**Cambridge Assessment
International Education**

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS   **0580/22**

Paper 2 (Extended)   **February/March 2023**

                                                                              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 [ ].

[Turn over

1

12	15	27	29	91	93

From the list of numbers, write down

(a) a cube number

.... [1]

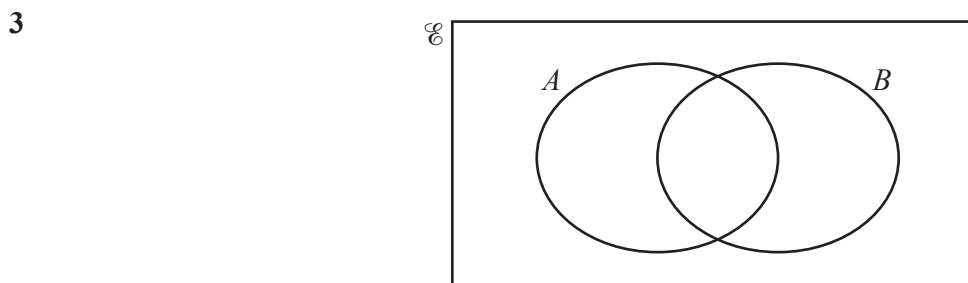**(b)** a prime number.

.... [1]

2 $\mathbf{v} = \begin{pmatrix} -1 \\ 3 \end{pmatrix}$ $\mathbf{y} = \begin{pmatrix} 2 \\ 5 \end{pmatrix}$

Find

(a) $\mathbf{v} - \mathbf{y}$

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

(b) $2\mathbf{v}$.

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

3

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

4 23, 17, 11, 5, ...

(a) Write down the next number in this sequence.

.... [1]

(b) Find the nth term of this sequence.

.... [2]

5 Factorise completely.

$$8g - 2g^2$$

.... [2]

6 **Without using a calculator**, work out $\dfrac{4}{7} \div 8$.

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

.... [2]

7 Solve.

(a) $15t + 8 = 4 - t$

$t = $ .... [2]

(b) $\dfrac{25 - 2u}{3} = 2$

$u = $ .... [2]

8 Calculate 0.3^2.
Give your answer in standard form.

.... [2]

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

$$3x - 2y = 19$$
$$x + y = 3$$

$x = $ ....

$y = $ .... [3]

10
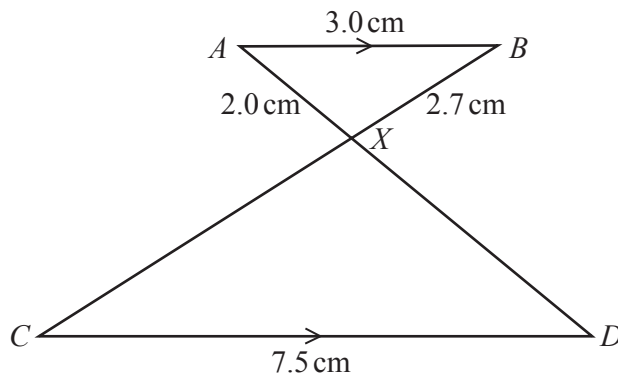
In the diagram, *AB* and *CD* are parallel.
The lines *CB* and *AD* intersect at *X*.
$AB = 3.0$ cm, $AX = 2.0$ cm, $BX = 2.7$ cm and $CD = 7.5$ cm.

Find the length of *BC*.

$BC = $ .... cm [3]

11 Find the highest common factor (HCF) of $12x^{12}$ and $16x^{16}$.

.... [2]

12 In a regular polygon, the interior angle and the exterior angle are in the ratio interior : exterior = 11 : 1.
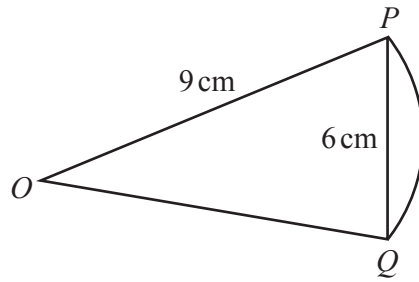
Find the number of sides of this regular polygon.

.... [3]

13
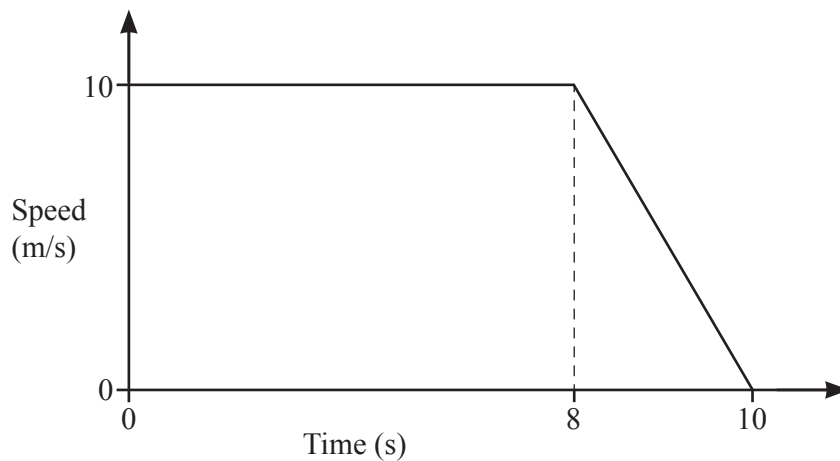
The diagram shows the speed–time graph for part of a car journey.

Calculate the total distance travelled during the 10 seconds.

.... m [2]

14

The diagram shows a sector of a circle with centre O and radius $9\,cm$.
The length of the chord PQ is $6\,cm$.

Calculate the length of the arc PQ.

.... cm [3]

15 Simplify $\left(3125w^{3125}\right)^{\frac{1}{5}}$.

.... [2]

16 y is inversely proportional to x^2.
When $x = 3$, $y = 2$.

Find y when $x = 2$.

$y =$ .... [3]

17
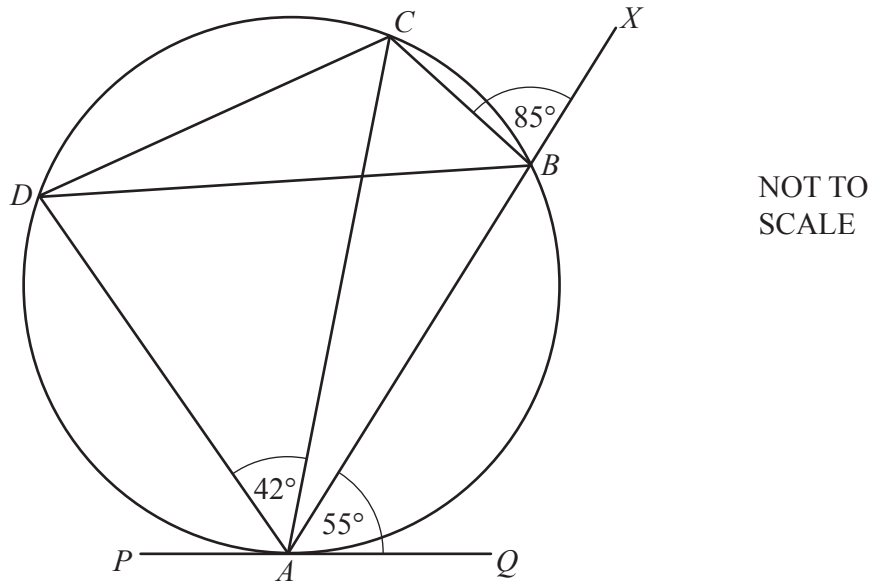
ABCD is a cyclic quadrilateral, *ABX* is a straight line and *PQ* is a tangent to the circle at *A*.
Angle *CBX* = 85°, angle *BAQ* = 55° and angle *CAD* = 42°.

Find

(a) angle *CBD*

Angle *CBD* = ... [1]

(b) angle *ACB*

Angle *ACB* = ... [1]

(c) angle *ADC*

Angle *ADC* = ... [1]

(d) angle *BCD*

Angle *BCD* = ... [2]

(e) angle *PAD*.

Angle *PAD* = ... [1]

18 Two solids are mathematically similar and have volumes $81\,\text{cm}^3$ and $24\,\text{cm}^3$.
The surface area of the smaller solid is $44\,\text{cm}^2$.

Calculate the surface area of the larger solid.

.... cm^2 [3]

19 Find the values of x when $6x + y = 10$ and $y = x^2 - 3x + 10$.

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

20 Find the *n*th term of each sequence.

(a)   –1,   0,   7,   26,   63,   …

.... [2]

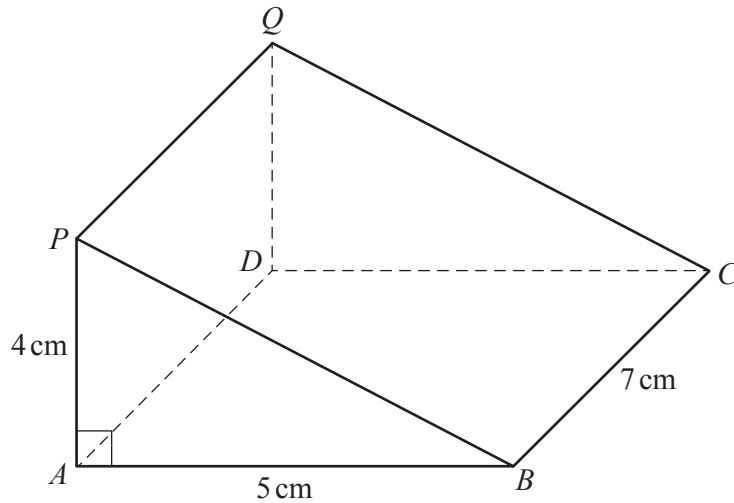(b)   24,   12,   6,   3,   1.5,   …

.... [2]

21 A car travels 14 km, correct to the nearest kilometre.
This takes 12 minutes, correct to the nearest minute.

Calculate the lower bound of the speed of the car.
Give your answer in kilometres per minute.

.... km/min [3]

22

NOT TO SCALE

The diagram shows a triangular prism *ABCDQP* of length 7 cm.
The cross-section is triangle *PAB* with *PA* = 4 cm, *AB* = 5 cm and angle *PAB* = 90°.

Calculate the angle between the line *PC* and the base *ABCD*.

.... [4]

23 Simplify.

$$\frac{5x^2 - 19x + 12}{x^2 - 9}$$

.... [4]

24 The probability of Jamie hitting a target is $\frac{1}{3}$.

The probability that he hits the target for the first time on his nth attempt is $\frac{64}{2187}$.

Find the value of n.

$n =$ .... [2]

Question 25 is printed on the next page.

25 $\qquad$ f$(x) = x^3 + 1$

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

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

Cambridge Assessment
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MATHEMATICS **0580/22**

Paper 2 (Extended) **February/March 2023**

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 2023 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **7** printed pages.

[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).
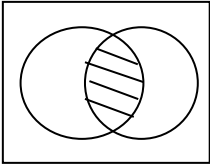

GENERIC MARKING PRINCIPLE 6:

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.

0580/22   **Muhammad Shafiq ur Rehman (03247304567) Aitchison College (www.sirshafiq.com)**
Cambridge IGCSE – Mark Scheme   February/March 2023
PUBLISHED

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)	27	**1**	
1(b)	29	**1**	
2(a)	$\begin{pmatrix} -3 \\ -2 \end{pmatrix}$	**1**	
2(b)	$\begin{pmatrix} -2 \\ 6 \end{pmatrix}$	**1**	
3	Correct shading	**1**	
4(a)	–1	**1**	
4(b)	$29 - 6n$ oe final answer	**2**	**B1** for $k - 6n$ or $29 - kn$ or $29 - 6n$ seen then spoiled
5	$2g(4 - g)$ final answer	**2**	**B1** for $2(4g - g^2)$ or for $g(8 - 2g)$ or for $2g(4 - g)$ seen then spoiled
6	$\dfrac{4}{7} \times \dfrac{1}{8}$ oe or $\dfrac{4}{7} \div \dfrac{56}{7}$ oe	**M1**	
	$\dfrac{1}{14}$ cao	**A1**	
7(a)	$-\dfrac{1}{4}$ oe	**2**	**M1** for $15t + t = 4 - 8$ oe
7(b)	9.5 oe	**2**	**M1** for $25 - 2u = 3 \times 2$ oe or for $\dfrac{25}{3} - 2 = \dfrac{2u}{3}$

Question	Answer	Marks	Partial Marks
8	9×10^{-2}	**2**	**B1** for 0.09 oe or **M1** for *their* decimal correctly converted to standard form if negative power
9	Correctly eliminating one variable	**M1**	
	$[x =]$ 5	**A1**	
	$[y =]$ –2	**A1**	If **M0** scored **SC1** for 2 values satisfying one of the original equations.
10	9.45	**3**	**M2** for $\dfrac{2.7 \times 7.5}{3} + 2.7$ oe OR **B2** for 6.75 oe or **M1** for $\dfrac{3}{7.5} = \dfrac{2.7}{XC}$ oe If 0 scored **SC1** for answer 7.7
11	$4x^{12}$ final answer	**2**	**B1** for $4x^k$ or kx^{12} or for $4x^{12}$ seen then spoiled
12	24	**3**	**M2** for $180(n-2) = 11 \times 360$ oe OR **M1** for $\dfrac{180}{11+1}$ [× 11] oe **M1** for $\dfrac{360}{their\ 15}$ or for $\dfrac{(n-2) \times 180}{n} = (180 - their\ 15)$
13	90	**2**	**M1** for a correct area calculation e.g. 8 × 10 or 0.5 × 2 × 10 or better
14	6.12 or 6.116… to 6.118	**3**	**M1** for $\sin = \dfrac{3}{9}$ oe or $\cos = \dfrac{9^2 + 9^2 - 6^2}{2 \times 9 \times 9}$ oe **M1 dep** for $\dfrac{their\ angle}{360} \times \pi \times 2 \times 9$ dependent on use of trig for *their angle*
15	$5w^{625}$ final answer	**2**	**B1** for kw^{625} or $5w^k$ final answer or for $5w^{625}$ then spoiled

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Question	Answer	Marks	Partial Marks
16	4.5 oe	3	**M2** for $2^2 \times y = 3^2 \times 2$ OR **M1** for $y = \dfrac{k}{x^2}$ **M1** for $y = \dfrac{their\,k}{2^2}$
17(a)	42	1	
17(b)	55	1	
17(c)	85	1	
17(d)	108	2	**M1** for [angle $ACD =$] 53 or [angle $BAC =$] 30
17(e)	53	1	
18	99	3	**M2** for $44 \times \left(\dfrac{81}{24}\right)^{\frac{2}{3}}$ oe or **M1** for $\left(\dfrac{81}{24}\right)^{\frac{1}{3}}$ oe or $\left(\dfrac{24}{81}\right)^{\frac{1}{3}}$ oe or $\left(\dfrac{44}{Area}\right)^3 = \left(\dfrac{24}{81}\right)^2$ oe
19	0 and –3	3	**B2** for $x^2 + 3x$ [= 0] or better or **M1** for $10 - 6x = x^2 - 3x + 10$ oe or for correct simplification of *their* quadratic to the form $ax^2 + bx + c$ [= 0] or better or finding $y = 28$ and $y = 10$
20(a)	$\left(n-1\right)^3 - 1$ oe	2	**M1** for any cubic or third differences = 6
20(b)	$24 \times \left(\dfrac{1}{2}\right)^{n-1}$ oe	2	**M1** for $c \times \left(\dfrac{1}{2}\right)^{an+b}$ oe where a, b and c are constants and $a > 0$
21	1.08	3	**M2** for $\dfrac{13 \text{ to } 14}{12 + 0.5}$ oe or $\dfrac{14 - 0.5}{12 \text{ to } 13}$ oe or **M1** for $14 + 0.5$ oe or $14 - 0.5$ oe or $12 + 0.5$ oe or $12 - 0.5$ oe

Question	Answer	Marks	Partial Marks
22	24.9 or 24.93 to 24.94	4	**M3** for $\tan = \dfrac{4}{\sqrt{5^2 + 7^2}}$ oe or **M2** for $5^2 + 7^2$ oe or $5^2 + 7^2 + 4^2$ oe or **M1** for recognition of angle *PCA*.
23	$\dfrac{5x-4}{x+3}$ final answer	4	**B2** for $(5x-4)(x-3)$ or **B1** for $(5x+a)(x+b)$ with $ab = 12$ or $a + 5b = -19$ or for $5x(x-3)-4(x-3)$ or $x(5x-4)-3(5x-4)$ **B1** for $(x+3)(x-3)$
24	7	2	**B1** for answer 6 or **M1** for $\left(\dfrac{2}{3}\right)^k \left(\dfrac{1}{3}\right)$ shown with $k > 1$ or $\left(\dfrac{2}{3}\right)^{an+b} \left(\dfrac{1}{3}\right) = \dfrac{64}{2187}$ oe or for $3^n = 2187$ soi or $2^{n-1} = 64$ or $3^{n-1} = 729$ or better
25	$\sqrt[3]{x-1}$ or $(x-1)^{\frac{1}{3}}$	2	**M1** for $x = y^3 + 1$ or for $y - 1 = x^3$ or better

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NUMBER

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NUMBER

MATHEMATICS   **0580/42**

Paper 4 (Extended)   **February/March 2023**

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 [ ].

[Turn over

1 **(a) (i)** Alain and Beatrice share \$750 in the ratio   Alain : Beatrice = 8 : 7.

Show that Alain receives \$400.

[1]

(ii) (a) Alain spends \$150.

Write \$150 as a percentage of \$400.

.... % [1]

(b) He invests the remaining \$250 at a rate of 2% per year simple interest.

Calculate the amount Alain has at the end of 5 years.

\$ .... [3]

(iii) Beatrice invests her \$350 at a rate of 0.25% per **month** compound interest.

Calculate the amount Beatrice has at the end of 5 years.
Give your answer correct to the nearest dollar.

\$ .... [3]

(b) Carl, Dina and Eva share 100 oranges.
The ratio   Carl's oranges : Dina's oranges = 3 : 5.
The ratio   Carl's oranges : Eva's oranges = 2 : 3.

Find the number of oranges Carl receives.

.... [2]

(c) Fred buys a house.
At the end of the first year, the value of the house increases by 5%.
At the end of the second year, the value of the house increases by 3% of its value at the end of the first year.
The value of Fred's house at the end of the second year is $60 564.

Calculate how much Fred paid for the house.

$ .... [3]

(d) Gabrielle invests $500 at a rate of r% per year compound interest.
At the end of 8 years the value of Gabrielle's investment is $609.20 .

Find the value of r.

$r =$ .... [3]

2 **(a)** 100 students take part in a reaction test.
The table shows the results.

Reaction time (seconds)	6	7	8	9	10	11
Number of students	3	32	19	29	11	6

(i) Write down the mode.

.... s [1]

(ii) Find the median.

.... s [1]

(iii) Calculate the mean.

.... s [3]

(iv) Two students are chosen at random.

Find the probability that both their reaction times are greater than or equal to 9 seconds.

.... [2]

(b) The box-and-whisker plot shows the heights, h cm, of some students.

Height (cm)
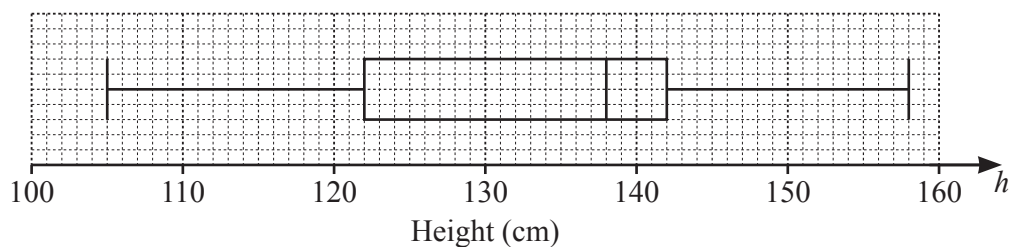
(i) Find the range.

.... cm [1]

(ii) Find the interquartile range.

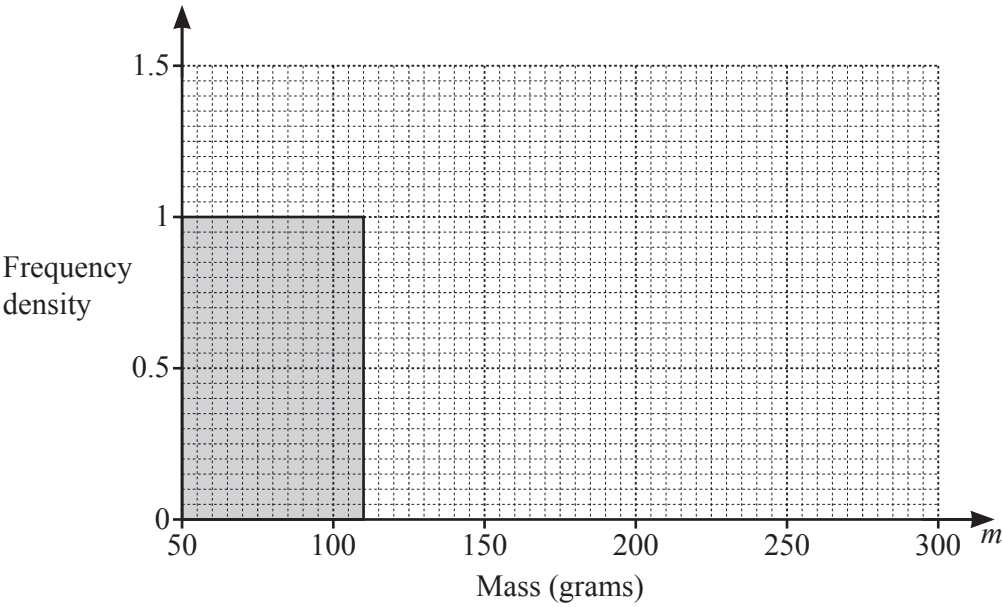.. cm [1]

(c) The mass of each of 200 potatoes is measured.
The table shows the results.

Mass (m grams)	$50 < m \leqslant 110$	$110 < m \leqslant 200$	$200 < m \leqslant 300$
Frequency	60	99	41

(i) Calculate an estimate of the mean.

.... g [4]

(ii) Complete the histogram to show the information in the table.

Mass (grams)

[2]

3

12 cm

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3 cm
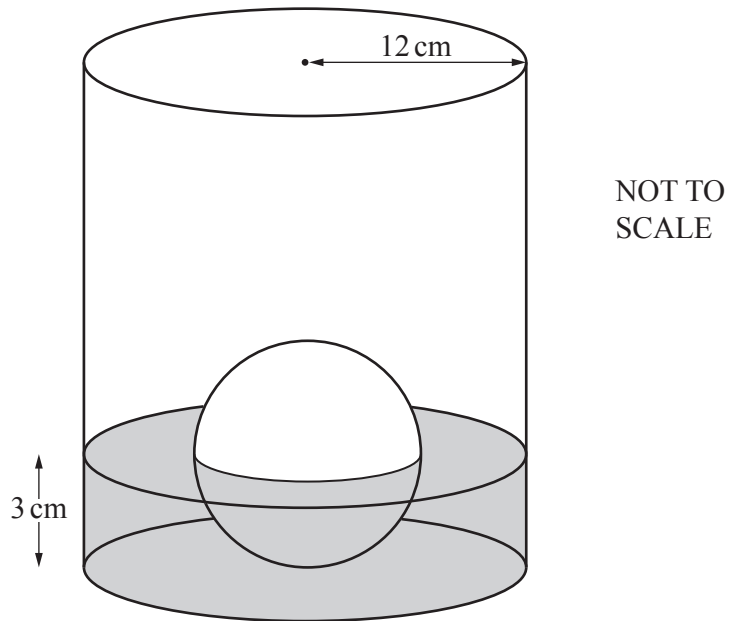
The diagram shows a cylinder containing water.
There is a solid metal sphere touching the base of the cylinder.
Half of the sphere is in the water.

The radius of the cylinder is 12 cm and the radius of the sphere is 3 cm.

(a) The sphere is removed from the cylinder and the level of the water decreases by h cm.

Show that $h = 0.125$.
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

[3]

(b) The water in the cylinder is poured into another cylinder of radius R cm.
The depth of the water in this cylinder is 18 cm.

Calculate the value of R.

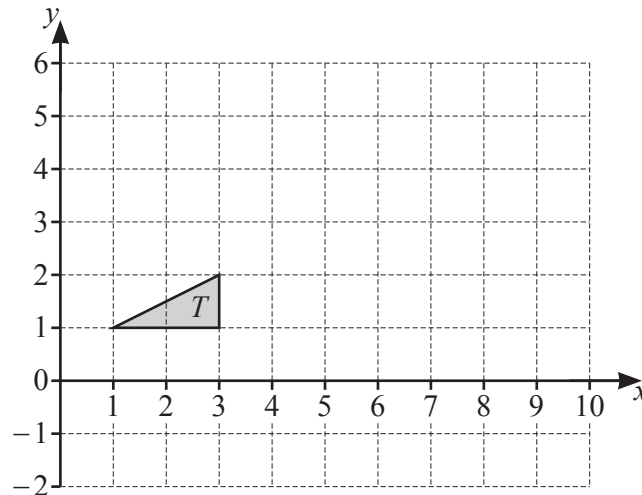$R =$ .... [3]

(c) The sphere is melted down and some of the metal is used to make 30 cubes with
edge length 1.5 cm.

Calculate the percentage of metal **not** used.
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

.... % [3]

4 **(a)**

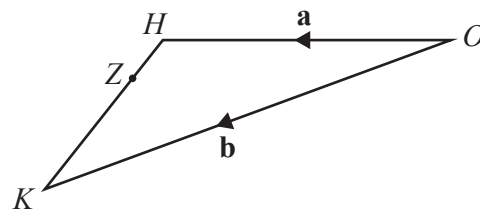**(i)** Enlarge triangle T by scale factor 3, centre $(0, 2)$. [2]

(ii) **(a)** Rotate triangle T about $(4, 2)$ by 90° clockwise.
Label the image P. [2]

(b) Reflect triangle T in the line $x + y = 6$.
Label the image Q. [3]

(c) Describe fully the **single** transformation that maps triangle P onto triangle Q.

....

.... [2]

(b)

NOT TO
SCALE

The diagram shows triangle OHK, where O is the origin.
The position vector of H is **a** and the position vector of K is **b**.
Z is the point on HK such that $HZ : ZK = 2 : 5$.

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

.... [3]

5 **(a)** Expand and simplify.
$$(2p^2 - 3)(3p^2 - 2)$$

.... [2]

(b) $s = \frac{1}{2}(u+v)t$

(i) Find the value of s when $u = 20$, $v = 30$ and $t = 7$.

$s = $ .... [2]

(ii) Rearrange the formula to write v in terms of s, u and t.

$v = $ .... [3]

(c) Factorise completely.

(i) $2qt - 3t - 6 + 4q$

.... [2]

(ii) $x^3 - 25x$

.... [3]

6
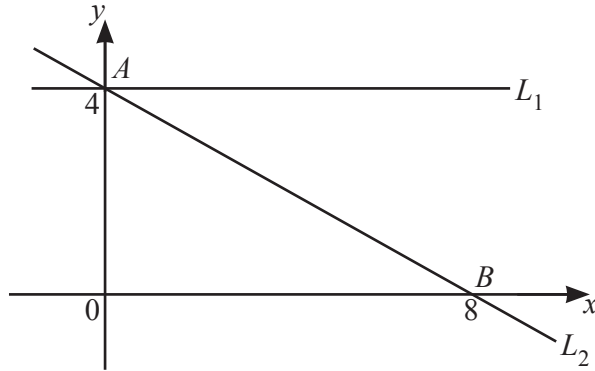
NOT TO
SCALE

A is the point $(0, 4)$ and B is the point $(8, 0)$.
The line L_1 is parallel to the x-axis.
The line L_2 passes through A and B.

(a) Write down the equation of L_1.

.... [1]

(b) Find the equation of L_2.
Give your answer in the form $y = mx + c$.

$y =$ .... [2]

(c) C is the point $(2, 3)$.
The line L_3 passes through C and is perpendicular to L_2.

(i) Show that the equation of L_3 is $y = 2x - 1$.

[3]

(ii) L_3 crosses the x-axis at D.

Find the length of CD.

.... [5]

7 $\mathscr{E} = $ {students in a class} $P = $ {students who study Physics} $C = $ {students who study Chemistry}

$n(\mathscr{E}) = 24$ $n(P) = 17$ $n(C) = 14$ $n(P \cap C) = 9$

(a) Complete the Venn diagram.
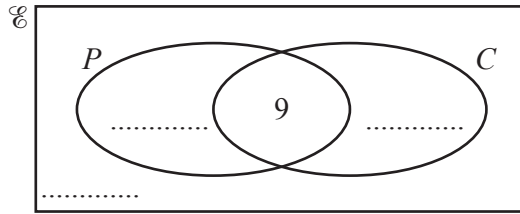
[2]

(b) (i) Find $n(P \cap C')$.

.... [1]

(ii) Find $n(P \cup C')$.

.... [1]

(c) Two students are picked from the class at random.

Find the probability that one student studies both subjects and one student studies Chemistry but not Physics.

.... [3]

(d) Two of the students who study Physics are picked at random.

Find the probability that they both study Chemistry.

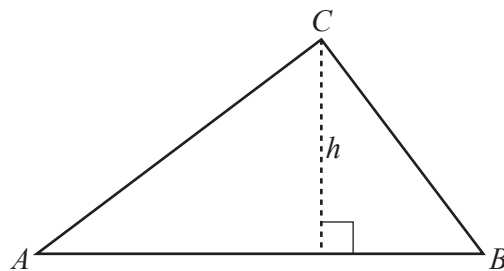.. [2]

8 (a)
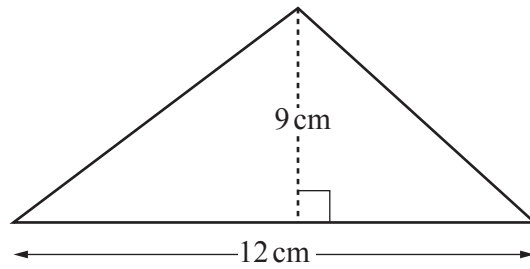
NOT TO
SCALE

Calculate the area of the triangle.

.... cm^2 [2]

(b)

NOT TO
SCALE

$AB = (2x + 3)$ cm and $h = (x + 5)$ cm.
The area of triangle $ABC = 50$ cm^2.

Find the value of x, giving your answer correct to 2 decimal places.
You must show all your working.

$x =$ .... [6]

[Turn over

9 $f(x) = x^3 - 3x^2 - 4$

(a) Find the gradient of the graph of $y = f(x)$ where $x = 1$.

.... [3]

(b) Find the coordinates of the turning points of the graph of $y = f(x)$.

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

(c) Sketch the graph of $y = \text{f}(x)$.
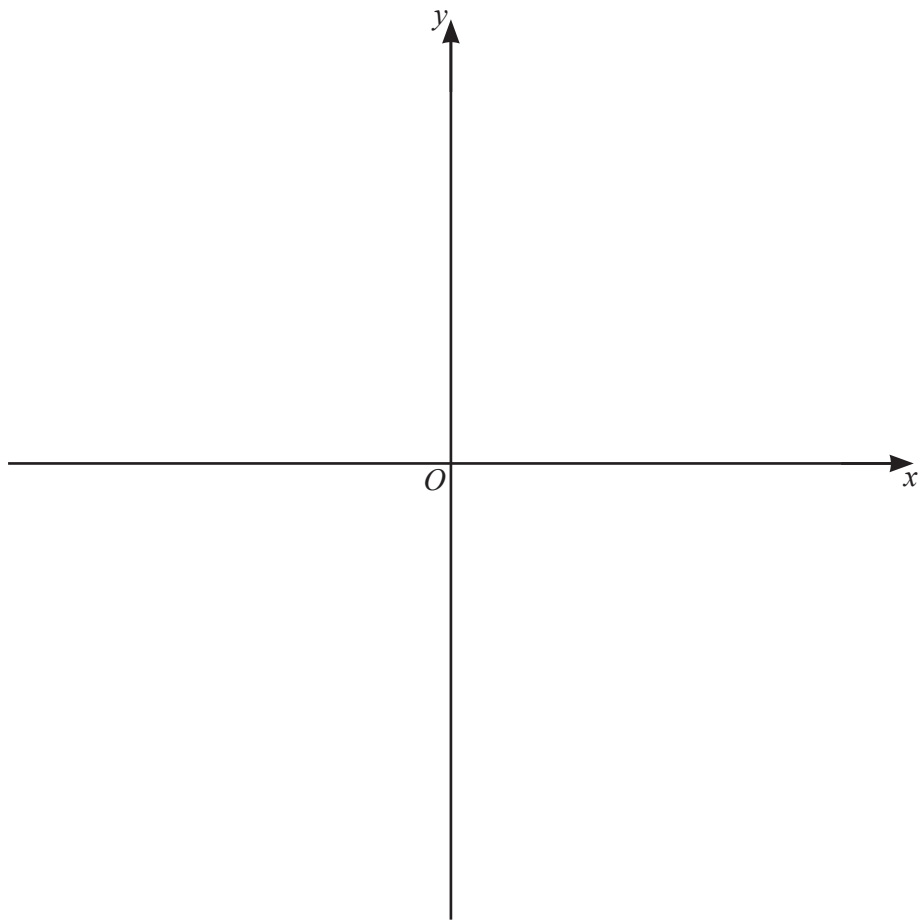
[2]

10
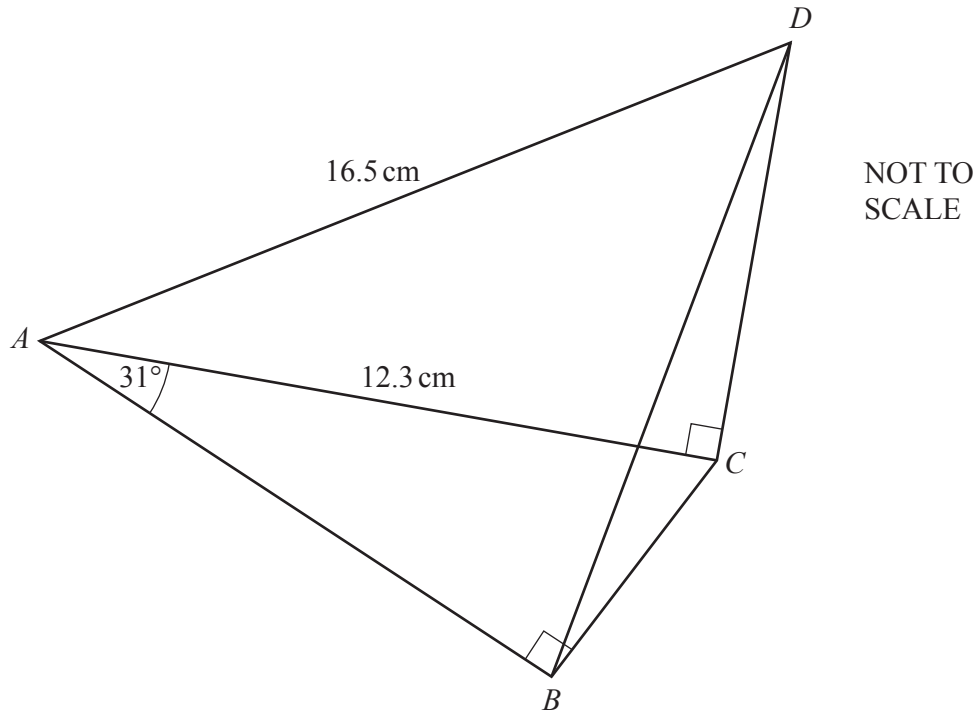
The diagram shows a quadrilateral *ABCD*.
AC = 12.3 cm and *AD* = 16.5 cm.
Angle *BAC* = 31°, angle *ABC* = 90° and angle *ACD* = 90°.

(a) Show that *AB* = 10.54 cm, correct to 2 decimal places.

[2]

(b) Show that angle *DAC* = 41.80° correct to 2 decimal places.

[2]

(c) Calculate *BD*.

BD = ...cm [3]

(d) Calculate angle *CBD*.

Angle *CBD =* .... [4]

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

.... cm [4]

11 $f(x) = 2x - 1$ $g(x) = 3x + 2$ $h(x) = \dfrac{1}{x}, x \neq 0$ $j(x) = x^2$

(a) Find $j(-1)$.

.... [1]

(b) Find x when $f(x) + g(x) = 0$.

$x =$ .... [2]

(c) Find $gg(x)$, giving your answer in its simplest form.

.... [2]

(d) Find $hf(x) + gh(x)$, giving your answer as a single fraction in its simplest form.

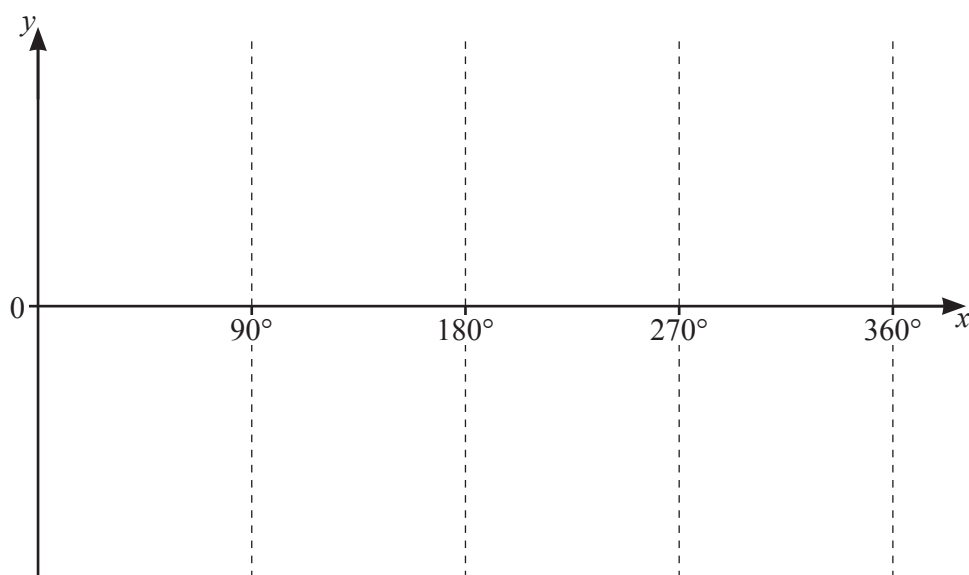.. [4]

(e) When $pp(x) = x$, $p(x)$ is a function such that $p^{-1}(x) = p(x)$.

Draw a ring around the function that has this property.

    $f(x) = 2x - 1$ $g(x) = 3x + 2$ $h(x) = \dfrac{1}{x}, x \neq 0$ $j(x) = x^2$

[1]

12 **(a)** Sketch the graph of $y = \tan x$ for $0° \leqslant x \leqslant 360°$.

[2]

(b) Find x when $\tan x = \dfrac{1}{\sqrt{3}}$ and $0° \leqslant x \leqslant 360°$.

.... [2]

20

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Cambridge Assessment
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MATHEMATICS **0580/42**

Paper 4 (Extended) **February/March 2023**

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 2023 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

[Turn over

0580/42

Muhammad Shafiq ur Rehman (03247304567) Aitchison College (www.sirshafiq.com)
Cambridge IGCSE – Mark Scheme
PUBLISHED

February/March 2023

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)	$\dfrac{750}{8+7} \times 8$ [= 400]	**M1**	
1(a)(ii)(a)	37.5	**1**	
1(a)(ii)(b)	275	**3**	**M2** for $250 + \dfrac{250 \times 2 \times 5}{100}$ oe or **M1** for $\dfrac{250 \times 2 \times 5}{100}$ oe
1(a)(iii)	407[.00] cao nfww	**3**	**B2** for 406.5 to 406.7 or **M1** for $350 \times \left(1 + \dfrac{0.25}{100}\right)^{60}$ oe isw If 0 scored **SC1** for answer 354 or answer 406
1(b)	24	**2**	**M1** for [C : D =] 6 : 10 oe and [C : E =] 6 : 9 oe or for $\dfrac{6}{6+10+9}[\times 100]$ oe

Question	Answer	Marks	Partial Marks
1(c)	56 000 nfww	3	**M2** for $60564 \div \left(1+\dfrac{3}{100}\right) \div \left(1+\dfrac{5}{100}\right)$ oe or **M1** for $[x\times]\left(1+\dfrac{3}{100}\right)\times\left(1+\dfrac{5}{100}\right)$ or for $60564 \div \left(1+\dfrac{3}{100}\right)$ oe or $60564 \div \left(1+\dfrac{5}{100}\right)$ If 0 scored, **SC1** for answer 65499 to 65500
1(d)	2.5[0] or 2.499...	3	**M2** for $\sqrt[8]{\dfrac{609.20}{500}}$ oe or **M1** for $500\times(...)^8 = 609.2[0]$ oe
2(a)(i)	7	1	
2(a)(ii)	8	1	
2(a)(iii)	8.31	3	**M1** for 3×6 + 32×7 + 19×8 + 29×9 + 11×10 + 6×11 oe **M1dep on M1** for $\dfrac{\sum fx}{100}$
2(a)(iv)	$\dfrac{23}{110}$ oe	2	**M1** for $\dfrac{k}{100}\times\dfrac{k-1}{99}$ oe, $k<100$ or **B1** for $\dfrac{46}{100}$ and $\dfrac{45}{99}$
2(b)(i)	53	1	
2(b)(ii)	20	1	

Question	Answer	Marks	Partial Marks
2(c)(i)	151.975	4	**M1** for 80, 155, 250 soi **M1** for $\sum fx$ where x is in correct interval including boundaries **M1 dep** for $\dfrac{\sum fx}{200}$ dep on second M1
2(c)(ii)	Correct histogram completed with widths 110 to 200 and 200 to 300 and heights 1.1 and 0.41	2	**B1** for one correct block If 0 scored, **SC1** for 1.1 and 0.41 seen
3(a)	$[\,h=\,]\ \dfrac{\frac{1}{2}\times\frac{4}{3}\times\pi\times 3^3}{\pi\times 12^2}$ oe leading to 0.125 or $3-\dfrac{\pi\times 12^2\times 3-\frac{1}{2}\times\frac{4}{3}\times\pi\times 3^3}{\pi\times 12^2}$ oe leading to 0.125	M3	**M2** for $\pi\times 12^2\times h=\frac{1}{2}\times\frac{4}{3}\times\pi\times 3^3$ oe or for $\pi\times 12^2\times 3=\pi\times 12^2\times x+\tfrac{2}{3}\times\pi\times 3^3$ oe or for $\dfrac{\frac{1}{2}\times\frac{4}{3}\times\pi\times 3^3}{\pi\times 12^2\times 3}=\dfrac{h}{3}$ oe or **M1** for $\pi\times 12^2\times h$ or $\frac{1}{2}\times\frac{4}{3}\times\pi\times 3^3$ oe or $\pi\times 12^2\times 3$

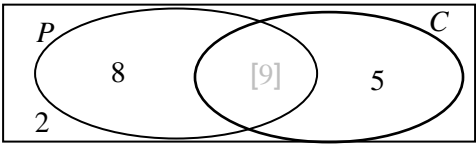| Question	Answer	Marks	Partial Marks
3(b)	4.8[0] or 4.795 to 4.796	3	**M2** for $\pi \times 12^2 \times (3 - 0.125) = \pi \times R^2 \times 18$ oe or $\pi \times 12^2 \times 3 - \frac{2}{3} \times \pi \times 3^3 = \pi \times R^2 \times 18$ or **B1** for $3 - 0.125$ or for 414π oe
3(c)	10.5 or 10.47 to 10.49	3	**M2** for $\dfrac{\frac{4}{3} \times \pi \times 3^3 - 30 \times 1.5^3}{\frac{4}{3} \times \pi \times 3^3}$ or $\dfrac{30 \times 1.5^3}{\frac{4}{3} \times \pi \times 3^3} \times 100$ oe or **M1** for $\frac{4}{3} \times \pi \times 3^3 - 30 \times 1.5^3$ or $\dfrac{30 \times 1.5^3}{\frac{4}{3} \times \pi \times 3^3}$ oe
4(a)(i)	Triangle at (3, –1), (9, –1), (9, 2)	2	**B1** for correct shape, size and orientation or for correct plots but no triangle
4(a)(ii)(a)	Triangle at (3, 3), (4, 3), (3, 5)	2	**B1** for correct shape size and orientation or for rotation about (4, 2) 90° anticlockwise or for correct plots but no triangle
4(a)(ii)(b)	Triangle at (4, 3), (5, 3), (5, 5)	3	**B2** for correct shape size and orientation or for correct plots but no triangle or **M1** for $x + y = 6$ drawn
4(a)(ii)(c)	Reflection $x = 4$	2	**B1** for each

Question	Answer	Marks	Partial Marks
4(b)	$\frac{5}{7}\mathbf{a} + \frac{2}{7}\mathbf{b}$ final answer	3	**B2** for correct unsimplified answer OR **M2** for $\overrightarrow{HZ} = \frac{2}{7}(\mathbf{b}-\mathbf{a})$ or $\overrightarrow{KZ} = \frac{5}{7}(\mathbf{a}-\mathbf{b})$ oe or **M1** for $\overrightarrow{HK} = -\mathbf{a}+\mathbf{b}$ or $\overrightarrow{KH} = -\mathbf{b}+\mathbf{a}$ or for a correct route
5(a)	$6p^4 - 13p^2 + 6$ final answer	2	**B1** for three of $6p^4 - 9p^2 - 4p^2 + 6$ seen
5(b)(i)	175	2	**M1** for $\frac{1}{2}(20+30)\times 7$ oe
5(b)(ii)	$\frac{2s-ut}{t}$ or $\frac{2s}{t}-u$ final answer	3	**B2** for correct answer but unsimplified e.g. $\frac{s\div t}{0.5}-u$, $\frac{s}{\frac{1}{2}t}-u$, $\frac{s}{0.5t}-u$ **OR** **M1** for correct multiplication by 2 or division by 0.5 **M1** for correctly rearranging terms to isolate term in v **M1** for correct division by t Max 2 marks if final answer incorrect
5(c)(i)	$(2q-3)(t+2)$ final answer	2	**B1** for $t(2q-3)+2(2q-3)$ or $2q(t+2)-3(t+2)$

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Question	Answer	Marks	Partial Marks
5(c)(ii)	$x(x+5)(x-5)$ final answer	3	**B2** for $(x^2-5x)(x+5)$ or $(x^2+5x)(x-5)$ or for correct answer seen then spoiled or **B1** for $x(x^2-25)$
6(a)	$y = 4$ oe	1	
6(b)	$[y =] -\dfrac{1}{2}x + 4$ final answer	2	**B1** for grad $= -\dfrac{4}{8}$ oe soi or $[y =] kx + 4$
6(c)(i)	Gradient $= \dfrac{-1}{their \text{ gradient in} (b)}$	M1	Accept e.g. $2 \times -\dfrac{1}{2} = -1$ oe or states negative reciprocal of $-\dfrac{1}{2} = 2$
	Substituting (2, 3) in *their* equation.	M1	$3 = 2 \times their\ m + c$
	leading to $y = 2x - 1$	A1	No errors or omissions
6(c)(ii)	3.35 or 3.354...	5	**B2** for $\left(\dfrac{1}{2}, 0\right)$ soi or x-coordinate of $D = \dfrac{1}{2}$ or **M1** for $2x - 1 = 0$ **M2** for $(2 - their\frac{1}{2})^2 + (3 - their\, 0)^2$ oe or **M1** for $(2 - their\frac{1}{2})$ and $(3 - their\, 0)$ oe

Question	Answer	Marks	Partial Marks
7(a)	Completed Venn diagram.	2	**B1** for two correct values
7(b)(i)	8	1	**FT** *their* **(a)** *their* 8 dep < 24
7(b)(ii)	19	1	**FT** *their* **(a)** 24 – *their* 5 dep on positive answer
7(c)	$\dfrac{15}{92}$ oe	3	**M2** for $[2\times]\dfrac{9}{24}\times\dfrac{their\,5}{23}$ oe or **M1** for $\dfrac{9}{24}$ and $\dfrac{their\,5}{23}$ **or** $\dfrac{their\,5}{24}$ and $\dfrac{9}{23}$ If 0 scored **SC1** for answer $\dfrac{5}{32}$ oe
7(d)	$\dfrac{9}{34}$ oe	2	**B1** for $\dfrac{9}{17}$ seen
8(a)	54	2	**M1** for $\dfrac{1}{2}\times12\times9$

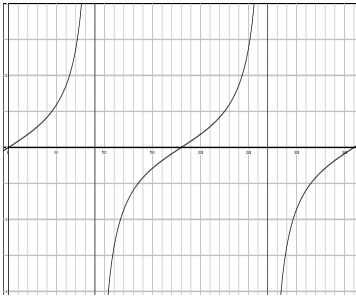| Question	Answer	Marks	Partial Marks
8(b)	$2x^2 + 13x - 85 \, [= 0]$	**B3**	**M1** for $\dfrac{1}{2}(2x+3)(x+5) \, [= 50]$ oe **B1** for $2x^2 + 10x + 3x + 15$
	$\dfrac{-13 \pm \sqrt{13^2 - 4(2)(-85)}}{2(2)}$ oe or $-\dfrac{13}{4} \pm \sqrt{\dfrac{85}{2} + \left(\dfrac{13}{4}\right)^2}$ oe	**M2**	**M1** for $\sqrt{13^2 - 4 \times 2 \times -85}$ oe or for $\dfrac{-13 + \text{or} - \sqrt{p}}{2(2)}$ oe or for $[2]\left(x + \dfrac{13}{4}\right)^2$
	4.03 cao	**B1**	
9(a)	–3	**3**	**B2** for $3x^2 - 6x$ or **B1** for $3x^2 - kx$ or for $kx^2 - 6x$ or for $3x^2 - 6x + c$
9(b)	(0, –4) and (2, –8)	**4**	**B3** for $x = 0$ and 2 or for (2, –8) OR **M1** for *their* $3x^2 - 6x = 0$ or stating $\dfrac{dy}{dx} = 0$ oe **M1** for correct method to solve *their* $3x^2 - 6x = 0$

Question	Answer	Marks	Partial Marks
9(c)	Correct sketch 	**2**	Max on negative y-axis and min in correct quadrant and extends into first quadrant **B1** for positive cubic graph and two turning points
10(a)	$\cos 31 = \dfrac{AB}{12.3}$ oe	**M1**	
	10.543...	**A1**	
10(b)	$\cos = \dfrac{12.3}{16.5}$ oe	**M1**	
	41.801 to 41.802	**A1**	
10(c)	16.7 or 16.8 or 16.74 to 16.75…	**3**	**M2** for $\sqrt{10.54^2 + 16.5^2 - 2 \times 10.54 \times 16.5 \times \cos(31+41.8)}$ or for $\sqrt{6.33^2 + 11^2 - 2 \times 6.33 \times 11 \times \cos(180-31)}$ OR **M1** for $10.54^2 + 16.5^2 - 2 \times 10.54 \times 16.5 \times \cos(31+41.8)$ or for $6.33^2 + 11^2 - 2 \times 6.33 \times 11 \times \cos(90+90-31)$ oe **A1** for 280 or 281 or 280.4 to 280.6

Question	Answer	Marks	Partial Marks
10(d)	18.9 to 20.7… nfww	4	**M1** for $\sin 31 = \dfrac{BC}{12.3}$ oe or better and $\sin 41.8[0] = \dfrac{CD}{16.5}$ oe **M2dep on M1** for $\cos [DBC] = \dfrac{their(c)^2 + 6.34^2 - 10.998^2}{2 \times their(c) \times 6.34}$ or **M1dep on M1** for $10.998^2 = their\ (c)^2 + 6.34^2 - 2 \times their\ (c) \times 6.34 \times \cos DBC$
10(e)	2.05 to 2.24… nfww	4	**M1** for $\sin 31 = \dfrac{BC}{12.3}$ oe or better or $\sin 41.8[0] = \dfrac{CD}{16.5}$ oe **M2dep on M1** for $\dfrac{\text{dist}}{theirBC} = \sin(their\ \text{angle}\ CBD)$ or $\dfrac{\text{dist}}{theirCD} = \sin(their\ \text{angle}\ CDB)$ or **M1** for recognition of shortest distance
11(a)	1	1	
11(b)	$-\dfrac{1}{5}$ or -0.2	2	**M1** for $2x - 1 + 3x + 2 = 0$ oe isw
11(c)	$9x + 8$ final answer	2	**M1** for $3(3x + 2) + 2$

Question	Answer	Marks	Partial Marks
11(d)	$\dfrac{4x^2 + 5x - 3}{x(2x-1)}$ final answer	4	**M1** for $\dfrac{1}{2x-1}$ and $3\left(\dfrac{1}{x}\right) + 2$ oe **B1** for $x + 3(2x-1) + 2x(2x-1)$ oe or better isw **B1** for common denominator $= x(2x-1)$ isw If 0 scored, **SC1** for answer $\dfrac{4x^2 + 9x + 3}{x(2x+1)}$
11(e)	h(x) indicated	1	
12(a)	Correct sketch 	2	Condone curve touching asymptotes but not crossing **B1** for one section correct or for 3 sections in correct part of graph but with incorrect curvature and no other sections in incorrect part of graph
12(b)	30 **and** 210 final answer	2	**B1** for each If 0 scored **SC1** for two answers (one acute and one reflex) with a difference of 180