CAMBRIDGE

Example Practice Papers for Cambridge IGCSE® Mathematics Extended Practice Book

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NAME

Cambridge IGCSE Mathematics Extended Practice Book

Example Practice Paper 2 **1 hour 30 minutes**

PLEASE NOTE: this example practice paper contains *exam-style* questions only

READ THESE INSTRUCTIONS FIRST

Answer **all** questions.

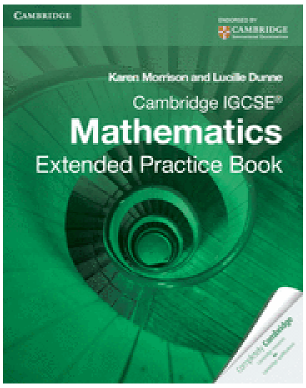
Working for a question should be written below the question.

If the answer is not exact but a degree of accuracy has not been provided, give the answer as follows:
- to three significant figures for all values, except
- to one decimal place for degrees
- for π, use either your calculator value or 3.142.

The number of marks is given in brackets [ ] next to each question or part question.

The total of the marks for this paper is 67.

PLEASE NOTE: this practice examination paper has been written in association with the below publication and is not an official exam paper:



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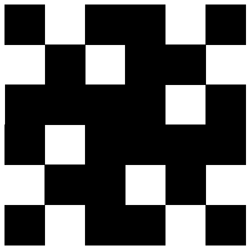
1



(a) For the diagram above write down

(i) the order of rotational symmetry,

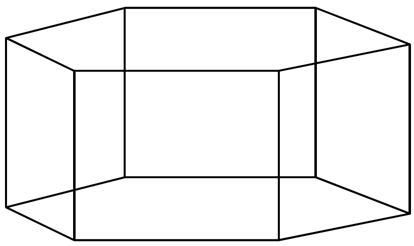
Answer(a)(i) .... [1]

(ii) the number of lines of symmetry.

Answer(a)(ii) .... [1]

(b) The prism below has 6 square faces and a regular hexagonal cross-section.

Write down the number of **planes** of symmetry for the prism.



Answer(b) .... [1]

---

2 Calculate the value of $\dfrac{2\sqrt{3+\frac{4}{7}}}{(2-\sqrt{3})^2}$

(a) writing down all the figures in your calculator answer,

Answer(a) .... [1]

(b) writing you answer correct to 3 decimal places.

Answer(b) .... [1]

3 Find the midpoint of the line joining the points $A(4, 3)$ and $B(-3, 0)$.

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

---

4 Expand the brackets and simplify.

$$\frac{1}{3}(9x-3)-5(x-3)$$

Answer .... [2]

---

5 Zagreb changed \$600 into euros at an exchange rate of \$1 = €1.25.
He later changed all of the euros back into dollars at an exchange rate of \$1 = €1.20.

How many dollars did he receive?

Answer \$ .... [2]

---

6 Solve the simultaneous equations.

$$x + 4y = -19$$
$$3y - 5 = 2x$$

Answer x = ...

Answer y = ... [3]

---

7 The dimensions of a rectangle are 13 cm by 7 cm, correct to the nearest cm.
Find the smallest possible area of the rectangle.

Answer ………………………………. cm^2 [2]

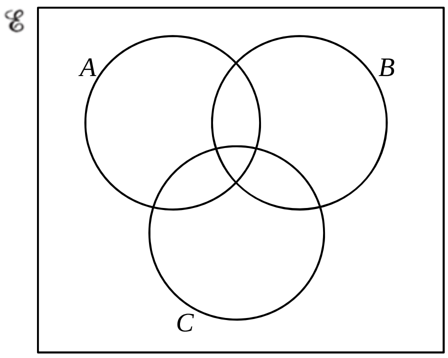
---

8 The intensity of radiation from the Sun, R, is inversely proportional to the square of the distance from the Sun, d.
When $d = 2 \times 10^8$, $R = 20$.
Find d when $R = 500$.

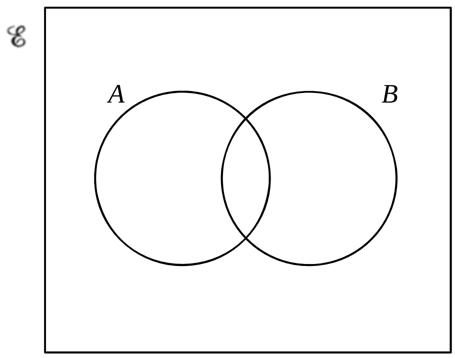
Answer $d =$ ………………………………. [3]

---

9 Shade the region required in each Venn diagram.



$(A \cap B) \cup C$



$A \cap B'$

[2]

---

10 A woman invested $300 for 5 years at 7% per year **compound** interest.

Calculate the final amount she had after 5 years.

Answer $ ………………………………. [3]

11

$$\mathbf{A} = \begin{pmatrix} 3 & -4 \\ 1 & 2 \end{pmatrix}$$

Work out

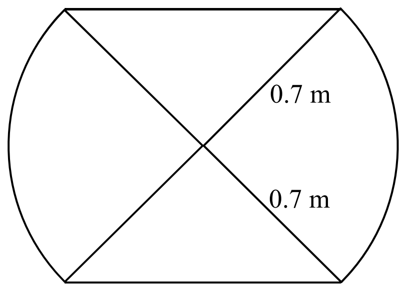
(a) $\mathbf{A}^2$

Answer(a) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(b) $\mathbf{A}^{-1}$, the inverse of **A**

Answer(b) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

12



A conference table is made of two quarter circles and two identical triangles.
The radius of the quarter circles is 0.7 m.

Calculate the surface area of the top of the table.

Answer ………………………………… m^2 [3]

Written specifically for the publication '*Cambridge IGCSE Mathematics Core Practice Book'*.
Cambridge International Examinations does not take responsibility for this content or the associated answers.

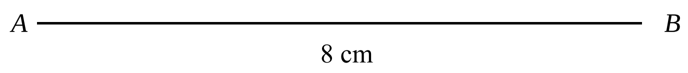
13 Make x the subject of $y = \dfrac{5 - \sqrt{x}}{6}$

Answer x = ... [3]

---

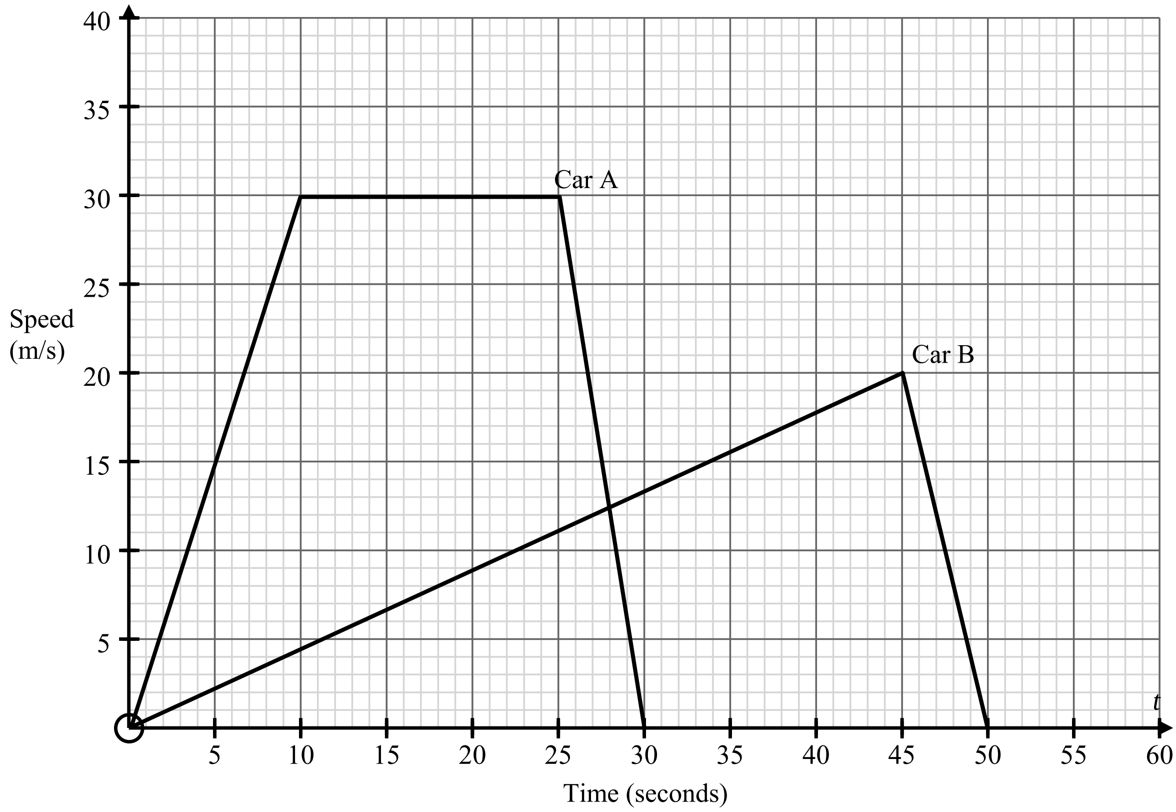
14 The lengths of the sides of a parallelogram are 6 cm and 8 cm.
The length of the longer diagonal of the parallelogram is 11 cm.
AB is a side of the parallelogram.

Using a straight edge and a compasses only, construct the parallelogram.



[3]

15



The graph above shows the journey of two cars, A and B.

(a) Work out the acceleration of car A during the first 10 seconds.

Answer(a) …………………………… m/s^2 [2]

(b) Calculate how far car B travels before coming to rest.

Answer(b) ……………………………… m [2]

(c) State which car experiences the highest **deceleration**.

Answer(c) ……………………………… [1]

16 Simplify

(a) $\left(\dfrac{x^{10}}{32}\right)^{0.6}$

Answer(a) .... [2]

(b) $\left(4x^{-3}\right)^{-2} \div 2^{-2}x^{5}$

Answer(b) .... [2]

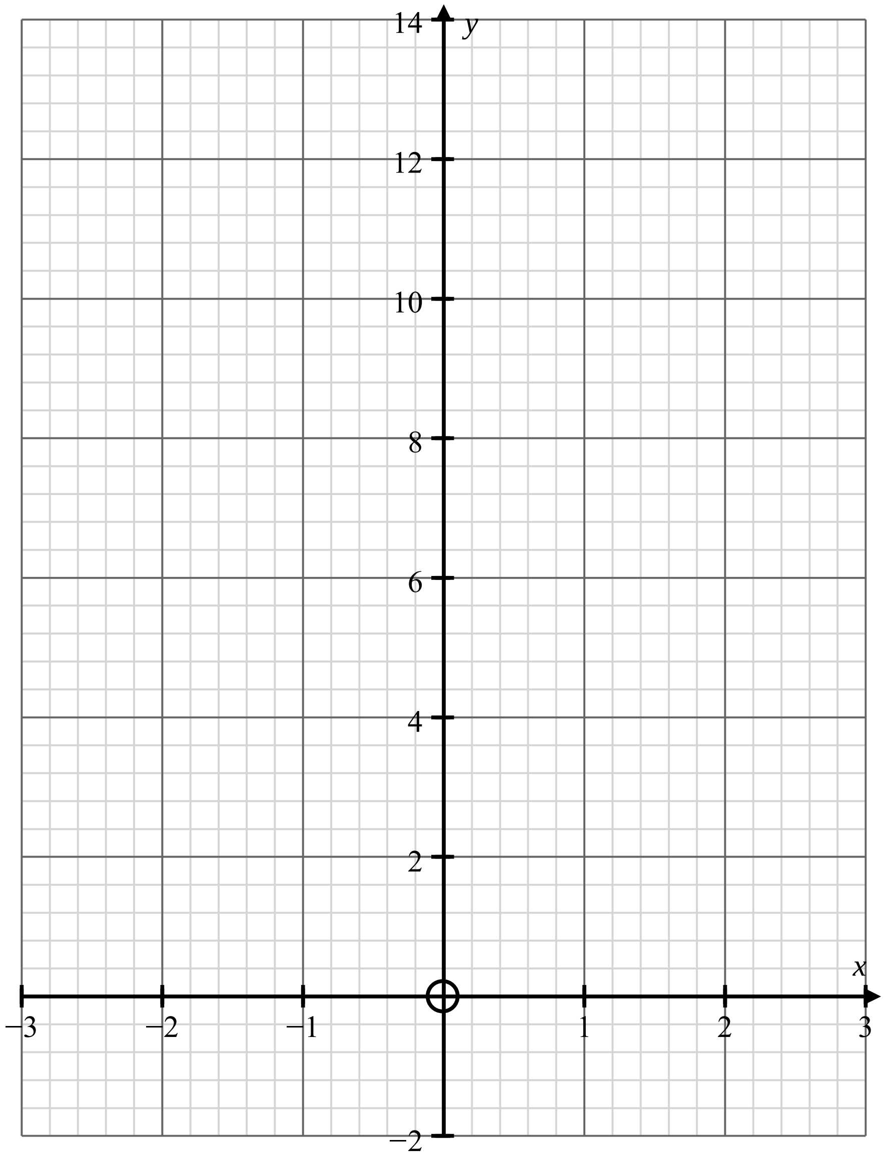
---

17 Simplifying as much as possible, write the following as a single fraction.

$$\frac{x^2+6x-16}{x^2+5x-14}-1$$

Answer [4]

18



(a) Draw the lines $y = 12$, $6x + 2y = 12$ and $y - 6x = 0$ on the grid above. [4]

(b) Write the letter R in the region defined by the three inequalities below.

$y \leq 12$ $6x + 2y \geq 12$ $y - 6x \geq 0$

[1]

19 Solve the equation.

$$x^2 - 12x + 30 = 0$$

Show all your working and give your answers correct to 2 decimal places.

Answer $x =$ ………… or $x =$ …………… [3]

---

20 $\mathrm{f}(x) = \dfrac{x-5}{x}$ $\quad \mathrm{g}(x) = \dfrac{1}{x^2}$

(a) Work out f(3).

Answer(a) ……………………………… [1]

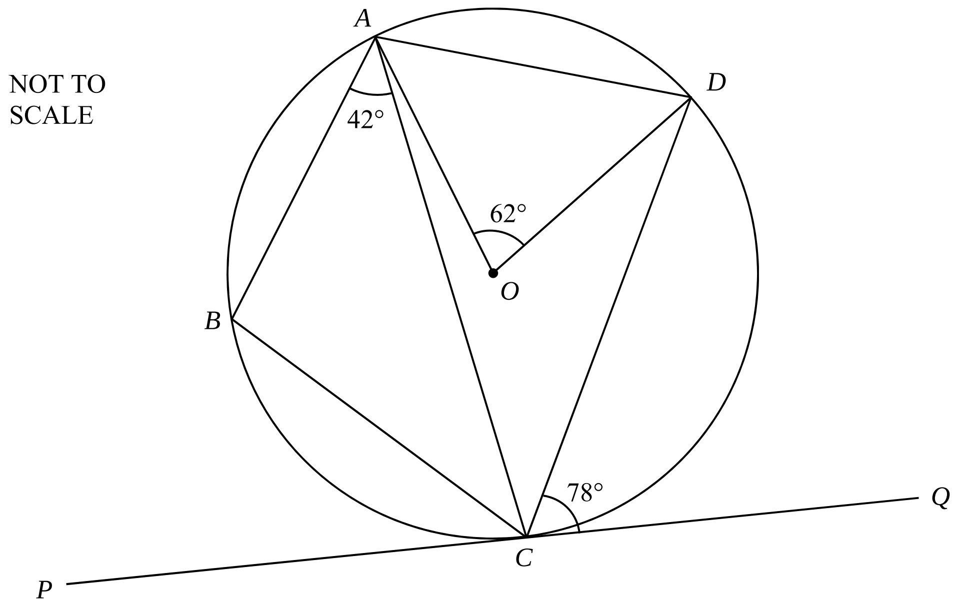
(b) Find fg(x) in its simplest form.

Answer(b) ……………………………… [2]

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

Answer(c) ……………………………… [2]

21



A, B, C and D lie on the circle, centre O.
The line PCQ is a tangent to the circle at C.
Angle $AOD = 62°$, angle $BAC = 42°$ and angle $DCQ = 78°$.

Find

(a) angle ODA

Answer(a) Angle ODA = ………………… [1]

(b) angle ACD

Answer(b) Angle ACD = ………………… [1]

(c) Angle $PCB = 42°$, find BAD

Answer(c) Angle BAD = ………………… [1]

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Example Practice Paper 2 (Extended)

Mark Scheme

Key: A – Accuracy marks awarded for a correct answer seen.
M – Method marks awarded for clear attempt to apply correct method.
oe – Or Equivalent.
“ ” – allow M marks for methods that include wrong answers from previous results.

1	(a)(i)	4	A1
	(a)(ii)	0	A1
	(b)	7	A1

2	(a)	52.64365994… (accept more figures)	A1
	(b)	52.644	A1

3		$\frac{1}{2}(x_1 + x_2)$ or $\frac{1}{2}(y_1 + y_2)$	M1
		(0.5, 1.5)	A1 A1

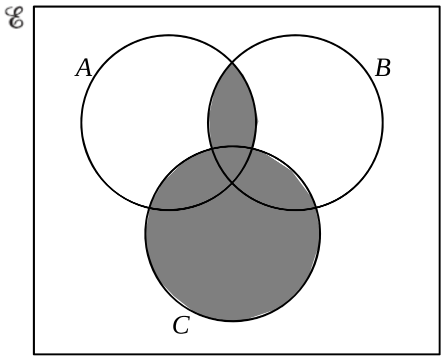
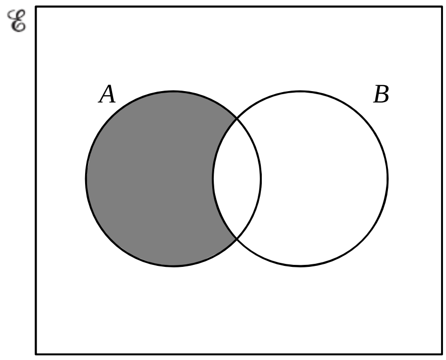
4		$3x - 1 - 5x + 15$	M1
		$14 - 2x$ oe	A1

5		600 × 1.25 ÷ 1.20	M1
		$625	A1

6		Clear attempt at elimination or substitution method	M1
		$x = -7$, $y = -3$	A1 A1

7		12.5 × 6.5 (rounding down)	M1
		81.25	A1

8		500 ÷ 20 = 25	M1
		$2 \times 10^8 \div \sqrt{"25"}$ (allow methods that involve finding a formula)	M1
		4×10^7 oe	A1

9		 	A1 A1

10		300×1.07^n	M1
		300×1.07^5	M1
		420.77	A1

11	(a)	$\begin{pmatrix} 5 & -20 \\ 1 & 0 \end{pmatrix}$ Any 2 correct	M1
		$\begin{pmatrix} 5 & -20 \\ 1 & 0 \end{pmatrix}$ All 4 correct	A1
	(b)	$\begin{pmatrix} 2 & 4 \\ -1 & 3 \end{pmatrix}$ seen **or** $\frac{1}{10}$	M1
		$\begin{pmatrix} 2 & 4 \\ -1 & 3 \end{pmatrix}$ seen **and** $\frac{1}{10}$; accept $\begin{pmatrix} 0.2 & 0.4 \\ -0.1 & 0.3 \end{pmatrix}$	A1

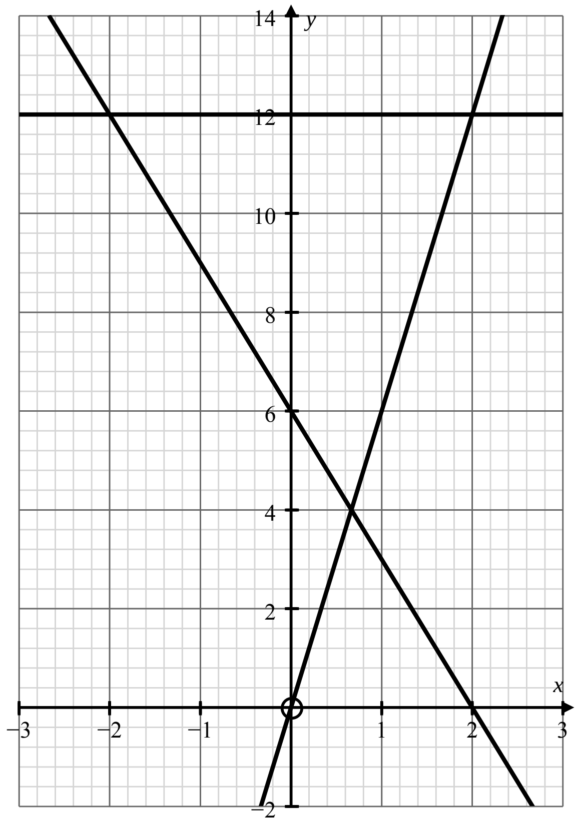
12		0.7^2 , $\frac{\pi \times 0.7^2}{2}$	M1 M1
		1.26 m^3	A1

13		$6y = 5 - \sqrt{x}$	M1
		$\sqrt{x} = 5 - 6y$	M1
		$x = (5 - 6y)^2$	A1

14		Two arcs at 6 cm from A **and** B	M1
		Arc at 11 cm from A **or** B	M1
		Arc at 8 cm from intersection of 11 cm and 6 cm arc, and fully correct answer	A1

15	(a)	$30 \div 10$	M1
		3 m/s^2	A1
	(b)	$0.5 \times 20 \times 45 + 0.5 \times 20 \times 5$ **or** $\frac{1}{2} \times 50 \times 20$ (finding area under car B curve)	M1
		500 m	A1
	(c)	Car A (it has the steeper downward gradient)	A1

16	(a)	$\left(\frac{x^{10}}{32}\right)^{\frac{3}{5}} = \left(\frac{x^2}{2}\right)^3$	M1
		$\frac{x^6}{8}$	A1
	(b)	$\frac{x^6}{16} \div \frac{x^5}{4}$	M1
		$\frac{x}{4}$	A1

17		$\dfrac{(x-2)(x+8)}{(x-2)(x+7)}-1$	M1
		$\dfrac{x+8}{x+7}-\dfrac{x+7}{x+7}$	M1
		$\dfrac{x+8-x-7}{x+7}$	M1
		$\dfrac{1}{x+7}$	A1
18	(a)		A1 A1 A1 A1
	(b)	**R** labelled in triangle formed by lines	A1

19		$x=\dfrac{12\pm\sqrt{144-120}}{2}$	M1
		8.45, 3.55	A1 A1

20	(a)	$-\dfrac{2}{3}$	A1
	(b)	$\dfrac{\frac{1}{x^2}-5}{\frac{1}{x^2}}$	M1
		$1-5x^2$	A1
	(c)	$x=\dfrac{y-5}{y}$ exchange letters, rearrange to $y = \ldots$	M1
		$f^{-1}(x)=\dfrac{5}{1-x}$	A1

21	(a)	59° (isosceles triangle)	A1
	(b)	31° (angle at centre = 2 × angle at circumference)	A1
	(c)	120° (opposite angles in a cyclic quadrilateral)	A1
			Total: 67

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Cambridge IGCSE Mathematics Extended Practice Book

Example Practice Paper 4 **2 hours 30 minutes**

PLEASE NOTE: this example practice paper contains *exam-style* questions only

READ THESE INSTRUCTIONS FIRST

Answer **all** questions.

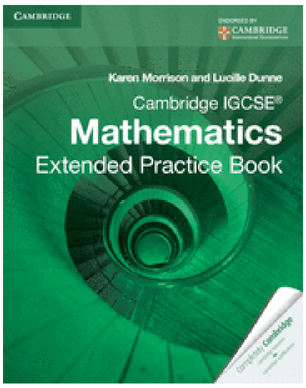
Working for a question should be written below the question.

If the answer is not exact but a degree of accuracy has not been provided, give the answer as follows:
- to three significant figures for all values, except
- to one decimal place for degrees
- for π, use either your calculator value or 3.142.

The number of marks is given in brackets [ ] next to each question or part question.

The total of the marks for this paper is 130.

PLEASE NOTE: this practice examination paper has been written in association with the below publication and is <u>not</u> an official exam paper:



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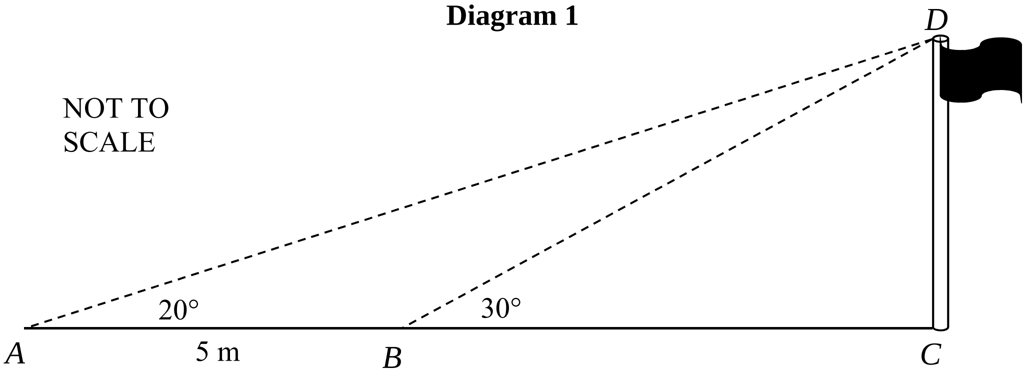
1 One way to measure the height of a flag pole from the ground is to stand in two different positions and measure the angle of inclination of the top of the pole, as well as the difference between the two positions. This is shown below.

Diagram 1



In Diagram 1, angle $DAC = 20°$ and angle $DBC = 30°$. The length $AB = 5$ m.

(a) Find

(i) angle ABD,

Answer(a)(i) .... [1]

(ii) angle ADB,

Answer(a)(ii) .... [1]

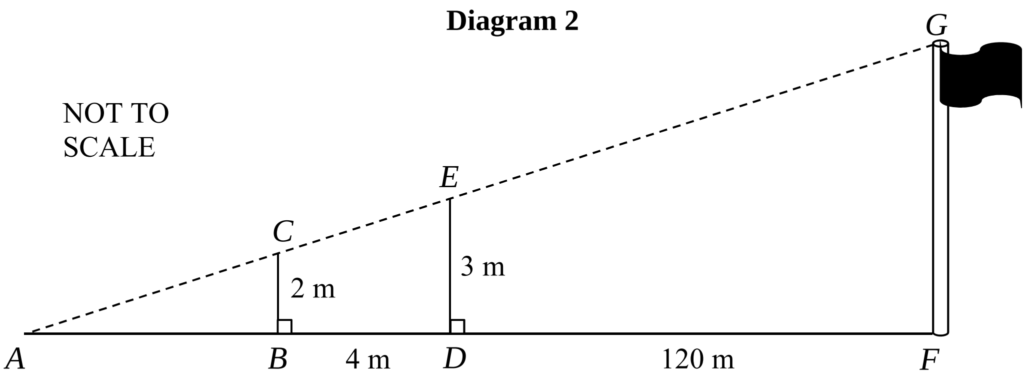
(iii) the length BD, using the sine rule,

Answer(a)(iii) .... m [3]

(iv) the height of the flag pole, CD.

Answer(a)(iv) .... m [3]

Another way to measure the height of the flag pole is to use two short poles of a known height and line them up so that their tops aim towards the flag. This is shown in Diagram 2.



In Diagram 2, $BC = 2$ m, $DE = 3$ m, $BD = 4$ m and $DF = 120$ m.

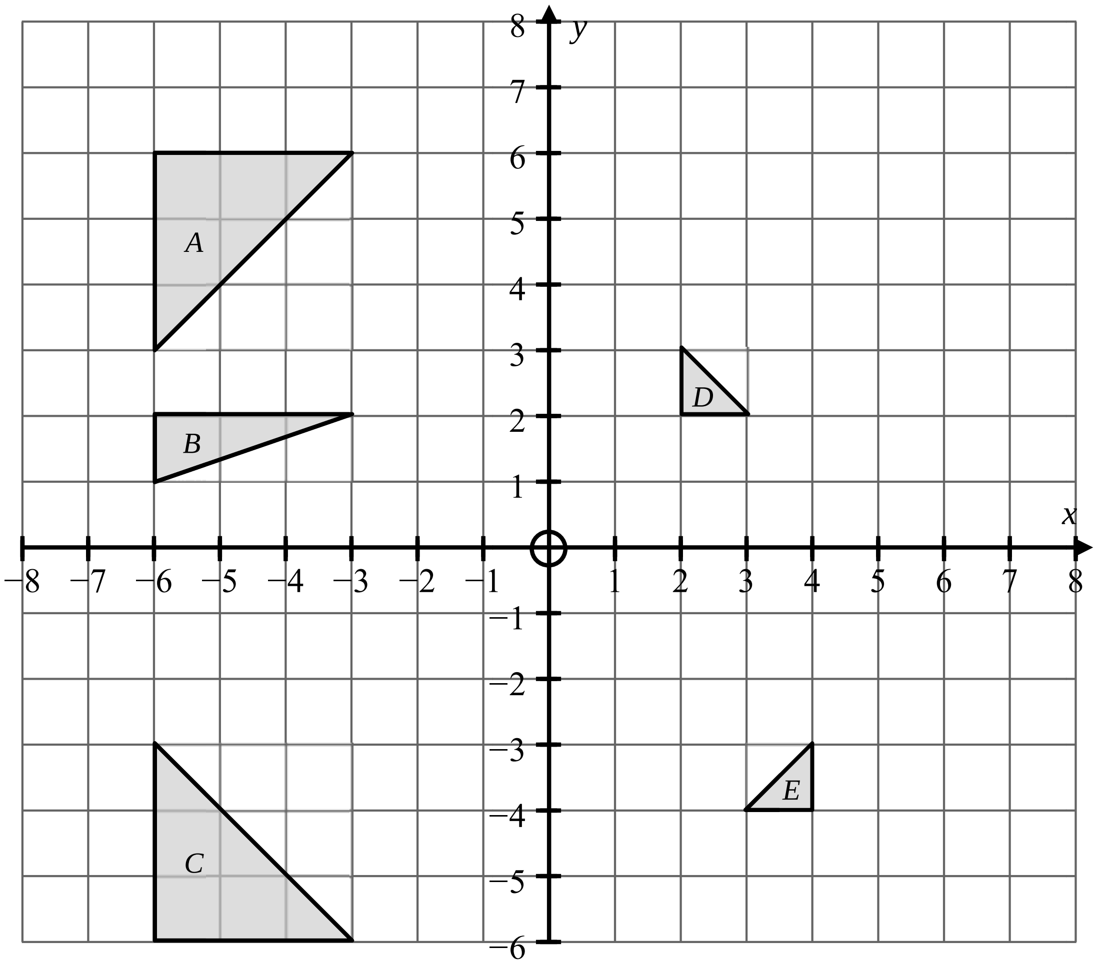
(b) **(i)** By considering the similar triangles ABC and ADE, find the length of AB.

Answer(b)(i) …………………………… m [3]

(ii) By considering the similar triangles ABC and AFG, find the height of the flagpole, FG.

Answer(b)(ii) …………………………… m [2]

2



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

(i) triangle A onto C,

Answer(a)(i) .... [2]

(ii) triangle C onto D,

Answer(a)(ii) .... [3]

(iii) triangle D onto E,

Answer(a)(iii) .... [3]

(iv) triangle *Bon* to *A*.

Answer(a)(iv) .... [3]

(b) Find the matrix representing the transformation which maps

(i) triangle *A* onto *C*,

Answer(b)(i) $\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

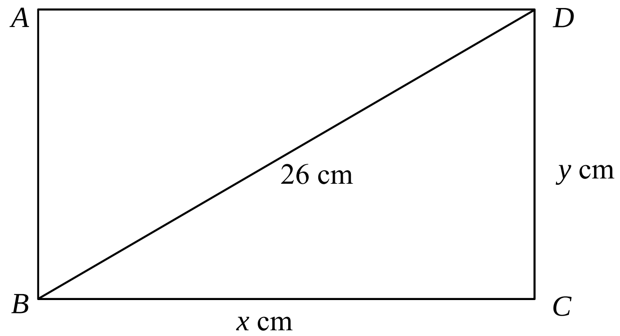
(ii) triangle *B* onto *A*.

Answer(b)(ii) $\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

3

Diagram 1

NOT TO SCALE



The diagram shows a rectangle with a width of x cm and a height of y cm.

(a) **(i)** If the perimeter of the rectangle is 68 cm, show that $y = 34 - x$.

Answer(a)(i)

[2]

(ii) The diagonal of the rectangle is 26 cm.
Show, using Pythagoras' theorem, that x satisfies the equation $x^2 - 34x + 240 = 0$.

Answer(a)(ii)

[3]

(iii) Factorise $x^2 - 34x + 240$.

Answer(a)(iii) .... [2]

(iv) Solve the equation $x^2 - 34x + 240 = 0$.

Answer(a)(iv) $x =$ .... or $x =$ .... [1]

Diagram 2

NOT TO SCALE

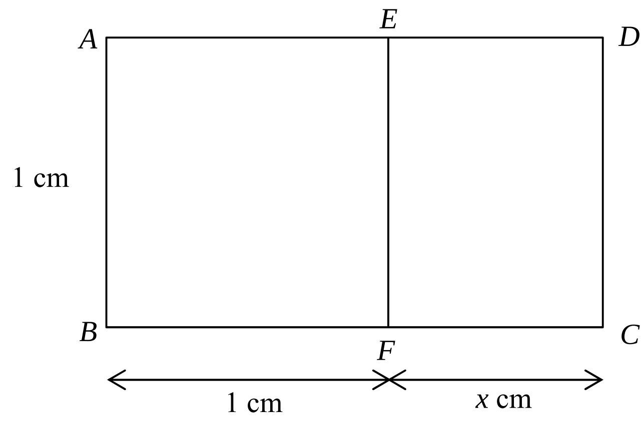


Diagram 2 shows a **different** rectangle. The line EF cuts $ABCD$ into two rectangles.

(b) (i) Rectangle $ABCD$ is **similar to** rectangle $DEFC$.
Show that $x^2 + x - 1 = 0$.

Answer(b)(i)

[3]

(ii) Solve the equation $x^2 + x - 1 = 0$, giving your answers correct to 3 decimal places.

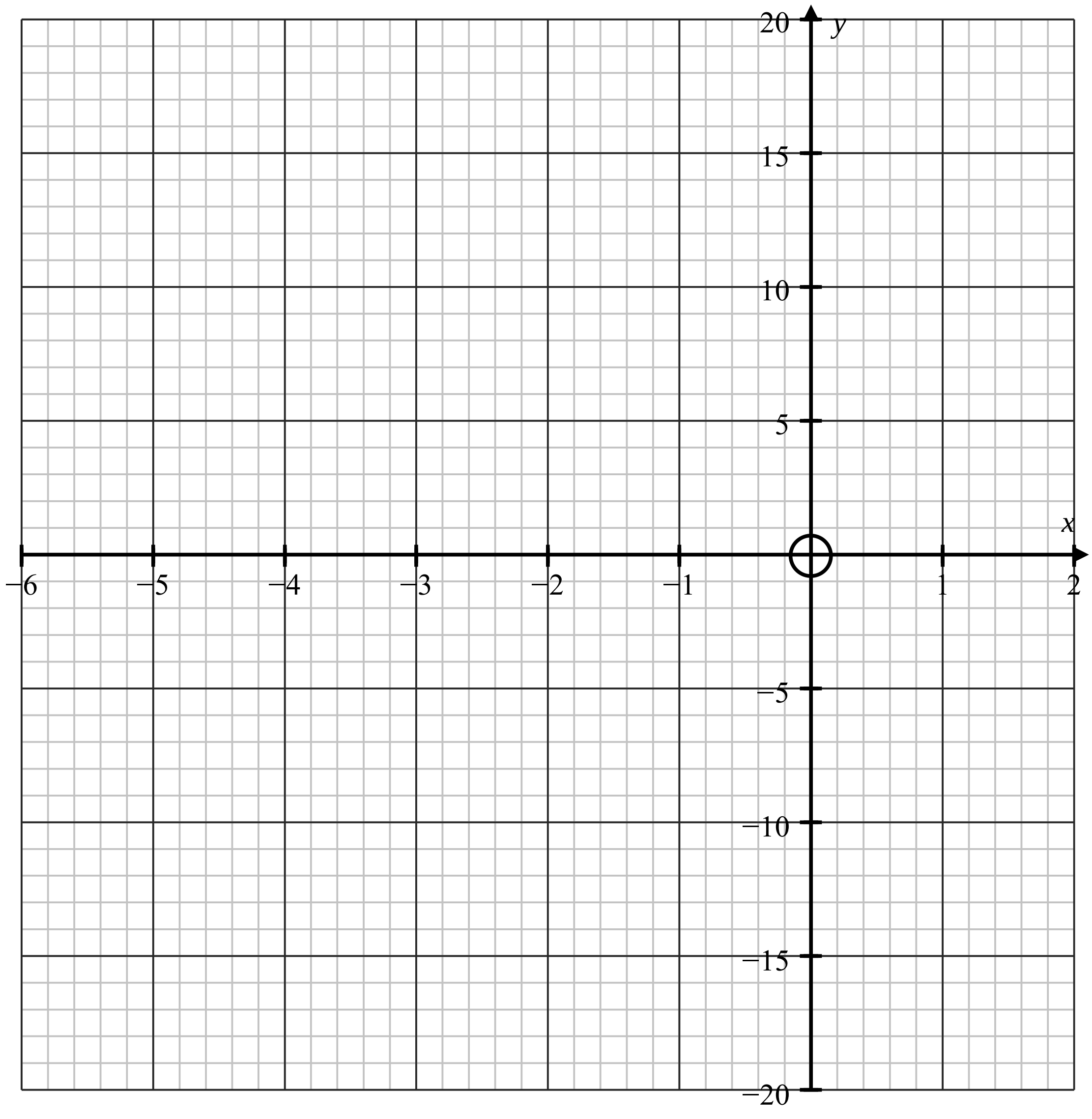
Answer(b)(ii) $x =$ ……… or $x =$ ……… [3]

4 **(a)** The table shows some values for the equation $y = \frac{x^4}{5} + x^3$.

x	−5.5	−5	−4	−3.5	−3	−2	−1	0	1	1.5	2
y	16.6		−12.8	−12.9	−10.8	−4.8	−0.8		1.2		11.2

(i) Write the missing values of y in the empty spaces. [3]

(ii) On the grid, draw the graph of $y = \frac{x^4}{5} + x^3$ for $-5.5 \le x \le 2$.



[5]

(b) Use your graph to solve the equation $\frac{x^4}{5} + x^3 = 5$.

Answer(b) $x =$ ……… or $x =$ ……… [2]

(c) **(i)** By drawing a tangent, work out the gradient of the graph where $x = -1.5$.

Answer(c)(i) …………………………… [3]

(ii) Write down the gradient of the graph where $x = 0$.

Answer(c)(ii) …………………………… [1]

(d) **(i)** On the grid, draw the line $y = -2x - 10$. [1]

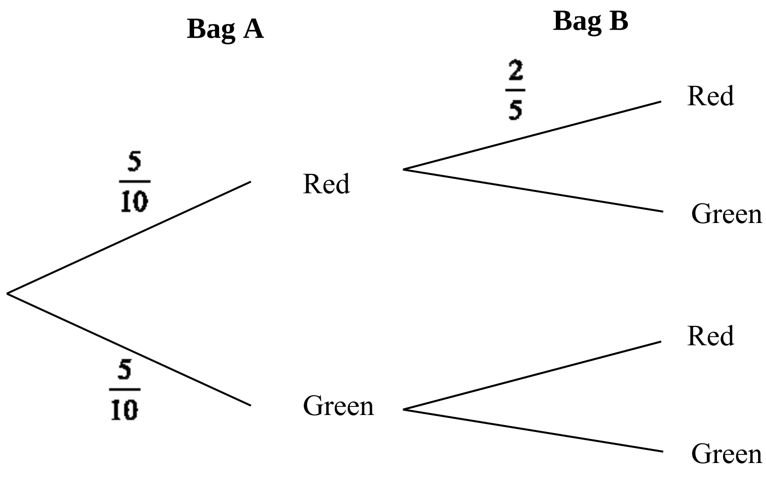
(ii) Use your graphs to solve the equation $\frac{x^4}{5} + x^3 + 2x + 10 = 0$.

Answer(d)(ii) $x =$ ……… or $x =$ ……… [2]

5 Bag A contains 5 red beads and 5 green beads.
Bag B contains 2 red beads and 3 green beads.

A bead is taken at random from bag A, then a bead is taken at random from bag B.

(a) Complete the tree diagram below, showing the probabilities of each outcome. [3]



(b) Calculate the probability that

(i) two red beads are picked,

Answer(b)(i) .... [2]

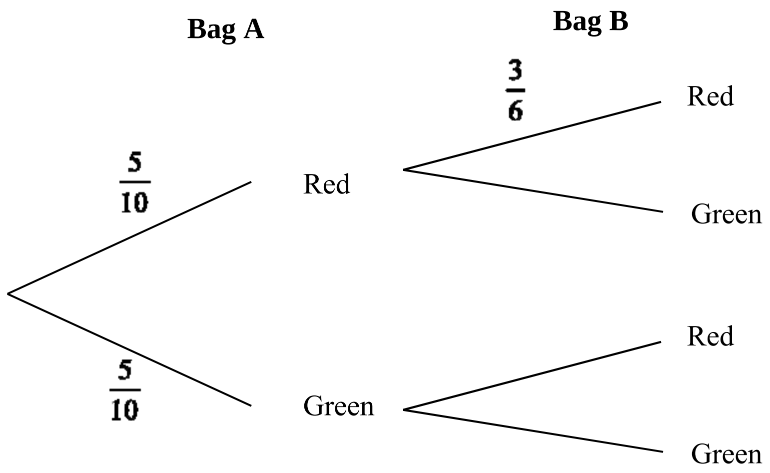
(ii) **exactly one** red bead is picked.

Answer(b)(ii) .... [2]

(c) All the beads are returned to the bags.

A bead is taken from bag A, its colour noted, and placed in bag B.
A bead is now taken from bag B.

(i) Complete the tree diagram to show the new probabilities. [3]



Calculate the probability that

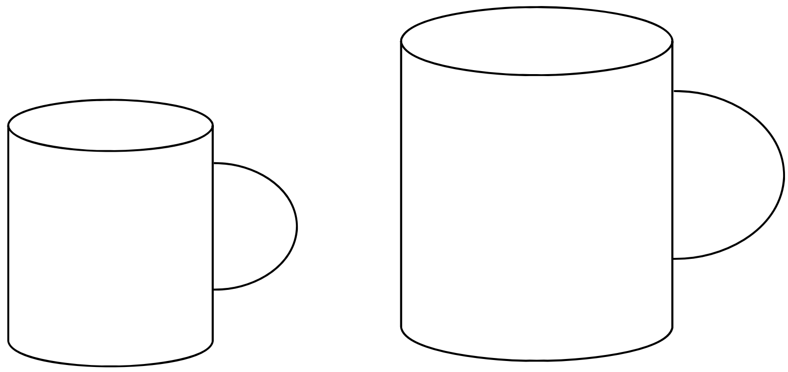
(ii) two red beads are picked,

Answer(c)(ii) .... [2]

(iii) **at least one** green bead is picked.

Answer(c)(iii) .... [2]

6



Small mug **Large mug**

A small cylindrical mug has a diameter of 8 cm, and a holds 500 cm^3 of water.

(a) Calculate the height of the small mug.

Answer(a) ………………………cm [2]

(b) **(i)** Work out how many cm^3 there are in 1 m^3.

Answer(b)(i) …………………………… [2]

(ii) Work out how many small mugs would be filled by 1 m^3 of water.

Answer(b)(ii) …………………………… [1]

(c) The large mug holds 1000 cm^3 of water.

(i) Work out the scale factor for volumes between the small and large mug.

Answer(c)(i) …………………………… [1]

(ii) Work out the scale factor for lengths between the small and large mug.

Answer(c)(ii) …………………………… [2]

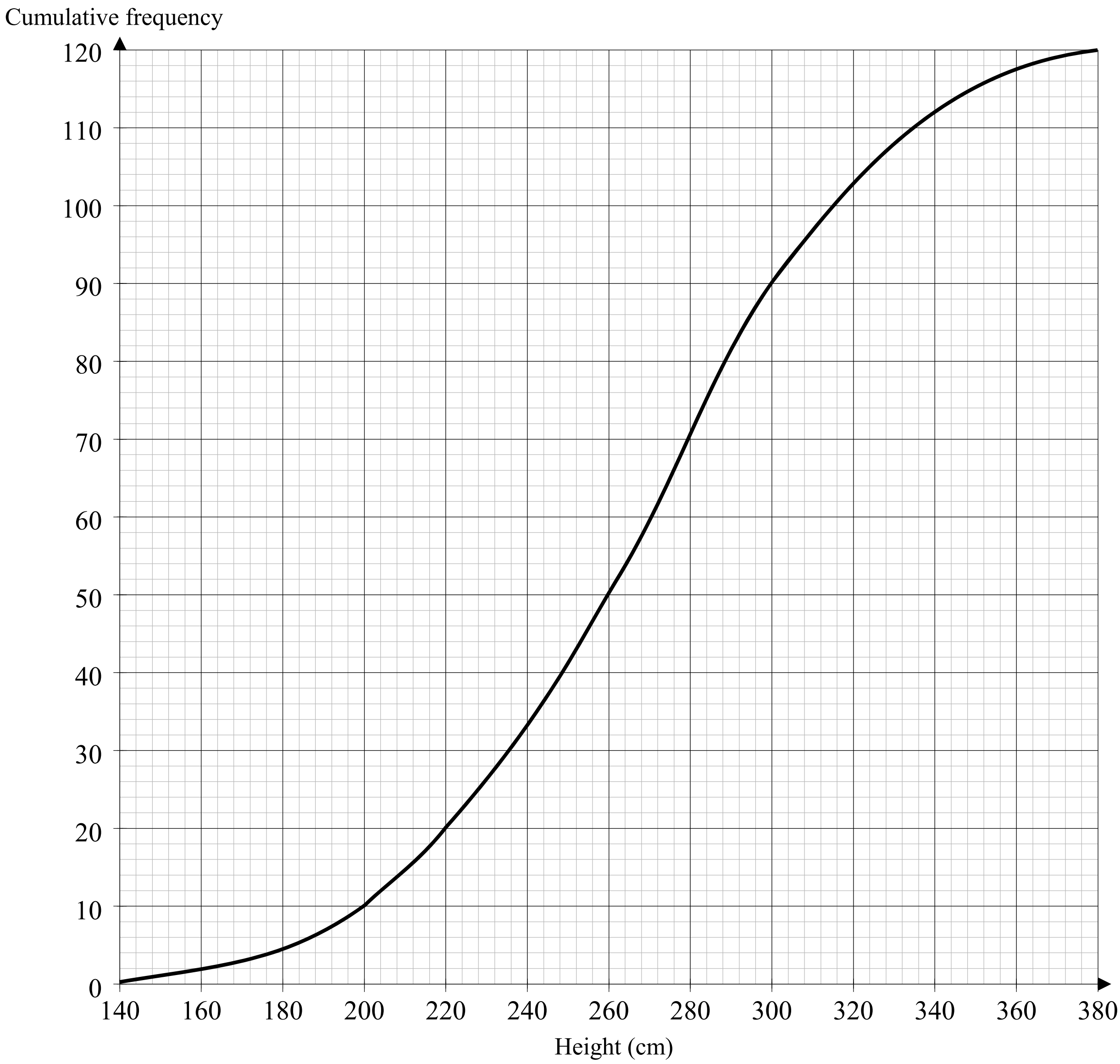
(iii) Work out the height of the large mug.

Answer(c)(iii) ………………………cm [2]

(d) Calculate the volume of the largest sphere which would fit inside the large mug.

Answer(d) ……………………cm^3 [3]

7 The heights of 120 trees in an orchard are measured.
The results are used to draw this cumulative frequency diagram.



(a) Find

(i) the median height,

Answer(a)(i) ………………………cm [1]

(ii) the lower quartile,

Answer(a)(ii) ………………………cm [1]

(iii) the interquartile range,

Answer(a)(iii) ………………………cm [1]

(iv) the number of trees with a height greater than 316 cm.

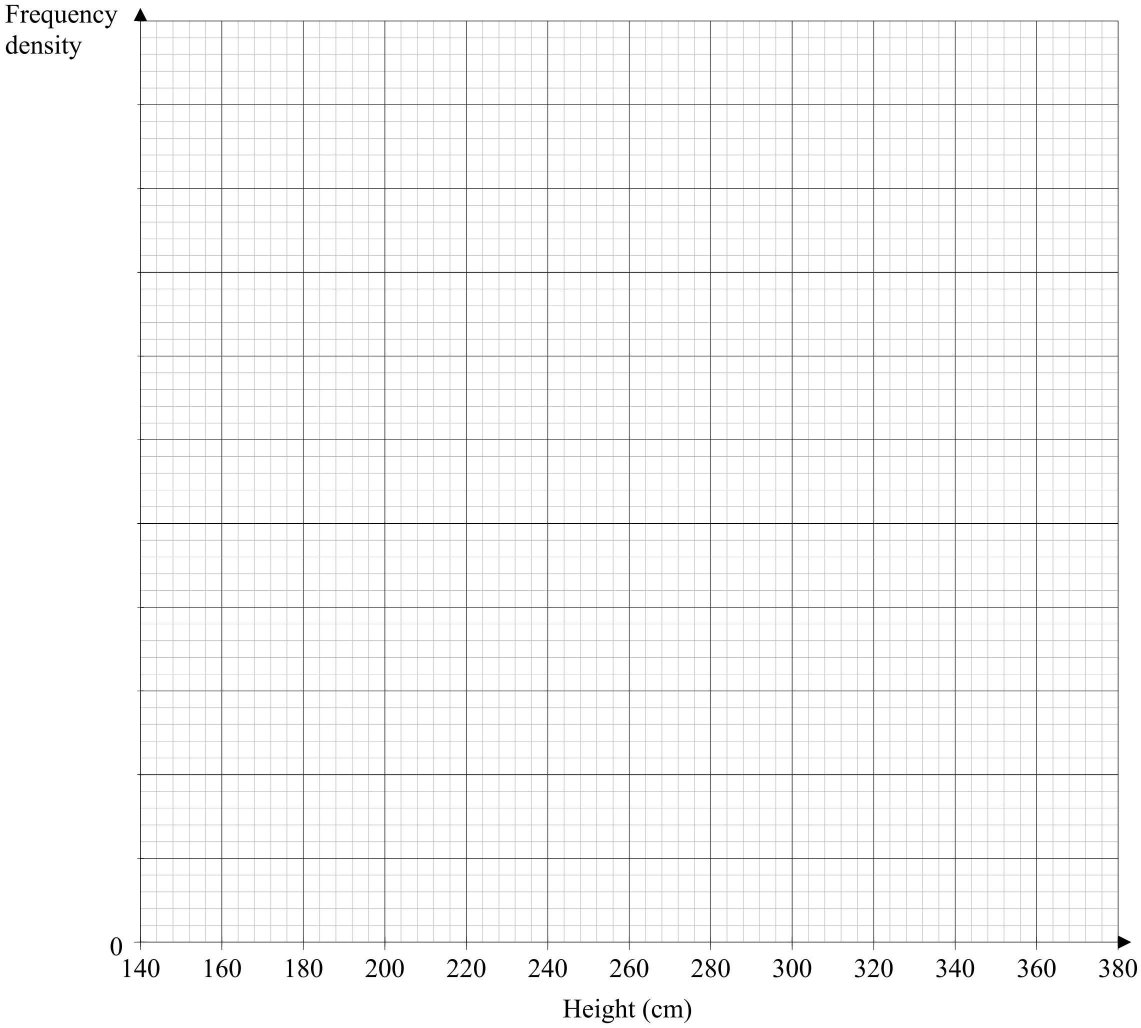
Answer(a)(iv) …………………………… [2]

(b) The frequency table shows the information about the 120 trees that were measured.

Height (h cm)	$140 \le h \le 200$	$200 \le h \le 220$	$220 \le h \le 260$	$260 \le h \le 300$	$300 \le h \le 380$
Frequency	10			40	30

(i) Use the cumulative frequency diagram to complete the table above. [2]

(ii) Construct a histogram to represent this information.



[4]

(c) Calculate an estimate of the mean height of the 120 trees.

Answer(c) .... [3]

8 **(a)** Solve the equation $\frac{x-5}{6}+\frac{x+2}{9}=-4$

Answer(a) $x =$ .... [4]

(b) **(i)** $y=\frac{5}{x-3}-\frac{4}{x+4}$

Find the value of y when $x = 2$.

Answer(b)(i) $y =$ .... [2]

(ii) Write $\frac{5}{x-3}-\frac{4}{x+4}$ as a single fraction.

Answer(b)(ii) .... [2]

(iii) Solve the equation $\dfrac{5}{x-3} - \dfrac{4}{x+4} = \dfrac{1}{x}$

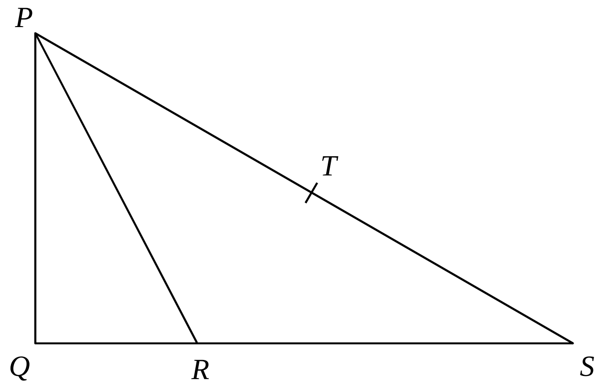
Answer(b)(iii) $x =$ .... [3]

(c) $a = \dfrac{b}{c+d}$

Find c in terms of a, b and d.

Answer(c) $c =$ .... [3]114

9



The diagram shows the triangle *PQS*.
T is the midpoint of *PS* and *R* divides *QS* in the ratio 1 : 3.
$\overrightarrow{PT} = \mathbf{a}$ and $\overrightarrow{PQ} = \mathbf{b}$.

(a) Express in terms of **a** and/or **b**, as simply as possible, the vectors

(i) $\overrightarrow{PS}$

Answer(a)(i) $\overrightarrow{PS} =$ .... [1]

(ii) $\overrightarrow{QS}$

Answer(a)(ii) $\overrightarrow{QS} =$ .... [2]

(iii) $\overrightarrow{PR}$

Answer(a)(iii) $\overrightarrow{PR} =$ .... [2]

(b) Show that $\overrightarrow{RT} = \frac{1}{4}(2\mathbf{a} - 3\mathbf{b})$

Answer(b)

[3]

10

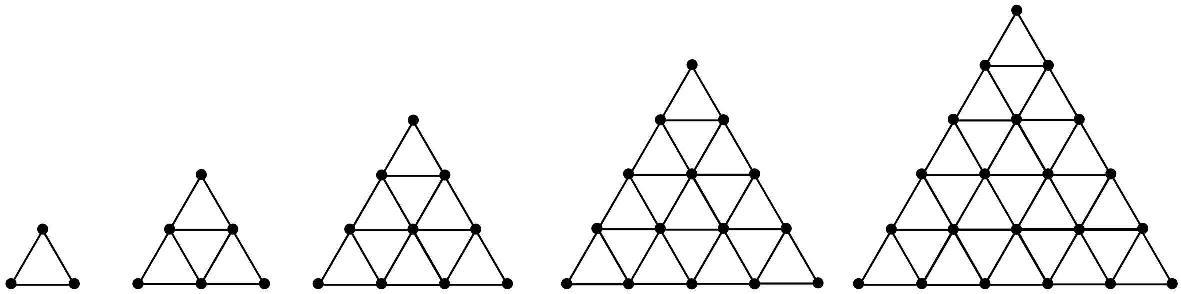


Diagram 1 Diagram 2 Diagram 3 Diagram 4 Diagram 5

The diagram shows a pattern of triangles of dots.

(a) Complete the table below.

Diagram number	1	2	3	4	5
Number of triangles	1	4	9		
Number of dots	3	6	10		

[2]

(b) Work out the number of triangles and the number of dots in the 8th diagram.

Answer (b) Number of triangles = ……………… , Number of dots = ………………… [2]

(c) Write down an expression for the number of triangles in the *n*th diagram.

Answer(c) ……………………………....... [1]

(d) The number of dots in the *n*th diagram is $k(n^2 + 3n + 2)$.

Find

(i) the value of *k*,

Answer(d)(i) k = …………………………… [2]

(ii) the number of dots in diagram 100.

Answer(d)(ii) ………………………………… [1]

Cambridge IGCSE Mathematics Extended Practice Book

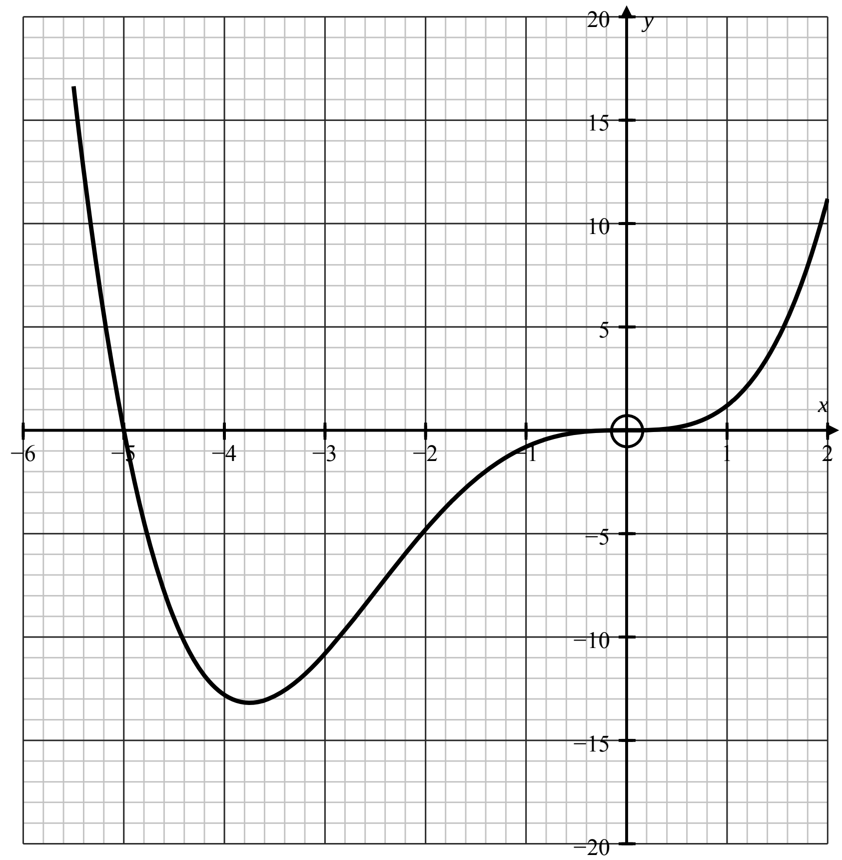
Example Practice Paper 4 (Extended)

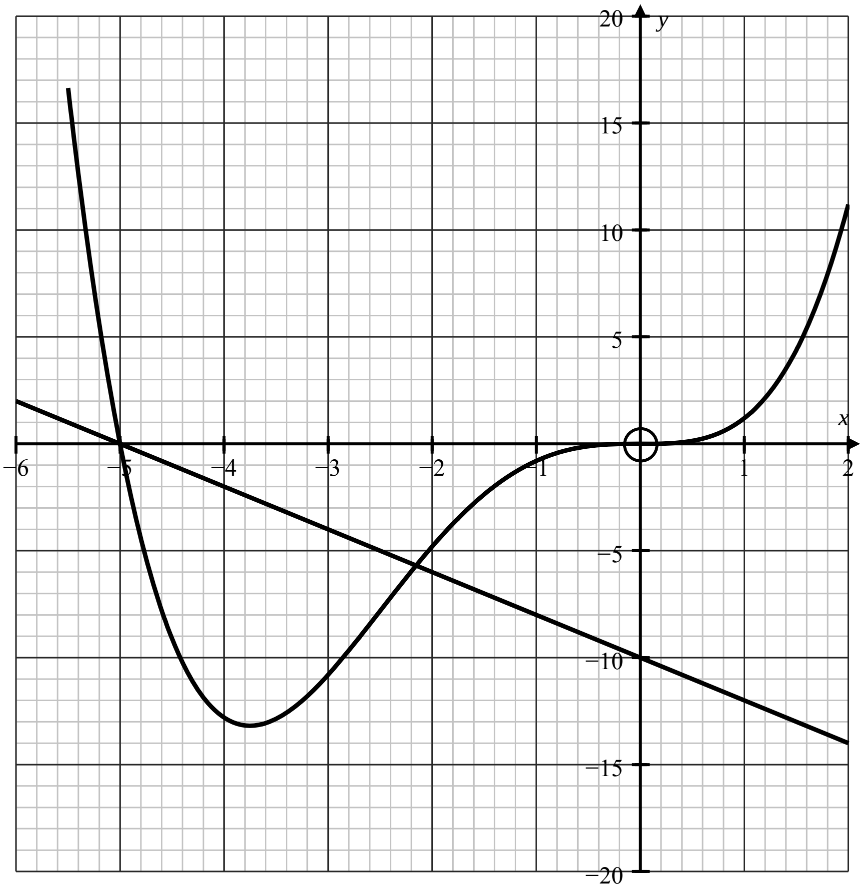
Mark Scheme

Key: A – Accuracy marks awarded for a correct answer seen.
M – Method marks awarded for clear attempt to apply correct method.
oe – Or Equivalent.
“ ” – allow M marks for methods that include wrong answers from previous results.

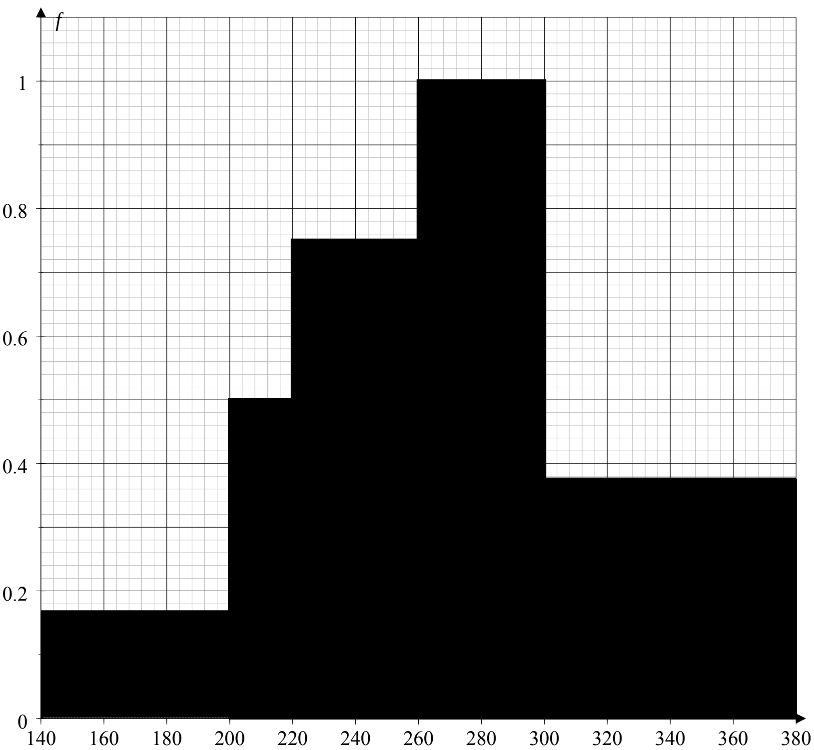
1	(a)(i)	150°	A1
	(a)(ii)	10°	A1
	(a)(iii)	$\frac{BD}{\sin 20°} = \frac{5}{\sin 10°}$	M1 M1
		9.85 m	A1
	(a)(iv)	$\sin 30° = \frac{CD}{BD}$	M1
		CD = sin 30° × “9.848…”	M1
		4.92 m	A1
	(b)(i)	$\frac{3}{2} = \frac{4+AB}{AB}$	M1
		$3AB = 8 + 2AB$	M1
		AB = 8 m	A1
	(b)(ii)	$\frac{132}{8} = \frac{FG}{2}$	M1
		FG = 33 m	A1
2	(a)(i)	Reflection, in x-axis	A1 A1
	(a)(ii)	Enlargement, factor $\frac{1}{3}$, centre (6, 6)	A1 A1 A1
	(a)(iii)	Rotation, 180°, about (3, −1)	A1 A1 A1
	(a)(iv)	Stretch in y-direction, scale factor 3, about x-axis as invariant line	A1 A1 A1
	(b)(i)	$\begin{pmatrix} 1 & 0 \\ ... & ... \end{pmatrix}$	A1
		$\begin{pmatrix} ... & ... \\ 0 & -1 \end{pmatrix}$	A1
	(b)(ii)	$\begin{pmatrix} 1 & 0 \\ ... & ... \end{pmatrix}$	A1
		$\begin{pmatrix} ... & ... \\ 0 & 3 \end{pmatrix}$	A1

3	(a)(i)	$2x+2y=68$	M1
		$x+y=34$	A1
	(a)(ii)	$x^2+y^2=26^2$	M1
		$x^2+(34-x)^2=26^2$	M1
		$2x^2+68x+34^2-26^2=0$ proceeding to result	M1
	(a)(iii)	$(x-10)(x-24)$	A1 A1
	(a)(iv)	$x = 10$ or 24	A1
	(b)(i)	$\dfrac{AD}{AB}=\dfrac{DC}{FC}$ oe	M1
		$\dfrac{1+x}{1}=\dfrac{1}{x}$ oe	M1
		$x(1+x)=1$ leading to result	A1
	(b)(ii)	$x=\dfrac{-1\pm\sqrt{5}}{2}$	M1
		$x = 0.618,\ \ -1.618$	A1 A1

4	(a)(i)	0, 0, 4.4 (accept 4.39)	A1 A1 A1
	(a)(ii)		Shape A1 Points accurate A1 A1 Smooth curve A1 Domain correct A1
	(b)	−5.2, 1.6 (allow ± 0.5 squares from their graph)	A1 A1
	(c)(i)	Correct tangent drawn	M1
		Correct triangle used to calculate gradient	M1
		Gradient = approx. 4	A1
	(c)(ii)	0	A1

	(d)(i)		A1
	(d)(ii)	−5, −2.2 (allow ± 0.5 squares)	A1 A1
5	(a)	From top to bottom of tree diagram: P(G) = 3/5, P(R) = 2/5, P(G) = 3/5	A1 A1 A1
	(b)(i)	$\frac{5}{10}\times\frac{2}{5}$	M1
		0.2 oe	A1
	(b)(ii)	$\left(\frac{5}{10}\times\frac{3}{5}\right)+\left(\frac{5}{10}\times\frac{2}{5}\right)$	M1
		0.5 oe	A1
	(c)(i)	From top to bottom of tree diagram: P(G) = 3/6, P(R) = 2/6, P(G) = 4/6	A1 A1 A1
	(c)(ii)	$\frac{5}{10}\times\frac{3}{6}$	M1
		0.25 oe	A1
	(c)(iii)	$1-0.25$ oe	M1
		0.75 oe	A1

6	(a)	$\frac{500}{\pi \times 4^2}$	M1
		9.95 cm	A1
	(b)(i)	$100^3 = 1\,000\,000$ oe	M1 A1
	(b)(ii)	$\frac{1\,000\,000}{500} = 2000$	A1
	(c)(i)	$\frac{1000}{500} = 2$	A1
	(c)(ii)	$\sqrt[3]{2}$	M1
		1.26	A1
	(c)(iii)	"9.95" × "1.26"	M1
		12.5 cm	A1
	(d)	$r = 4 \times$ "1.26" $= 5.04\ldots$	M1
		$V = \frac{4}{3}\pi(5.04...)^3$	M1
		536 cm^3	A1

7	(a)(i)	270 cm	A1
	(a)(ii)	236 cm	A1
	(a)(iii)	300 – 236 = **64 cm**	A1
	(a)(iv)	Reading correctly at 316 cm	M1
		120 – 100 = 20 trees	A1
	(b)(i)	10, 30	A1 A1
	(b)(ii)		Widths A1 Relative heights A1 A1 Correct FDs A1
	(c)	$10 \times 170 + 10 \times 210 + 30 \times 240 + 40 \times 280 + 30 \times 340 = 32400$	M1
		$\frac{\text{"32400"}}{120}$	M1
		270 cm	A1

8	(a)	Finding LCM of 6 and 9 (18)	M1
		$\dfrac{3(x-5)+2(x+2)}{18}=-4$	M1
		$3x-15+2x+4=-72$	M1
		$x=-\dfrac{61}{5}$ oe	A1
	(b)(i)	$\dfrac{5}{-1}-\dfrac{4}{6}$	M1
		$-5\frac{2}{3}$ oe	A1
	(b)(ii)	$\dfrac{5(x+4)-4(x-3)}{(x-3)(x+4)}$	M1
		$\dfrac{x+32}{(x-3)(x+4)}$ (allow expanded denominator)	A1
	(b)(iii)	$\dfrac{x+32}{(x-3)(x+4)}=\dfrac{1}{x}$	M1
		$x^2+32x=x^2+x-12$ leading to $31x=-12$	M1
		$x=-\dfrac{12}{31}$	A1
	(c)	$a(c+d)=b$	M1
		$c+d=\dfrac{b}{a}$	M1
		$c=\dfrac{b}{a}-d$ oe	A1

9	(a)(i)	2**a**	A1
	(a)(ii)	$\overrightarrow{QS}=\overrightarrow{QP}+\overrightarrow{PS}$	M1
		−**b** + 2**a**	A1
	(a)(iii)	$\overrightarrow{PR}=\overrightarrow{PQ}+\overrightarrow{QR}$ leading to $\mathbf{b}+\frac{1}{4}(-\mathbf{b}+2\mathbf{a})$	M1
		$\frac{3}{4}\mathbf{b}+\frac{1}{2}\mathbf{a}$	A1
	(b)	$\overrightarrow{RT}=\overrightarrow{RQ}+\overrightarrow{QP}+\overrightarrow{PT}$ **or** **PR** + **RT** = **a,** so **RT** = **a** − **PR**	M1
		$-\frac{1}{4}(-\mathbf{b}+2\mathbf{a})-\mathbf{b}+\mathbf{a}$ **or** **a** − (¾**b** + ½**a**) = ½**a** − ¾**b**	M1
		$-\frac{3}{4}\mathbf{b}+\frac{1}{2}\mathbf{a}$ leading to result given	A1

10	(a)	Triangles 16, 25	A1
		Dots 15, 21	A1
	(b)	Triangles 64, Dots 45	A1 A1
	(c)	n^2	A1
	(d)(i)	$k(1^2+3\times1+2)=3$	M1
		$k=0.5$	A1
	(d)(ii)	$0.5(100^2+3\times100+2)=5151$	A1

			Total: 130