	h^7 final answer	1	
13(b)	$\frac{x^3}{343}$ final answer	1	
13(c)	6	1	
14	29.5 or 29.53...	2	M1 for $2 \times \pi \times 4.7$ oe
15	$\frac{7}{3}$ oe improper fraction	M1	or $\frac{k}{3} \times \frac{11}{14}$ where $k > 3$
	$1\frac{5}{6}$ cao	A2	A1 for $\frac{77}{42}$ or $\frac{11}{6}$ or $1\frac{35}{42}$
16(a)	$[y =] -2x - 7$ final answer	2	B1 for $-2x + c$ or $kx - 7$, $k \neq 0$ final answer
16(b)	$y = \frac{1}{2}x[\pm 0]$ final answer	2	FT $-\frac{1}{\text{their gradient in (a)}}$ B1 for $y = kx[\pm 0]$ oe, $k \neq 0$ or $y = \text{their} \frac{1}{2}x + c$ oe for any c or $\text{their} \frac{1}{2}x [\pm 0]$ oe

Question	Answer	Marks	Partial Marks
17	77.8 or 77.77 to 77.80	5	<p>B4 for answer 22.2[%] or 22.20[%] to 22.23[%] OR</p> <p>M1 for $\tan^{-1} \frac{11}{4}$ oe or $\tan^{-1} \frac{4}{11}$ oe</p> <p>M2 for $4 \times 11 - \frac{\text{their acute angle}}{360} \times \pi \times 4^2$ oe</p> <p>or M1 for $\frac{\text{their acute angle}}{360} \pi \times 4^2$ oe</p> <p>M1 for $\frac{\text{their shaded area}}{4 \times 11} [\times 100]$ oe</p> <p>or $\frac{\text{their sector area}}{4 \times 11} \times 100$ oe</p>
18	A correct equation leading to 41	3	<p>M2 for $4x = 164$</p> <p>or M1 for $x + 2(x - 24) + x - 16 = 100$ oe</p> <p>or M1 for correctly simplifying <i>their</i> equation to the form $kx = c$ provided at least one part correct from $[2](x - 24)$ oe or $x - 16$</p> <p>or B1 for answer 41 without an equation in x shown</p>
19	$\frac{2}{3}$ oe	3	<p>M1 for $y = \frac{k}{\sqrt{x+4}}$</p> <p>M1 for $y = \frac{\text{their } k}{\sqrt{77+4}}$</p>

Question	Answer	Marks	Partial Marks
20	$x^2 + 6x - 40 [=0]$ or $y^2 - 40y - 41 [=0]$	M2	M1 for correct method to eliminate one variable e.g. $x^2 - 2(11 - 3x) = 18$ or $\frac{(11 - y)^2}{3^2} - 2y = 18$
	$(x - 4)(x + 10) [=0]$ or $(y - 41)(y + 1) [=0]$	M1	or for correct factors for <i>their</i> quadratic equation or for correct use of quadratic formula for <i>their</i> quadratic equation or for correctly completing the square for <i>their</i> quadratic equation
	$x = 4, y = -1$ $x = -10, y = 41$	B2	B1 for $x = 4, x = -10$ or for $y = -1, y = 41$ or for a correct pair of x and y values If B0 scored and at least 1 method mark scored SC1 for correct substitution shown of both of <i>their</i> x values or <i>their</i> y values into $3x + y = 11$ or $x^2 - 2y = 18$
21(a)	35.1 or 35.05 to 35.06	4	M3 for $\tan = \frac{14.5}{\sqrt{18.6^2 + 9^2}}$ oe or M2 for $[AC^2 =] 18.6^2 + 9^2$ oe or better or $[AG^2 =] 18.6^2 + 9^2 + 14.5^2$ or M1 for recognising the angle GAC

Question	Answer	Marks	Partial Marks
21(b)	$30 - \sqrt{18.6^2 + 9^2 + 14.5^2}$ $30 - \frac{14.5}{\sin(\text{their}(\mathbf{a}))}$ or $30 - \frac{\sqrt{18.6^2 + 9^2}}{\cos(\text{their}(\mathbf{a}))}$	M2	M1 for $AG^2 = 18.6^2 + 9^2 + 14.5^2$ oe or better or $\sin(\text{their}(\mathbf{a})) = \frac{14.5}{AG}$ or $\cos(\text{their}(\mathbf{a})) = \frac{\sqrt{18.6^2 + 9^2}}{AG}$
	4.75 to 4.78...	A1	
22(a)	$a - \frac{2}{5}b$ oe simplified	2	M1 for $-b + a + \frac{3}{5}b$ or a correct route
22(b)	$\frac{5}{2}a$ oe	2	B1 for ka where $k > 1$ or $\frac{5}{2}\overline{OR}$



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MATHEMATICS**0580/42**

Paper 4 (Extended)

February/March 2022**2 hours 30 minutes**

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

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

INFORMATION

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

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

- 1 A company employed 300 workers when it started and now employs 852 workers.

(a) Calculate the percentage increase in the number of workers.

..... % [2]

(b) Of the 852 workers, the ratio part-time workers : full-time workers = 5 : 7.

Calculate the number of full-time workers.

..... [2]

(c) The company makes 40 600 headphones in one year.

Write this number

(i) in words,

..... [1]

(ii) in standard form.

..... [1]

(d) In one month, the company sells 3 000 headphones.

Of these, 48% are exported, $\frac{3}{8}$ are sold to shops and the rest are sold online.

Calculate the number of headphones that are sold online.

..... [3]

3

- (e) One year, sales increased by 15%.
The following year sales increased by 18%.

Calculate the overall percentage increase in sales.

..... % [3]

- 2 The table shows some values for $y = x^2 - \frac{1}{3x}$, $x \neq 0$.
The y -values are rounded to 1 decimal place.

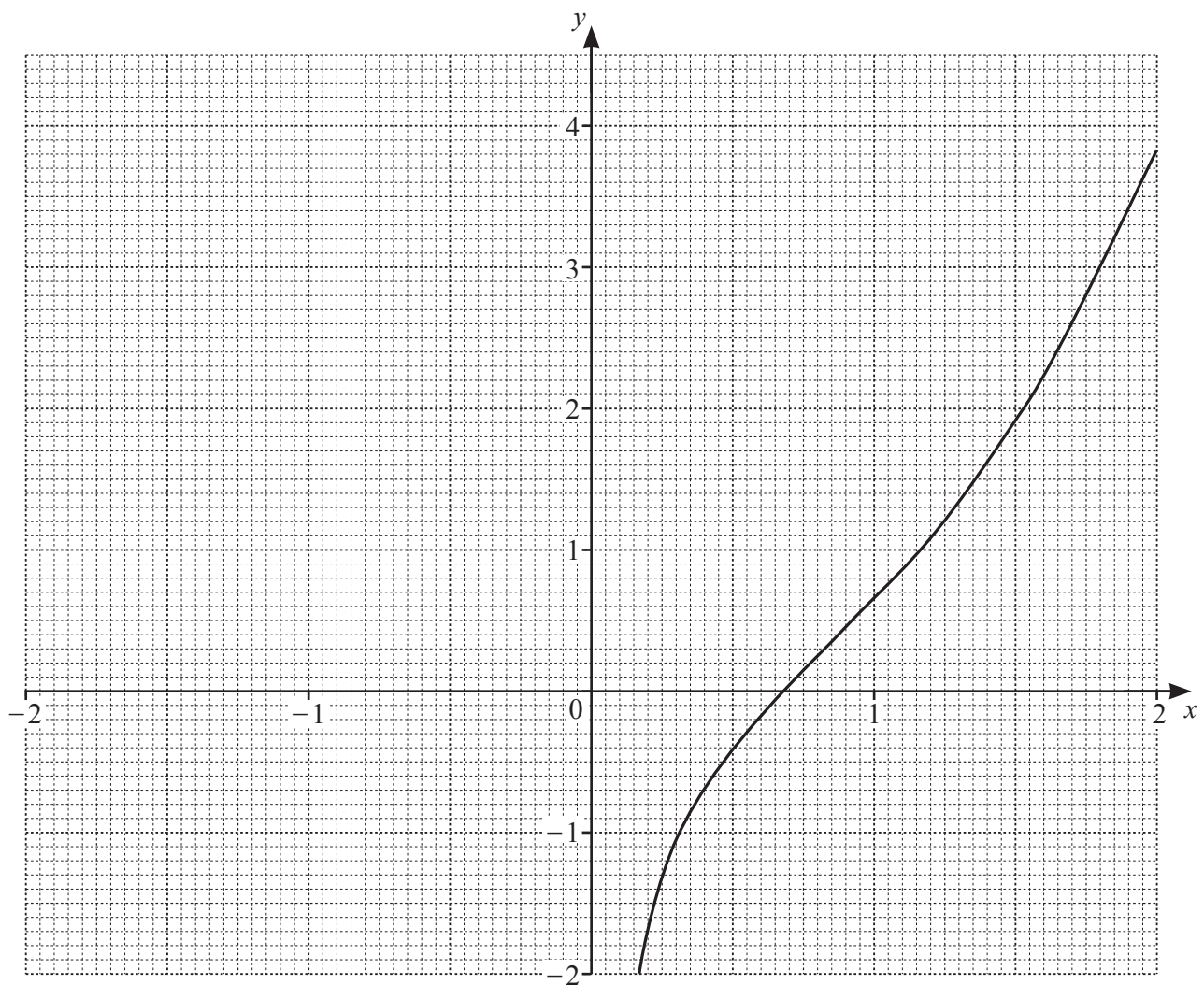
x	-2	-1.5	-1	-0.75	-0.5	-0.25	-0.1
y	4.2	2.5	1.3			1.4	3.3

(a) Complete the table.

[2]

(b) On the grid, draw the graph of $y = x^2 - \frac{1}{3x}$ for $-2 \leq x \leq -0.1$.

The graph of $y = x^2 - \frac{1}{3x}$ for $x > 0$ has been drawn for you.



[4]

(c) By drawing a suitable line on the grid, solve the equation $x^2 - \frac{1}{3x} + 1 = 0$.

$x =$ [2]

3

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

$$g(x) = x^2$$

(a) Find

(i) $gf(3)$,

..... [2]

(ii) $fg(x)$,

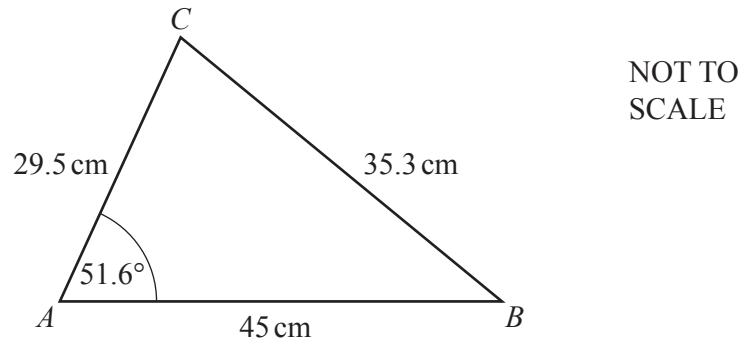
..... [1]

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

..... [1]

(b) Find the value of x when $f(x) = 15$. $x =$ [2]

4 (a)



In triangle ABC , $AB = 45$ cm, $AC = 29.5$ cm, $BC = 35.3$ cm and angle $CAB = 51.6^\circ$.

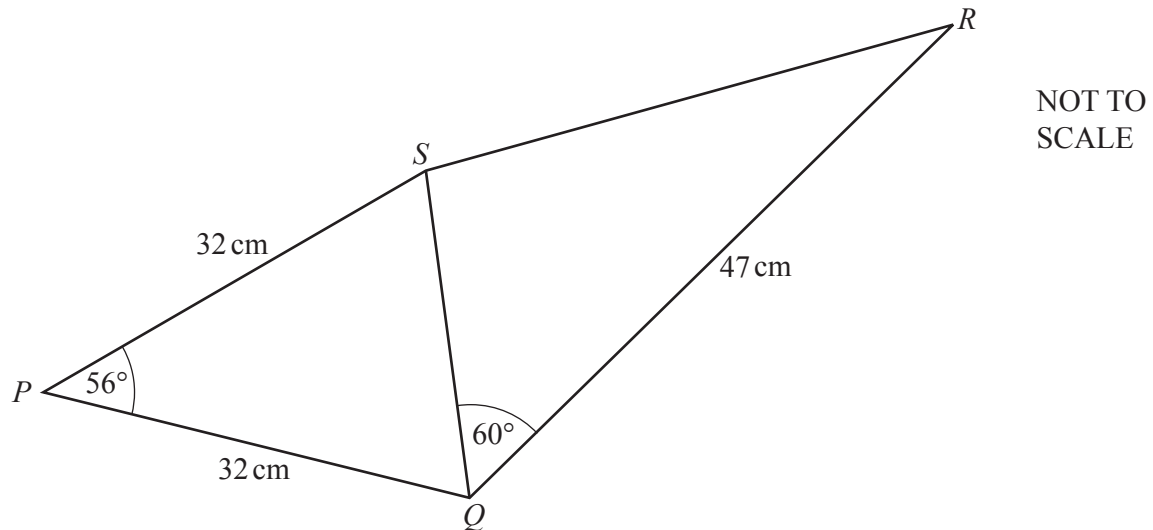
(i) Calculate angle ABC .

Angle $ABC = \dots\dots\dots$ [3]

(ii) Calculate the area of triangle ABC .

$\dots\dots\dots$ cm^2 [2]

(b)

NOT TO
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The diagram shows a quadrilateral $PQRS$ formed from two triangles, PQS and QRS . Triangle PQS is isosceles, with $PQ = PS = 32$ cm and angle $SPQ = 56^\circ$. $QR = 47$ cm and angle $SQR = 60^\circ$.

(i) Calculate SR .

$SR = \dots\dots\dots$ cm [4]

(ii) Calculate the shortest distance from P to SQ .

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

- 5 The table shows information about the mass, m grams, of each of 120 letters.

Mass (m grams)	$0 < m \leq 50$	$50 < m \leq 100$	$100 < m \leq 200$	$200 < m \leq 500$
Frequency	43	31	25	21

- (a) Calculate an estimate of the mean mass.

..... g [4]

- (b) Iraj draws a histogram to show this information.
He makes the height of the first bar 17.2 cm.

Calculate the height of each of the remaining bars.

height of bar for $50 < m \leq 100$ cm

height of bar for $100 < m \leq 200$ cm

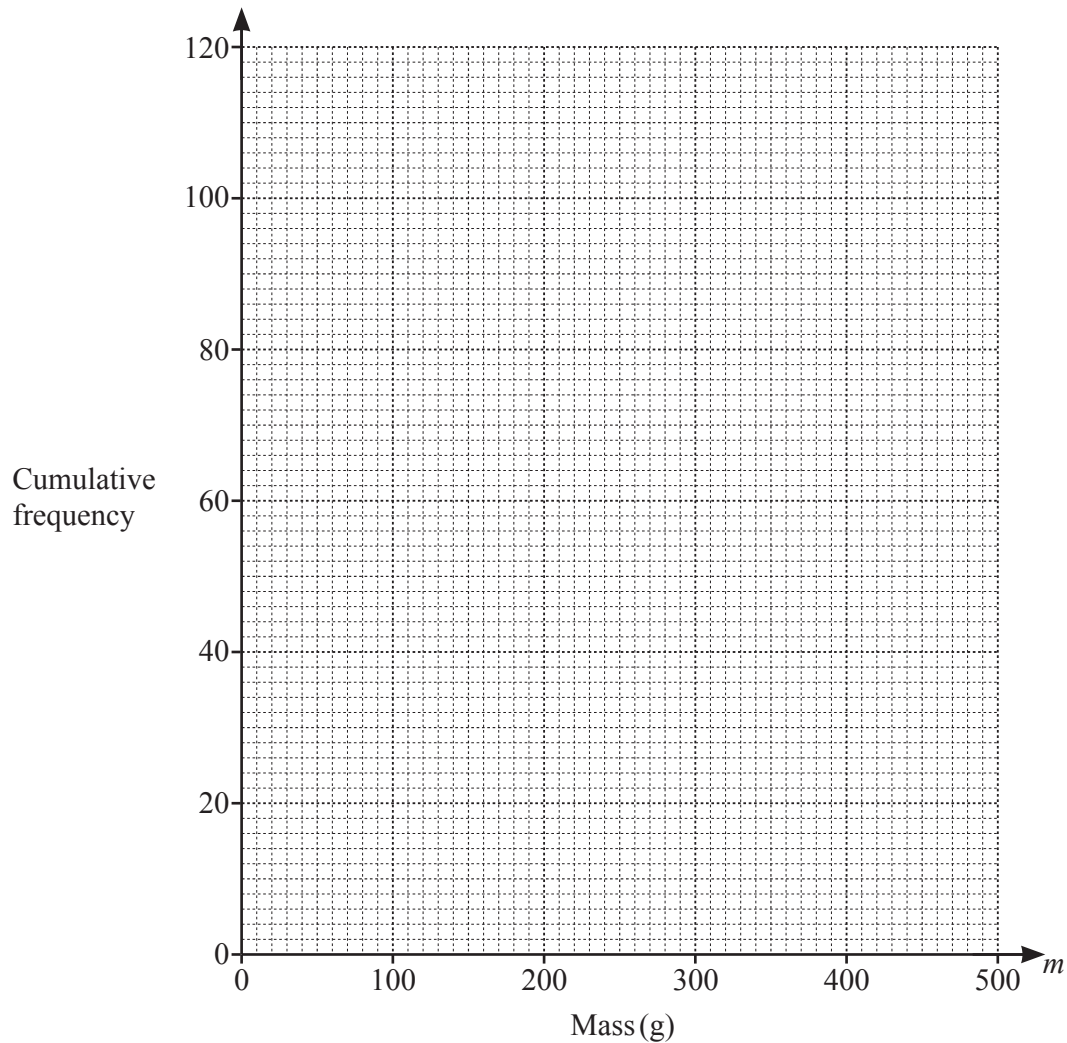
height of bar for $200 < m \leq 500$ cm [3]

- (c) Complete the cumulative frequency table.

Mass (m grams)	$m \leq 50$	$m \leq 100$	$m \leq 200$	$m \leq 500$
Cumulative frequency				

[2]

(d) Draw a cumulative frequency diagram.



[3]

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

(i) the median,

..... g [1]

(ii) the upper quartile,

..... g [1]

(iii) the 40th percentile,

..... g [2]

(iv) the number of letters with a mass m where $250 < m \leq 400$.

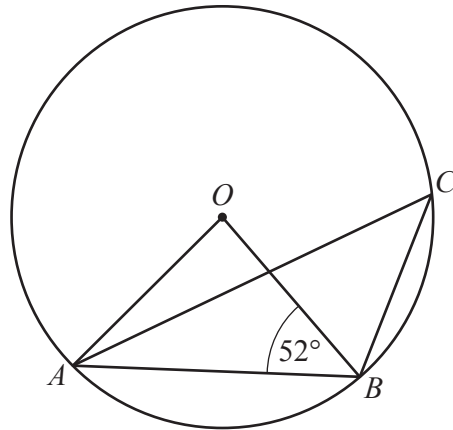
..... [2]

- 6 (a) The interior angle of a regular polygon is 156° .

Calculate the number of sides of this polygon.

..... [2]

(b)



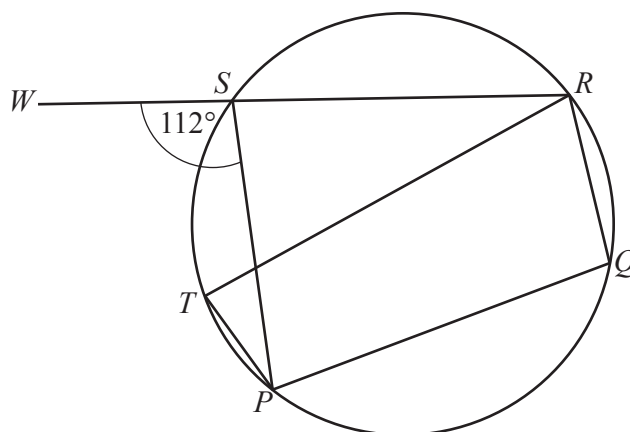
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SCALE

A , B and C lie on a circle, centre O .
Angle $OBA = 52^\circ$.

Calculate angle ACB .

Angle $ACB =$ [2]

(c)



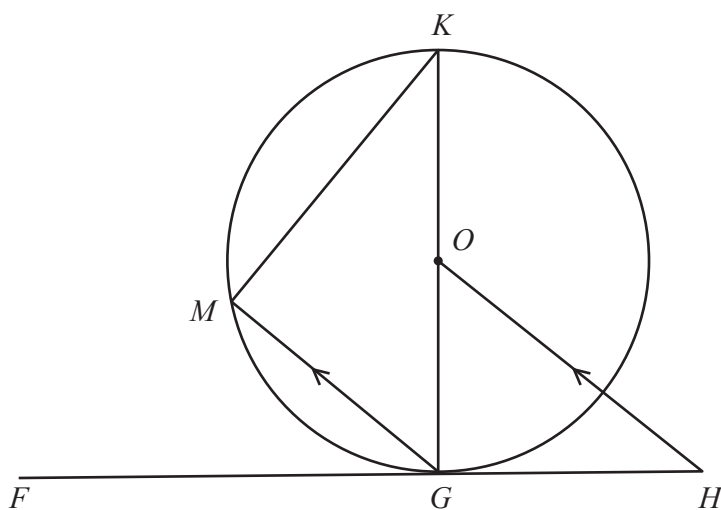
NOT TO
SCALE

P, Q, R, S and T lie on a circle.
 WSR is a straight line and angle $WSP = 112^\circ$.

Calculate angle PTR .

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

(d)



NOT TO
SCALE

G, K and M lie on a circle, centre O .
 FGH is a tangent to the circle at G and MG is parallel to OH .

Show that triangle GKM is mathematically similar to triangle OHG .
Give a geometrical reason for each statement you make.

.....

.....

.....

.....

.....

[4]

7 Two rectangular picture frames are mathematically similar.

- (a) The areas of the frames are 350 cm^2 and 1134 cm^2 .
The width of the smaller frame is 17.5 cm.

Calculate the width of the larger frame.

..... cm [3]

- (b) A picture in the smaller frame has length 15 cm and width 10.5 cm, both correct to the nearest 5 mm.

Calculate the upper bound for the area of this picture.

..... cm^2 [2]

- (c) In a sale, the price of a large frame is reduced by 18%.
Parthi pays \$166.05 for 5 large frames in the sale.

Calculate the original price of one large frame.

\$ [2]

- (d) Parthi advertises a large frame for a price of \$57 or 48.20 euros.
The exchange rate is \$1 = 0.88 euros.

Calculate the difference between these prices, in dollars and cents, correct to the nearest cent.

\$ [3]

- 8 Darpan runs a distance of 12 km and then cycles a distance of 26 km. His running speed is x km/h and his cycling speed is 10 km/h faster than his running speed. He takes a total time of 2 hours 48 minutes.

- (a) An expression for the time, in hours, Darpan takes to run the 12 km is $\frac{12}{x}$.

Write an equation, in terms of x , for the total time he takes in hours.

..... [3]

- (b) Show that this equation simplifies to $7x^2 - 25x - 300 = 0$.

[4]

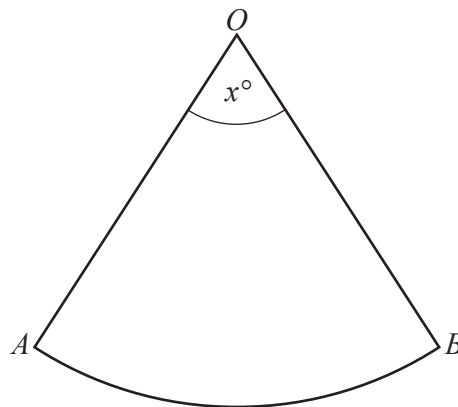
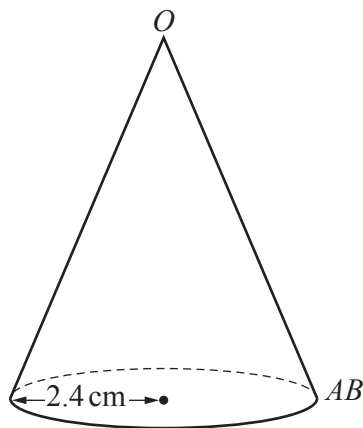
- (c) Use the quadratic formula to solve $7x^2 - 25x - 300 = 0$.
You must show all your working.

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

- (d) Calculate the number of minutes Darpan takes to run the 12 km.

..... min [2]

9 (a)

NOT TO
SCALE

The volume of a paper cone of radius 2.4 cm is 95.4 cm^3 .

The paper is cut along the slant height from O to AB .

The cone is opened to form a sector OAB of a circle with centre O .

Calculate the sector angle x° .

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

..... [6]

- (b) An empty fuel tank is filled using a cylindrical pipe with diameter 8 cm.
Fuel flows along this pipe at a rate of 2 metres per second.
It takes 24 minutes to fill the tank.

Calculate the capacity of the tank.

Give your answer in litres.

..... litres [4]

10 (a) Expand and simplify.

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

..... [3]

(b) Make g the subject of the formula.

$$M = \frac{2fg}{g-c}$$

$g =$ [4]

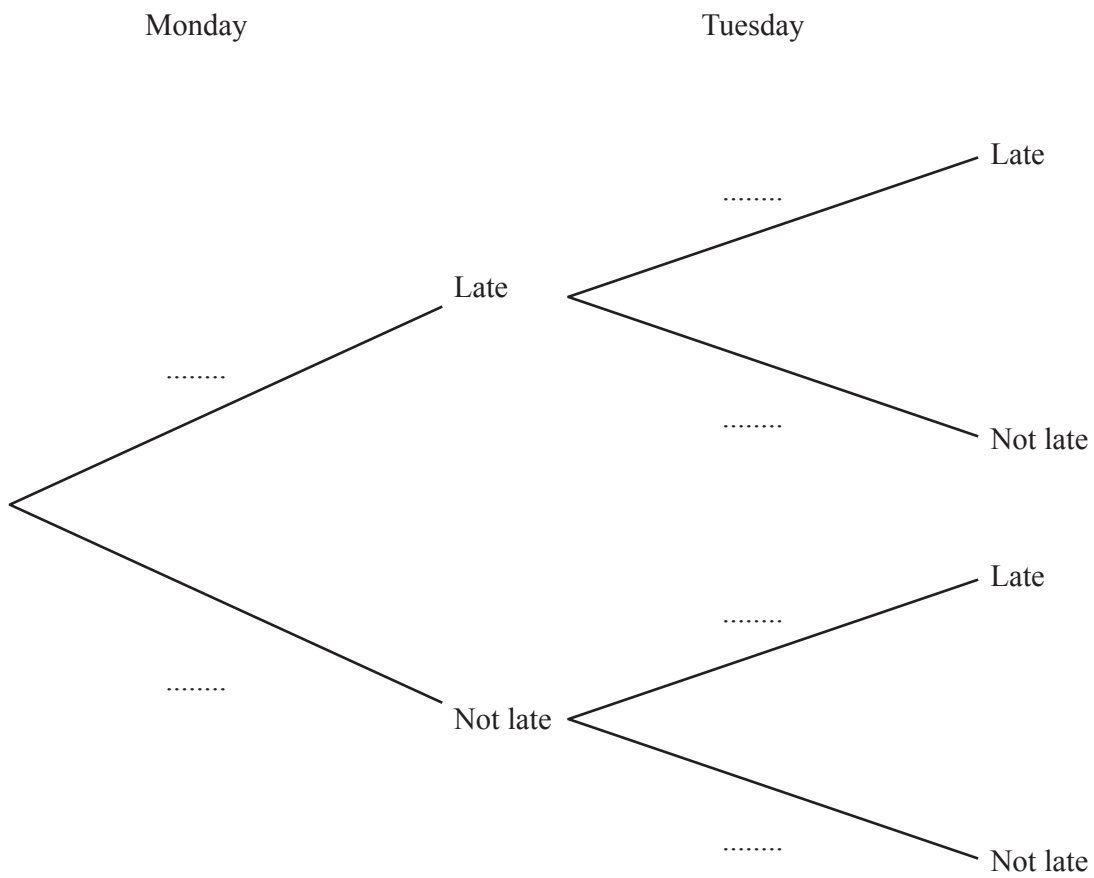
(c) Simplify.

$$\frac{4x^2 - 16x}{x^2 - 16}$$

..... [3]

11 (a) The probability that Shalini is late for school on any day is $\frac{1}{6}$.

(i) Complete the tree diagram for Monday and Tuesday.

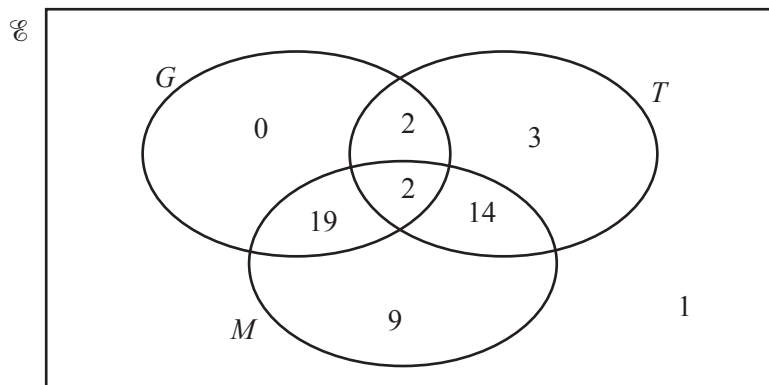


[2]

(ii) Calculate the probability that Shalini is late on Monday but is not late on Tuesday.

..... [2]

- (b) The Venn diagram shows the number of students in a group of 50 students who wear glasses (G), who wear trainers (T) and who have a mobile phone (M).



- (i) Use set notation to describe the region that contains only one student.

- (ii) Find $n(T' \cap (G \cup M))$.

..... [1]

..... [1]

- (iii) One student is picked at random from the 50 students.

Find the probability that this student wears trainers but does not wear glasses.

..... [1]

- (iv) Two students are picked at random from those wearing trainers.

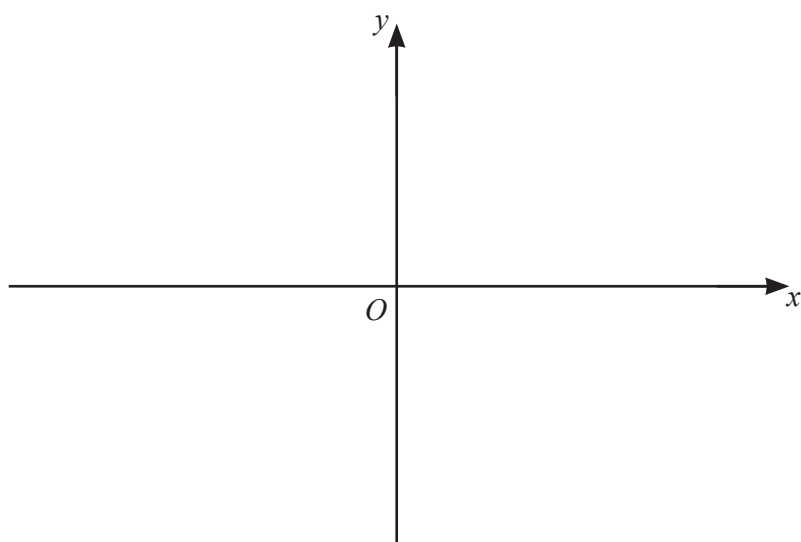
Find the probability that both students have mobile phones.

..... [3]

12 (a) Solve the equation $\tan x = 11.43$ for $0^\circ \leq x \leq 360^\circ$.

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

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



[3]

- (c) A curve has equation $y = x^3 + ax + b$.
The stationary points of the curve have coordinates $(2, k)$ and $(-2, 10 - k)$.

Work out the value of a , the value of b and the value of k .

$a = \dots\dots\dots$, $b = \dots\dots\dots$, $k = \dots\dots\dots$ [6]

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Cambridge IGCSE™

MATHEMATICS

0580/42

Paper 4 (Extended)

February/March 2022

MARK SCHEME

Maximum Mark: 130

Published

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

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

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

Cambridge International is publishing the mark schemes for the February/March 2022 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **10** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level 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
nfw	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	184	2	M1 for $\frac{852-300}{300}[\times 100]$ oe or for $\frac{852}{300}\times 100[-100]$ oe
1(b)	497	2	M1 for $\frac{852}{5+7}\times k$ oe where $k = 1, 5$ or 7
1(c)(i)	Forty thousand six hundred	1	
1(c)(ii)	4.06×10^4	1	
1(d)	435	3	M2 for $3000\times\left(1-\frac{48}{100}-\frac{3}{8}\right)$ oe or B2 for 2565, or 1440 and 1125 or 1875 and 1440 or 1560 and 1125 or M1 for $1-\frac{48}{100}-\frac{3}{8}$ or $3000\times\left(\frac{48}{100}+\frac{3}{8}\right)$ oe or B1 for 1440 or 1125 or 1560 or 1875 If 0 scored SC1 for answer 975
1(e)	35.7	3	M2 for $\frac{100+15}{100}\times\frac{100+18}{100}[-1]$ oe or better or M1 for $k\times\frac{100+15}{100}\times\frac{100+18}{100}$ oe
2(a)	1[.0] 0.9	2	B1 for each
2(b)	correct curve 	4	B3 FT for 6 or 7 points B2 FT for 4 or 5 points B1 FT for 2 or 3 points

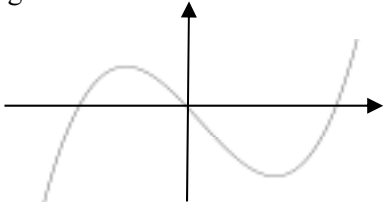
Question	Answer	Marks	Partial Marks
2(c)	ruled line at $y = -1$	B1	
	0.3 to 0.32	B1	
3(a)(i)	169	2	M1 for $g(13)$ or $(1+4x)^2$ or better
3(a)(ii)	$1+4x^2$ final answer	1	
3(a)(iii)	x	1	
3(b)	3.5 or $\frac{7}{2}$	2	M1 for $1+4x=15$
4(a)(i)	40.9 or 40.91...	3	M2 for $[\sin ABC = \frac{29.5 \sin 51.6}{35.3}]$ oe or for $[\cos ABC = \frac{35.3^2 + 45^2 - 29.5^2}{2 \times 35.3 \times 45}]$ or M1 for $\frac{29.5}{\sin ABC} = \frac{35.3}{\sin 51.6}$ oe or for correct implicit cosine rule
4(a)(ii)	520 or 520.0 to 520.2...	2	FT <i>their</i> (a)(i) if used provided working shown M1 for $0.5 \times 29.5 \times 45 \times \sin 51.6$ oe or for $0.5 \times 35.3 \times 45 \times \sin(\text{their(a)(i)})$ or for $0.5 \times 35.3 \times 29.5 \sin(180 - 51.6 - \text{their(a)(i)})$
4(b)(i)	41.2 or 41.21 to 41.23	4	M1 for $SQ = 2 \times 32 \times \sin\left(\frac{1}{2} \times 56\right)$ oe or $\sqrt{32^2 + 32^2 - 2 \times 32 \times 32 \times \cos 56}$ oe or $\frac{32 \sin 56}{\sin((180 - 56) \div 2)}$ oe M2 for $SR^2 = 47^2 + (\text{their } SQ^2) - 2 \times 47 \times \text{their } SQ \times \cos 60$ or M1 for implicit form
4(b)(ii)	28.3 or 28.25 to 28.29...	3	M2 for $32 \times \sin 62$ oe or M1 for recognition that line from P is perpendicular to SQ
5(a)	121 or 120.8... or $120 \frac{5}{6}$	4	M1 for midpoints soi M1 for use of $\sum fx$ with x in correct interval including both boundaries but not if x is 50, 50, 100 and 300 M1 (dep on 2nd M1) for $\sum fx \div 120$

Question	Answer	Marks	Partial Marks
5(b)	12.4 5 1.4	3	B1 for each If 0 scored SC1 for fd's [0.86,] 0.62, 0.25 and 0.07 oe
5(c)	43 74 99 120	2	B1 for 2 or 3 correct
5(d)	Correct diagram	3	B1 for correct horizontal placement for 4 plots B1FT for correct vertical placement for 4 plots B1FT dep on at least B1 for reasonable increasing curve or polygon through <i>their</i> 4 points If 0 scored SC1 FT for 3 out of 4 points correctly plotted
5(e)(i)	Strict FT <i>their</i> median reading	1	
5(e)(ii)	Strict FT <i>their</i> UQ reading	1	
5(e)(iii)	Strict FT <i>their</i> reading at 40th percentile	2	B1 for 48 written or mark at cf = 48 on graph
5(e)(iv)	Strict FT <i>their</i> reading at 400 – <i>their</i> reading at 250	2	B1 for either correct reading at 250 or 400
6(a)	15	2	M1 for $\frac{360}{180-156}$ or for $\frac{180(n-2)}{n} = 156$ oe
6(b)	38	2	B1 for $AOB = 76$
6(c)	68	2	B1 for $RSP = 68$ or $RQP = 112$

Question	Answer	Marks	Partial Marks
6(d)	Two pairs of equal angles identified with fully correct reasons	M3	<p>M2 for one pair of equal angles identified with fully correct reasons</p> <p>$KMG = 90$ angle in semicircle and $OGH = 90$ angle between tangent and radius</p> <p>OR</p> <p>$KMG = OGH$ alternate segment</p> <p>OR</p> <p>$GOH = MGK$ alternate angles</p> <p>OR</p> <p>Angle $FGM =$ angle GHO corresponding and angle $FGM = GKM$ alternate segment and angle $H =$ angle K</p> <p>or M1 for $KMG = 90$, angle in semicircle or $OGH = 90$, angle between tangent and radius</p>
	Two or three pairs of angles equal [so similar] oe	A1	Dep on M3 with no incorrect work seen
7(a)	31.5	3	<p>M2 for $17.5 \times \sqrt{\frac{1134}{350}}$ oe</p> <p>or M1 for $\sqrt{\frac{1134}{350}}$ oe isw or $\sqrt{\frac{350}{1134}}$ oe isw</p> <p>or for $\frac{1134}{350} = \left(\frac{x}{17.5}\right)^2$ oe</p>
7(b)	163.9375 or $163\frac{15}{16}$ final answer	2	B1 for $15 + 0.25$ or $10.5 + 0.25$ or better seen
7(c)	40.5[0]	2	M1 for $x \times \left(1 - \frac{18}{100}\right) = \frac{166.05}{[5]}$ oe
7(d)	\$2.23 final answer	3	<p>B2 for 2.227... or 2.23 seen</p> <p>OR</p> <p>M2 for $57 - \frac{48.2}{0.88}$ oe</p> <p>or M1 for $\frac{48.2}{0.88}$ oe</p> <p>If 0 scored SC1 for 57×0.88 oe seen</p>

Question	Answer	Marks	Partial Marks
8(a)	$\frac{12}{x} + \frac{26}{x+10} = 2.8$ oe isw	3	B2 for $\frac{12}{x} + \frac{26}{x+10}$ oe isw OR B1 for $\frac{26}{x+10}$ seen B1 for time = 2.8 or $\frac{168}{60}$ or $2\frac{48}{60}$ oe
8(b)	$12(x+10) + 26x = 2.8x(x+10)$ or better	M2	FT <i>their</i> time, provided 2 algebraic fractions one in x and other in $\pm x \pm 10$ M1 for $12(x+10) + 26x$ seen or better
	$12x + 120 + 26x = 2.8x^2 + 28x$	M1	FT <i>their</i> equation dep on M2
	$2.8x^2 - 10x - 120 = 0$ oe or $30x + 300 + 65x = 7x^2 + 70x$ or better leading to $7x^2 - 25x - 300 = 0$	A1	with no errors or omissions
8(c)	$\frac{[-]25 \pm \sqrt{([-]25)^2 - 4 \times 7 \times -300}}{2 \times 7}$ oe	B2	B1 for $\sqrt{([-]25)^2 - 4(7)(-300)}$ or better or for $\frac{[-]25 + \sqrt{q}}{2 \times 7}$ or $\frac{[-]25 - \sqrt{q}}{2 \times 7}$
	- 5 and 8.57 or 8.571...	B2	B1 for each or SC1 for final answers 5 and -8.57
8(d)	84 to 84.01...	2	FT $\frac{720}{\text{their positive answer}}$ to 3 sf or better M1 for $\frac{12}{\text{their positive answer}} [\times 60]$ oe
9(a)	54[.0] or 53.99 to 54.03...	6	M2 for $[h =] 95.4 \times 3 \div (\pi \times 2.4^2)$ oe or M1 for $95.4 = \frac{1}{3} \times \pi \times 2.4^2 \times h$ M2 for [slant ht, $l =] \sqrt{(\text{their } h)^2 + 2.4^2}$ or M1 for $(\text{their } h)^2 + 2.4^2$ M1 for $\frac{x}{360} \times 2 \times \pi \times \text{their } l = 2 \times \pi \times 2.4$ oe or $\frac{x}{360} \times \pi \times (\text{their } l)^2 = \pi \times 2.4 \times \text{their } l$

Question	Answer	Marks	Partial Marks
9(b)	14500 or 14470 to 14480	4	M3 for $200 \times 60 \times 24 \times \pi \times 4^2 [\div 1000]$ or $2 \times 60 \times 24 \times \pi \times 0.04^2 [\times 1000]$ or M2 for $200 \times \pi \times 4^2$ or for $2 \times \pi \times 0.04^2$ or M1 for $\pi \times 4^2$ oe or $\pi \times 0.04^2$ seen oe isw or $1000 \text{ cm}^3 = 1 \text{ litre}$ soi or $1 \text{ m}^3 = 1000 \text{ litres}$ soi or for 24×60 seen oe
10(a)	$x^3 + 2x^2 - 5x - 6$ final answer	3	B2 for correct expansion of three brackets unsimplified or for simplified expression of correct form with 3 out of 4 terms correct or B1 for correct expansion of 2 of the 3 given brackets with at least 3 terms out of four correct
10(b)	$\frac{Mc}{M-2f}$ or $\frac{-Mc}{2f-M}$ final answer	4	M1 for clearing $g - c$ from denominator e.g. $M(g - c) = 2fg$ M1 for correctly isolating terms in g in numerator on one side M1 for correctly factorising or simplifying, to single term in g in an equation M1 for correctly dividing by bracket to final answer
10(c)	$\frac{4x}{x+4}$ final answer	3	B1 for $4x(x - 4)$ B1 for $(x + 4)(x - 4)$
11(a)(i)	$\frac{1}{6}$ oe on all late branches $\frac{5}{6}$ oe on all not late branches	2	B1 for one correct vertical pair $\frac{1}{6}$ oe and $\frac{5}{6}$ oe
11(a)(ii)	$\frac{5}{36}$ oe	2	FT <i>their</i> tree M1 for <i>their</i> $\frac{1}{6} \times \text{their } \frac{5}{6}$
11(b)(i)	$(G \cup T \cup M)'$ oe	1	
11(b)(ii)	28	1	
11(b)(iii)	$\frac{17}{50}$ oe	1	

Question	Answer	Marks	Partial Marks
11(b)(iv)	$\frac{4}{7}$ oe	3	M2 for $\frac{16}{21} \times \frac{15}{20}$ or M1 for $\frac{n}{21} \times \frac{n-1}{20}$ or for $\frac{16}{21}$ and $\frac{15}{20}$ seen If 0 scored SC1 for answer $\frac{256}{441}$ oe
12(a)	85[.0], 265[.0] and no others	2	B1 for each If 0 scored SC1 for two values in the range with a difference of 180 but not multiples of 90
12(b)	correct shape and passes through origin 	3	B1 for any positive cubic shape B1 for sketch with one max and one min and with 3 roots including zero If 0 scored, SC1 for $x(x+2)(x-2)$ soi
12(c)	$a = -12$ $b = 5$ $k = -11$	6	B5 for 2 correct OR B2 for $3x^2 + a$ or B1 for $3x^2$ isw M1dep on at least B1 for <i>their</i> $\frac{dy}{dx} = 0$ M1dep on at least B1M1 for $x = 2$ or $x = -2$ substituted in <i>their</i> $\frac{dy}{dx} = 0$ equation M1 for $k = 2^3 + 2 \times \text{their } a + b$ and $10 - k = (-2)^3 + (-2) \times \text{their } a + b$