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EDEXCEL INTERNATIONAL GCSE MATHS: QUESTIONS BY TOPIC

Constructions, Loci, Congruence & Similarity (G2)

International GCSE Mathematics A (4MA1) · Higher tier

32 questions · 106 marks · Mark schemes included

Past papers January 2019 - June 2025 · 3 sub-topics

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HOW TO USE THIS BOOKLET

Questions are grouped by sub-topic and run from the lowest to the highest mark tariff, then oldest paper first.

Click any row below to jump straight to that sub-topic or question.

On every question page, click ANSWER in the top-right corner to jump to its mark scheme; < QUESTION brings you back.

A gold bar in the left margin marks exactly where the question sits on the original page.

Diagrams, graphs, grids and tables are printed exactly as they appear in the original papers.

Each question is filed under its main topic; longer questions may also test skills from other topics.

QUESTION	SOURCE	MARKS	PAGE
G2a CONSTRUCTIONS, LOCI & SCALE DRAWINGS		10 Qs · 22 marks	3
1. Q2	IGCSE Paper 2H June 2019	2	4
2. Q5	IGCSE Paper 2H January 2020	2	5
3. Q6	IGCSE Paper 2HR January 2020	2	6
4. Q2	IGCSE Paper 1HR November 2020	2	7
5. Q3	IGCSE Paper 1H January 2023	2	8
6. Q4	IGCSE Paper 2HR January 2023	2	9
7. Q2	IGCSE Paper 1H November 2024	2	10
8. Q4	IGCSE Paper 2H June 2025	2	11
9. Q7	IGCSE Paper 1HR January 2019	3	12
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G2b CONGRUENCE & SIMILARITY		22 Qs · 84 marks	14
11. Q16	IGCSE Paper 2H January 2019	3	15
12. Q20	IGCSE Paper 1H November 2020	3	16
13. Q20	IGCSE Paper 1H January 2021	3	17
14. Q20	IGCSE Paper 2H June 2021	3	18
15. Q3	IGCSE Paper 2H January 2022	3	19
16. Q12	IGCSE Paper 2HR June 2022	3	20
17. Q6	IGCSE Paper 2H June 2019	4	21
18. Q4	IGCSE Paper 2HR June 2019	4	22
19. Q20	IGCSE Paper 2HR January 2020	4	23
20. Q4	IGCSE Paper 2H November 2021	4	24
21. Q17	IGCSE Paper 1H January 2022	4	25
22. Q18	IGCSE Paper 1HR January 2022	4	26
23. Q20	IGCSE Paper 1HR June 2022	4	27
24. Q3	IGCSE Paper 1HR June 2023	4	28
25. Q2	IGCSE Paper 2H November 2023	4	29
26. Q18	IGCSE Paper 1HR June 2024	4	30
27. Q12	IGCSE Paper 2HR June 2024	4	31
28. Q26	IGCSE Paper 1HR June 2025	4	32
29. Q5	IGCSE Paper 2H June 2025	4	33
30. Q26	IGCSE Paper 2H June 2025	4	34
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QUESTION	SOURCE	MARKS	PAGE
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G2c PLANS, ELEVATIONS & 3D SHAPES

No questions on this sub-topic in the available past papers.



QUESTIONS

32 questions · 106 marks · 2 sub-topics

SUB-TOPIC G2a

CONSTRUCTIONS, LOCI & SCALE DRAWINGS

Sub-topic G2a · 10 questions · 22 marks · lowest tariff first



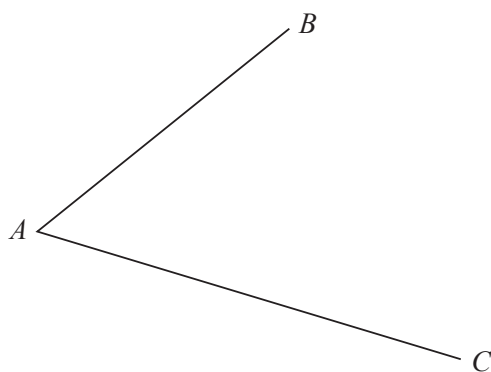
- 2 Use ruler and compasses to construct the perpendicular bisector of the line DE .
You must show all your construction lines.



(Total for Question 2 is 2 marks)

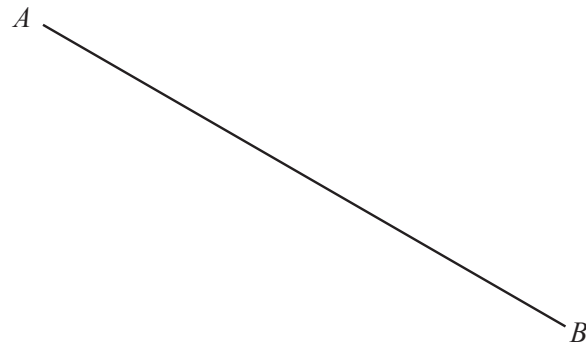


- 5 Use ruler and compasses to construct the bisector of angle BAC .
You must show all your construction lines.



(Total for Question 5 is 2 marks)

- 6 Use ruler and compasses only to construct the perpendicular bisector of the line AB .
You must show all your construction lines.



(Total for Question 6 is 2 marks)

Answer ALL TWENTY THREE questions.

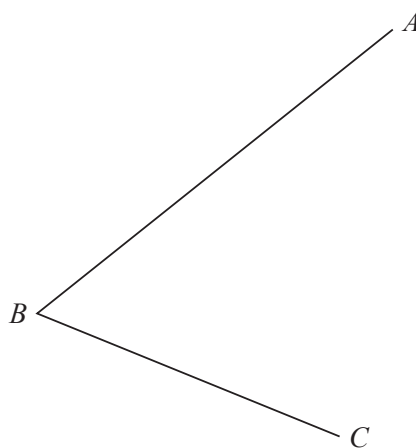
Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Show that $3\frac{3}{4} \times \frac{7}{9} = 2\frac{11}{12}$

(Total for Question 1 is 3 marks)

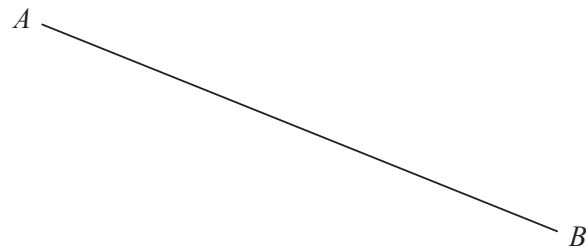
- 2 Using ruler and compasses only, construct the bisector of angle ABC .
You must show all your construction lines.



(Total for Question 2 is 2 marks)



- 3 Use ruler and compasses only to construct the perpendicular bisector of line AB .
You must show all your construction lines.



(Total for Question 3 is 2 marks)



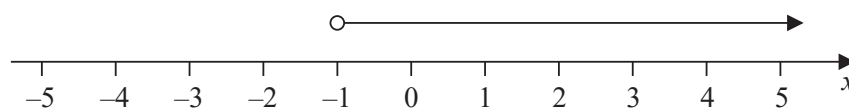
3 $-8 < 2y \leq 2$

y is an integer.

(a) Find all the possible values of y

(2)

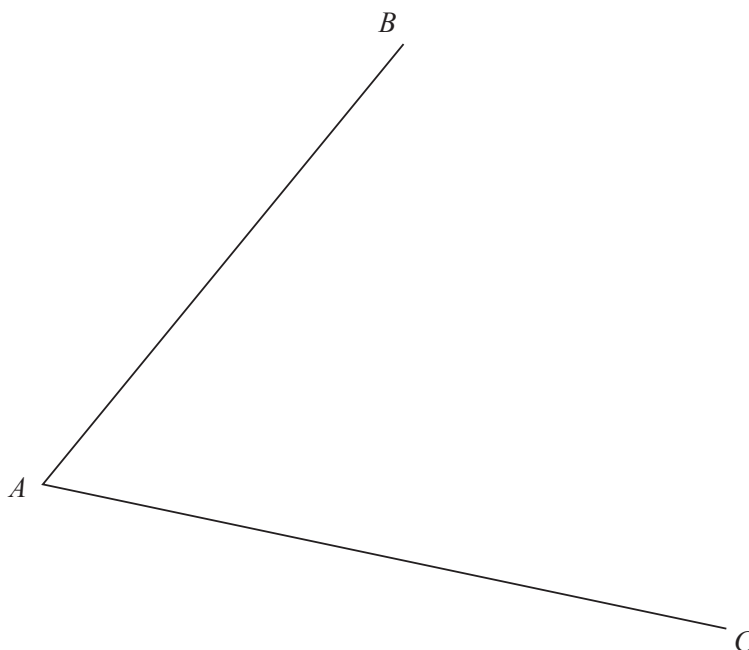
(b) Write down the inequality shown on the number line.



(1)

(Total for Question 3 is 3 marks)

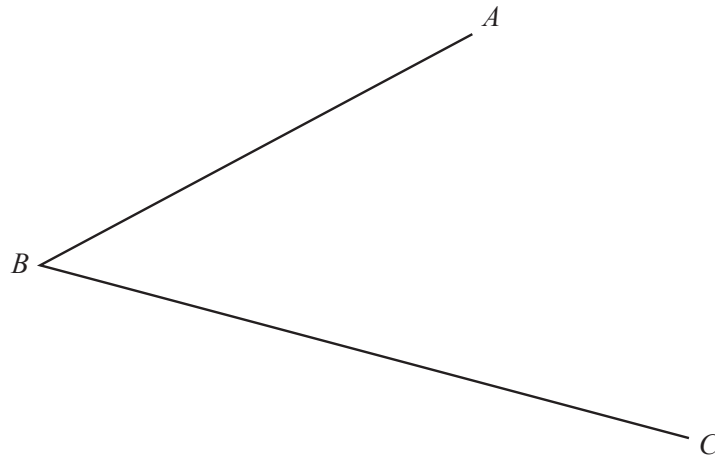
- 4 Using ruler and compasses only, construct the bisector of angle BAC
You must show all your construction lines.



(Total for Question 4 is 2 marks)



- 2 Use ruler and compasses only to construct the bisector of angle ABC
You must show all your construction lines.



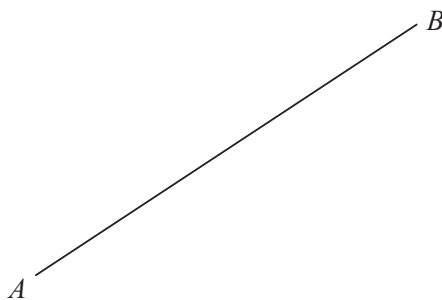
(Total for Question 2 is 2 marks)



3 Show that $7\frac{1}{3} - 3\frac{4}{7} = 3\frac{16}{21}$

(Total for Question 3 is 3 marks)

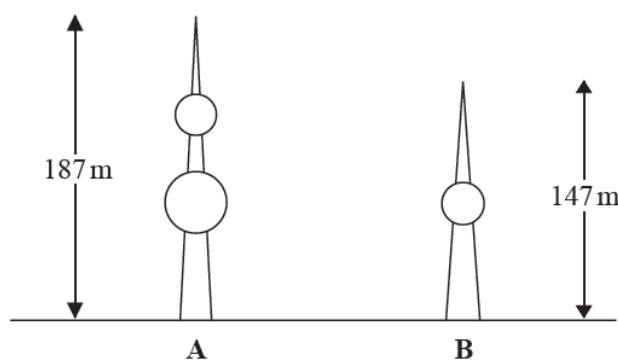
- 4 Using ruler and compasses only, construct the perpendicular bisector of the line AB
Show all your construction lines.



(Total for Question 4 is 2 marks)



- 7 The diagram shows two water towers in Kuwait.



The real height of tower **A** is 187 m.

The real height of tower **B** is 147 m.

Ahmed makes a scale model of both towers.

The height of tower **A** on the scale model is 90 cm.

Work out the height of tower **B** on the scale model.

Give your answer correct to the nearest centimetre.

cm

(Total for Question 7 is 3 marks)

Answer ALL TWENTY THREE questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1** A plane has a length of 73 metres.

A scale model is made of the plane.

The scale of the model is 1 : 200

Work out the length of the scale model.

Give your answer in centimetres.

cm

(Total for Question 1 is 3 marks)

- 2** Here are the first five terms of an arithmetic sequence.

7 11 15 19 23

Write down an expression, in terms of n , for the n th term of this sequence.

(Total for Question 2 is 2 marks)



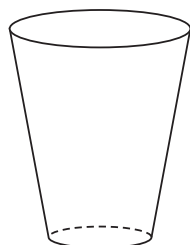
SUB-TOPIC G2b

CONGRUENCE & SIMILARITY

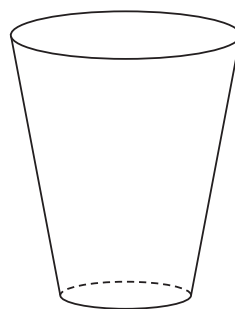
Sub-topic G2b · 22 questions · 84 marks · lowest tariff first



16 The diagram shows two mathematically similar vases, **A** and **B**.



A



B

Diagram **NOT**
accurately drawn

A has a volume of 405 cm^3

B has a volume of 960 cm^3

B has a surface area of 928 cm^2

Work out the surface area of **A**.

cm^2

(Total for Question 16 is 3 marks)

20 **R** and **S** are two similar solid shapes.

Shape **R** has surface area 108 cm^2 and volume 135 cm^3

Shape **S** has surface area 300 cm^2

Work out the volume of shape **S**.

..... cm^3

(Total for Question 20 is 3 marks)



20 **A** and **B** are two similar solids.

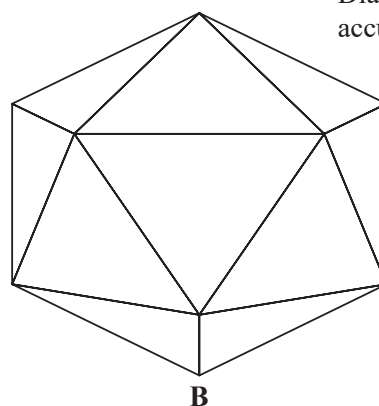
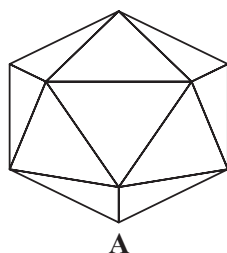


Diagram **NOT**
accurately drawn

A has a volume of 1836 cm^3

B has a volume of 4352 cm^3

B has a total surface area of 1120 cm^2

Work out the total surface area of **A**.

..... cm^2

(Total for Question 20 is 3 marks)

20 Mathematically similar wooden blocks are made in a workshop.

There are small blocks and there are large blocks.

The volume of each small block is 300 cm^3

Given that

the surface area of each small block : the surface area of each large block = $25 : 36$

work out the volume of each large block.

..... cm^3

(Total for Question 20 is 3 marks)



3

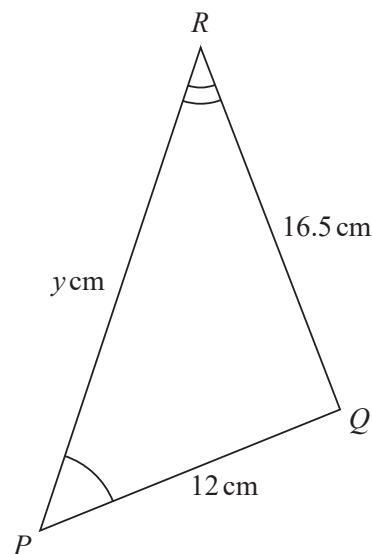
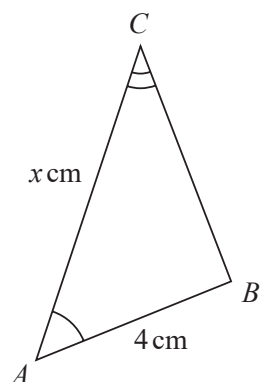


Diagram **NOT**
accurately drawn

Triangle ABC is similar to triangle PQR

$$AB = 4 \text{ cm} \quad PQ = 12 \text{ cm} \quad RQ = 16.5 \text{ cm} \quad AC = x \text{ cm} \quad PR = y \text{ cm}$$

(a) Calculate the length of BC

..... cm
(2)

(b) Write down an expression for y in terms of x

$y =$
(1)

(Total for Question 3 is 3 marks)



12

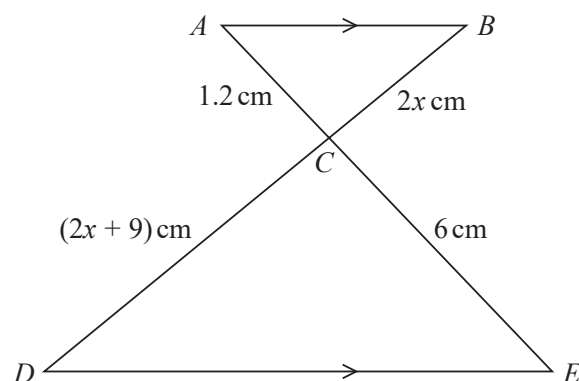


Diagram **NOT**
accurately drawn

ACE and BCD are straight lines.
 AB is parallel to DE

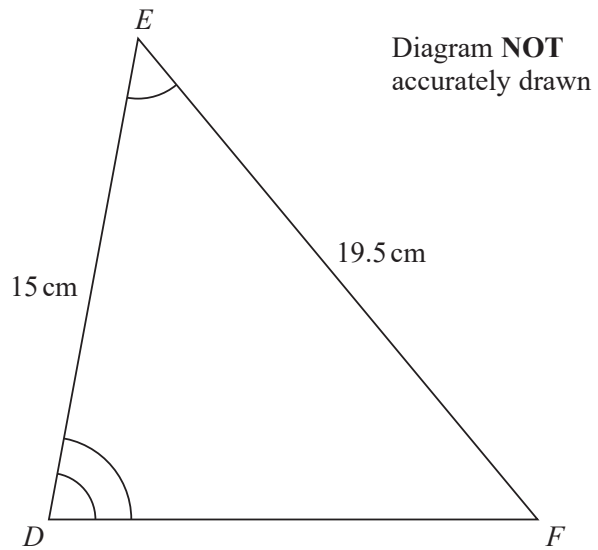
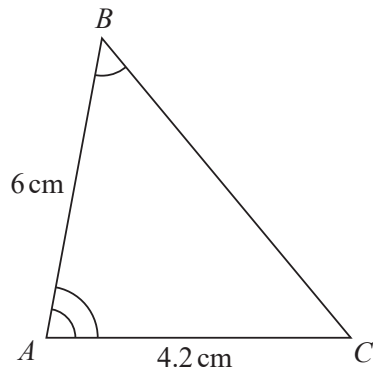
Work out the value of x

$x = \dots\dots\dots$

(Total for Question 12 is 3 marks)



6 ABC and DEF are similar triangles.



(a) Work out the length of DF .

.....cm
(2)

(b) Work out the length of BC .

.....cm
(2)

(Total for Question 6 is 4 marks)

- 4 ABC and DEF are similar triangles.

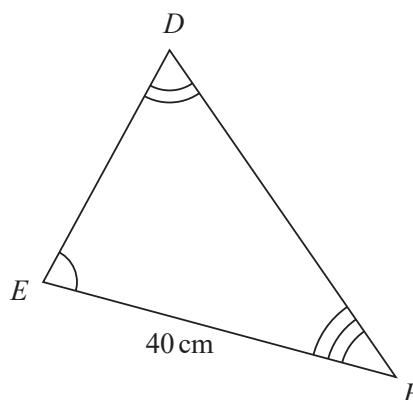
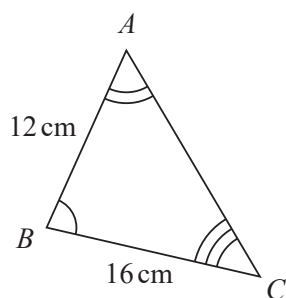


Diagram **NOT**
accurately drawn

- (a) Work out the length of DE .

..... cm
(2)

The area of triangle DEF is 525 cm^2

- (b) Find the area of triangle DEF in m^2

..... m^2
(2)

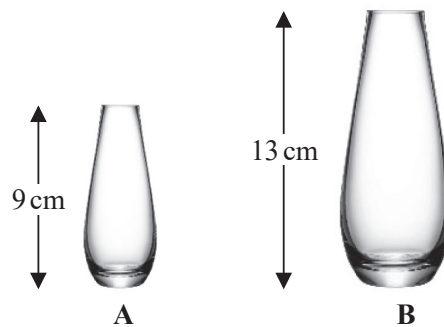
(Total for Question 4 is 4 marks)

- 5 Factorise $x^2 - 5x - 36$

.....
(Total for Question 5 is 2 marks)



20 The diagram shows two similar vases, **A** and **B**.



The height of vase **A** is 9 cm and the height of vase **B** is 13 cm.

Given that

$$\text{surface area of vase A} + \text{surface area of vase B} = 1800 \text{ cm}^2$$

calculate the surface area of vase **A**.

..... cm²

(Total for Question 20 is 4 marks)

4 ABC and DEF are similar triangles.

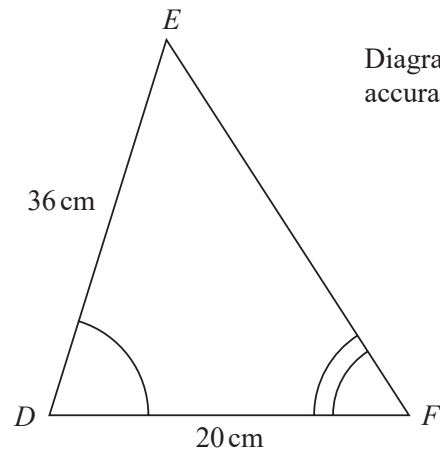
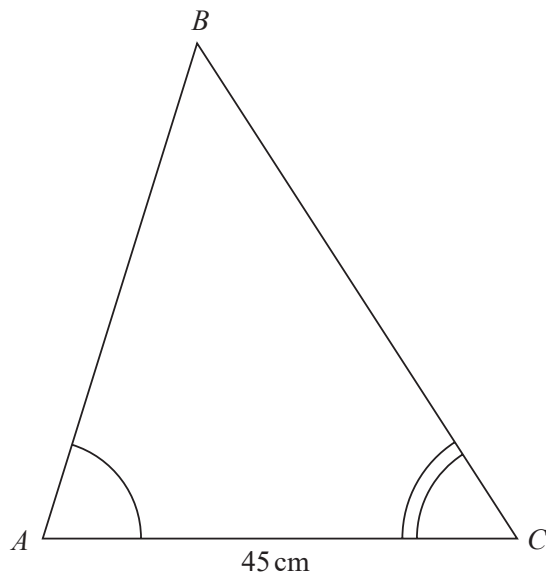


Diagram **NOT**
accurately drawn

(a) Work out the length of AB .

..... cm
(2)

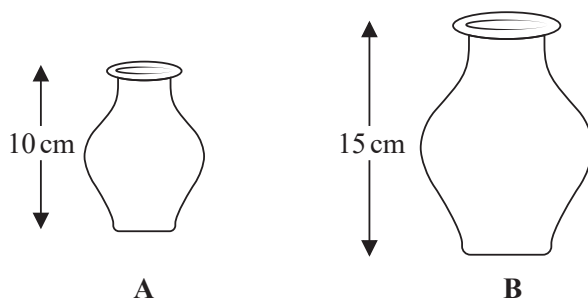
Given that $BC = 54\text{ cm}$,

(b) work out the length of EF .

..... cm
(2)

(Total for Question 4 is 4 marks)

17 A and B are two similar vases.



Vase A has height 10 cm.

Vase B has height 15 cm.

The difference between the volume of vase A and the volume of vase B is 1197 cm^3

Calculate the volume of vase A

..... cm^3

(Total for Question 17 is 4 marks)

18 The three solids **A**, **B** and **C** are similar such that

the surface area of **A** : the surface area of **B** = 4 : 9

and

the volume of **B** : the volume of **C** = 125 : 343

Work out the ratio

the height of **A** : the height of **C**

Give your ratio in its simplest form.

.....
(Total for Question 18 is 4 marks)



20 The diagram shows two similar metal statues.



A



B

Diagram **NOT**
accurately drawn

The volume of statue **B** is 20% less than the volume of statue **A**

The surface area of statue **B** is $k\%$ less than the surface area of statue **A**

Work out the value of k

Give your answer correct to 3 significant figures.

$k = \dots\dots\dots$

(Total for Question 20 is 4 marks)

3 $ABCD$ and $EFGH$ are similar quadrilaterals.

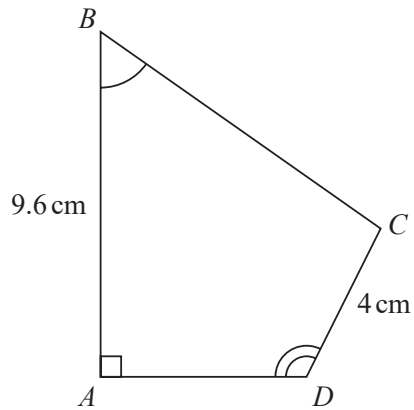
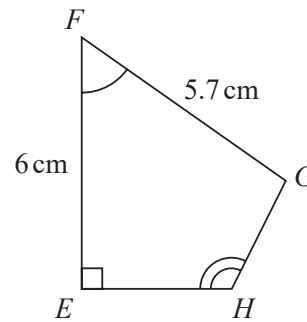


Diagram **NOT**
accurately drawn



(a) Work out the length of GH

..... cm
(2)

(b) Work out the length of BC

..... cm
(2)

(Total for Question 3 is 4 marks)

- 2 The diagram shows triangle ABC and triangle ECD

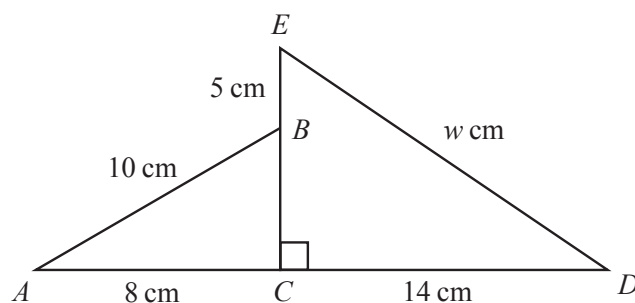


Diagram **NOT**
accurately drawn

ACD and EBC are straight lines.

$$AB = 10 \text{ cm} \quad AC = 8 \text{ cm} \quad EB = 5 \text{ cm} \quad CD = 14 \text{ cm} \quad ED = w \text{ cm}$$

Work out the value of w

Give your answer correct to one decimal place.

$$w = \dots\dots\dots$$

(Total for Question 2 is 4 marks)



18 The diagram shows two similar vases, A and B

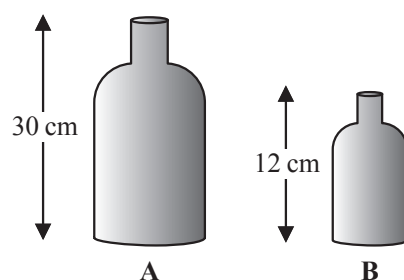


Diagram **NOT**
accurately drawn

The height of vase A is 30 cm

The height of vase B is 12 cm

Given that

$$\text{surface area of vase A} - \text{surface area of vase B} = 178.5 \text{ cm}^2$$

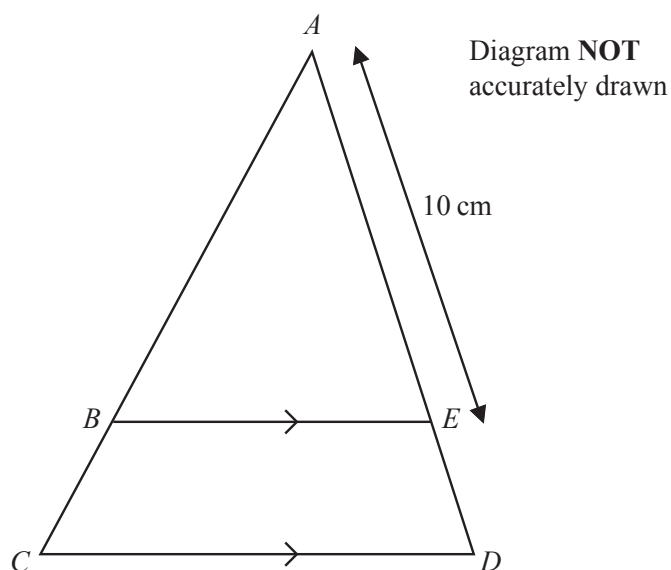
find the surface area of vase A

..... cm²

(Total for Question 18 is 4 marks)



12



In the diagram, ABC and AED are straight lines.
 BE is parallel to CD

$$AE = 10 \text{ cm} \quad \text{and} \quad CD = 1.5 \times BE$$

(a) Work out the length of ED

..... cm
 (2)

$$AB = (2x + 5) \text{ cm} \text{ and } BC = (3x - 5) \text{ cm}$$

(b) Work out the value of x

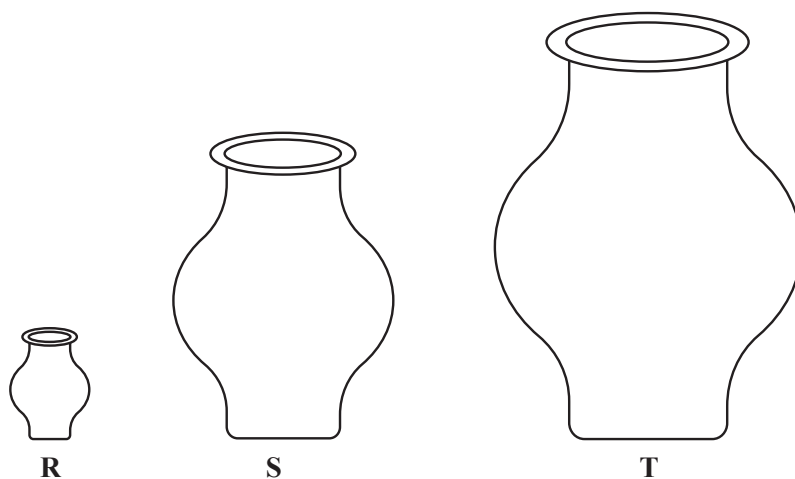
$x =$
 (2)

(Total for Question 12 is 4 marks)



26 **R**, **S** and **T** are three similar vases.

Diagram **NOT**
accurately drawn



The volume of vase **S** is 72.8% more than the volume of vase **R**

The height of vase **R** is h cm

The height of vase **T** is $6h$ cm

The surface area of vase **S** is A cm²

The surface area of vase **T** is kA cm²

Work out the value of k

$k = \dots\dots\dots$

(Total for Question 26 is 4 marks)

TOTAL FOR PAPER IS 100 MARKS



- 5 The diagram shows two similar quadrilaterals, $ABCD$ and $EFGH$

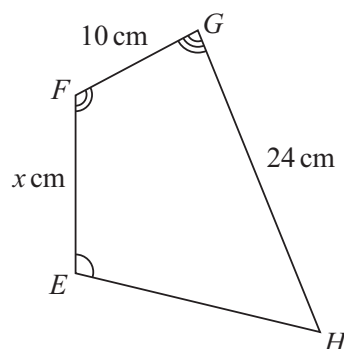
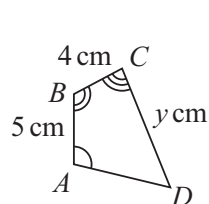


Diagram **NOT**
accurately drawn

$$AB = 5 \text{ cm} \quad BC = 4 \text{ cm} \quad CD = y \text{ cm}$$

$$EF = x \text{ cm} \quad FG = 10 \text{ cm} \quad GH = 24 \text{ cm}$$

- (a) Work out the value of x

$$x = \dots\dots\dots (2)$$

- (b) Work out the value of y

$$y = \dots\dots\dots (2)$$

(Total for Question 5 is 4 marks)



26 **A** and **B** are two similar solids.

The height of solid **A** is 31 cm

The height of solid **B** is 18.6 cm

Given that

$$\text{volume of solid A} - \text{volume of solid B} = 735 \text{ cm}^3$$

find the volume of solid **A**

..... cm³

(Total for Question 26 is 4 marks)

TOTAL FOR PAPER IS 100 MARKS



23 Solid **A** is similar to solid **B**

Here is some information about solid **A** and solid **B**

	solid A	solid B
Height (cm)	3^x	
Area (cm ²)	7776	486
Volume (cm ³)	8^x	2^{x+4}

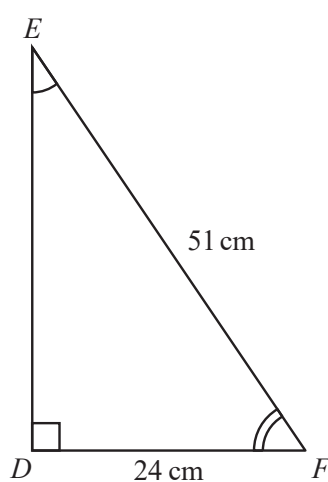
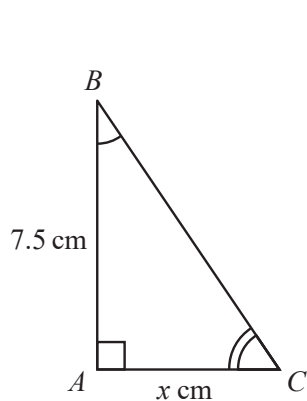
Work out the height of solid **B**
Give your answer as a decimal.



(Total for Question 23 is 5 marks)



10 Here are two similar triangles.



Diagrams **NOT**
accurately drawn

Work out the value of x
Show your working clearly.

$x =$

(Total for Question 10 is 5 marks)



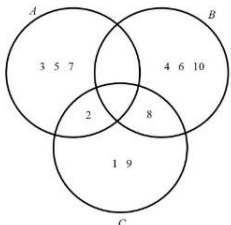
MARK SCHEMES

official mark schemes, in the same order as the questions



Question	Working	Answer	Mark	Notes
Apart from questions 9, 16, 20, 23 (where the mark scheme states otherwise) the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method				
1	$95 \times 8 + 105 \times 12 + 115 \times 15 + 125 \times 10 + 135 \times 3 (= 5400)$ or $760 + 1260 + 1725 + 1250 + 405 (= 5400)$			M2 for at least 4 correct products added (need not be evaluated) or If not M2 then award M1 for consistent use of value within interval (including end points) for at least 4 products which must be added or correct midpoints used for at least 4 products and not added
	'5400' ÷ '48'			M1 dep on at least M1 Allow division by their Σf provided addition or total under column seen
		112.5	4	A1 oe accept 112 or 113 from complete working Accept 112.5 with no working Do not accept 112 or 113 with no working
				Total 4 marks
2	Two pairs of intersecting arcs with equal radius centre D and E			M1 for 2 pairs of arcs that intersect within guidelines or correct perpendicular bisector without arcs.



			Correct bisector with arcs	2	A1
					Total 2 marks
3	(a)	Examples There are no members that are in both <i>A</i> and <i>B</i> No members in common (in <i>A</i> and <i>B</i>) No numbers the same (in <i>A</i> and <i>B</i>) <i>B</i> has even numbers. <i>A</i> has odd numbers except 2 which is not in <i>B</i> Nothing in <i>A</i> is in <i>B</i> or No overlap <i>A</i> and <i>B</i> don't share any numbers	Correct statement	1	B1 for a statement which indicates correct meanings for intersection and empty set
	(b)		1 and 9	1	B1
	(c)	e.g. 	1, 2, 8, 9	2	B2 for fully correct (B1 for 3 or 4 correct with no more than one addition or a fully correct Venn diagram)

4	$30 + 4x + 10 + x + 20 (= 5x + 60)$ or $180 - 30 (=150)$		4	M1 Allow $5x + 60 = n$ where $n \neq 180$ or for subtracting 30 from 180	M2 for $5x + 30 = 150$ oe
	e.g. $30 + 4x + 10 + x + 20 = 180$ or $5x + 60 = 180$ oe or $180 - 30 - 10 - 20 (=120)$			M1 for setting up the equation or for subtracting all numerical values of angles from 180	
	$5x = '120'$ or $'120' \div 5$			M1 for correctly simplifying to $ax = b$ or for dividing $'120'$ by 5	
		24		A1 for 24	
Total 4 marks					

5		Fully correct angle bisector with all relevant arcs shown	2	B2 Fully correct angle bisector with all arcs shown. B1 for all arcs and no angle bisector drawn or for a correct angle bisector within guidelines but not arcs or insufficient arcs	
					Total 2 marks

Question	Working	Answer	Mark	Notes
4	$8.5^2 + 5.6^2 (= 103.61)$		3	M1
	$\sqrt{8.5^2 + 5.6^2}$			M1
		10.2		A1 Accept 10.1 to 10.2 or better
Total 3 marks				
5	3 hours 36 mins = 216 (mins) or 3.6 (hours) or $3\frac{36}{60}$ oe (hours)		3	M1
	$2470 \div 3.6$ or $2470 \div 3\frac{36}{60}$ or $2470 \div 216 \times 60$			M1 Allow $2470 \div 3.36 (= 735$ or better)
		686		A1 Accept 686.1 or better
Total 3 marks				
6		Fully correct perpendicular bisector with all relevant arcs shown.	2	B2 Fully correct bisector with all arcs. Correct arcs can be on the same side of AB. B1 for all correct arcs and no bisector drawn or for a correct bisector within guidelines but no arcs. NB: On tramlines = within tramlines.
Total 2 marks				
7	(adding) $10x = -5$ or $21x + 35y = 42$ $21x - 15y = -33$ then $50y = 75$		3	M1 Correct method to eliminate x or y Or making coefficients of x or y the same and correct operator has been applied to eliminate x or y (2 out of 3 terms correct implies a correct operator) or correct algebraic substitution for x or y into other equation
		$x = -0.5$ oe $y = 1.5$ oe		A1 Both A marks dep on M1
				A1
Total 3 marks				

International GCSE Maths A (4MA1) November 2020 – Paper 1HR Mark scheme				
Apart from Questions 1, 3c, 12, 13b, 19, 23 where the mark scheme states otherwise, the correct answer, unless clearly obtained by an incorrect method, should be taken to imply a correct method.				
Q	Working	Answer	Mark	Notes
1	e.g. $\frac{15}{4}$		3	M1 for $3\frac{3}{4}$ expressed as an improper fraction
	e.g. $\frac{15}{4} \times \frac{7}{9} = \frac{105}{36}$ or $\frac{105}{36}$ oe			M1 correct cancelling or multiplication of numerators and denominators without cancelling
	e.g. $\frac{15}{4} \times \frac{7}{9} = \frac{35}{12} = 2\frac{11}{12}$ or $\frac{15}{4} \times \frac{7}{9} = \frac{105}{36} = \frac{35}{12} = 2\frac{11}{12}$ or $\frac{15}{4} \times \frac{7}{9} = \frac{105}{36} = 2\frac{33}{36} = 2\frac{11}{12}$	shown		A1 dep on M2, for conclusion to $2\frac{11}{12}$ from correct working – either sight of the result of the multiplication e.g. $\frac{105}{36}$ oe must be seen or correct cancelling prior to the multiplication to $\frac{35}{12}$ NB: use of decimals scores no marks
				Total 3 marks
2			2	M1 Arcs on BC, AB and arcs from these points meeting or for bisector without arcs
		Correct bisector		A1 must see correct arcs
				Total 2 marks

2	$6-12x$ or $2-4x = \frac{5}{3} - \frac{8}{3}x$		3	M1 for expansion of bracket on the LHS or dividing the RHS by 3 with two terms
	$6-5=12x-8x$ or $1=4x$ or $-12x+8x=5-6$ oe or $-4x=-1$ or $\frac{8}{3}x-4x=\frac{5}{3}-2$ oe or $2-\frac{5}{3}=-\frac{8}{3}x+4x$ oe			M1 ft (dep on 4 terms) for terms in x on one side of equation; number terms on the other
	<i>Working required</i>	$\frac{1}{4}$		A1 oe dep on M1 awarded
				Total 3 marks

3	Two pairs of intersecting arcs with equal radii centre A and B		2	M1 for arcs that intersect within or on the guidelines or correct perpendicular bisector without arcs.
	<i>Working required</i>	Bisector with construction arcs		A1 for a fully correct bisector with two intersecting arcs
				Total 2 marks



4		Fully correct angle bisector with all relevant arcs shown	2	B2 for a fully correct angle bisector with all relevant arcs shown If not B2 then B1 for all arcs and no angle bisector drawn or for a correct angle bisector within the guidelines but no correct arcs or insufficient correct arcs
				Total 2 marks

5	<table><tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>y</td><td>10</td><td>7.5</td><td>5</td><td>2.5</td><td>0</td><td>-2.5</td><td>-5</td></tr></table>	x	-2	-1	0	1	2	3	4	y	10	7.5	5	2.5	0	-2.5	-5	Correct line	3	B3 for a correct line between $x = -2$ and $x = 4$ If not B3 then award B2 for a line segment through at least 3 of $(-2, 10), (-1, 7.5), (0, 5), (1, 2.5), (2, 0), (3, -2.5), (4, -5)$ or all points plotted correctly If not B2 then award B1 for at least 2 correct points plotted or stated (may be seen in a table) or for a line drawn with a negative gradient through $(0, 5)$ or for a line with a gradient of -2.5
x	-2	-1	0	1	2	3	4													
y	10	7.5	5	2.5	0	-2.5	-5													
				Total 3 marks																

2		Fully correct angle bisector with all relevant arcs	2	B2 for a fully correct angle bisector with all arcs shown (the line and the arcs can intersect on or within the overlay guidelines) (B1 for all arcs and no angle bisector drawn or for a correct angle bisector within or on guidelines but no arcs or insufficient arcs) NB Overlay is available
				Total 2 marks

Question	Working	Answer	Mark	Notes
4*		Bisector with construction arcs	2	B2 B2 for a fully correct perpendicular bisector with 2 pairs of intersecting arcs shown (the line and the arcs can intersect on or within the overlay guidelines) (B1 for 2 pairs of intersecting arcs and no perpendicular bisector drawn or for a correct bisector perpendicular drawn within or on guidelines but no arcs or insufficient arcs or one pair of intersecting arcs and perpendicular bisector drawn on just one side of AB) NB Overlay is available
				Total 2 marks



Question	Working	Answer	Mark	Notes	
5	$30.5 \div 8 (= 3.8125)$ OR $60 \div 8 (= 7.5)$ $"3.8125" \times 60$ OR $30.5 \times "7.5"$	228.75	3	M1 M1 A1	M2 for $30.5 \div \frac{8}{60}$ oe accept 229, 228.8
6	$3x + 10 = x + 52$ $3x - x = 52 - 10$ or $2x = 42$ or $x = 21$ $y = 180 - 2 \times ("21" + 52)$ or $y = 180 - 2 \times (3 \times "21" + 10)$ or $y = 180 - ("21" + 52) - (3 \times "21" + 10)$	34	4	M1 M1 M1 A1	for equating the expressions for angle <i>P</i> and angle <i>Q</i> for isolating the terms in <i>x</i> for a complete method dep on M2
7	eg $\frac{187}{147}$ or $\frac{147}{187}$ or $\frac{90}{187}$ or $\frac{187}{90}$ eg $90 \div \frac{187}{147}$ or $90 \times \frac{147}{187}$ or $147 \times \frac{90}{187}$ or $147 \div \frac{187}{90}$	71	3	M1 M1 A1	for an appropriate scale factor, candidates may work in either cm or m for a complete method, candidates may work in either cm or m 70.7 – 71



Question	Working	Answer	Mark	Notes	
1	$73 \div 200 (=0.365)$ or $73 \times 100 (=7300)$ or $1 \text{ cm} = 2 \text{ m}$ oe $"0.365" \times 100$ or $"7300" \div 200$ $73 \div 2$			M1 M1 A1	M2 for $100 \div \frac{200}{73}$ oe Allow their incorrectly converted $73 \text{ m} \div 200$
2		36.5 $4n + 3$	3 2	B2 oe	e.g. $7 + 4(n - 1)$ or $4n + (7 - 4)$ etc allow $T_n = 4n + 3$ or $x = 4n + 3$ etc If not B2 then award B1 for answer of $4n + k$ ($k \neq 3$) or $n = 4n + 3$
3	$90 \div (2 + 13) (=6)$ or $\frac{12 + x}{90 + x} = \frac{1}{3}$ $"6" \times 2 (=12)$ or $"6" \times 13 (=78)$ or $3(12 + x) = 90 + x$ $("78" \div 2) - "12"$ or $2x = 54$ or $"78" \times 3/2 - "78" - "12"$ oe			M1 M1 M1 A1	M2 for $\frac{2}{15} \times 90 (=12)$ or $\frac{13}{15} \times 90 (=78)$ dep on a correct method for "78" and "12"
		27	4		

Question	Working	Answer	Mark	Notes
16	e.g. $\sqrt[3]{\frac{960}{405}} \left(= \frac{4}{3} \right) (=1.3...)$ or $\sqrt[3]{\frac{405}{960}} \left(= \frac{3}{4} \right) (=0.75)$ $\left(\frac{3}{4} \right)^2 \times 928$ or $928 \div \left(\frac{4}{3} \right)^2$ oe	522	3	M1 for a correct linear scale factor M1 for a complete method A1
17 (a) (b) (c)	$g(-1.5) = 1 \div (1 - 2 \times -1.5) (=0.25)$ or $fg(x) = 4 - 3 \times \left(\frac{1}{1 - 2x} \right)$ oe	-11 0.5 oe	1 1	B1 B1 M1 $g(-1.5)$ must be the correct calculation alone.
18	7.5 or 8.5 or 4.65 or 4.55 25 or 15 $\frac{4.55}{25 - 7.5}$	3.25 oe	2	A1
		0.26 oe	4	M1 M1 M1 for $\frac{LB_1}{UB - LB_2}$ with $4.55 \leq LB_1 < 4.6$ and $20 < UB \leq 25$ and $7.5 \leq LB_2 < 8$ A1 for 0.26 from correct working

19	$\frac{6}{3-\sqrt{7}} \times \frac{3+\sqrt{7}}{3+\sqrt{7}} \text{ or } \frac{6}{3-\sqrt{7}} \times \frac{-3-\sqrt{7}}{-3-\sqrt{7}}$			M1
	$\frac{6(3+\sqrt{7})}{3^2-7} \text{ or } \frac{6(3+\sqrt{7})}{2} \text{ or } \frac{6(-3-\sqrt{7})}{-3^2+7} \text{ or } \frac{6(-3-\sqrt{7})}{-2}$			M1 (numerator may be expanded or denominator may be 4 terms which need to be all correct)
		$9+3\sqrt{7}$	3	A1 dep on M2 for $9+3\sqrt{7}$ or $3(3+\sqrt{7})$ from correct working
Total 3 marks				

20	$\sqrt{\frac{300}{108}} \text{ or } \sqrt{\frac{108}{300}} \text{ or } \sqrt{\frac{25}{9}} \text{ oe or } \sqrt{\frac{9}{25}} \text{ oe or } \left(\frac{300}{108}\right)^3 = \left(\frac{V}{135}\right)^2 \text{ oe}$			M1 for a correct linear scale factor (fraction or ratio) or for the use of $\left(\frac{A_1}{A_2}\right)^3 = \left(\frac{V_1}{V_2}\right)^2$
	$135 \times \left(\sqrt{\frac{300}{108}}\right)^3 \text{ oe or } \sqrt{\frac{300^3}{108^3}} \times 135^2 \text{ or } \sqrt{390625}$			M1
		625	3	A1
Total 3 marks				

20	$\sqrt[3]{\frac{4352}{1836}}$ or $\frac{4}{3}$ or 1.33(33...) or 4:3 or $\sqrt[3]{\frac{1836}{4352}}$ or $\frac{3}{4}$ or 0.75 or 3:4		3	M1 for a correct length scale factor or a correct length ratio
	e.g. $1120 \div \left(\frac{4}{3}\right)^2$ oe or $1120 \times \left(\frac{3}{4}\right)^2$ oe			M1 (dep on M1) for a correct method to work out the surface area of A
		630		A1
				Total 3 marks

21	(a)(i)	(-12, 15)	1	B1
	(ii)	(-9, 5)	1	B1
	(b)	$a = 2$ and $b = 90$	2	B2 for both values correct (B1 for $a = 2$ or $b = 90$ or $a = -2$ and $b = -90$)
				Total 4 marks



Question	Working	Answer	Mark	Notes
20	eg $\sqrt{\frac{36}{25}} \left(= \frac{6}{5} \right)$ or $\sqrt{\frac{25}{36}} \left(= \frac{5}{6} \right)$ or $\sqrt{36}:\sqrt{25}$ (6:5) or $\sqrt{25}:\sqrt{36}$ (5:6) or $\frac{(\sqrt{25})^3}{(\sqrt{36})^3} = \left(\frac{125}{216} \right)$ oe or $\frac{36^3}{25^3} = \frac{(\text{vol of large})^2}{300^2}$ or $\frac{36}{25} = \frac{(\text{vol of large})^{\frac{2}{3}}}{300^{\frac{2}{3}}}$ oe		3	M1 for a correct scale factor for length – may be given as a fraction or ratio or a correct scale factor for volume given as a fraction or ratio or a correct equation for the volume of each large block
	eg $300 \times \left(\frac{6}{5} \right)^3$ or $300 \div \left(\frac{5}{6} \right)^3$ oe or $\sqrt{\frac{300^2 \times 36^3}{25^3}}$ or $\left(\frac{36 \times 300^{\frac{2}{3}}}{25} \right)^{\frac{3}{2}}$ oe			M1 for a complete method to find the volume of a large block
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	518.4		A1 allow 518
Total 3 marks				

3	(a)	$\frac{12}{4}(=3)$ or $\frac{4}{12}(=0.3)$ or $\frac{BC}{4} = \frac{16.5}{12}$ or $BC \div 16.5 = 4 \div 12$ or $(BC \Rightarrow) 16.5 \div \frac{12}{4}$ oe		2	M1 correct scale factor (given as 3 or a fraction or a ratio) or correct equation using BC or a correct expression for BC (award for SF even if not used)
			5.5		A1
	(b)		$3x$	1	B1 allow $3 \times x$ or $x \times 3$ ft their “3” in (a)
					Total 3 marks

4	(a)	17.75	1	B1 oe
	(b)	18.25	1	B1 oe 18.249 (allow 18.249...)
				SC B1 for 17.5 in (a) and 18.5 (or 18.49) in (b)
				Total 2 marks

12	eg $6 \div 1.2 (= 5)$ or $1.2 \div 6 (= \frac{1}{5})$ or $\frac{2x}{1.2} = \frac{2x+9}{6}$ oe or $\frac{2x}{2x+9} = \frac{1.2}{6}$ oe		3	M1 for finding the scale factor or using a correct ratio or fraction method
	eg “5” $\times 2x = 2x + 9$ or $2x \times 6 = 1.2(2x+9)$ oe eg $12x = 2.4x + 10.8$ or $9.6x = 10.8$ oe			M1 for setting up an equation in x and removing denominators
		$\frac{9}{8}$		A1 oe eg 1.125 (allow 1.12 or 1.13)
Total 3 marks				

13	eg $2 \times \pi \times 5.2 (= 32.6 \dots \text{or } \frac{52}{5} \pi)$ oe $\frac{67}{360} \times 2 \times \pi \times 5.2 (= 6.08 \dots \text{or } \frac{871}{450} \pi)$ oe		3	M1 for finding the whole circumference or the arc length
	$\frac{67}{360} \times 2 \times \pi \times 5.2 + 2 \times 5.2$ oe			M1 for a complete method
		16.5		A1 accept 16.4 - 16.5 (not in terms of π)
Total 3 marks				



6	(a)	$\frac{15}{6}$ or $\frac{6}{2.5}$ or $\frac{4.2}{0.4}$ or $\frac{6}{0.7}$ or $\frac{6}{1.4}$ (2857.....) oe			M1 for a correct scale factor, accept ratio notation eg 6 : 15
			10.5	2	A1 oe
	(b)	$19.5 \div 2.5$ or 19.5×0.4 oe or $4.2 \times \frac{19.5}{(a)}$			M1 If using <i>DF</i> ft their answer from part (a)
			7.8	2	A1 oe
					Total 4 marks

7		e.g. 30×26.8 (= 804) or 13×25 (= 325) or $(26.8 - 25) \times 30$ or 1.8×30			M1 for finding the total marks for the boys or the total test marks
		e.g. $(30 \times 26.8 - 13 \times 25) \div (30 - 13)$ (= 28.1764...) or $(('804' - '325') \div (30 - 13))$ (= 28.1764...) or $(('804' - '325' \div 17))$ (= 28.1764...) or $((26.8 - 25) \times 30) \div 17 + 25$ (= 28.1764...) or $'1.8' \times 30 \div 17 + 25$ (= 28.1764...)			M1 for a complete method to find the mean mark for the girls
			28.2	3	A1 accept 28.15 – 28.2 (accept without working) (Accept 28 from complete working)
					Total 3 marks

International GCSE Maths					
Apart from Q2, 17, 18d, 20, & 24 (where the mark scheme states otherwise) the correct answer, unless obtained from an incorrect method, should be taken to imply a correct method					
Question	Working	Answer	Mark	Notes	
1	(a)	$x > -3$	1	B1	Accept $-3 < x$
	(b)	$4y - y \leq 8 + 13$	2	M1	Arranging y's on one side and the numbers on the other side. (allow $4y - y = 8 + 13$ oe or $4y - y < 8 + 13$ oe or $4y - y > 8 + 13$ oe or $4y - y \geq 8 + 13$ oe)
		$y \leq 7$ oe		A1	Allow $y \leq 21/3$
Total 3 marks					
2			3	M1	Sight of $\frac{17}{3}$ and $\frac{11}{4}$ or $5\frac{8}{12}$ and $2\frac{9}{12}$
				M1	or $\frac{68n}{12n}$ $\frac{33n}{12n}$
				A1	Dep on M2
				M1	
				A1	Dep on M2
				M1	
				A1	Dep on M2
Total 3 marks					

Question		Working	Answer	Mark	Notes	
3	(a)		-5, 5, 5, -5	2	B2	All 4 correct values If not B2 then B1 for 2 or 3 correct values
	(b)		Fully correct curve	2	M1 A1	Plotting at least 6 points correctly from their table dep on B1 in part(a) Do not accept horizontal line at top of curve or straight line segments
Total 4 marks						
4	(a)	$40 \div 16 \times 12$ oe	30	2	M1 A1	$40 \times \frac{12}{16}$ oe
	(b)	$525 \div 100^2$	0.0525 oe	2	M1 A1	$\frac{525}{100^2}$ Accept 5.25×10^{-2}
Total 4 marks						
5			$(x + 4)(x - 9)$	2	M1 A1	For $(x + a)(x + b)$ where $ab = -36$ and a and b are integers Ignore extension to roots $x = -4$ & 9
						Total 2 marks
6		P(mint =) $1 - (0.35 + 0.32 + 0.12)$ (= 0.21) P(strawberry or mint =) $0.32 + 0.21$	0.53 oe	3	M1 M1 A1	Or a correct equation summing to 1 Dep Allow 0.53/1
						Total 3 marks
7		$55 \div (6 + 3 + 2)$ (= 5) $(6 \times "5") - (2 \times "5")$	20	3	M1 M1 A1	Or $\frac{4}{11} \times 55$ (= 30) or $\frac{2}{11} \times 55$ (= 10) Or M2 for Won = 30 and Lost = 10 (can be seen in a ratio 30 : 15: 10)
						Total 3 marks

Question	Working	Answer	Mark	Notes
18	eg $9 \times 6 = 8 \times PD$ oe		2	M1 A correct equation involving PD
		6.75		A1 oe
Total 2 marks				
19 (a)	eg $\frac{2(4-3x)}{10} - \frac{5(3x-5)}{10} = -3$ oe or $2(4-3x) - 5(3x-5) = -3 \times 2 \times 5$ $8 - 6x - 15x + 25 = -30$ oe		3	M1 Correct fractions over common denominator as an equation or Multiplying both sides by 10
				M1 A correct equation with no denominators or brackets
		3		A1 dep on M1
(b)	$(5y+8)(y-5) (\leq 0)$ or $(y =) \frac{-17 \pm \sqrt{(-17)^2 - 4 \times 5 \times -40}}{2 \times 5}$ -1.6, 5 oe		3	M1 Correct method to solve 3 term quadratic – factorising or correct use of formula
				A1 Correct critical values
		$-1.6 \leq y \leq 5$ oe		A1 Condone change of variable in place of y throughout this question.
Total 6 marks				
20	$(ASF =) \frac{13^2}{9^2}$ or $\frac{9^2}{13^2}$		4	M1 Correct SF for area. Accept $1.44^2 (= 2.07 \text{ or } 2.09)$ or better for ASF or $0.69^2 (= 0.47 \text{ or } 0.48)$ or better for ASF
	eg $A + \left(\frac{13^2}{9^2}\right) A = 1800$			M1ft Dep on previous M1
	eg $\frac{250}{81} A = 1800$			M1ft
		583.2		A1 Awrt 583
Total 4 marks				

3	(a)		$\frac{31}{70}$	1	B1 $\frac{31}{70}$ Accept 0.44(28571.....) or 44.(2....)%
	(b)	$4 \times 6 + 12 \times 14 + 20 \times 19 + 28 \times 25 + 36 \times 6 (= 1488)$ or $24 + 168 + 380 + 700 + 216 (= 1488)$		4	M2 for at least 4 correct products added (need not be evaluated) If not M2 then award: (M1 for consistent use of value within interval (including end points) for at least 4 products which must be added or correct midpoints used for at least 4 products and not added)
		$\frac{4 \times 6 + 12 \times 14 + 20 \times 19 + 28 \times 25 + 36 \times 6}{70}$ oe eg '1488' $\div 70$			M1 dep on at least M1 Allow division by their Σf provided addition or total under column seen
		Correct answer scores full marks (unless from obvious incorrect working)	21.26		A1 awrt 21.26 accept 21.3
					Total 5 marks



4	(a)	$\frac{45}{20}$ or $\frac{20}{45}$ or $\frac{36}{20}$ or $\frac{20}{36}$ oe 2.25 or 0.44(44...) or 1.8 or 0.55(55...)		2	M1 for a correct scale factor, accept ratio notation eg 45 : 20
		Correct answer scores full marks (unless from obvious incorrect working)	81		A1
	(b)	$54 \div '2.25'$ or $54 \times '0.44(44...)'$ oe or $36 \times \frac{54}{81}$		2	M1 can fit if M1 scored in (a)
		Correct answer scores full marks (unless from obvious incorrect working)	24		A1
					Total 4 marks



17	eg $2^3 : 3^3$ or $8 : 27$ or $10^3 : 15^3$ oe or $\left(\frac{15}{10}\right)^3$ or $1.5^3 (= 3.375)$ or $\left(\frac{3}{2}\right)^3 \left(\frac{27}{8}\right)$ or $\left(\frac{10}{15}\right)^3$ or $\left(\frac{2}{3}\right)^3 \left(\frac{8}{27}\right)$		4	M1 for a correct ratio or scale factor for the volumes
	eg $\frac{1197}{27-8}$ or $\frac{1197}{15^3-10^3}$ or $\frac{19}{8} V_A - V_A = 1197$ oe or $\frac{19}{8} V_A = 1197$ oe			M1 for a correct method to find the value of 1 share of volume or for setting up a correct equation using the scale factor for the volumes
	eg $8 \times \frac{1197}{27-8}$ or $10^3 \times \frac{1197}{15^3-10^3}$ or $\frac{8}{19} \times 1197$ oe			M1 complete correct method to find volume of vase A
		504		A1
				Total 4 marks

18	3.445, 3.455, 1.85, 1.95, 4.5, 5.5		3	B1 any one bound
	$(A =) 3.445 - \frac{1.95^2}{4.5}$			M1 $A = LB_w - \frac{(UB_x)^2}{LB_y}$ where $3.445 \leq LB_w < 3.45$, $1.9 < UB_x \leq 1.95$, $4.5 \leq LB_y < 5$
		2.6		A1 oe, (dep on M1), from correct figures (3.445, 1.95, 4.5)
				Total 3 marks



18	$\sqrt{4} : \sqrt{9} (= 2 : 3)$ or $\frac{\sqrt{4}}{\sqrt{9}} \left(= \frac{2}{3} \right)$ oe or $\sqrt{9} : \sqrt{4} (= 3 : 2)$ or $\frac{\sqrt{9}}{\sqrt{4}} \left(= \frac{3}{2} \right)$ oe		4	M1 for finding the ratio or fraction for lengths for $A : B$ or $B : A$
	$\sqrt[3]{125} : \sqrt[3]{343} (= 5 : 7)$ or $\frac{\sqrt[3]{125}}{\sqrt[3]{343}} \left(= \frac{5}{7} \right)$ oe or $\sqrt[3]{343} : \sqrt[3]{125} (= 7 : 5)$ or $\frac{\sqrt[3]{343}}{\sqrt[3]{125}} \left(= \frac{7}{5} \right)$ oe			M1 for finding the ratio or fraction for lengths for $B : C$ or $C : B$
	$A : B = 10 : 15$ and $B : C = 15 : 21$ oe			M1 for manipulating $A : B$ and $B : C$ so that both B values are equal
		10 : 21		A1 Allow 1 : 2.1 SC3 for 21 : 10 with all working shown
Total 4 marks				

19	(a)		$-\frac{4}{3}$	1	B1
	(b)	$3(x^2 + 4x) + 19$ and $3[(x + 2)^2 - 2^2] + 19$ or $3\left(x^2 + 4x + \frac{19}{3}\right)$ and $3\left((x + 2)^2 - 2^2 + \frac{19}{3}\right)$ or $a = 3$ and $2ab = 12$ oe and $b^2a + c = 19$ oe or $a = 3$ and $b = \frac{12}{2 \times 3}$ oe and $c = -\frac{12^2}{4 \times 3} + 19$ oe			M1 for correctly taking out a factor of 3 and correctly completing the square or for equating coefficients by expanding $a(x + b)^2 + c = ax^2 + 2abx + b^2a + c$ or for equating coefficients by using $ax^2 + bx + c = a\left(x + \frac{b}{2a}\right)^2 - \frac{b^2}{4a} + c$
			$3(x + 2)^2 + 7$		A1 accept $a = 3, b = 2, c = 7$
Total 3 marks					

20	(Length sf =) $\sqrt[3]{0.8}$ (= 0.928...) or $\sqrt[3]{1.25}$ (=1.07...) or $\sqrt[3]{4}:\sqrt[3]{5}$ oe		4	M1	for a correct linear scale factor
	(Area sf =) $\left(\sqrt[3]{0.8}\right)^2$ (= 0.861...) or 86.1...(%) or $\left(\sqrt[3]{1.25}\right)^2$ (=1.16...) or 116...(%) or $\left(\sqrt[3]{4}\right)^2:\left(\sqrt[3]{5}\right)^2$ oe			M1	for a correct area scale factor
	eg (k =) (1–"0.861...") $\times$ 100 or (100 – "86.1...") or $100 - \frac{100}{\text{"1.16"}}$ or $100 - \frac{100}{\text{"116"}}$ $\times$ 100 or $100 - 100 \times \frac{\left(\sqrt[3]{4}\right)^2}{\left(\sqrt[3]{5}\right)^2}$			M1	for a method to find the percentage reduction
		13.8		A1	accept 13.7 – 13.9
				Total 4 marks	



2	(a)(i)	5, 7, 11, 13	1	B1
	(ii)	5, 6, 8, 10, 12, 14, 15	1	B1
	(b)	Correct reason	1	B1 eg 9 is not a member of C or 9 is not in C or C only contains 6, 8, 10, 12, 14 or 9 is outside of C there must be no contradictory or incorrect statements
Total 3 marks				

3	(a)	eg $\frac{9.6}{6} (= 1.6 \text{ oe})$ or $\frac{6}{9.6} (= 0.625 \text{ oe})$ or $\frac{("GH")}{6} = \frac{4}{9.6} \text{ oe}$	2	M1 for a correct scale factor accept ratio notation eg 9.6 : 6 (can be seen near the diagram)
		Correct answer scores full marks (unless from obvious incorrect working)	2.5	A1 oe allow 2,5
	(b)	eg $5.7 \times "1.6"$ or $5.7 \div "0.625"$ or $5.7 \times \frac{4}{"2.5"}$ or $5.7 \div \frac{"2.5"}{4}$ or $\frac{("BC")}{9.6} = \frac{5.7}{6}$	2	M1 ft their scale factor from (a)
		Correct answer scores full marks (unless from obvious incorrect working)	9.12	A1 oe ft their scale factor from (a) allow 9,12
Total 4 marks				

Question	Working	Answer	Mark	Notes
2	$10^2 - 8^2 (=36)$ or $8^2 + BC^2 = 10^2$ oe or $\cos BAC = \frac{8}{10}$ ($BAC = 36.869\dots$)		4	M1
	$\sqrt{10^2 - 8^2} (=6)$ or $\tan^{-1} 36.869\dots \times 8 (=6)$ or $\sin^{-1} 36.869\dots \times 10 (=6)$			M1 (beware that $14 - 8 = 6$ has been seen and scores zero)
	$w = \sqrt{(5 + "6")^2 + 14^2} (= \sqrt{317})$ or $EDC = \tan^{-1} \left(\frac{5 + "6"}{14} \right) (= 38.157)$ and $w = \frac{"11"}{\sin 38.157\dots}$ or $w = \frac{14}{\cos 38.157\dots}$ or $CED = \tan^{-1} \left(\frac{14}{"11"} \right) (= 51.84\dots)$ and $w = \frac{11}{\cos 51.84\dots}$ or $w = \frac{14}{\sin 51.84\dots}$			M1 ft Allow use of <i>their</i> value of <i>BC</i>
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	17.8		A1 awrt 17.8 if no other marks scored then B1 for 22.6(5...)
				Total 4 marks

WATCH OUT FOR $\sqrt{10^2 + 8^2}$ (12.8...) + 5 = 17.8 (which is the same as the answer....but a completely wrong method)



18	30 : 12 (= 5 : 2) or 30 ÷ 12 (= 2.5 oe) or 12 : 30 (= 2 : 5) or 12 ÷ 30 (= 0.4 oe)		4	M1 for a method to find ratio for the lengths or linear scale factor
	eg $5^2x - 2^2x = 178.5$ or $2.5^{n^2}y - y = 178.5$ or $k - 0.4^{n^2}k = 178.5$ oe			M1 for setting up an equation using the surface areas
	$\frac{178.5}{5^2 - 2^2} \times 5^2 (= 8.5 \times 25)$ or $\frac{178.5}{2.5^{n^2} - 1} \times 2.5^{n^2} (= 34 \times 6.25)$ oe or $\frac{178.5}{1 - 0.4^{n^2}} (= 178.5 \div \frac{21}{25})$ oe			M1 for a complete method
	Correct answer scores full marks (unless from obvious incorrect working)	212.5		A1 oe
				Total 4 marks



12	(a)	$(AD=)10\times1.5 (= 15)$ oe		2	M1
		<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	5		A1
	(b)	$(2x+5)+(3x-5)=1.5\times(2x+5)$ oe or $5x=1.5\times(2x+5)$ oe or $5x=3x+7.5$ oe or $\frac{3x-5}{2x+5}=\frac{1}{2}$ oe		2	M1 for a correct equation for x
		<i>Working not required, so correct answer scores full marks (unless from obvious incorrect working)</i>	3.75		A1 oe eg $\frac{15}{4}$ or $3\frac{3}{4}$
					Total 4 marks



26	eg $\sqrt[3]{1.728}(=1.2)$ oe or (length R : S =) 1 : 1.2 oe eg 5 : 6 or (length R : S : T =) 1 : 1.2 : 6 oe eg 5 : 6 : 30 or (volume S : T =) 1.728 : 216 or 216 $\div$ 1.728 (= 125)		4	M1 for method to find the scale factor between the heights of R and S or for a correct ratio for the lengths R : S or for a correct ratio for the lengths R : S : T or for a correct ratio or scale factor for the volumes S : T
	eg $6 \div "1.2" (= 5)$ or $\sqrt[3]{\frac{216}{1.728}} (= 5)$ (length S : T =) 1 : 5 or $\sqrt[3]{1.728} : \sqrt[3]{216}$ (area S : T =) " 1.2^{n^2} " : 6^2 oe or (area S : T =) 6^2 : 30^2 oe or (area R : S : T =) 1 : " 1.2^{n^2} " : 6^2 oe or (area R : S : T =) 5^2 : 6^2 : 30^2 oe			M1 for method to find the scale factor between the heights of S and T or for a correct ratio of the heights of S and T in the form 1 : n or for a correct method to find the ratio for the areas S : T fit their ratio of lengths or for a correct method to find the ratio for the areas R : S : T fit their ratio of lengths (maybe seen as the two separate ratios of R : S and R : T)
	eg " 5^{n^2} " or (area S : T =) 1^2 : " 5^{n^2} " or (area S : T =) 1 : 25 or ($k =$) $\frac{36}{1.44}$ oe			M1 for squaring the scale factor of the heights of S and T or for a correct ratio in the form 1 : n for the areas S : T fit their ratio of areas, may be implied by their final answer or for a correct calculation using the area ratio of S : T to find the value of k
	Correct answer scores full marks (unless from obvious incorrect working)	25		A1 cao
				Total 4 marks

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Question	Working	Answer	Mark	Notes
5* (a)	$\frac{10}{4} \left(= \frac{5}{2} = 2.5 \right)$ or $\frac{4}{10} \left(= \frac{2}{5} = 0.4 \right)$ or $\frac{x}{5} = \frac{10}{4}$ oe or $\frac{x}{10} = \frac{5}{4}$ oe		2	M1 for a correct SF can be expressed as a fraction, decimal or ratio (may or may not be used) or for a correct equation in x Allow any letter for x
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	12.5		A1 oe eg $\frac{50}{4}$ or $\frac{25}{2}$ or $12\frac{1}{2}$ or $12\frac{2}{4}$
(b)	$24 \div [2.5]$ oe or $\frac{y}{24} = \frac{4}{10}$ oe or $\frac{y}{24} = \frac{5}{[12.5]}$ oe or $\frac{y}{4} = \frac{24}{10}$ oe or $\frac{y}{5} = \frac{24}{[12.5]}$ oe		2	M1 ft ie [2.5] is their SF from (a) or for a correct equation in y Allow any letter for y ft their answer to (a) ie [12.5] is their answer to (a)
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	9.6		A1 oe eg $\frac{48}{5}$ or $9\frac{3}{5}$ If (a) $x = 9.6$ and (b) $y = 12.5$ then M1A0M1A0
Total 4 marks				

Question	Working	Answer	Mark	Notes
26*	$A : B = 31 : 18.6 (= 5 : 3)$ oe or $A^3 : B^3 = 31^3 : 18.6^3 (= 5^3 : 3^3)$ oe or $\frac{31}{18.6} \left(= \frac{5}{3} \right)$ oe or $\frac{18.6}{31} \left(= \frac{3}{5} \right)$ oe or $\left(\frac{18.6}{31} \right)^3$ oe or $\frac{27}{125}$ oe or $\left(\frac{31}{18.6} \right)^3$ oe or $\frac{125}{27}$ oe		4	M1 for correct linear SF or volume SF either as a fraction or ratio. Allow $\frac{5}{3} = 1.6(6\dots)$ truncated or rounded
	$V_A - \left(\frac{3}{5} \right)^3 V_A (= 735)$ oe or $V_A - \frac{27}{125} V_A (= 735)$ oe or $\frac{98}{125} V_A (= 735)$ oe or $\frac{V_A}{V_A - 735} = \frac{31^3}{18.6^3}$ oe or $\left(\frac{5}{3} \right)^3 V_B - V_B (= 735)$ oe or $\frac{125}{27} V_B - V_B (= 735)$ oe or $\frac{98}{27} V_B (= 735)$ oe or $\frac{V_B + 735}{V_B} = \frac{31^3}{18.6^3}$ oe or $1 - \left(\frac{3}{5} \right)^3 \left(= \frac{98}{125} = 0.784 \right)$ oe or $\left(\frac{5}{3} \right)^3 - 1 \left(= \frac{98}{27} = 3.62(962\dots) \right)$ oe or $5^3 - 3^3 (= 125 - 27 = 98)$			M1 Note: 735 is given in the equation Allow any letter for V_A or for V_B $V_A - \left(\frac{3}{5} \right)^3 V_A (= 735)$ can be written as $V_A - \frac{V_A}{\left(\frac{5}{3} \right)^3} (= 735)$ or $\left(\frac{5}{3} \right)^3 V_B - V_B (= 735)$ can be written as $\frac{V_B}{\left(\frac{3}{5} \right)^3} - V_B (= 735)$
	$(V_A =) 735 \times \frac{125}{98}$ oe or $(V_A =) 735 \div \frac{98}{125}$ oe or $(V_A =) \frac{31^3 \times 735}{31^3 - 18.6^3}$ oe or $(V_B =) 735 \times \frac{27}{98} (= 202.5)$ oe or $(V_B =) 735 \div \frac{98}{27} (= 202.5)$ or $(V_B =) \frac{18.6^3 \times 735}{31^3 - 18.6^3} (= 202.5)$ oe or $735 \div 98 \times 5^3$ oe or 7.5×125 oe or $735 \div 98 \times 3^3 (= 202.5)$ oe or $7.5 \times 27 (= 202.5)$ oe			M1 for a correct method to find V_A or V_B
	Working not required, so correct answer scores full marks (unless from obvious incorrect working)	937.5		A1 oe allow 938 from correct working
				Total 4 marks

23	$\sqrt{\frac{7776}{486}}$ or $\sqrt{16}$ or 4 oe or $\sqrt{\frac{486}{7776}}$ or $\sqrt{\frac{1}{16}}$ or $\frac{1}{4}$ oe	Alternative for M2 a correct equation linking area and volume $\left(\frac{486}{7776}\right)^3 = \left(\frac{2^{x+4}}{8^x}\right)^2$ oe or $\left(\frac{7776}{486}\right)^3 = \left(\frac{8^x}{2^{x+4}}\right)^2$ oe		5	M1 for a correct linear scale factor
	$8^x = \left(\sqrt{\frac{7776}{486}}\right)^3 \times 2^{x+4}$ oe eg $8^x = 4^3 \times 2^{x+4}$ oe or $\frac{1}{8^x} = \left(\sqrt{\frac{486}{7776}}\right)^3 \times \frac{1}{2^{x+4}}$ oe				M1 for setting up a correct equation for volume
	eg $2^{3x} = 2^6 \times 2^{x+4}$ or $(4^{\frac{3}{2}})^x = 4^3 \times 4^{\frac{1}{2}(x+4)}$ $\frac{1}{2^{3x}} = \frac{1}{2^6} \times \frac{1}{2^{x+4}}$ oe or $3x = 6 + x + 4$ oe or $x = 5$	$\frac{1}{2^{12}} = \frac{2^{2x+8}}{2^{6x}}$ oe or $2^{12} = \frac{2^{6x}}{2^{2x+8}}$ oe or $12 = 6x - 2x - 8$ oe or $x = 5$			M1 for a correct equation using just powers of 2 or powers of 4 (or 8 or 16) or a correct linear equation in x or the correct value for x
	$3^5 \div 4$ oe or $3^5 \times \frac{1}{4}$ oe				M1 a correct calculation for the height of solid B
			60.75		A1 oe accept 60.8 or 61 (from correct working)
					Total 5 marks



10	eg $51^2 = (DE)^2 + 24^2$ oe or $2601 = (DE)^2 + 576$ oe or $(DE^2 =) 51^2 - 24^2 (= 2025)$ oe or $(DE^2 =) 2601 - 576 (= 2025)$ oe or $\cos(DFE) = \frac{24}{51}$ or $\sin(DEF) = \frac{24}{51}$	5	M1 for applying Pythagoras theorem correctly
	$(DE =) \sqrt{51^2 - 24^2} (= \sqrt{2025} = 45)$ or $(DE =) \sqrt{2601 - 576} (= \sqrt{2025} = 45)$ or $(DFE =) \cos^{-1}\left(\frac{24}{51}\right) (= 61.9\dots)$ or $(DEF =) \sin^{-1}\left(\frac{24}{51}\right) (= 28.0\dots)$		M1 for square rooting
	$\frac{\text{their } DE}{7.5} (= 6)$ oe or $\frac{7.5}{\text{their } DE} \left(= \frac{1}{6}\right)$ or $\frac{x}{24} = \frac{7.5}{\text{their } DE}$ oe or $\tan \text{"their } 61.9\dots" = \frac{7.5}{(x)}$ or $\tan \text{"their } 28.0\dots" = \frac{(x)}{7.5}$ or $\frac{(x)}{\sin(\text{their } 28.0)} = \frac{7.5}{\sin(\text{their } 61.9)}$ NB Their <i>ED</i> or their 61.9 or their 28.0 must be clearly identified Their 61.9.. or their 28.0.. cannot be used as lengths of the triangle Their 45 cannot be used as an angle of the triangle		M1 for a correct method to find the scale factor Allow correct use of sine rule/cosine rule/Pythagoras theorem Allow 0.17 or better for $\frac{1}{6}$ Special case Allow $(DE =) \sqrt{51^2 + 24^2}$ ($= \sqrt{3177} = 3\sqrt{353} = 56.3\dots$) for "45" for this mark
	$24 \div "6"$ oe or $24 \times \frac{1}{6}$ or $24 \times "1.67"$ or $(x =) \frac{7.5}{\text{their } ED} \times 24$ or $(x =) \frac{7.5}{\tan \text{"their } 61.9\dots"}$ oe or $(x =) 7.5 \times \tan \text{"their } 28.0\dots"$ oe or $(x =) \frac{7.5}{\sin(\text{their } 61.9)} \times \sin(\text{their } 28.0)$ oe or $51 \times \frac{1}{6} (= 8.5)$ and $(x =) \sqrt{8.5^2 - 7.5^2} (= \sqrt{16})$		M1 dep on previous M1 for a correct method to find <i>x</i> or for finding <i>BC</i> and using Pythagoras theorem to find <i>x</i> Allow $24 \times \frac{7.5}{56(.3\dots)}$ or $24 \div \frac{56(.3\dots)}{7.5}$ for scale factor for this mark
	Working required	4	A1 dep on M2 The value of 4 must come from correct figures
Total 5 marks			

