Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

3190611897

MATHEMATICS **0580/22**

Paper 2 (Extended) **February/March 2021**

1 hour 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

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

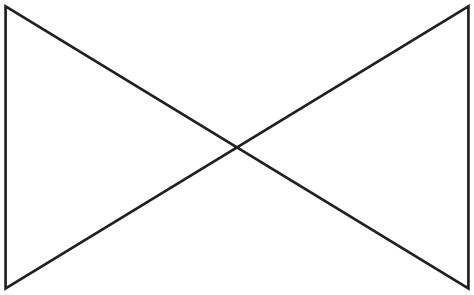
INFORMATION

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

This document has **12** pages.

[Turn over

1



(a) Complete this statement.

The diagram has rotational symmetry of order ..... [1]

(b) On the diagram, draw all the lines of symmetry. [2]

2 Sahil and Anika share \$78 in the ratio 5 : 8.

Calculate the amount each receives.

Sahil \$ .....

Anika \$ ..... [2]

3 The number of passengers on a bus is recorded each day for 14 days.

15	18	22	17	35	38	24
19	19	24	25	31	36	29

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

1	
2	
3	

Key: 1 | 5 represents 15 passengers

[2]

(b) Find the median.

..... [1]

4 By writing each number correct to 1 significant figure, find an estimate for the value of

$$\frac{2.8 \times 82.6}{27.8 - 13.9}.$$

..... [2]

5 The number of bowls of hot soup sold decreases when the temperature rises.

What type of correlation does this statement describe?

..... [1]

6 Joseph spends $\frac{5}{24}$ of one week's earnings to buy a jacket.
The cost of the jacket is \$56.50 .

Calculate the amount Joseph earns in a week.

\$ ..... [2]

7 **Without using a calculator,** work out $2\frac{1}{4} \times 3\frac{2}{3}$.

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

..... [3]

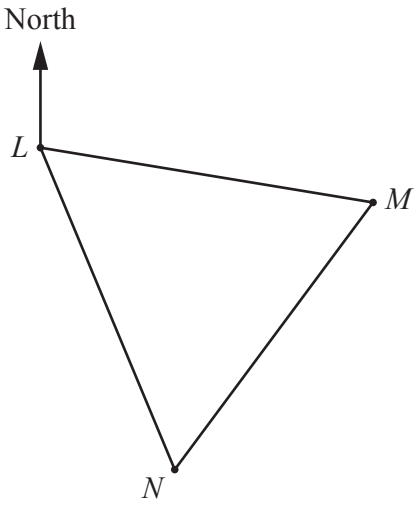
8 Write $0.\dot{3}\dot{7}$ as a fraction.

..... [1]

9 Calculate $4.8 \times 10^6 + 3.7 \times 10^7$.
Give your answer in standard form.

..... [1]

10



NOT TO SCALE

On a map, the positions of the towns L, M and N form an equilateral triangle.
The bearing of M from L is 103°.

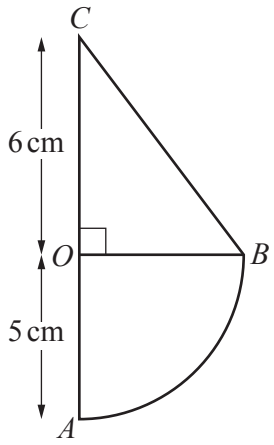
Work out the bearing of L from N.

..... [2]

11 Find the highest common factor (HCF) of 36 and 84.

..... [2]

12



NOT TO SCALE

The diagram shows a shape made from a quarter-circle, OAB, and a right-angled triangle OBC. The radius of the circle is 5 cm and $OC = 6$ cm.

Calculate the area of the shape.

..... cm^2 [3]

13 The population of one variety of butterfly is decreasing exponentially at a rate of 34% per year. At the end of 2014, the population was 125.9 million.

Calculate the population at the end of 2019.

..... million [2]

14 **(a)** These are the first four terms of a sequence.

29 22 15 8

Write down the next two terms.

..... , ... [2]

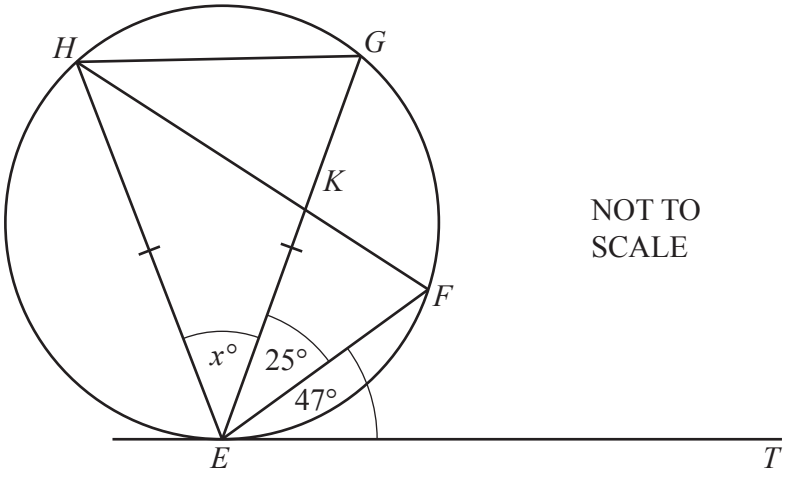
(b) These are the first five terms of another sequence.

4 7 12 19 28

Find the nth term.

..... [2]

15

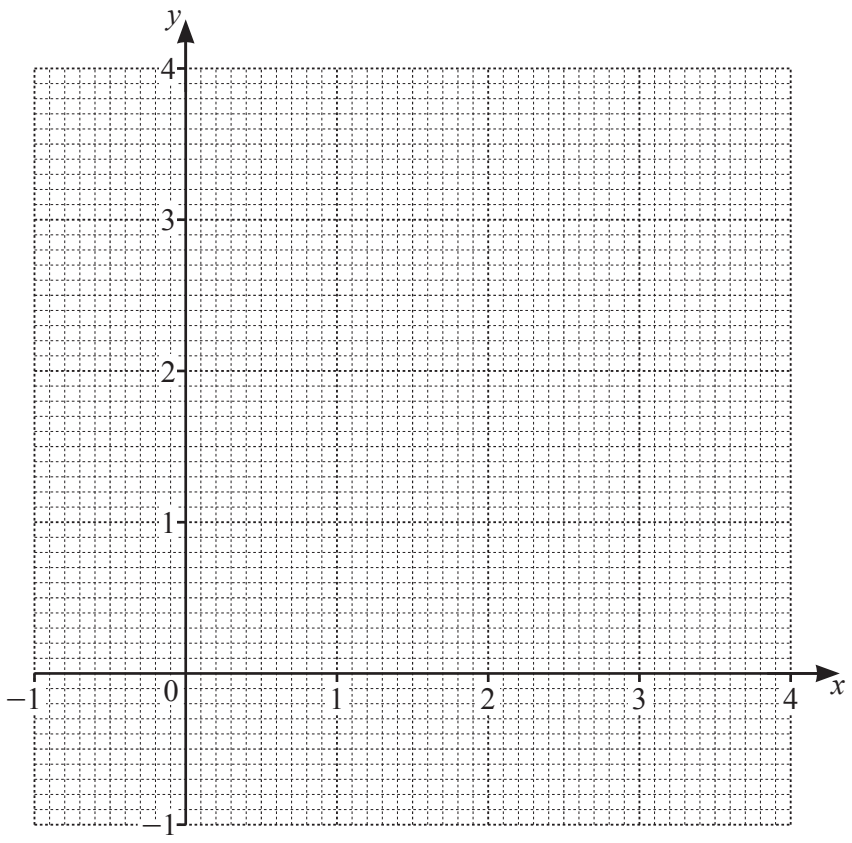


Points E, F, G and H lie on the circle and $EG = EH$.
HF and EG intersect at K.
ET is a tangent to the circle at E.
Angle $FET = 47°$ and angle $FEG = 25°$.

Find the value of x.

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

16



The region R satisfies these three inequalities.

$$y > 1 \qquad y < 2x + 2 \qquad x + y \leqslant 3$$

By drawing three suitable lines, and shading unwanted regions, find and label the region R. [5]

17 Some students were asked how many books they each had in their school bags.
The table shows some of this information.

Number of books	5	6	7	8	9	10
Frequency	4	5	x	11	7	5

The mean number of books is 7.6 .

Calculate the value of x.

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

18 Simplify $\left(343x^9\right)^{\frac{2}{3}}$.

..... [2]

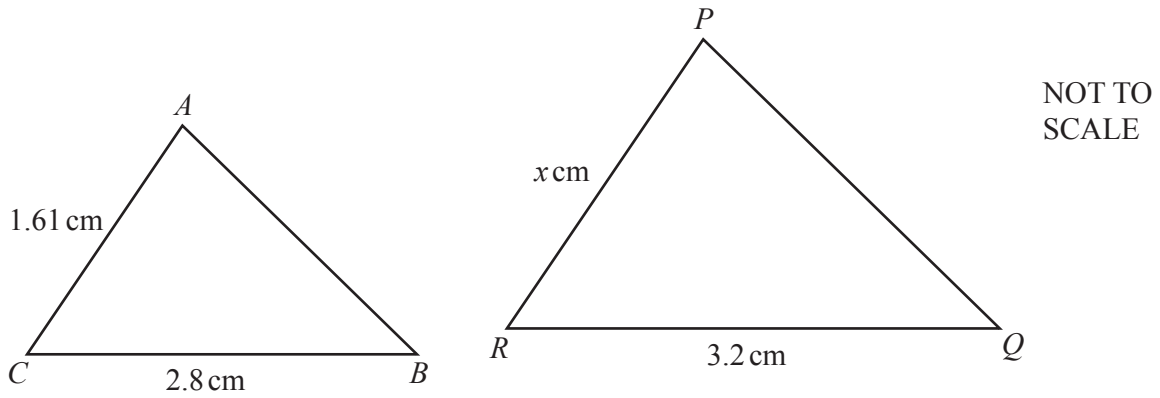
19 Solve the simultaneous equations.
You must show all your working.

$$x - y = 7$$
$$x^2 + y = 149$$

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

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

20 (a)



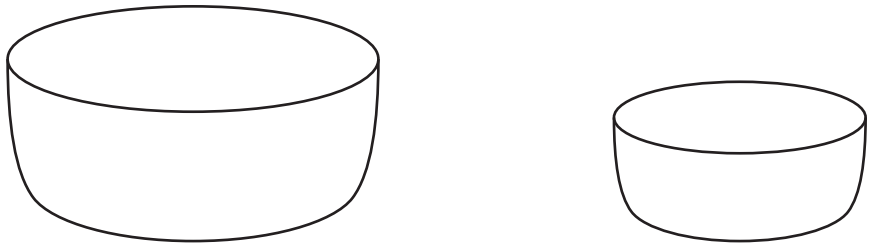
NOT TO SCALE

Triangle ABC is mathematically similar to triangle PQR.

Find the value of x.

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

(b)



NOT TO SCALE

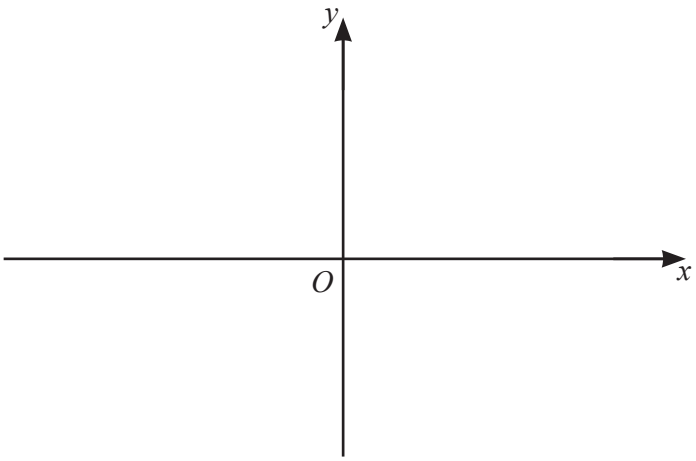
The diagram shows two mathematically similar bowls.
The larger bowl has capacity 7.8 litres and height 11.5 cm.
The smaller bowl has capacity 4 litres.

Calculate the height of the smaller bowl.

..... cm [3]

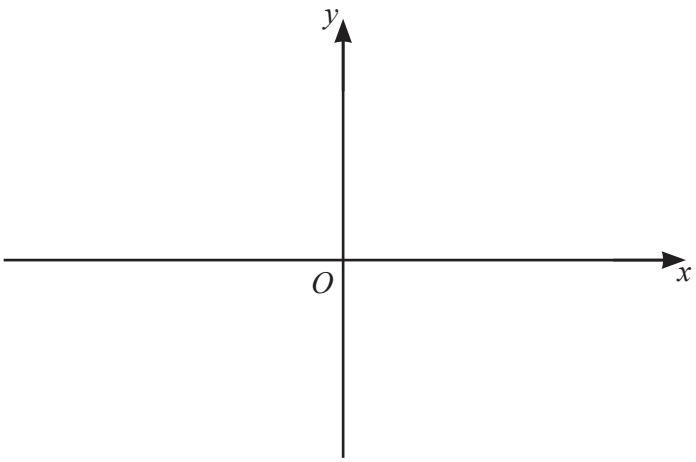
21 On the axes, sketch the graph of each of these functions.

(a) $y = \frac{1}{x}$



[2]

(b) $y = 4^x$



[2]

22 **(a)** A bag of rice has a mass of 25 kg, correct to the nearest kilogram.

Calculate the lower bound of the total mass of 10 of these bags.

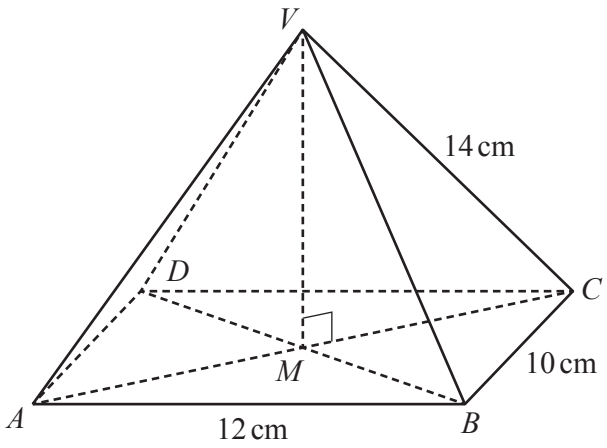
..... kg [1]

(b) Virat has 200 metres of wire, correct to the nearest metre.
He cuts the wire into n pieces of length 3 metres, correct to the nearest 20 centimetres.

Calculate the largest possible value of n.

$n =$ ..... [3]

23



NOT TO SCALE

The diagram shows a pyramid $VABCD$ with a rectangular base.
V is vertically above M, the intersection of the diagonals AC and BD.
$AB = 12$ cm, $BC = 10$ cm and $VC = 14$ cm.

Calculate the angle that VC makes with the base $ABCD$.

..... [4]

Question 24 is printed on the next page.

24 A curve has equation $y = x^3 - 2x^2 + 5$.

Find the coordinates of its two stationary points.

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

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MATHEMATICS **0580/22**

Paper 22 (Extended) **March 2021**

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 March 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

[Turn over

Generic Marking Principles

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

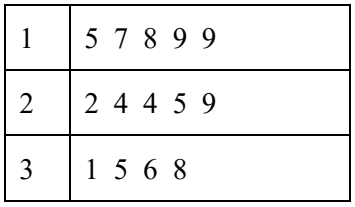
GENERIC MARKING PRINCIPLE 6:

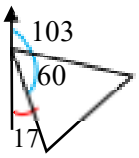
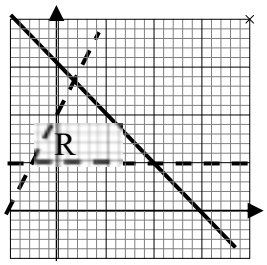
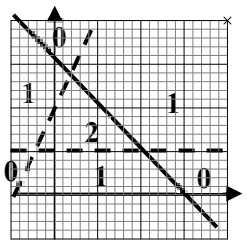
Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

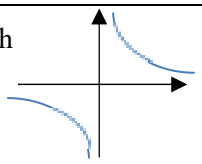
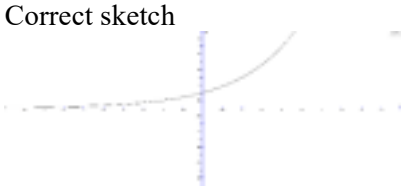
Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, 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)	2	**1**	
1(b)	2 correct lines	**2**	**B1** for each
2	30 48	**2**	**M1** for $\frac{78}{5+8} \times k$ oe where $k = 1$, 5 or 8
3(a)		**2**	**B1** for two rows correct or for a fully correct unordered stem-and-leaf diagram or for a correct diagram with one leaf incorrect or omitted
3(b)	24	**1**	
4	3, 80, 30 and 10 seen and answer 12	**2**	**M1** for 3 out of 4 correct elements or for all correct but with any trailing zeros If 0 scored **SC1** for answer 12
5	Negative	**1**	
6	271.2[0]	**2**	**M1** for 56.50 ÷ 5 or 56.50 × 24 oe or better
7	$\frac{9}{4}$ and $\frac{11}{3}$ oe improper fractions	**M1**	
	$\frac{99}{12}$ oe improper fraction	**A1**	
	$8\frac{1}{4}$ cao final answer	**A1**	dep on 1st A1 If M0 scored **SC1** for $\frac{9}{4}$ or $\frac{11}{3}$ oe improper fraction
8	$\frac{37}{99}$ oe fraction	**1**	
9	4.18×10^{7} cao	**1**	

Question	Answer	Marks	Partial Marks
10	343	**2**	**B1** for 103 in correct position **and** 60 or 17 in correct position 
11	12	**2**	**M1** for $2^2 \times 3^2$ and $2^2 \times 3 \times 7$ or for $2 \times 2 \times 3$ final answer or **B1** for 2, 3, 4 or 6 as final answer
12	34.6 or 34.63 to 34.64	**3**	**M2** for $\frac{1}{4} \times \pi \times 5^2 + \frac{1}{2} \times 5 \times 6$ oe or **M1** for $\frac{1}{4} \times \pi \times 5^2$ oe or $\frac{1}{2} \times 5 \times 6$ oe
13	15.8 or 15.76 to 15.77	**2**	**M1** for $125.9 \times \left(1 - \frac{34}{100}\right)^5$ oe
14(a)	1 −6	**2**	**B1** for each If 0 scored, **SC1** for two terms with a difference of –7
14(b)	$n^2 + 3$ oe	**2**	**M1** for any quadratic or second differences = 2
15	36	**2**	**M1** for angle $EHG = 72$ or for angle $EHF = 47$ **and** $GHF = 25$
16	3 correct ruled lines and *R* clearly indicated 	**5**	**B1** for each line $y = 1$ dashed $y = 2x + 2$ dashed $x + y = 3$ solid **B2** for correct region or **B1** for region satisfying 2 inequalities  or **SC1** for shading of the **wanted** region only

Question	Answer	Marks	Partial Marks
17	13 nfww	3	**M2** for $251+7x=7.6(32+x)$ or better or **M1** for $\frac{5\times4+6\times5+7x+8\times11+9\times7+10\times5}{32+x}=7.6$ oe
18	$49x^6$ final answer	2	**B1** for $49x^k$ or nx^6 as final answer
19	$x^2+x-156$ [=0] or $y^2+15y-100$ [=0]	M2	**M1** for $x^2+x=7+149$ or correct substitution
	$(x-12)(x+13)$ [=0] or $(y-5)(y+20)$ [=0]	M1	or for correct factors for *their* quadratic equation or for correct use of quadratic formula or completing the square for *their* equation
	[x =] 12 [y =] 5 [x =] –13 [y =] –20	B2	**B1** for $x = 12$, $x = -13$ or for $y = 5$, $y = -20$ or for a correct pair of x and y values If B0 scored and at least 2 method marks scored **SC1** for correct substitution of both of *their* x values or *their* y values into $x - y = 7$ or $x^2 + y = 149$
20(a)	1.84	2	**M1** for $\frac{1.61}{x}=\frac{2.8}{3.2}$ oe
20(b)	9.20 or 9.204 to 9.205	3	**M2** for $11.5\times\sqrt[3]{\frac{4}{7.8}}$ oe or **M1** for $\sqrt[3]{\frac{4}{7.8}}$ or $\sqrt[3]{\frac{7.8}{4}}$ oe seen or for $\frac{11.5^3}{x^3}=\frac{7.8}{4}$ oe
21(a)	Correct sketch 	2	**B1** for one correct branch or attempt at correct shape
21(b)	Correct sketch 	2	**B1** for correct shape but crossing x-axis or correct shape but just in one quadrant

Question	Answer	Marks	Partial Marks
22(a)	245	**1**	
22(b)	69 cao nfww	**3**	**M2** for $\frac{200+0.5}{3-0.1}$ oe or **M1** for 200 ± 0.5 oe or 3 ± 0.1 oe seen
23	56.1 or 56.09…	**4**	**M3** for $\cos[\ldots] = \frac{\frac{1}{2}\sqrt{10^2+12^2}}{14}$ oe or **M2** for $[MC =] \frac{1}{2}\sqrt{10^2+12^2}$ oe or **M1** for $[AC^2 =] 10^2+12^2$ oe or **B1** for indicating required angle
24	(0, 5) $\left(\frac{4}{3}, \frac{103}{27}\right)$ oe	**5**	**B2** for $3x^2 - 4x$ or **B1** for $3x^2$ or $-4x$ **M1** for *their* derivative = 0 oe or $\frac{dy}{dx} = 0$ **B1** for $[x =] 0$ and $\frac{4}{3}$ or for 1 correct coordinate pair

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CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

7036525531

MATHEMATICS **0580/42**

Paper 4 (Extended) **February/March 2021**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

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

INFORMATION

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

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

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1

Painter	Plumber	Electrician
$35 per hour	Fixed charge $40 plus $26.50 per hour	$48 per hour for the first 2 hours then $32 per hour

These are the rates charged by a painter, a plumber and an electrician who do some work for Mr Sharma.

(a) The painter works for 7 hours.

Calculate the amount Mr Sharma pays the painter.

$ ..... [1]

(b) Mr Sharma pays the plumber $252.

Calculate how many hours the plumber works.

..... hours [2]

(c) Mr Sharma pays the electrician $224.

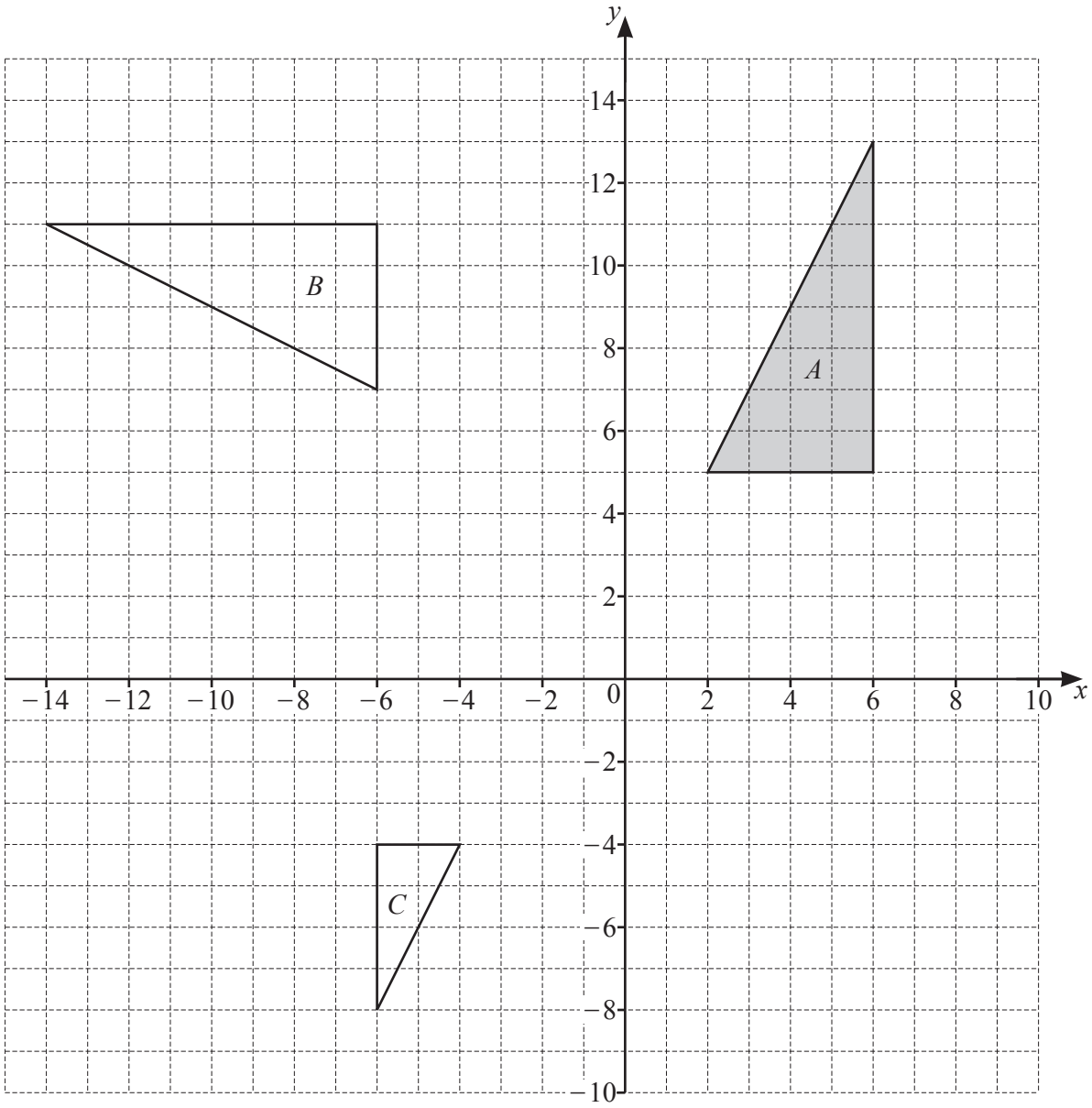
Calculate how many hours the electrician works.

..... hours [2]

(d) Write down the ratio of the amount Mr Sharma pays to the painter, the plumber and the electrician. Give your answer in its lowest terms.

painter : plumber : electrician = ... : ..... : ..... [2]

2



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

(i) triangle A onto triangle B,

.....

..... [3]

(ii) triangle A onto triangle C.

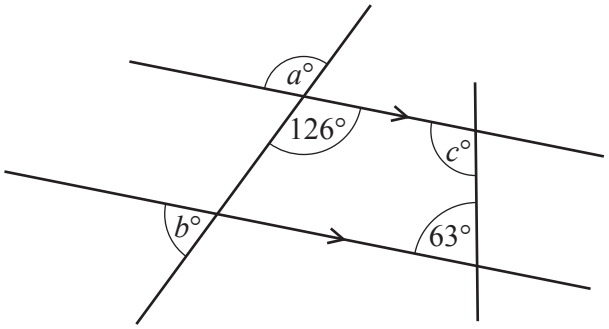
.....

..... [3]

(b) Draw the image of triangle A after a translation by the vector $\begin{pmatrix} -5 \\ -10 \end{pmatrix}$. [2]

(c) Draw the image of triangle A after a reflection in the line $y = 4$. [2]

3 **(a)**



NOT TO SCALE

The diagram shows two straight lines intersecting two parallel lines.

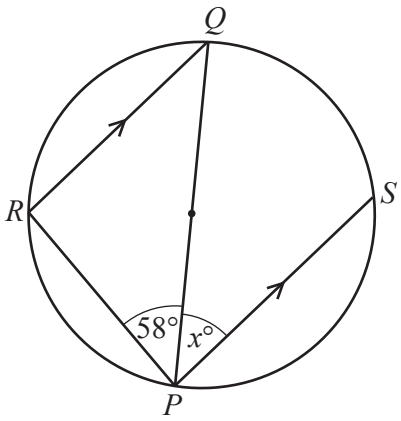
Find the values of a, b and c.

$a =$ .....

$b =$ .....

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

(b)



NOT TO SCALE

Points R and S lie on a circle with diameter PQ.
RQ is parallel to PS.
Angle $RPQ = 58°$.

Find the value of x, giving a geometrical reason for each stage of your working.

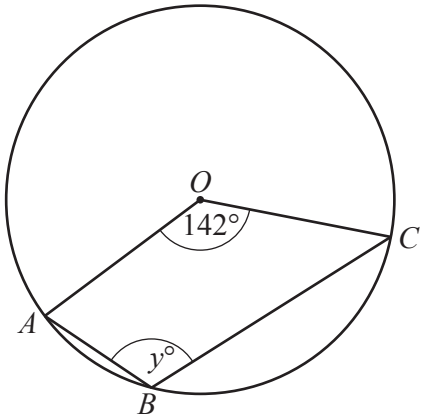
.....

.....

.....

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

(c)



NOT TO SCALE

Points A, B and C lie on a circle, centre O.
Angle $AOC = 142°$.

Find the value of y.

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

4 **(a)** A shop gives each of 1000 people a voucher.
28 people use their voucher.
The shop now gives each of 16 500 people a voucher.

Calculate how many of these 16 500 people are expected to use their voucher.

..... [1]

(b) In a class activity, all the 15 students wear hats.
7 students wear red hats, 6 students wear green hats and 2 students wear white hats.

(i) One of these students is picked at random.

Find the probability that this student wears a red hat.

..... [1]

(ii) Two of the 15 students are picked at random.

Show that the probability that these two students wear hats of the same colour is $\frac{37}{105}$.

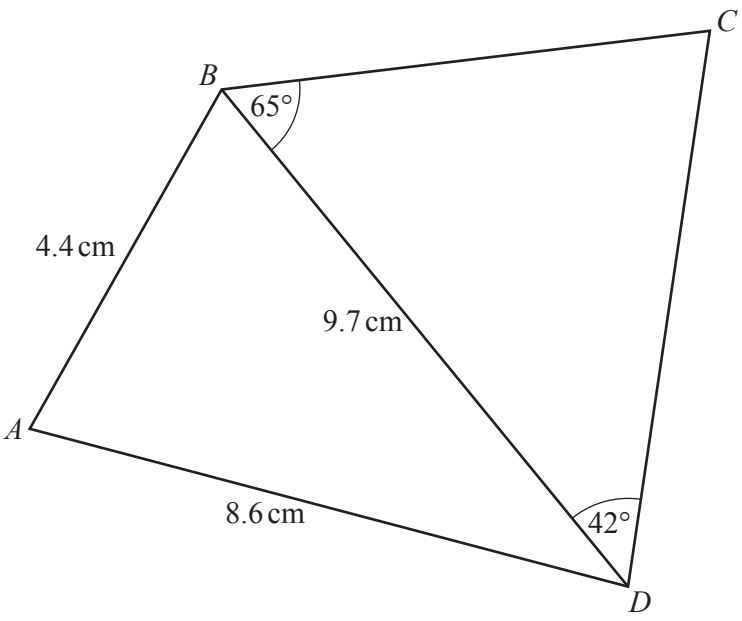
[3]

(iii) Three of the 15 students are picked at random.

Find the probability that at least two of these three students wear red hats.

..... [4]

5



NOT TO SCALE

(a) Calculate angle *ADB*.

Angle *ADB* = ... [3]

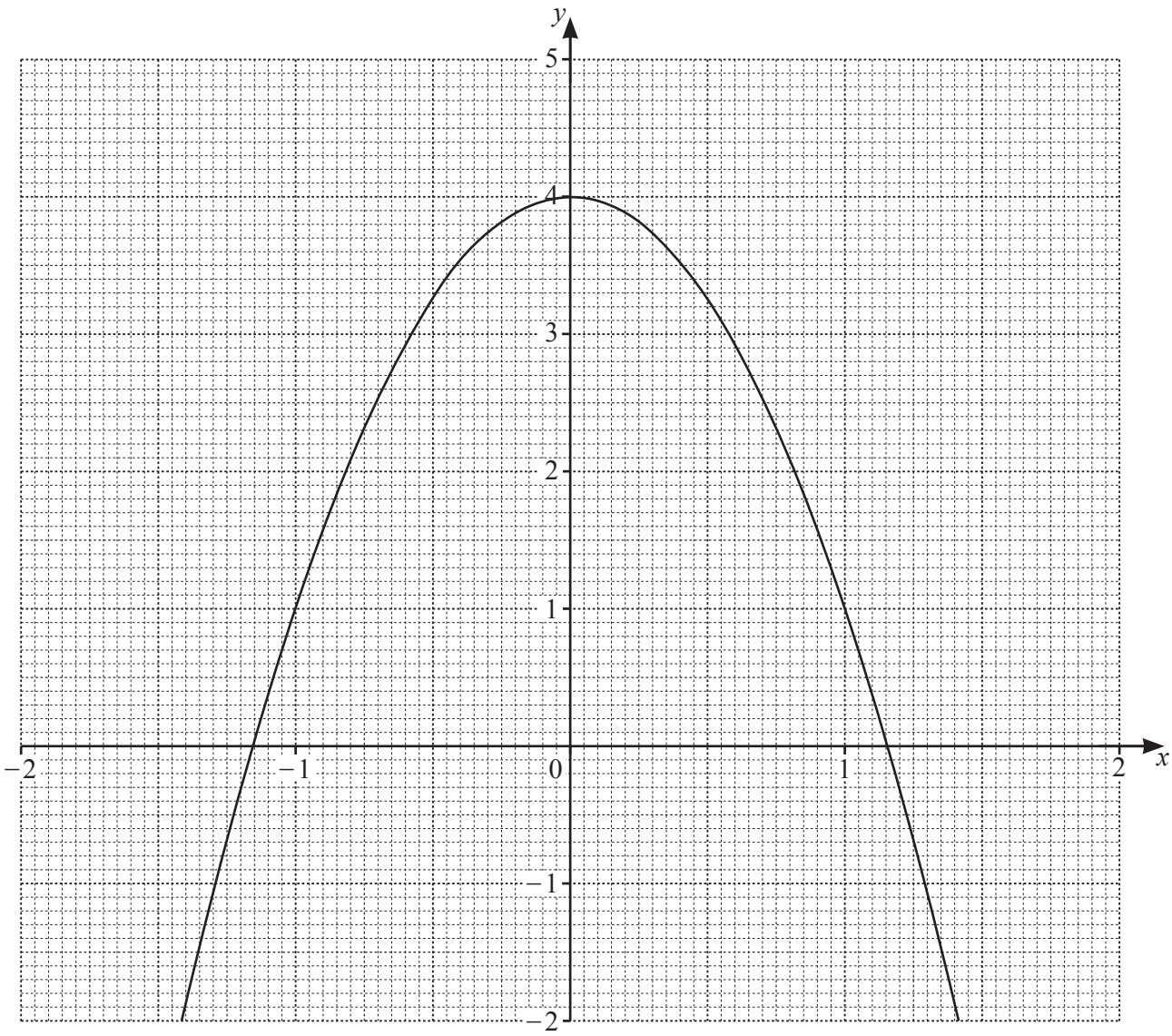
(b) Calculate *DC*.

DC = ... cm [4]

(c) Calculate the shortest distance from *C* to *BD*.

..... cm [3]

6



(a) The grid shows the graph of $y = a + bx^2$.

The graph passes through the points with coordinates (0, 4) and (1, 1).

(i) Find the value of a and the value of b.

$a =$ .....

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

(ii) Write down the equation of the tangent to the graph at (0, 4).

..... [1]

(iii) The equation of the tangent to the graph at $x = -1$ is $y = 6x + 7$.

Find the equation of the tangent to the graph at $x = 1$.

..... [2]

(b) The table shows some values for $y = 1 + \frac{5}{3-x}$ for $-2 \leqslant x \leqslant 1.5$.

x	-2	-1.5	-1	-0.5	0	0.5	1	1.5
y	2	2.11		2.43		3		4.33

(i) Complete the table. [3]

(ii) On the grid, draw the graph of $y = 1 + \frac{5}{3-x}$ for $-2 \leqslant x \leqslant 1.5$. [4]

(c) **(i)** Write down the values of x where the two graphs intersect.

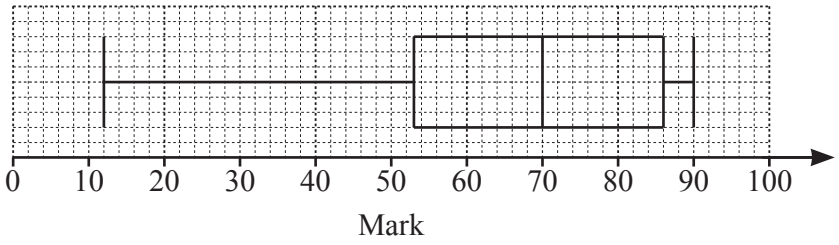
$x =$ ..... or $x =$ ..... [2]

(ii) The answers to **part(c)(i)** are two solutions of a cubic equation in terms of x.

Find this equation in the form $ax^3 + bx^2 + cx + d = 0$, where a, b, c and d are integers.

..... [4]

7 **(a)** The box-and-whisker plot shows information about the marks scored by some students in a test.



(i) Write down the median mark. ..... [1]

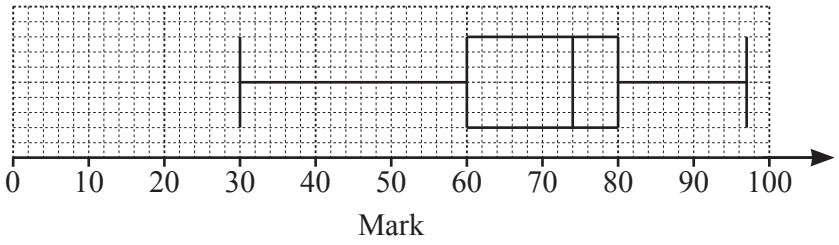
(ii) Work out the range.

..... [1]

(iii) Jais scored a mark in the test that was higher than the marks scored by 75% of the students.

Write down a possible mark for Jais. ..... [1]

(iv) This box-and-whisker plot shows information about the marks scored by the same students in a second test.



Make one comparison between the distributions of marks in the two tests.

.....

..... [1]

(b) The table shows information about the height, h cm, of each of 50 plants.

Height (h cm)	$0 < h \leqslant 20$	$20 < h \leqslant 30$	$30 < h \leqslant 34$	$34 < h \leqslant 40$	$40 < h \leqslant 60$
Frequency	4	9	20	15	2

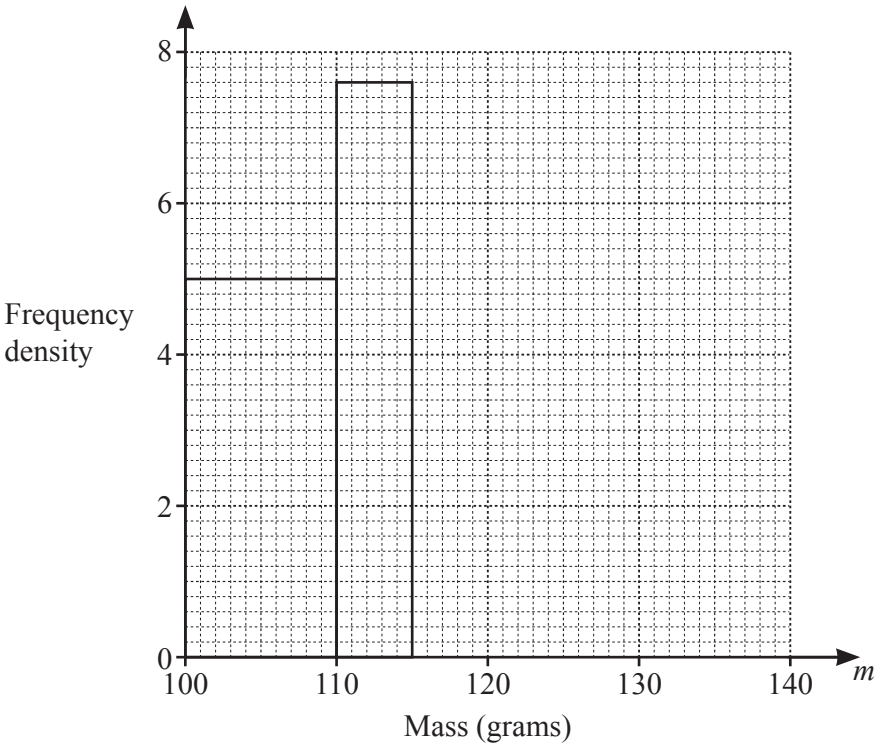
Calculate an estimate of the mean.

..... cm [4]

(c) Some apples are weighed and the mass, m grams, of each apple is recorded.
The table shows the results.

Mass (m grams)	$100 < m \leqslant 110$	$110 < m \leqslant 115$	$115 < m \leqslant 125$	$125 < m \leqslant 140$
Frequency	50	x	44	51

The histogram shows some of the information from the table.



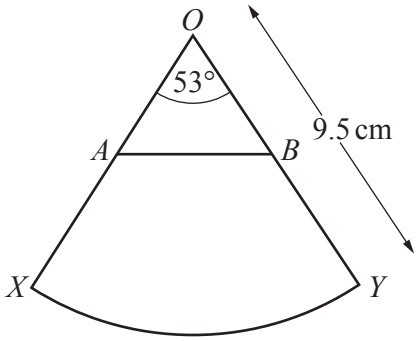
(i) Work out the value of x.

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

(ii) Complete the histogram.

[2]

8 (a)



NOT TO SCALE

The diagram shows a sector OXY of a circle with centre O and radius 9.5 cm.
The sector angle is 53°.
A lies on OX, B lies on OY and $OA = OB$.

(i) Show that the area of the sector is 41.7 cm^2, correct to 1 decimal place.

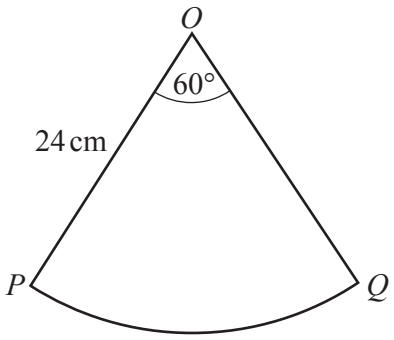
[2]

(ii) The area of triangle OAB is $\frac{1}{3}$ of the area of sector OXY.

Calculate OA.

$OA =$ ..... cm [4]

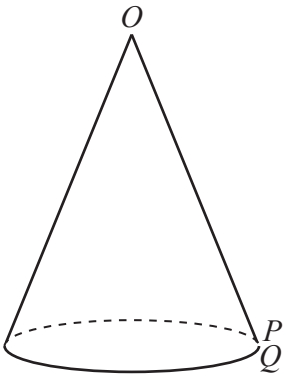
(b)



NOT TO SCALE

The diagram shows a sector OPQ of a circle with centre O and radius 24 cm.
The sector angle is 60°.

A cone is made from this sector by joining OP to OQ.



NOT TO SCALE

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 [6]

9 **(a)** Factorise.

(i) $5am + 10ap - bm - 2bp$

..... [2]

(ii) $15(k+g)^2 - 20(k+g)$

..... [2]

(iii) $4x^2 - y^4$

..... [2]

(b) Expand and simplify.

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

..... [3]

(c) $(x+a)^2 = x^2 + 22x + b$

Find the value of a and the value of b.

$a =$ .....

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

10 **(a)** A box is a cuboid with length 45 cm, width 30 cm and height 42 cm.
The box is completely filled with 90.72 kg of sand.

Calculate the density of this sand in kg/m^3.
[Density = mass ÷ volume]

..... kg/m^3 [3]

(b) A bag contains 15000 cm^3 of sand.
Some of this sand is used to completely fill a hole in the shape of a cylinder.
The hole is 30 cm deep and has radius 10 cm.

Calculate the percentage of the sand from the bag that is used.

..... % [3]

(c) Sand costs $98.90 per tonne.
This cost includes a tax of 15%.

Calculate the amount of tax paid per tonne of sand.

$ ..... [3]

(d) Raj buys some sand for 3540 rupees.

Calculate the cost in dollars when the exchange rate is $1 = 70.8 rupees.

$ ..... [2]

11 Gaya spends \$48 to buy books that cost \$$x$ each.

(a) Write down an expression, in terms of x, for the number of books Gaya buys.

..... [1]

(b) Myra spends \$60 to buy books that cost \$$(x+2)$ each.
Gaya buys 4 more books than Myra.

Show that $x^2 + 5x - 24 = 0$.

[4]

(c) Solve by factorisation.

$$x^2 + 5x - 24 = 0$$

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

(d) Find the number of books Myra buys.

..... [1]

12 **(a)** Find the gradient of the curve $y = 2x^3 - 7x + 4$ when $x = -2$.

..... [3]

(b) A is the point (7, 2) and B is the point (−5, 8).

(i) Calculate the length of AB.

..... [3]

(ii) Find the equation of the line that is perpendicular to AB and that passes through the point (−1, 3).
Give your answer in the form $y = mx + c$.

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

(iii) AB is one side of the parallelogram $ABCD$ and

- $\overrightarrow{BC} = \begin{pmatrix} -a \\ -b \end{pmatrix}$ where $a > 0$ and $b > 0$
- the gradient of BC is 1
- $\left|\overrightarrow{BC}\right| = \sqrt{8}$.

Find the coordinates of D.

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

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Cambridge Assessment International Education

Cambridge IGCSE™

MATHEMATICS **0580/42**

Paper 4 (Extended) **March 2021**

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 March 2021 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.

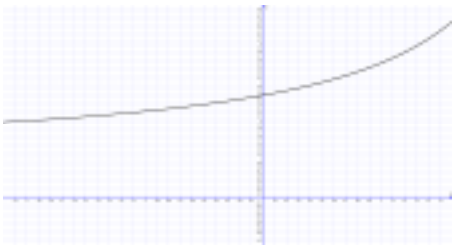
Maths-Specific Marking Principles	
1	Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.
2	Unless specified in the question, answers may be given as fractions, 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
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	245	**1**	
1(b)	8	**2**	**M1** for $40 + 26.5x = 252$ oe or **B1** for 212 seen
1(c)	6	**2**	**M1** for $(224 - 2 \times 48) \div 32$ oe or $2 \times 48 + 32(x - 2) = 224$ soi
1(d)	35 : 36 : 32 final answer	**2**	**B1** for *their* (a) : 252 : 224 or equivalent ratio
2(a)(i)	rotation 90 anticlockwise oe (–3, 2)	**3**	**B1** for each
2(a)(ii)	enlargement $-\frac{1}{2}$ $(-2,-1)$	**3**	**B1** for each
2(b)	Image at (– 3, – 5) (1, − 5) (1, 3)	**2**	**B1** for translation by $\begin{pmatrix}-5\\k\end{pmatrix}$ or $\begin{pmatrix}k\\-10\end{pmatrix}$
2(c)	Image at (2, 3) (6, 3) (6, − 5)	**2**	**B1** for reflection in $y = k$ or $x = 4$
3(a)	126 54 117	**3**	**B1** for each
3(b)	angle [in a] semicircle is 90	**B1**	Do not accept triangle for angle
	Allied, co-interior [add to 180] or Angles in triangle [= 180] **and** alternate oe	**B1**	
	32	**B1**	
3(c)	109	**2**	**B1** for 218 or 71 in correct places or correctly labelled

Question	Answer	Marks	Partial Marks
4(a)	462	**1**	
4(b)(i)	$\frac{7}{15}$ oe	**1**	
4(b)(ii)	$\frac{7}{15}\times\frac{6}{14}+\frac{6}{15}\times\frac{5}{14}+\frac{2}{15}\times\frac{1}{14}$ $=\frac{37}{105}$	**3**	**M2** for addition of two of $\frac{7}{15}\times\frac{6}{14}+\frac{6}{15}\times\frac{5}{14}+\frac{2}{15}\times\frac{1}{14}$ or **M1** for one of the products seen
4(b)(iii)	$\frac{29}{65}$ oe	**4**	**M3** for $\frac{7}{15}\times\frac{6}{14}\times\frac{5}{13}+3\times\frac{7}{15}\times\frac{6}{14}\times\frac{6}{13}+3\times\frac{7}{15}\times\frac{6}{14}\times\frac{2}{13}$ oe or $1-3\left(\frac{8}{15}\times\frac{7}{14}\times\frac{7}{13}\right)-\left(\frac{8}{15}\times\frac{7}{14}\times\frac{6}{13}\right)$ oe or **M2** for the sum of at least two of $\frac{7}{15}\times\frac{6}{14}\times\frac{5}{13}$, $N\times\frac{7}{15}\times\frac{6}{14}\times\frac{6}{13}$, $N\times\frac{7}{15}\times\frac{6}{14}\times\frac{2}{13}$ seen or for $\frac{7}{15}\times\frac{6}{14}\times\frac{13}{13}$ or $\frac{7}{15}\times\frac{6}{14}+N\times\frac{7}{15}\times\frac{6}{14}\times\frac{k}{13}$ seen or **M1** for $\frac{7}{15}\times\frac{6}{14}\times\frac{5}{13}$ or $N\times\frac{7}{15}\times\frac{6}{14}\times\frac{6}{13}$ or $N\times\frac{7}{15}\times\frac{6}{14}\times\frac{2}{13}$ seen If 0 scored **SC1** for $\frac{1519}{3375}$ oe
5(a)	27[.0] or 26.97… nfww	**3**	**M2** for [cos =] $\frac{8.6^2+9.7^2-4.4^2}{2\times8.6\times9.7}$ or **M1** for implicit form
5(b)	9.19 or 9.192 to 9.193	**4**	**B1** for [angle BCD =] 73 seen **M2** for $\frac{9.7\times\sin 65}{\sin(180-65-42)}$ oe or **M1** for $\frac{\sin(180-65-42)}{9.7}=\frac{\sin 65}{DC}$ oe

Question	Answer	Marks	Partial Marks
5(c)	6.15 or 6.149 to 6.151…	**3**	**M2** for $\frac{d}{their\,9.19} = \sin 42$ oe or **M1** for right angle between line from C to BD and BD soi
6(a)(i)	$[a =]\ 4$ $[b =] -3$ nfww	**2**	**B1** for $[a =]\ 4$ **B1** for $[b =] -3$ nfww
6(a)(ii)	$y = 4$ oe	**1**	
6(a)(iii)	$y = -6x + 7$ oe final answer	**2**	**B1** for answer $-6x + 7$ or answers $y = -6x + c$ or $y = kx + 7$ $(k < 0)$
6(b)(i)	2.25 2.67 3.5	**3**	**B1** for each
6(b)(ii)	correct curve 	**4**	**B3 FT** for 7 or 8 points or **B2 FT** for 5 or 6 points or **B1 FT** for 3 or 4 points
6(c)(i)	–0.78 to –0.72 and 0.55 to 0.59	**2**	**B1** for each
6(c)(ii)	$3x^3 - 9x^2 - 3x + 4$ $[= 0]$ final answer	**4**	**B3FT** for 3 out of 4 correct terms or for $bx^3 - 3bx^2 + (a - 1)x + 8 - 3a$ $[= 0]$ oe or **B2FT** for 2 out of 4 correct terms or for 3 out of 4 terms from $bx^3 - 3bx^2 + (a - 1)x + 8 - 3a$ $[= 0]$ or **M1** for $1 + \frac{5}{3 - x} = their\ 4 + (their(-3))x^2$ oe
7(a)(i)	70	**1**	
7(a)(ii)	78	**1**	
7(a)(iii)	Value in range $86 < V \leq 90$	**1**	

Question	Answer	Marks	Partial Marks
7(a)(iv)	One general comment interpreting the median comparison nfww e.g. Students did better on second test oe OR One general comment interpreting IQR/range comparison nfww e.g. Students marks were more consistent on the 2nd test oe	**1**	
7(b)	31.2	**4**	**M1** for mid-values soi **M1** for Σfm where m is any value in interval including boundaries **M1** (dep on second **M1**) for *their* $\Sigma fm \div 50$
7(c)(i)	38	**1**	
7(c)(ii)	Blocks of heights 4.4 and 3.4 with correct widths	**2**	**B1** for each correct block If **B0** scored, **SC1** for both correct frequency densities soi

Question	Answer	Marks	Partial Marks
8(a)(i)	$\frac{53}{360}\times\pi\times9.5^2$	**M1**	
	41.74 to 41.75	**A1**	
8(a)(ii)	5.9[0] or 5.899 to 5.903..	**4**	**M3** for $\left[OA^2=\right]\ \frac{\frac{1}{3}\times41.7}{\frac{1}{2}\sin53}$ oe **M2** for $\frac{1}{2}\times OA^2\times\sin53=\frac{1}{3}\times41.7$ oe **M1** for $\frac{1}{2}\times OA\times OB\times\sin53=\frac{1}{3}\times41.7$ seen or better
8(b)	396 or 397 or 396.4 to 396.6	**6**	**M2** for $\left[r=\right]\left(\frac{60}{360}\times2\times\pi\times24\right)\div2\pi$ oe or better or **M1** for $2\pi r=\frac{60}{360}\times2\times\pi\times24$ oe **M2** for $\sqrt{24^2-a^2}$ or **M1** for $h^2+a^2=24^2$ **M1** for $\frac{1}{3}\pi\times their\ r^2\times their\ h$
9(a)(i)	$(5a-b)(m+2p)$ final answer	**2**	**M1** for $5a(m+2p)-b(m+2p)$ or $m(5a-b)+2p(5a-b)$ or **B1** for correct answer seen
9(a)(ii)	$5(k+g)(3k+3g-4)$ final answer	**2**	**M1** for correct partial factorisation by 5 or $(k+g)$ isw eg $5\left(3k^2+6kg+3g^2-4k-4g\right)$ or $5(3(k+g)^2-4(k+g))$ or $(k+g)\left(15(k+g)-20\right)$ or $(5k+5g)(3k+3g-4)$ or **B1** for correct answer seen
9(a)(iii)	$\left(2x-y^2\right)\left(2x+y^2\right)$ final answer	**2**	**M1** for answer in form $(a+b)(a-b)$ or **B1** for correct answer seen
9(b)	$3x^3-10x^2-x+12$ final answer	**3**	**B2** for correct unsimplified expansion or simplified expression with 3 terms correct in a 4-term expression of required form or **B1** for correct expansion of two of the brackets with at least 3 terms correct
9(c)	$[a=]$ 11 $[b=]$ 121	**2**	**B1** for each

Question	Answer	Marks	Partial Marks
10(a)	1600	**3**	**B2** for answer figs 16 or **M2** for 90.72 ÷ (figs45 × figs3 × figs42) or **M1** for volume = figs 45 × figs 3 × figs 42 isw
10(b)	62.8 or 62.83 to 62.84	**3**	**M2** for $\frac{\pi\times10^2\times30}{15000}\times100$ or **M1** for $\pi\times10^2\times30$
10(c)	12.9[0]	**3**	**B2** for 86 OR **M2** for $\frac{98.9}{1+\frac{15}{100}}\times0.15$ oe or $98.9-\frac{98.9}{1+\frac{15}{100}}$ oe or **M1** for $\left(1+\frac{15}{100}\right)a=98.9$ oe isw
10(d)	50	**2**	**M1** for 3540 ÷ 70.8
11(a)	$\frac{48}{x}$ final answer	**1**	Accept 48 ÷ x
11(b)	$their(a)-\frac{60}{x+2}=4$ oe	**M1**	FT *their* (a) provided expression in x
	$48(x+2)-60x=4x(x+2)$ oe	**M2**	**FT** *their* 3 term eqn with algebraic denominators, x and $x + 2$, for M2 or M1 **M1** for common denominator $x(x+2)$ oe seen or any two terms in a 3 term equation from ± 48 (x + 2) , ± 60x , ± 4x(x + 2) oe seen
	$48x + 96 – 60x = 4x^2 + 8x$ oe leading to $x^2+5x-24=0$	**A1**	With brackets expanded and no errors or omissions seen
11(c)	$(x-3)(x+8)$	**B2**	**B1** for $x(x + 8) – 3(x + 8)$ or $x(x – 3) + 8(x – 3)$ or $(x + a)(x + b)$ [= 0] where $ab = – 24$ or $a + b = 5$ [a, b integers]
	3 and − 8	**B1**	
11(d)	12	**1**	
12(a)	17	**3**	**M2** for $3\times2x^2-7$ or better isw or **M1** for $3\times2x^2$ oe or $kx^2 – 7$ seen

Question	Answer	Marks	Partial Marks
12(b)(i)	13.4 or 13.41 to 13.42	**3**	**M2** for $\sqrt{(-5-7)^2+(8-2)^2}$ oe or **M1** for $(-5-7)^2+(8-2)^2$ oe
12(b)(ii)	$[y=]\ 2x+5$ final answer	**4**	**M1** for [gradient of AB =] $\frac{8-2}{-5-7}$ oe **M1dep** for gradient $p = -1 \div$ *their* $-\frac{1}{2}$ oe **M1dep** on previous M1 for substituting $(-1, 3)$ into $y =$ *their* $px + c$ oe where *their* $p \neq 0$
12(b)(iii)	(5, 0)	**4**	**B3** for $\overrightarrow{AD} = \begin{pmatrix}-2\\-2\end{pmatrix}$ or $\overrightarrow{DA} = \begin{pmatrix}2\\2\end{pmatrix}$ or coordinates of C $(-7, 6)$ and $\left[\overrightarrow{CD} =\right] \begin{pmatrix}12\\-6\end{pmatrix}$ oe seen or **B2** for $a = b = 2$ soi or coordinates of C $(-7, 6)$ or **M1** for $a = b$ oe soi or for $a^2 + b^2 = \left(\sqrt{8}\right)^2$ oe or cos 45 = $\frac{a}{\sqrt{8}}$ oe or for $\left[\overrightarrow{DC} =\right] \begin{pmatrix}-12\\6\end{pmatrix}$ or $\left[\overrightarrow{CD} =\right] \begin{pmatrix}12\\-6\end{pmatrix}$ seen or $\frac{y-8}{x--5} = 1$ oe or $\frac{y-2}{x-7} = 1$