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EDEXCEL GCSE (9-1) MATHS: QUESTIONS BY TOPIC

Constructions, Loci, Congruence & Similarity (G2)

GCSE (9-1) Mathematics (1MA1) · Higher tier

35 questions · 117 marks · Mark schemes included

Past papers June 2017 - 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		5 Qs · 10 marks	3
1. Q4	GCSE Paper 2H June 2025	1	4
2. Q4	GCSE Paper 1H November 2019	2	5
3. Q5	GCSE Paper 1H November 2023	2	6
4. Q3	GCSE Paper 3H November 2024	2	7
5. Q8	GCSE Paper 2H June 2024	3	8
G2b CONGRUENCE & SIMILARITY		25 Qs · 90 marks	9
6. Q4	GCSE Paper 1H November 2020	1	10
7. Q15	GCSE Paper 3H November 2023	2	11
8. Q14	GCSE Paper 3H November 2017	3	12
9. Q13	GCSE Paper 3H June 2018	3	13
10. Q15	GCSE Paper 3H June 2022	3	14
11. Q20	GCSE Paper 3H November 2022	3	15
12. Q23	GCSE Paper 2H June 2023	3	16
13. Q13	GCSE Paper 1H November 2023	3	17
14. Q11	GCSE Paper 3H November 2023	3	18
15. Q19	GCSE Paper 1H June 2024	3	19
16. Q13	GCSE Paper 3H November 2024	3	20
17. Q21	GCSE Paper 1H June 2017	4	21
18. Q5	GCSE Paper 2H June 2017	4	22
19. Q15	GCSE Paper 1H November 2018	4	23
20. Q17	GCSE Paper 1H November 2019	4	24
21. Q22	GCSE Paper 1H November 2019	4	25
22. Q19	GCSE Paper 3H November 2020	4	26
23. Q23	GCSE Paper 3H November 2021	4	27
24. Q17	GCSE Paper 2H November 2022	4	28
25. Q5	GCSE Paper 3H November 2022	4	29
26. Q12	GCSE Paper 1H November 2024	4	30
27. Q22	GCSE Paper 1H November 2017	5	31
28. Q21	GCSE Paper 3H June 2018	5	32
29. Q8	GCSE Paper 1H June 2025	5	33
30. Q16	GCSE Paper 2H June 2025	5	34
G2c PLANS, ELEVATIONS & 3D SHAPES		5 Qs · 17 marks	35
31. Q4	GCSE Paper 1H June 2019	2	36
32. Q2	GCSE Paper 2H November 2022	2	37



QUESTION	SOURCE	MARKS	PAGE
33. Q3	GCSE Paper 3H June 2024	3	38
34. Q3	GCSE Paper 2H June 2017	4	40
35. Q5	GCSE Paper 1H June 2018	6	41

QUESTIONS

35 questions · 117 marks · 3 sub-topics

SUB-TOPIC G2a

CONSTRUCTIONS, LOCI & SCALE DRAWINGS

Sub-topic G2a · 5 questions · 10 marks · lowest tariff first



Macsen finds that each bag of gravel only covers an area of 11 m^2

(b) How does this affect your answer to part (a)?

.....

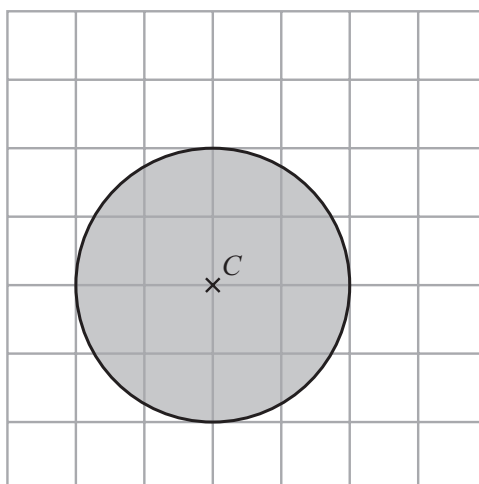
.....

.....

(1)

(Total for Question 3 is 5 marks)

4 The point C is shown on a centimetre grid.



A point P is at least 2 cm from the point C .

Nadia is asked to shade the region where point P could be.

Her answer is shown on the grid.

Explain the mistake Nadia has made.

.....

.....

.....

(Total for Question 4 is 1 mark)

- 4 Use a ruler and compasses to construct the line from the point P perpendicular to the line CD . You must show **all** construction lines.

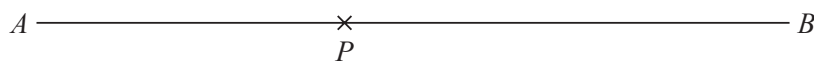
$\times P$

C _____ D

(Total for Question 4 is 2 marks)



- 5 The point P lies on the line AB .
Use ruler and compasses to construct an angle of 90° at P .
You must show all your construction lines.



(Total for Question 5 is 2 marks)



- 2 (a) Write 3.402×10^5 as an ordinary number.

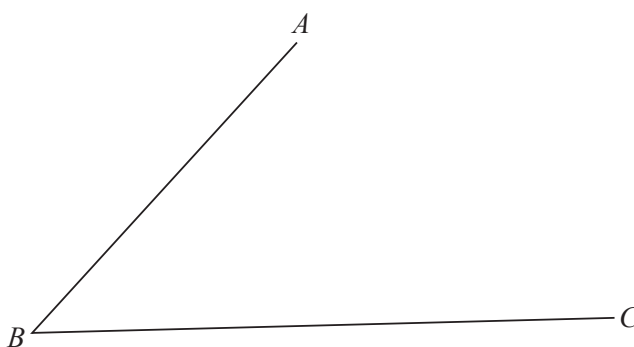
.....
(1)

- (b) Write 0.8026 in standard form.

.....
(1)

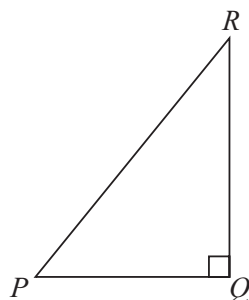
(Total for Question 2 is 2 marks)

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



(Total for Question 3 is 2 marks)

- 8 A playground is in the shape of a right-angled triangle.



Dan makes a scale drawing of the playground.
He uses a scale of 1 cm represents 5 m

The area of the playground on the scale drawing is 28 cm^2

The real length of QR is 40 m

Work out the real length of PQ .

..... m

(Total for Question 8 is 3 marks)

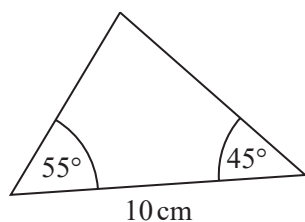
SUB-TOPIC G2b

CONGRUENCE & SIMILARITY

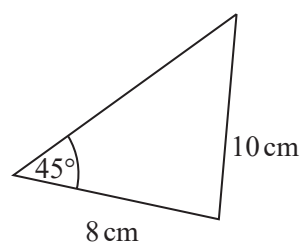
Sub-topic G2b · 25 questions · 90 marks · lowest tariff first



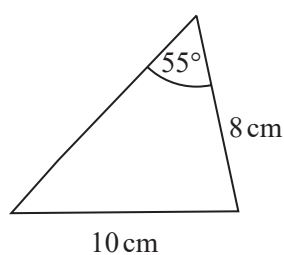
- 4 The diagram shows four triangles.



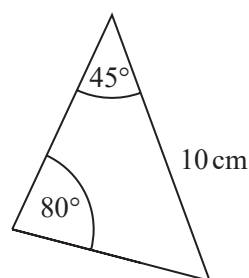
Triangle A



Triangle B



Triangle C



Triangle D

Two of these triangles are congruent.

Write down the letters of these two triangles.

..... and

(Total for Question 4 is 1 mark)

- 5 Sean pays £10 for 24 chocolate bars.

He sells all 24 chocolate bars for 50p each.

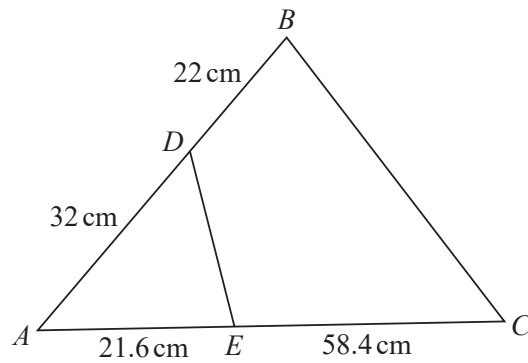
Work out Sean's percentage profit.

..... %

(Total for Question 5 is 3 marks)



15 The diagram shows triangle ABC and triangle AED .



Show that triangle ABC and triangle AED are similar.

(Total for Question 15 is 2 marks)

13 Write $x^2 + 6x - 7$ in the form $(x + a)^2 + b$ where a and b are integers.

(Total for Question 13 is 2 marks)

14 Cone **A** and cone **B** are mathematically similar.

The ratio of the volume of cone **A** to the volume of cone **B** is 27 : 8

The surface area of cone **A** is 297 cm^2

Show that the surface area of cone **B** is 132 cm^2

(Total for Question 14 is 3 marks)



13 Here are two similar solid shapes.



surface area of shape **A** : surface area of shape **B** = 3 : 4

The volume of shape **B** is 10 cm^3

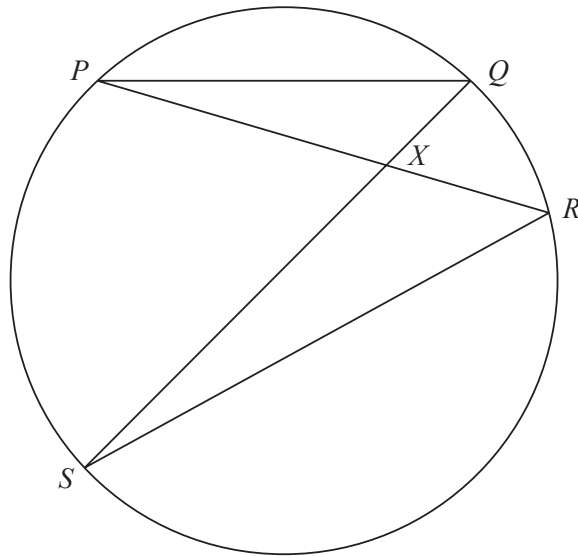
Work out the volume of shape **A**.

Give your answer correct to 3 significant figures.

..... cm^3

(Total for Question 13 is 3 marks)

15 P , Q , R and S are four points on a circle.



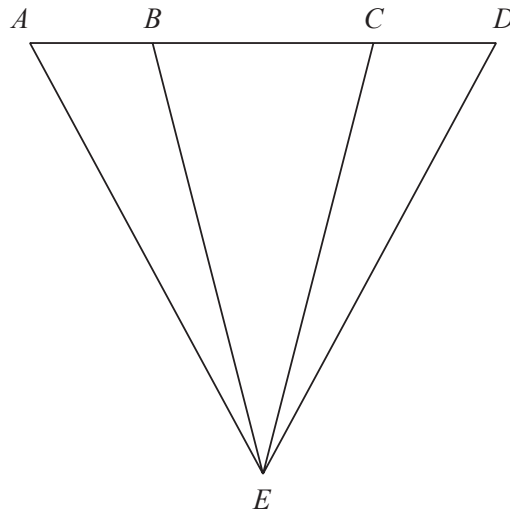
PXR and SXQ are straight lines.

Prove that triangle PQX and triangle SRX are similar.

(Total for Question 15 is 3 marks)



20 The diagram shows a triangle ADE .



$$AE = DE$$

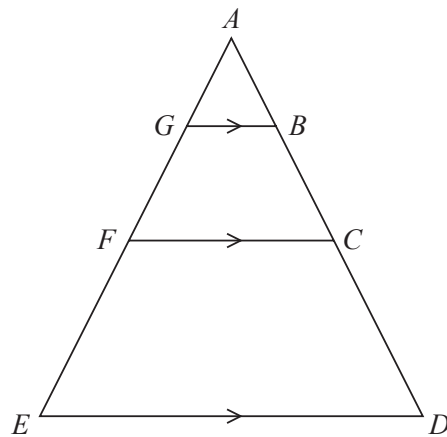
$$AB : BC : CD = 1 : 2 : 1$$

Prove that triangle ACE is congruent to triangle DBE .

(Total for Question 20 is 3 marks)



23 Here are three similar triangles, ABG , ACF and ADE .



$ABCD$ and $AGFE$ are straight lines.

$$AB:BC:CD = 1:2:3$$

Show that

$$\text{area of } ABG : \text{area of } BCFG : \text{area of } CDEF = 1:8:27$$

(Total for Question 23 is 3 marks)



12 The straight line **L** has equation $2y = 3x - 7$

Find an equation of the straight line perpendicular to **L** that passes through $(6, -5)$

.....
(Total for Question 12 is 3 marks)

13 Solid **A** and solid **B** are similar.

The ratio of the height of solid **A** to the height of solid **B** is $2:5$

The volume of solid **A** is 12 cm^3

Work out the volume of solid **B**.

..... cm^3
(Total for Question 13 is 3 marks)



10 Make m the subject of $k = p + \frac{2m}{5}$

(Total for Question 10 is 3 marks)

11 The floor plan of a house is drawn using a scale of 1 : 50
On the plan, a room in the house has a floor area of 48 cm^2

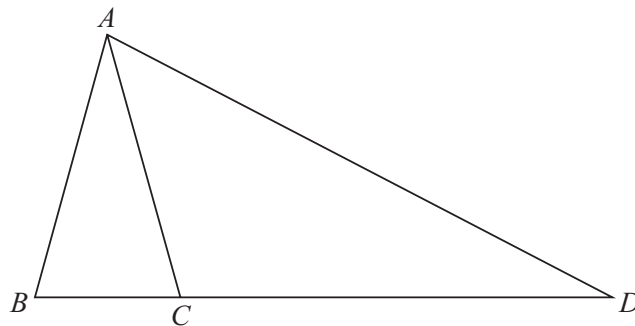
Work out the real area of the floor of this room.
Give your answer in m^2

..... m^2

(Total for Question 11 is 3 marks)



19



ABC and DAB are similar isosceles triangles.

$$AB = AC$$

$$AD = BD$$

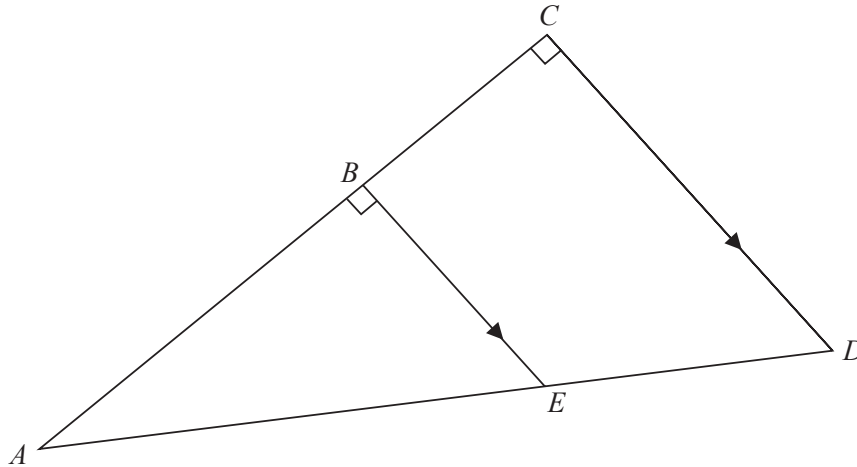
$$BC : CD = 4 : 21$$

Find the ratio $AB : AD$

(Total for Question 19 is 3 marks)



- 13 ABC and AED are straight lines.
 BE and CD are parallel.



$$\begin{aligned}BE &= 4.2 \text{ cm} \\CD &= 6.3 \text{ cm} \\AC &= 10.8 \text{ cm}\end{aligned}$$

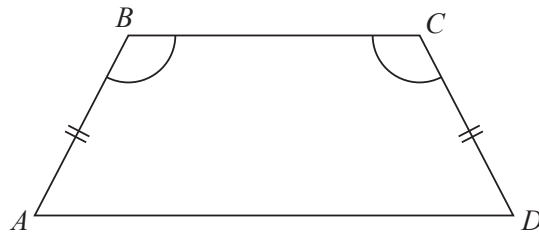
Work out the area of trapezium $BCDE$.

..... cm^2

(Total for Question 13 is 3 marks)



21 $ABCD$ is a quadrilateral.



$$AB = CD.$$

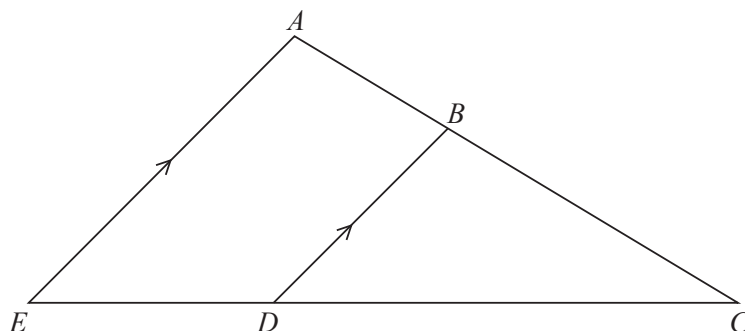
$$\text{Angle } ABC = \text{angle } BCD.$$

Prove that $AC = BD$.

(Total for Question 21 is 4 marks)



5



ABC and EDC are straight lines.

EA is parallel to DB .

$EC = 8.1$ cm.

$DC = 5.4$ cm.

$DB = 2.6$ cm.

(a) Work out the length of AE .

..... cm
(2)

$AC = 6.15$ cm.

(b) Work out the length of AB .

..... cm
(2)

(Total for Question 5 is 4 marks)



15 Three solid shapes **A**, **B** and **C** are similar.

The surface area of shape **A** is 4 cm^2

The surface area of shape **B** is 25 cm^2

The ratio of the volume of shape **B** to the volume of shape **C** is $27:64$

Work out the ratio of the height of shape **A** to the height of shape **C**.

Give your answer in its simplest form.

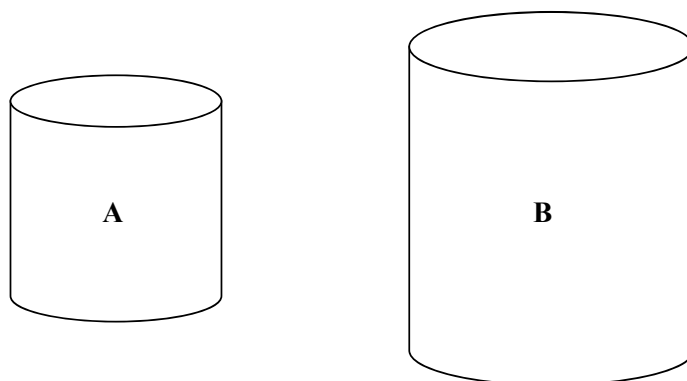
(Total for Question 15 is 4 marks)

16 Prove algebraically that $0.2\dot{5}\dot{6}$ can be written as $\frac{127}{495}$

(Total for Question 16 is 3 marks)



17 **A** and **B** are two similar cylindrical containers.



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

Tyler fills container **A** with water.

She then pours all the water into container **B**.

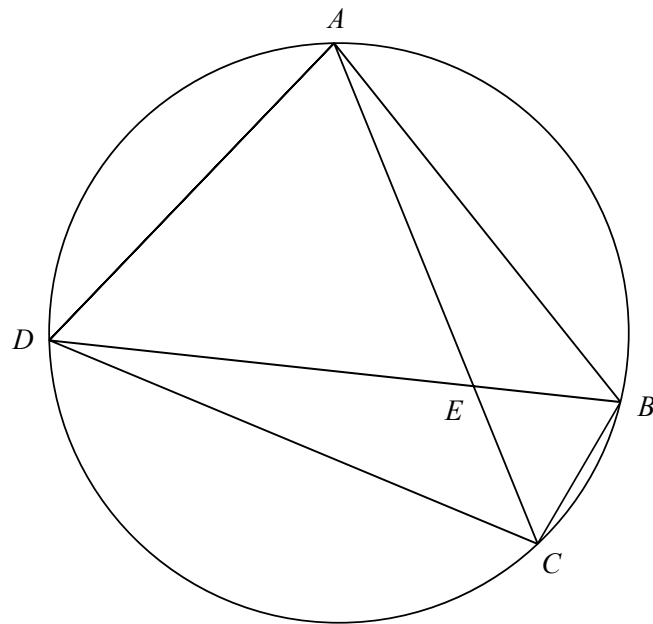
Tyler repeats this and stops when container **B** is full of water.

Work out the number of times that Tyler fills container **A** with water.

You must show all your working.

(Total for Question 17 is 4 marks)

22 A, B, C and D are four points on a circle.



AEC and DEB are straight lines.

Triangle AED is an equilateral triangle.

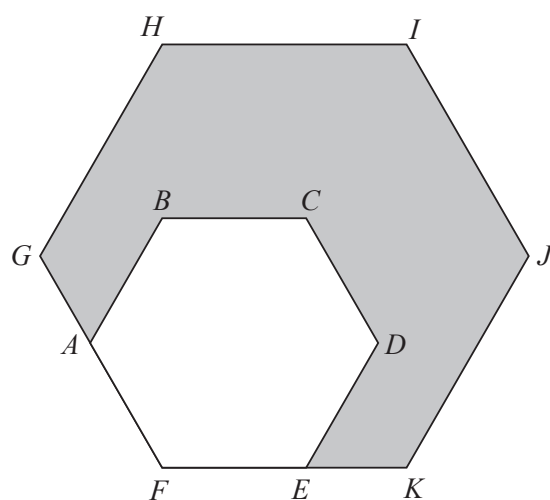
Prove that triangle ABC is congruent to triangle DCB .

(Total for Question 22 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS



19



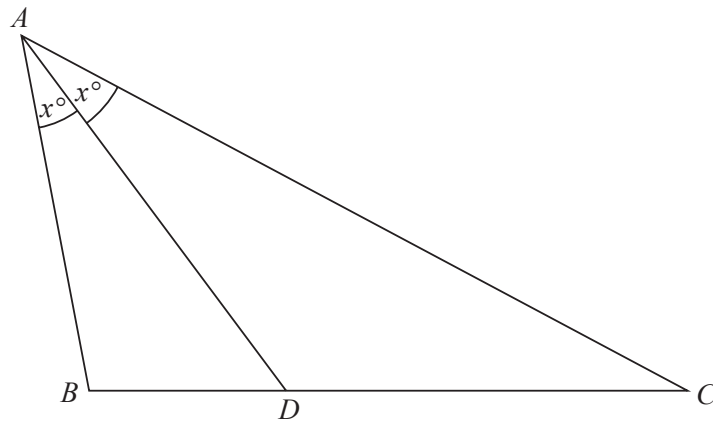
$ABCDEF$ is a regular hexagon with sides of length x .

This hexagon is enlarged, centre F , by scale factor p to give hexagon $FGHIJK$.

Show that the area of the shaded region in the diagram is given by $\frac{3\sqrt{3}}{2}(p^2 - 1)x^2$

(Total for Question 19 is 4 marks)

23 ABC is a triangle.



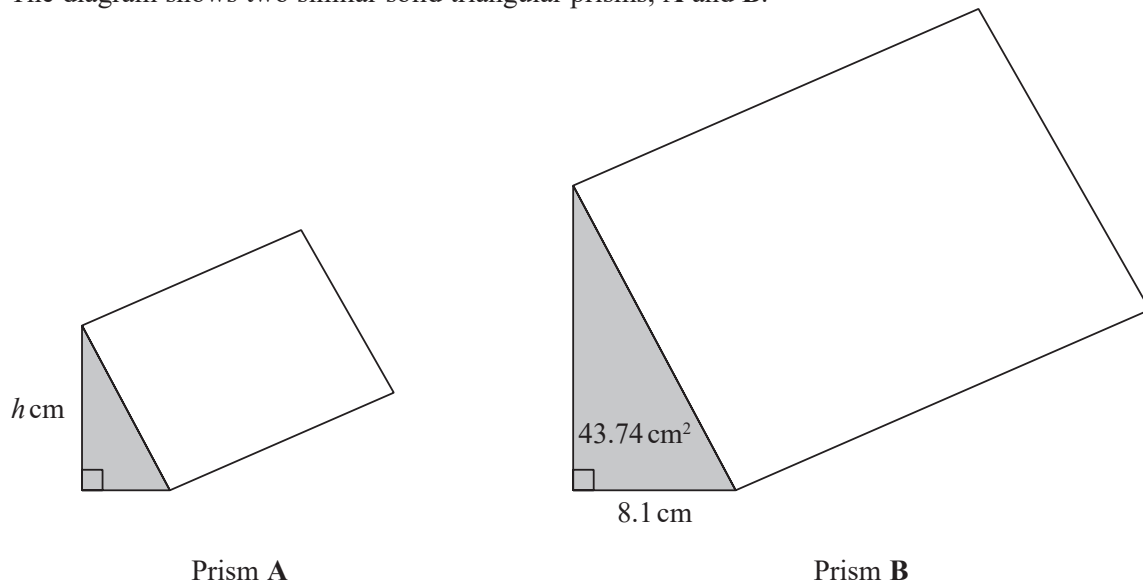
D is the point on BC such that $\text{angle } BAD = \text{angle } DAC = x^\circ$

Prove that $\frac{AB}{BD} = \frac{AC}{DC}$

(Total for Question 23 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

17 The diagram shows two similar solid triangular prisms, **A** and **B**.



The volume of prism **A** is 58.806 cm^3

The volume of prism **B** is 1587.762 cm^3

The cross section of each prism is a right-angled triangle.

For prism **B**

the length of the base of the triangle is 8.1 cm

the area of the triangle is 43.74 cm^2

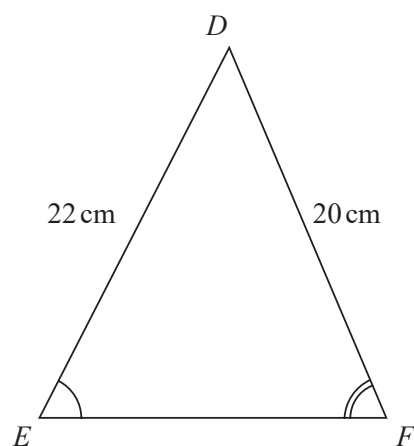
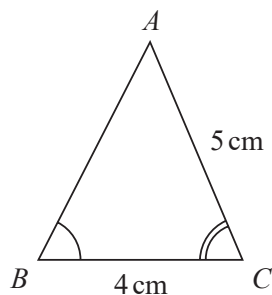
The height of the triangle for prism **A** is $h \text{ cm}$.

Work out the value of h .

$h = \dots\dots\dots$

(Total for Question 17 is 4 marks)

- 5 Triangle ABC and triangle DEF are similar.



- (a) Work out the length of EF .

..... cm
(2)

- (b) Work out the length of AB .

..... cm
(2)

(Total for Question 5 is 4 marks)

12 **A**, **B** and **C** are three solid spheres.

Sphere **A** has a volume of 64 cm^3

Sphere **B** has a volume of 125 cm^3

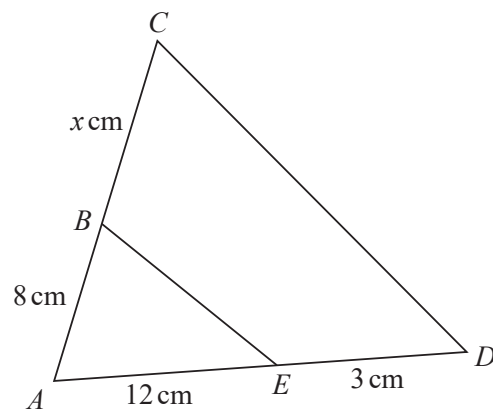
The radius of sphere **C** is 50% of the radius of sphere **B**.

Work out the ratio of the surface area of sphere **A** to the surface area of sphere **C**.
Give your answer in the form $a:b$ where a and b are integers.

.....
(Total for Question 12 is 4 marks)



22 The two triangles in the diagram are similar.



There are two possible values of x .

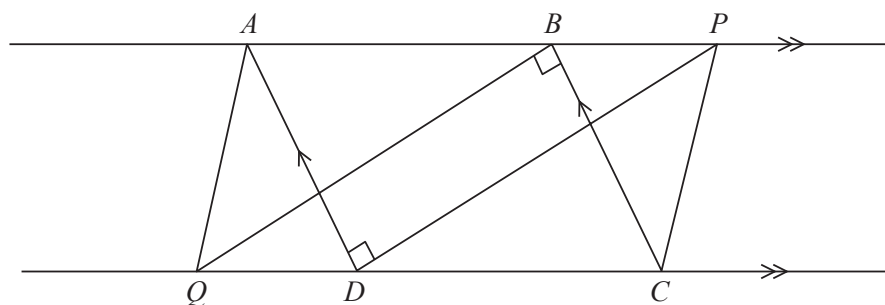
Work out each of these values.

State any assumptions you make in your working.

(Total for Question 22 is 5 marks)



21



$ABCD$ is a parallelogram.

ABP and QDC are straight lines.

Angle $ADP = \text{angle } CBQ = 90^\circ$

(a) Prove that triangle ADP is congruent to triangle CBQ .

(3)

(b) Explain why AQ is parallel to PC .

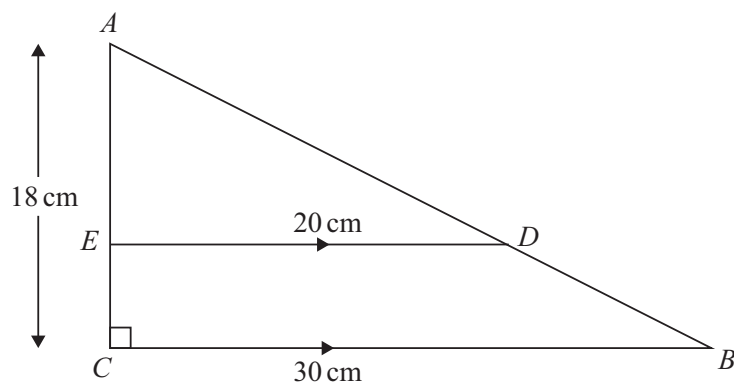
(2)

(Total for Question 21 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS



8 ABC is a right-angled triangle.



AEC and ADB are straight lines.

ED is parallel to CB .

(a) Prove that triangle ABC is similar to triangle ADE .

(2)

$ED = 20 \text{ cm}$ $CB = 30 \text{ cm}$ $AC = 18 \text{ cm}$

(b) Work out the length of EC .

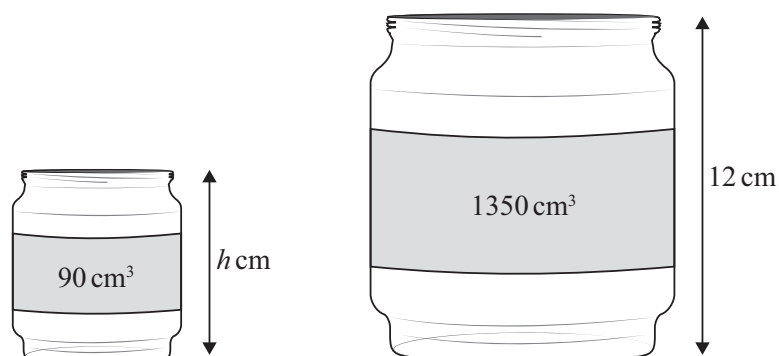
..... cm

(3)

(Total for Question 8 is 5 marks)



16 Two jars are mathematically similar.



- (a) Work out the height, h cm, of the smaller jar.
Give your answer correct to 1 decimal place.

..... cm
(4)

The surface area of the smaller jar is $A \text{ cm}^2$
The surface area of the larger jar is $pA \text{ cm}^2$

- (b) Find the exact value of p .

$p =$
(1)

(Total for Question 16 is 5 marks)

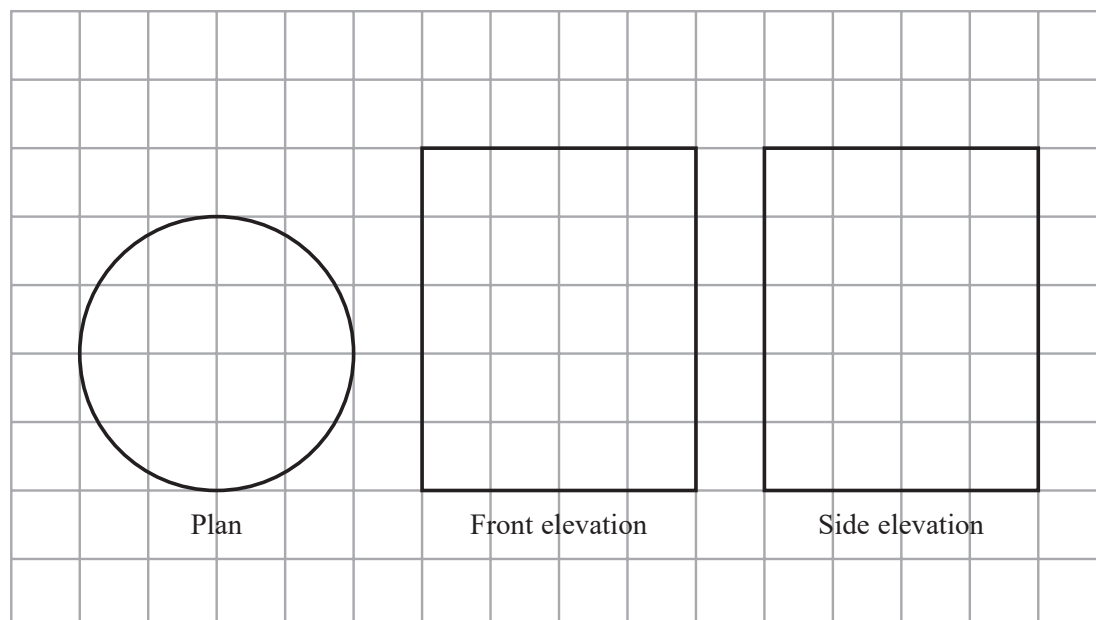
SUB-TOPIC G2c

PLANS, ELEVATIONS & 3D SHAPES

Sub-topic G2c · 5 questions · 17 marks · lowest tariff first



- 4 The diagram shows the plan, front elevation and side elevation of a solid shape, drawn on a centimetre grid.



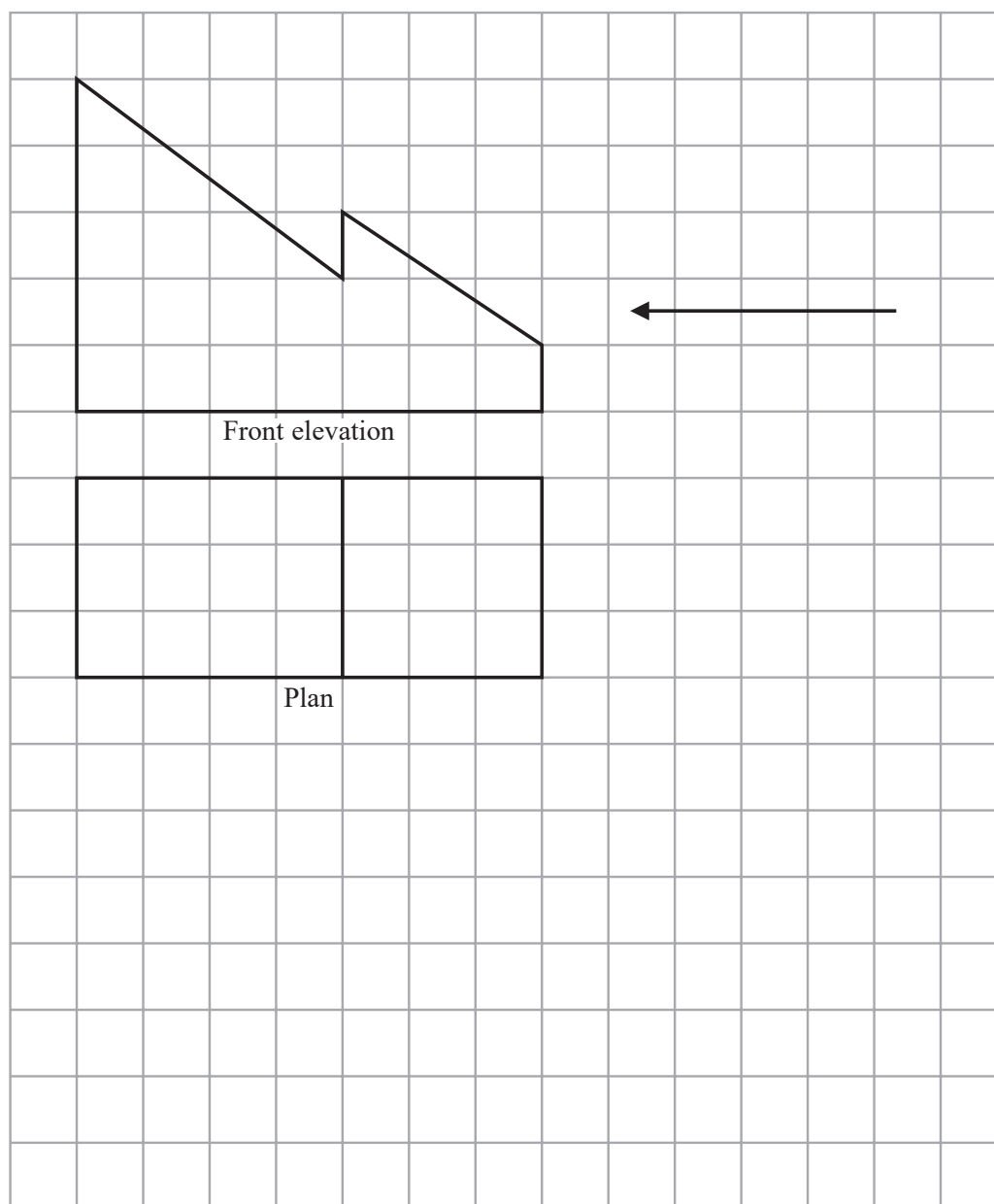
In the space below, draw a sketch of the solid shape.
Give the dimensions of the solid on your sketch.

(Total for Question 4 is 2 marks)



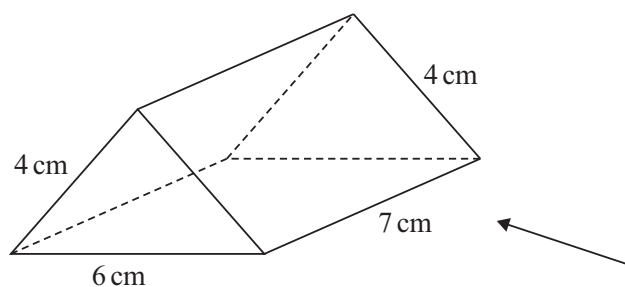
- 2 The front elevation and the plan of a solid are shown on the grid.

On the grid, draw the side elevation of the solid from the direction of the arrow.



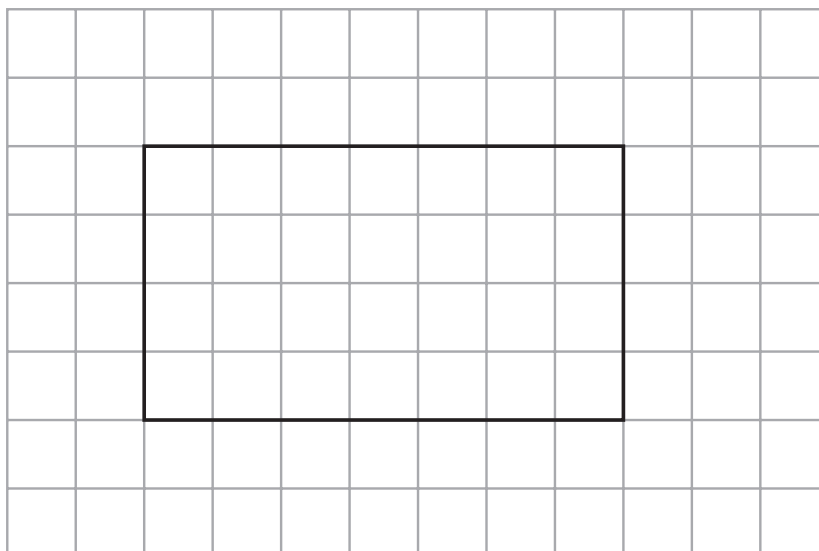
(Total for Question 2 is 2 marks)

- 3 The diagram shows a solid triangular prism.



Rana is trying to draw the side elevation of the solid prism from the direction of the arrow.

Here is her answer on a centimetre grid.



- (a) Explain why Rana's side elevation is not correct.

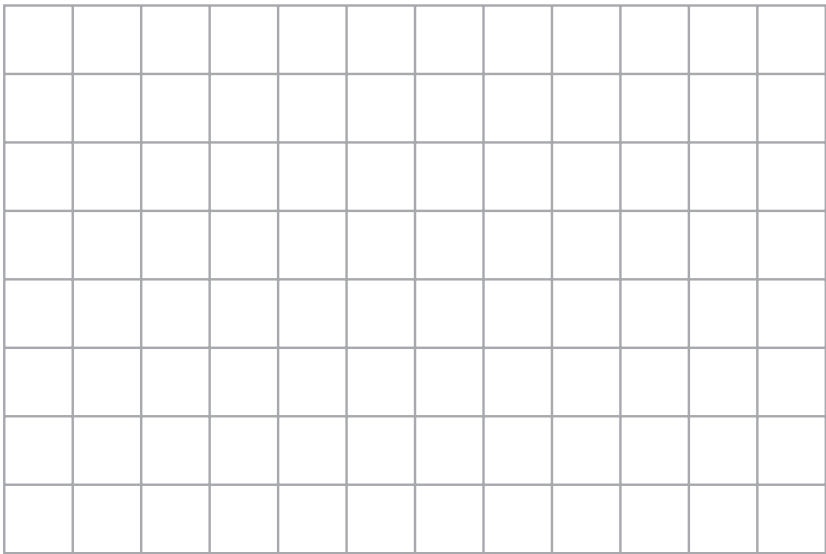
.....

.....

.....

(1)

(b) On the centimetre grid below, draw a plan of the solid prism.



(2)

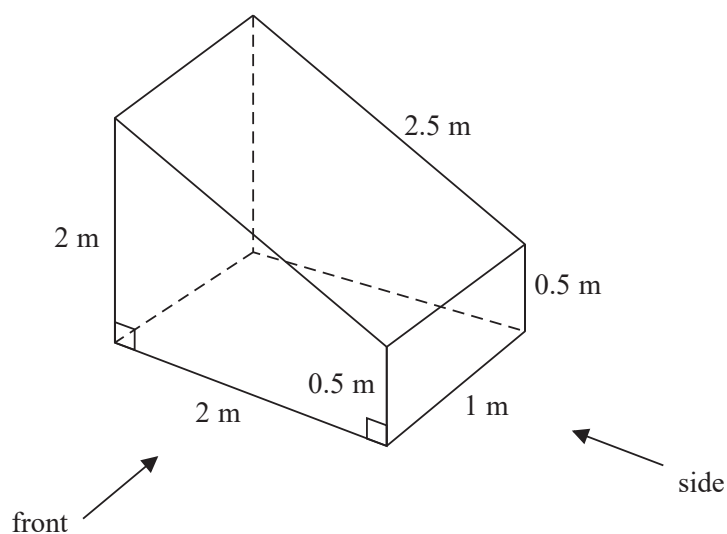
(Total for Question 3 is 3 marks)

- 4 A company has 25 000 workers.
The number of workers increases at a rate of 6% per year for 3 years.
Calculate the total number of workers at the end of the 3 years.

(Total for Question 4 is 4 marks)



- 3 The diagram shows a prism with a cross section in the shape of a trapezium.

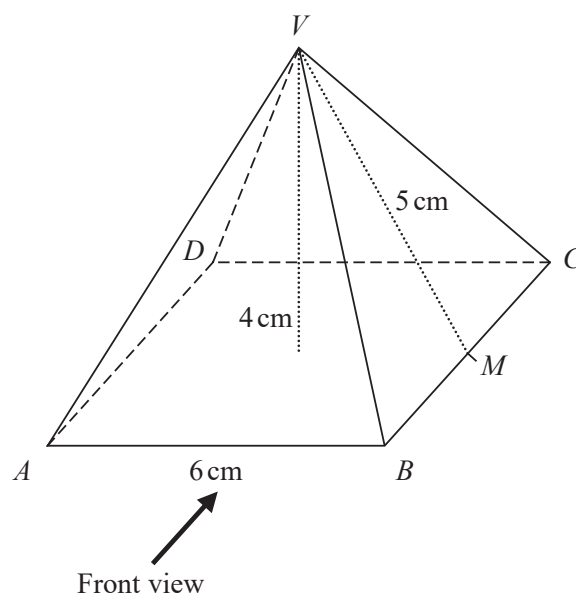


On the centimetre grid below, draw the front elevation and the side elevation of the prism.
Use a scale of 2 cm to 1 m.



(Total for Question 3 is 4 marks)

- 5 Here is a solid square-based pyramid, $VABCD$.



The base of the pyramid is a square of side 6 cm .

The height of the pyramid is 4 cm .

M is the midpoint of BC and $VM = 5\text{ cm}$.

- (a) Draw an accurate front elevation of the pyramid from the direction of the arrow.



(2)



(b) Work out the total surface area of the pyramid.

.....
(4)

(Total for Question 5 is 6 marks)



MARK SCHEMES

official mark schemes, in the same order as the questions



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
4	Explanation	C1	for valid explanation identifying mistake, Acceptable examples It's on the wrong side of circle She shaded inside the circle (but should be outside) Shaded where P can't be She shaded/drew less than 2cm She shaded at most 2 cm P should be outside (or on) the circle P should be anywhere outside the 2cm radius She shaded around point C not (at least) 2cm from point C Nadia should have shaded away from the circle Not acceptable examples Shading is wrong or she shaded it incorrectly Region is in the wrong place Doesn't fit inside the circle She shaded all the points between C and where all the points P could be The question says at least 2cm and not only 2cm away She shaded in too close She shaded a circle not a square or should've drawn/shaded a square	

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
2	2 (supported)	P1	for a process to find the number of men, eg. $(60 \div 2) \div 3 (= 10)$	$60 \div 3 = 20$ scores no marks Any ratio must come from correct processes to find the number of children and the number of men Award 0 marks for 2 with no correct supportive working Award full marks for 2 : 1 given as a final answer from correct supportive working
		P1	for a process to find the number of children, eg. $60 - "30" - "10" (= 20)$	
		P1	for a start of a process to find the value of n , eg. $("20" : "10") \div 5$ or $20 : 10 = 10 : 5$ or $"20" \div "10"$	
		A1	for 2 with supportive working	
3	$2 \frac{1}{3}$	M1	for either $\frac{7}{4}$ oe or $\frac{4}{3}$ oe	
		M1	for method to find the product, eg. $\frac{7 \times 4}{4 \times 3}$ or $\frac{21 \times 16}{12 \times 12}$ oe or for $\frac{28}{12}$ or $\frac{7}{3}$ oe	
		A1	for $2 \frac{1}{3}$ or an equivalent mixed number	
4	perpendicular line constructed	C2	for a fully correct construction with all relevant arcs drawn	Perpendicular line segment between P and CD must be within guidelines Accept dotted lines
		(C1	for a perpendicular line drawn from P to the line CD or all relevant arcs drawn)	



Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
4 (a)	3.5	P1	for a process to find the total length of the 5 sticks, eg $4.2 \times 5 (= 21)$ or for forming an equation, eg $\frac{7 + 4x}{5} = 4.2$	If figures are given as part of the answer they must be correct, but can allow ft
		P1	for complete process to find the mean eg $(“21” - 7) \div 4$	
		A1	oe	
(b)	Explanation	C1	for explanation Acceptable examples it reduced the mean my answer will be less the answer will be 1 it will be 2.5 less Not acceptable examples the mean will be more my answer will change it would decrease the lengths of the other sticks	
5	Angle constructed	C2 (C1	for fully correct construction with all arcs drawn for line drawn within guidelines with no (or incorrect) construction arcs or correct arcs drawn and no line seen)	Full marks cannot be awarded if no construction lines are seen



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
1	Points plotted at (130, 12) (150, 28) (170, 30) (190, 22) (210, 8) and joined with line segments	B2 (B1)	for correct plotting of 5 points and joining with line segments for points plotted correctly at midpoints or for a frequency polygon with one point incorrect or for a frequency polygon with first and last point joined directly or for joining the points with line segments at the correct heights consistent within intervals (including end points))	Ignore any histogram drawn Ignore any part of the frequency polygon outside of the range of the first and last point plotted. for example, at 120, 140, 160, 180, 200 or at 140, 160, 180, 200, 220
2 (a)	340 200	B1	cao	
(b)	8.026×10^{-1}	B1	cao	
3	Drawn	B2 (B1)	for a correct construction with all relevant arcs drawn for all relevant arcs drawn or for a bisector within guidelines but with no or insufficient arcs)	
4 (a)	(0.3) 0.7 0.3 0.7 0.3 0.7	B2 (B1)	all probabilities correctly placed for 0.7 correctly placed for Game 1)	Accept equivalent fractions or percentages for probabilities
(b)	0.49	M1 A1	for a correct method, ft their tree diagram eg 0.7×0.7 only oe, ft their tree diagram	ft their diagram provided probabilities are less than 1 An answer of $\frac{0.49}{1}$ scores M1A0 unless 0.49 seen

Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
8	35	P1 P1 A1	for one correct use of the given scale, eg $40 \div 5 (= 8)$ or $28 \times 5^2 (= 700)$ for process to use area of triangle, eg $28 = \frac{1}{2} \times PQ \times [QR]$ or $[area] = \frac{1}{2} \times PQ \times 40$ cao	Can award these marks in either order [QR] must be clearly identified as the drawing length, and cannot be 40 [area] must be clearly identified as the real area, and cannot be 28
9 (a) (b)	7.25 No with supporting reason	B1 C1	oe No with supporting reason Acceptable reasons: No, the 9 should be recurring No, 7.3491 is greater No, there are numbers between 7.349 and 7.350 Not acceptable reasons: Yes with any reason given Leila is correct ... 7.350 would round down She has rounded to 3sf and should only round to 2sf 7.349 rounds to 7.4	

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
1	$3n - 2$	B2 (B1)	for $3n - 2$ oe for $3n + k$ where $k \neq -2$ or is absent unambiguously shown)	Accept a different variable, eg. $3x - 2$ $n = 3n - 2$ gets B1 only $n + 3$ gets NO marks
2	Shown	M1 M1 C1	for conversion to improper fractions eg. $\frac{7}{3}$ or $\frac{15}{4}$ (dep) for method to multiply fractions, eg. $\frac{7 \times 15}{3 \times 4} (= \frac{105}{12})$ or $\frac{28 \times 45}{12 \times 12} (= \frac{1260}{144})$ oe for complete working showing each stage as far as $\frac{35}{4}$ or $8\frac{9}{12}$	Need not be shown with operators
3	B C D A	B2 (B1)	cao for two or three correct)	
4	A & D	B1	cao	



Paper: 1MA1/3H														
Question	Answer	Mark	Mark scheme	Additional guidance										
15	Shown	M1	for method to find comparable ratios eg $(21.6 + 58.4) \div 32 (= 2.5)$ and $(32 + 22) \div 21.6 (= 2.5)$ or $32 \div (21.6 + 58.4) (= 0.4)$ and $21.6 \div (32 + 22) (= 0.4)$ or $21.6 \div 32 (= 0.675)$ and $(32 + 22) \div (21.6 + 58.4) (= 0.675)$ or $32 \div 21.6 (= 1.48\dot{1})$ and $(21.6 + 58.4) \div (32 + 22) (= 1.48\dot{1})$	Fractions may be used. Accept 3 sf or more.										
		C1	for correct conclusion supported by the correct evaluation of 2 ratios to show they are equal	We do not require reference to the common angle.										
16	$\frac{1}{120}$	P1	for correctly identifying at least two of the number of options, eg 2 options for 1st digit, 4 options for 2nd digit	May be seen as part of a calculation <table border="1"><thead><tr><th>Position of digit</th><th>Number of options</th></tr></thead><tbody><tr><td>1st</td><td>2</td></tr><tr><td>2nd</td><td>4</td></tr><tr><td>3rd</td><td>3</td></tr><tr><td>4th</td><td>5</td></tr></tbody></table>	Position of digit	Number of options	1st	2	2nd	4	3rd	3	4th	5
Position of digit	Number of options													
1st	2													
2nd	4													
3rd	3													
4th	5													
		P1	for process to multiply the four numbers of options with at least three correct, eg $2 \times 4 \times 3 \times 5 (= 120)$ or for process to multiply 4 fractions with at least 3 correct $\frac{1}{2} \times \frac{1}{4} \times \frac{1}{3} \times \frac{1}{5}$ oe											
		A1	for $\frac{1}{120}$ oe											



Paper: 1MA1/3H				
Question	Working	Answer	Mark	Notes
11 (a)		57	B1	cao
(b)		Decision and reason	C1	Jamil might not be correct and reason, eg the maximum weight could be less than 80 or the minimum weight could be less than 40
(c)		Shown	C1	for evidence of reading from the graph at weight 65 (= 48 to 49) or at cf 45 (= 63)
			C1	eg 25% of 60 is 15 but only 11 potatoes have a weight greater than 65g or 25% of potatoes have a weight greater than 63g
12		48	M1	for $0.25 \times 0.6 (= 0.15)$ or $0.75 \times 0.4 (= 0.3)$
			M1	for $0.25 \times 0.6 (= 0.15)$ and $0.75 \times 0.4 (= 0.3)$ or for $24 \div "0.15" (= 160)$
			A1	cao
13		$(x + 3)^2 - 16$	M1	for $(x + 3)^2$ or $(x^2 + 6x - 7) x^2 + 2ax + a^2 + b$
			A1	cao
14		Shown	M1	for $\sqrt[3]{\frac{8}{27}} (= \frac{2}{3})$ or $\sqrt[3]{\frac{27}{8}} (= \frac{3}{2})$ or $2 : 3$ or $3 : 2$
			M1	for $\left(\sqrt[3]{\frac{8}{27}}\right)^2 (= \frac{4}{9})$ or $\left(\sqrt[3]{\frac{27}{8}}\right)^2 (= \frac{9}{4})$ or $4 : 9$ or $9 : 4$
			A1	132 from correct arithmetic



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
11	150 000	P1 P1 A1	for process to find cost in 2007, eg $162\,000 \div 0.9 (= 180\,000)$ oe for process to find cost in 2003, eg $[\text{cost in 2007}] \div 1.2 (= 150\,000)$ oe cao	Award 2 marks for $162\,000 \div 1.08$ oe
12 (a)	1.5	M1 A1	for method to find the gradient of the line, eg $\frac{12}{8}$ for 1.5 oe	Must see use of scales.
(b)	Explanation	C1	Explanation relating to rate of change of volume with time, eg rate at which the container fills or change in number of litres per second or number of litres added per second	Ignore any quantities given. Award the mark for an explanation involving rate.
(c)	Explanation	C1	Explanation relating to volume (amount) of liquid in the container at the start eg number of litres in the container when $t = 0$, amount of liquid in the container to start with	
13	6.50	M1 M1 A1	for method to find ratio or scale factor of lengths or volumes eg $\sqrt{3} : 2$ or $1 : 1.15(47\dots)$ or $0.86(60\dots) : 1$ or $\sqrt{27} : 8$ oe for complete method to find ratio of volumes and use to find required volume eg $10 \div ("1.15\dots")^3$ or $10 \times ("0.86\dots")^3$ for answer in the range 6.49 to 6.53	Scale factors may just be seen as 1.15..., 0.86...etc If an answer is given within the range then incorrectly rounded to 3 sig figs, award full marks. Accept 6.5



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
15	Proof	C1	for angle PQX = angle SRX as <u>angles in the same segment</u> are equal (or <u>angles</u> at the circumference <u>subtended</u> from the same <u>arc/chord</u> of a circle are equal) or angle QPX = angle RSX as <u>angles in the same segment</u> are equal (or <u>angles</u> at the circumference <u>subtended</u> from the same <u>arc/chord</u> of a circle are equal) or angle PXQ = angle SXR as <u>vertically opposite angles/ vertically opposite angles</u> are equal or for identifying two pairs of corresponding equal angles with no reason given	Underlined words need to be shown; reasons need to be linked to their method. Could be shown on the diagram
		C1	for identifying two pairs of corresponding equal angles with correct reasons given	
		C1	for stating that the triangles are similar because all three pairs of corresponding angles are equal with complete reasons given.	Note that the students third/final reason may be: <u>Angles in a triangle add up to 180</u>
16	17.4	B1	for stating any correct bound, eg. 6.75 or 6.85 or 0.045 or 0.055	Accept 6.849 or 6.8499... for 6.85 and 0.0549 or 0.05499.. for 0.055
		M1	using both UB of e and LB of f to work out value of $2e \div f$, eg $2[\text{UB of } e] \div [\text{LB of } f]$ or $\frac{2 \times 6.85}{0.045}$	$6.8 < \text{UB}(e) \leq 6.85$ $0.045 \leq \text{LB}(f) < 0.05$
		A1	for answer in the range 17.4 to 17.5 from correct working	If an answer is given in the range in working and then rounded incorrectly award full marks. Award 0 marks for a correct answer with no (or incorrect) supportive working

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
18	Description	C1 C1	for translation for $\begin{pmatrix} 8 \\ 0 \end{pmatrix}$	Award no marks if more than one transformation May be described as, for example “by 8 units in the direction of the x axis”
19	16	P1 A1	for $\text{Prob}(\text{R or G}) = 1 - 0.4 (= 0.6)$ or for (number of red or green counters) = $50 - 0.4 \times 50 (= 30)$ or for use of ratio, eg $[\text{probability}] \times \frac{8}{15} (= 0.32)$ or $[\text{number of counters}] \times \frac{8}{15}$ P1 for a complete process to find number of green counters, eg $(1 - 0.4) \times \frac{8}{15} \times 50$ or for $\frac{16}{50}$ cao	 [probability] may be 0.4 or 0.6 [number of counters] may be 20 or 50
20	Proof	C1 C1 C1	for angle $EAC = \text{angle } EDB$ (Base angles of an <u>isosceles triangle</u> are equal) or for explanation that $AB + BC = BC + CD$ using ratio so $AC = DB$ oe or $AE = DE$ (given) for at least 2 correct pairings with reasons for a complete proof including all reasons given and SAS	Reasons must be linked to their method.

Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
22	$1 - \left(\frac{4}{5}\right)^n - \left(\frac{1}{5}\right)^n$	P1 A1	for start to the process, eg P(at least one blue and at least one red) = $1 - P(\text{all blue}) - P(\text{all red})$ oe or $P(\text{all blue}) = \left(\frac{4}{5}\right)^n$ oe or $P(\text{all red}) = \left(\frac{1}{5}\right)^n$ for $1 - \left(\frac{4}{5}\right)^n - \left(\frac{1}{5}\right)^n$ oe	
23	Shown	M1 M1 C1	for start to process using ratio, eg $1 : 1 + 2 : 1 + 2 + 3 (= 1 : 3 : 6)$ for process to write down ratio of areas of triangles eg $1^2 : 3^2 : 6^2 (= 1 : 9 : 36)$ for correct working leading to answer, eg $1 : 9 - 1 : 36 - 9 = 1 : 8 : 27$	Values may not be seen in a ratio, can still award M marks May be seen combined with algebra



Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
13	187.5	M1	for $\left(\frac{5}{2}\right)^3$ or $\left(\frac{2}{5}\right)^3$ or 2.5^3 or $\left(\frac{1}{2.5}\right)^3$ or $2^3 : 5^3$	Accept $\frac{375}{2}$
		M1	for a complete method, eg $12 \div 8 \times 125$ or 12×2.5^3	
		A1	oe	
14	17	M1	for $27^{\frac{2}{3}} = \left(\sqrt[3]{27}\right)^2$ or 3^2 or $\sqrt[3]{27^2}$ or $\sqrt[3]{729}$ or $\left(\frac{1}{2}\right)^{-3} = \frac{1}{\left(\frac{1}{2}\right)^3}$ or 2^3	
		M1	for a full method eg “3” ² + “2” ³ or for correctly evaluating $27^{\frac{2}{3}}$ or $\left(\frac{1}{2}\right)^{-3}$ eg 9 or 8 seen	
		A1	cao	
15	25	M1	for a tangent drawn at $t = 3$	A tangent must be seen to award any marks
		M1	for a complete method to find the gradient from tangent eg $50 \div (4 - 2)$	This mark can be awarded if the tangent is drawn at $t \neq 3$
		A1	for answer in the range 22 to 28 or ft acceptable tangent	Award 0 marks for a correct answer (in the range) with no (or incorrect) supportive working

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
11	12	P1	for process of working with area scale factor, eg area SF = 50^2 (= 2500) or 0.5×0.5 (= 0.25) or $48 \times 50 \times 50$ (= 120 000) or for process which uses $1 \text{ (m}^2\text{)} = 10\,000 \text{ (cm}^2\text{)}$, eg $\frac{48}{10\,000}$	
		P1	for complete process, eg $\frac{120\,000}{100 \times 100}$ or “0.25” $\times$ 48	
		A1	cao	
12	246	P1	for start of process to find angle inside sector eg $\frac{x}{360} \times \pi \times 6.2^2 = 82.6$ or $\frac{82.6}{\pi \times 6.2^2} \times 360$ or for an answer in the range 113 to 114	The size of the angle in the unshaded sector is 114
		A1	for answer in range 246 to 247	If an answer is shown in the range in working and then incorrectly rounded award full marks.



Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
19	2 : 5	P1	for using similar triangles to form an equation eg $\frac{AB}{BC} = \frac{AD}{AB}$ oe or $\frac{AB}{4} = \frac{25}{AB}$ oe or $\frac{AB}{4k} = \frac{25k}{AB}$ oe or $AB : 4 = 25 : AB$ oe or $BC \times sf = BD \div sf$ oe or $4 \times sf = 25 \div sf$ oe or for working with the perpendicular height of triangle ABC eg $(h^2 =) 25^2 - 23^2 (= 96)$ or $(h =) \sqrt{25^2 - 23^2} (= \sqrt{96})$	May use x or any other letter for AB Accept $AB = 4 \times sf$, $AB = 25 \div sf$
		P1	for process to find AB eg $(AB =) \sqrt{4 \times 25} (= 10)$ oe or $\sqrt{96} \div 2 (= 10)$ or for process to find the scale factor eg $\sqrt{\frac{25}{4}} (= \frac{5}{2})$ oe	
		A1	oe	
20	$5\frac{5}{6}$	P1	for $2^x = 2^{n-\frac{1}{3}}$ or $2^y = 2^{\frac{5}{3}}$ or $x = n - \frac{1}{3}$ oe or $y = \frac{5}{3}$ oe or for $(2^{x+y}) = \frac{2^n}{\sqrt[3]{2}} \times (\sqrt{2})^5$	
		P1	for $2^{x+y} = 2^{n-\frac{1}{3}+\frac{5}{2}}$ or $x + y = n - \frac{1}{3} + \frac{5}{2}$ oe or $\frac{11}{2} = n - \frac{1}{3}$ oe	
		A1	oe eg $\frac{35}{6}$	



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
13	18.9	P1	for using length scale factor to find AB , eg $(AB =) 10.8 \div \left(\frac{3}{2}\right)$ or $(AB =) 10.8 \times \left(\frac{2}{3}\right)$ ($= 7.2$) for using length scale factor to find BC , eg $(BC =) 10.8 \div \frac{6.3}{6.3-4.2}$ or $(BC =) 10.8 \times \frac{6.3-4.2}{6.3}$ ($= 3.6$) or finds area scale factor, eg $\left(\frac{3}{2}\right)^2$ or $\left(\frac{2}{3}\right)^2$	Can use a combination of skills but must have a complete process to find AB or BC to score this mark
		P1	for a complete process to find the area of trapezium, eg $\frac{6.3+4.2}{2} \times (10.8 - "7.2")$ or $\frac{(6.3-4.2) \times "3.6"}{2} + "3.6" \times 4.2$ or $\frac{10.8 \times 6.3}{2} - \frac{7.2 \times 4.2}{2}$ or $\frac{10.8 \times 6.3}{2} - \frac{10.8 \times 6.3}{2} \div \left(\frac{3}{2}\right)^2$ or $\frac{10.8 \times 6.3}{2} - \frac{10.8 \times 6.3}{2} \times \left(\frac{2}{3}\right)^2$	
		A1	accept trailing zeros eg 18.90	



Paper: 1MA1/1H				
Question	Working	Answer	Mark	Notes
21			C1	states (angle) $ABC = (\text{angle}) BCD$
			C1	states 2 nd link $AB = CD$
			C1	states 3 rd link with reason: $BC = BC$ (common)
			C1	concludes proof by stating (triangle) $ABC \equiv (\text{triangle}) DCB$ with reason SAS and $AC = BD$
22		Proof	B1	(indep) for stating $\cos 30 = \frac{\sqrt{3}}{2}$
			M1	for $PQ^2 = 10^2 + 10^2 - 2 \times 10 \times 10 \times \cos PBQ$ or $AC^2 = x^2 + x^2 - 2 \times x \times x \times \cos 30 (=x^2(2-\sqrt{3}))$ oe
			M1	for $\cos PBQ = \frac{10^2 + 10^2 - PQ^2}{2 \times 10 \times 10}$ (implies previous M1)
			M1	for $\cos PBQ = \frac{10^2 + 10^2 - (x^2 + x^2 - 2 \times x \times x \times \cos 30)}{2 \times 10 \times 10}$
	$\cos PBQ = \frac{10^2 + 10^2 - x^2(2-\sqrt{3})}{200}$ $= \frac{200 - x^2(2-\sqrt{3})}{200}$		A1	conclusion of proof with all working seen



Paper: 1MA1/2H				
Question	Working	Answer	Mark	Notes
4 (a)		57.1	P1 P1 P1 A1	for a process to find time from Liverpool to Manchester, eg. $56 \div 70 (= 0.8 \text{ (hrs) or } 48 \text{ (mins)})$ for a process to find total distance, eg. $56 + 61 (= 117)$ or the total time, eg. $"48" + 75 (= 123)$ or $"0.8" + \frac{75}{60} (= 2.05)$ with consistent units of time (dep P2) for a correct process to find average speed with consistent units of time, eg. $"117" \div "2.05"$ or $"117" \div "123"$ for answer in the range 57 to 57.1
(b)		explanation	C1	for explaining that the time taken for the two parts of the journey must be the same or the distance from Leeds to York is $\frac{3}{4}$ of the distance from Barnsley to Leeds
5 (a)		3.9	M1 A1	for a ratio of $\frac{8.1}{5.4} (= 1.5)$ oe or $\frac{5.4}{8.1} (= 0.66\ldots)$ oe or $\frac{2.6}{5.4} (= 0.48\ldots)$ oe or $\frac{5.4}{2.6} (= 2.07\ldots)$ oe
(b)		2.05	M1 A1	for $\frac{5.4}{8.1} \times 6.15$ oe ($= 4.1$) or $\frac{2.7}{8.1} \times 6.15$ oe or ft "scale factor" from (a) cao



Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
14 (a)	$\frac{8}{27}$	M1	for showing the 4th root of 16 as 2 and the 4th root of 81 as 3 or $\frac{8}{n}$ ($n \neq 27$) or $\frac{n}{27}$ ($n \neq 8$) or an intention to find the 4th root and cube, eg. $\sqrt[4]{\left(\frac{16}{81}\right)^3}$ or $\left(\sqrt[4]{\frac{16}{81}}\right)^3$ oe	
		A1	cao	
		M1	for writing $\frac{1}{9} = 3^{-2}$, $9\sqrt{3} = 3^{2.5}$, $\frac{1}{\sqrt{3}} = 3^{-0.5}$ as powers of 3, with at least 2 correct or for working out $\frac{1}{9} \times 9\sqrt{3} \times \frac{1}{\sqrt{3}} = 1$	
		A1	cao	
15	3 : 10	P1	process to find ratio of lengths A:B = $\sqrt{4}:\sqrt{25}$ (= 2:5 or $\frac{2}{5}$ or 2, 5)	Accept working in fractions for the award of process marks but the final answer must be in correct simplified ratio notation
		P1	for process to find ratio of lengths B:C = $\sqrt[3]{27}:\sqrt[3]{64}$ (= 3:4 or $\frac{3}{4}$ or 3, 4)	
		P1	for process to write as one ratio eg. finding a common multiple of 3 and 5 or 6 : 15 : 20 oe	
		A1	cao	



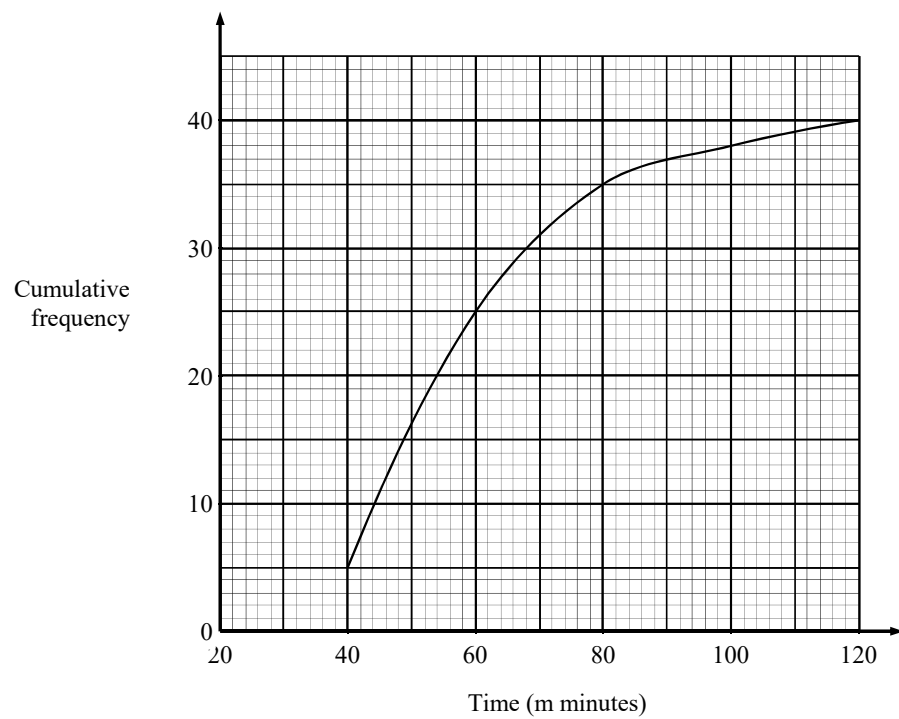
Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
17	4	P1	for process to find ratio of corresponding lengths, eg. $\sqrt{4} : \sqrt{9} (= 2 : 3)$	This may be seen by checking their volume, eg. $"8" \times 4 (= 32)$ and $"8" \times 3 (= 24)$ An answer of 4 with no supportive working gets no marks
		P1	for process to find ratio of volumes, eg $"2" : "3" (= 8 : 27)$	
		P1	for $"27" \div "8" (= 3.375)$	
		A1	for rounding to give an answer of 4 from correct working	



Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
22	Proof	C1	for one correct pair of equal angles with correct reason from: angle $ACB = \text{angle } ADB$, (<u>angles in the same segment</u> are equal) angle $DBC = \text{angle } DAC$, (<u>angles in the same segment</u> are equal) angle $ABD = \text{angle } ACD$, (<u>angles in the same segment</u> are equal) or for recognising all angles of 60 in triangle AED and in triangle CEB)	Underlined words need to be shown; reasons need to be linked to their statement(s)
		C1	for one identity, with reason(s), from the following list of alternatives: Alternatives: a complete method to show that angle $ACB = \text{angle } DBC (= 60)$, or BC being common to both triangles or $DB = DE + EB = AE + EC = AC$ (sides of an <u>equilateral triangle</u> are equal) or angle $ABC = 60 + \text{angle } ABD = 60 + \text{angle } ACD = \text{angle } DCB$ (<u>angles in the same segment</u> are equal) or angle $BDC = \text{angle } CAB$ (<u>angles in the same segment</u> are equal)	Pairs of equal angles may be just shown on the diagram
		C1	for a second identity, with reason(s), from the alternatives above	
		C1	for concluding the proof with a third identity, with reason(s), from the alternatives above, together with the condition for congruency, ASA or SAS or AAS	



Q10(a)



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
19	Proof	P1	for start to process to find area of $ABCDEF$, eg area of equilateral triangle = $\frac{1}{2} \times x \times x \times \sin 60 (= \frac{\sqrt{3}}{4}x^2)$ OR for start to process to find area of $FGHIJK$, eg area of equilateral triangle = $\frac{1}{2} \times px \times px \times \sin 60 (= \frac{\sqrt{3}}{4}p^2x^2)$	Any correct process to find the area of part of the hexagon is acceptable for this mark, eg $\frac{1}{2} \times x \times x \times \sin 120$ or $\frac{1}{2} \times (x + 2x) \times \frac{\sqrt{3}}{2}x$
		P1	for complete process of finding area of $ABCDEF$, eg $6 \times \frac{1}{2} \times x \times x \times \sin 60$ or $6 \times \frac{1}{2} \times x \times x \times \frac{\sqrt{3}}{2} \left(= \frac{3\sqrt{3}}{2}x^2 \right)$ oe OR for complete process of finding area of $FGHIJK$, eg $6 \times \frac{1}{2} \times px \times px \times \frac{\sqrt{3}}{2} \left(= \frac{3\sqrt{3}}{2}p^2x^2 \right)$ oe	Allow $\sin 60$ left in expressions for the first 3 marks.
		P1	for process of finding area of $ABCDEF$ eg $\frac{3\sqrt{3}}{2}x^2$ oe AND for process of finding area of $FGHIJK$, eg $p^2 \times \frac{3\sqrt{3}}{2}x^2$ oe	
		C1	correct algebra leading to given result, $\frac{3\sqrt{3}}{2}(p^2 - 1)x^2$	Accept $\frac{3\sqrt{3}}{2}x^2(p^2 - 1)$ as final result.



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
23	Proof (supported)	M1	for using the sine rule on triangle ABD or on triangle ADC , to involve sides AB , BD , AC , or DC eg $\frac{AB}{\sin ADB} = \frac{BD}{\sin x}$ oe or $\frac{AC}{\sin ADC} = \frac{DC}{\sin x}$ oe OR for an expression for the area of triangle ABD or for the area of triangle ADC eg $\frac{1}{2} AB AD \sin x$ or $\frac{1}{2} AD AC \sin x$ or $\frac{1}{2} h BD$ or $\frac{1}{2} h DC$	Accept extra letters eg y shown on diagram for any angle used
		M1	for using the sine rule on both triangle ABD and on triangle ADC , to involve sides AB , BD , AC , or DC eg $\frac{AB}{\sin ADB} = \frac{BD}{\sin x}$ oe and $\frac{AC}{\sin ADC} = \frac{DC}{\sin x}$ oe OR for two expressions for the area of either triangle ABD or for triangle ADC eg $\frac{1}{2} AB AD \sin x$ and $\frac{1}{2} h BD$ or $\frac{1}{2} AD AC \sin x$ and $\frac{1}{2} h DC$	
		M1	for stating or showing $\sin ADB = \sin ADC$, eg $\sin y = \sin (180 - y)$ OR for using two expressions to form an equation eg $\frac{\frac{1}{2} AB AD \sin x}{\frac{1}{2} AD AC \sin x} = \frac{\frac{1}{2} h BD}{\frac{1}{2} h DC}$ oe	
		C1	for a full method to arrive at the given answer	



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
17	3.6	P1	process to find the volume scale factor, eg $1587.762 \div 58.806 (= 27)$ or $58.806 \div 1587.762 (= 0.037\dots)$	
		P1	process to find the height of B , eg $2 \times 43.74 \div 8.1 (= 10.8)$ or process to find the area of A , eg $43.74 \div (\sqrt[3]{0.037\dots})^2 (= 4.86)$ or $43.74 \times (\sqrt[3]{0.037\dots})^2 (= 4.86)$	
		P1	complete process to find height of A , eg “10.8” $\div \sqrt[3]{27^n}$ or “4.86” $\times 2 \div (8.1 \div \sqrt[3]{27^n})$	
		A1	cao	
18	21.3	P1	for $\frac{1}{2} \times 11.2 \times 4.3 \times \sin(118)$	
		A1	answer in the range 21.26 to 21.3	If a correct answer within the range is shown in working but incorrectly rounded award full marks
19	$-\frac{3}{2}$ and $\frac{2}{3}$	M1	for $(2x \pm 3)(3x \pm 2)$ or $(6x \pm 4)(x \pm \frac{9}{6})$ or $(6x \pm 4)(x \pm \frac{3}{2})$ or correct substitution into the quadratic formula, eg $\frac{-5 \pm \sqrt{5^2 - 4 \times 6 \times (-6)}}{2 \times 6}$	
		M1	$(2x + 3)(3x - 2)$ $(6x - 4)(x + \frac{9}{6})$ or $(6x - 4)(x + \frac{3}{2})$ or $\frac{-5 \pm \sqrt{169}}{12}$ or one correct answer	
		A1	oe accept answers of -1.5 and in the range 0.66 to 0.67	

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
4	Yes (supported)	P1 P1 P1 C1	for a process to find the volume of 1 tank eg $\pi \times 40^2 \times 160$ (= 804247.7... or 804.2...or 256000π) for complete process to find the volume of 4 tanks, [volume of tank] $\times 4$ eg $\pi \times 40^2 \times 160 \times 4$ (= 3216990.8... or 3216.9... or 1024000π) or for process to find volume of fertiliser available per tank eg $32 \times 1000 \div 4$ (= 8000) for a process to find the volume of fertiliser needed for 1 tank eg [volume of tank] $\div 101$ (= 7962.8...) or 4 tanks (= 31851.3...) OR for a process to find volume of mixture that 32 litres of fertiliser will make eg 32000×101 (= 3232000) or 32×101 (= 3232) for Yes supported by correct figures shown eg a comparable figure in the range 31.8 to 31.9 (litres) or in the range 31800 to 31900 with 32000 (cm³) or in the range 3216 to 3217 with 3232 (litres) or in the range 3216000 to 3217000 with 3232000 (cm³) or in the range 7958 to 7963 with 8000 (cm³)	Values can be truncated or rounded For this mark, [volume of tank] must come from a calculation involving π, r^2, h For this mark, [volume of tank] must come from a calculation involving π, r^2, h or be stated as their volume. There are other possible pairs of values which can be used in the comparison
5	(a) 16 (b) 5.5	M1 A1 M1 A1	for a ratio of $\frac{20}{5}$ or $\frac{5}{20}$ or 4 or 0.25 or $\frac{5}{4}$ or $\frac{4}{5}$ or 1.25 or 0.8 oe cao for $22 \times "0.25"$ or $22 \div "4"$ oe oe	

Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
11 (a)	Explanation	C1	for explanation Acceptable examples the sum must be 5 and the product must be 6 she had the sum and the product the wrong way round it should be the other way around a and b must be multiplied together to make 6 Not acceptable examples the answer should be $(x + 3)(x + 2)$ the product of a and b is not 5	
(b)	$2(m - 1)(m + 1)$	M1	for a correct partial factorisation, eg $2(m^2 - 1)$ or $(2m - 2)(m + 1)$ or $(m - 1)(2m + 2)$	
		A1	cao	
(c)	$(a + b)(x - y)$	M1	for a correct partial factorisation, eg $x(a + b) - y(a + b)$ or $x(a + b) + y(-a - b)$ or $a(x - y) + b(x - y)$	
		A1	for $(a + b)(x - y)$ oe	
12	64 : 25	P1	for start of process to find ratio of lengths of A to B , eg $\sqrt[3]{64} (= 4)$ or $\sqrt[3]{125} (= 5)$ or 4 : 5	
		P1	for $\sqrt[3]{125} \div 2 (= 2.5)$ or $(\sqrt[3]{64})^2 (= 16)$	
		P1	for process to find ratio of areas of A to C , eg $"4"^{*2} : "2.5"^{*2} (= 16 : 6.25)$	
		A1	for 64 : 25 oe in form $a : b$ where a and b are integers	



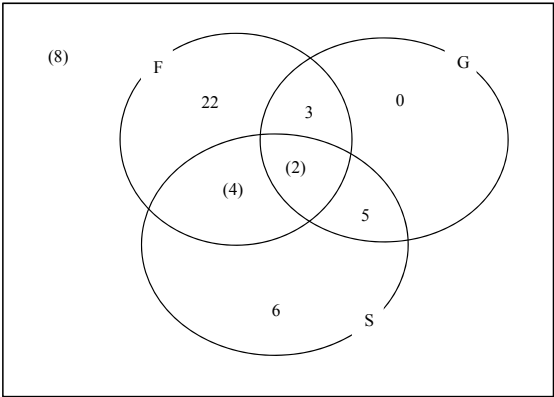
Paper: 1MA1/1H				
Question	Working	Answer	Mark	Notes
21	$\frac{6-\sqrt{8}}{\sqrt{2}-1} \times \frac{\sqrt{2}+1}{\sqrt{2}+1}$ $\frac{6\sqrt{2}+6-\sqrt{8}\sqrt{2}-\sqrt{8}}{2-1}$ $=6\sqrt{2}+6-4-2\sqrt{2}$	$2 + 4\sqrt{2}$	M1	for correct first step eg multiplies numerator and denominator by $\sqrt{2} + 1$ condone missing brackets
			M1	(dep) for expansion of numerator with 4 terms correct with or without signs or 3 out of exactly 4 terms correct
			A1	for $2 + 4\sqrt{2}$ oe or for stating $a = 2$ and $b = 4$
22		2, 14.5	P1	for scale factor of $\frac{12}{3}$ or $\frac{3}{12}$ or $\frac{15}{12}$ or $\frac{12}{15}$ or $\frac{8}{12}$ or $\frac{12}{8}$ or $\frac{15}{8}$ oe or correctly identifies 2 pairs of corresponding sides
			A1	for $x=2$
			P1	for complete method to find other value for x eg $\frac{15}{8} \times 12 = 8$
			A1	for $x = 14.5$
23		$x > 2$	C1	Describes both assumptions for similarity
			P1	for process to derive algebraic expressions for area of both rectangle and triangle eg $(x-1)(3x-2)$ and $(2x \times x) \div 2$ (condone missing brackets)
			M1	for method to rearrange inequality to $2x^2-5x+2 > 0$ oe providing in the form $ax^2 + bx + c > 0$
			M1	for a correct method to solve $2x^2-5x+2 > 0$
			M1	for establishing critical values 2 and $\frac{1}{2}$
			A1	$x > 2$



Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
21 (a)	Proof	C1	for starting the proof, identifying a pair of relevant equal sides or angles with reasons from $AD = BC$ (opposite sides of a parallelogram are equal) angle $PAD =$ angle QCB (opposite angles of a parallelogram are equal) angle $ADP =$ angle CBQ (given or both 90°)	Congruency conclusion must include a reference to ASA
		C1	(dep C1) for complete identification of all three equal aspects with reasons	
	Explanation	C1	(dep C2) for conclusion of congruency proof	
		C1	for identifying a pair of equal sides or angles in $APCQ$, with reason, eg $AP = QC$ since triangle ADP is congruent to triangle CBQ	
(b)		C1	(dep C1) for reasoning that $APCQ$ is a parallelogram so opposite sides of a parallelogram are parallel	



Q20



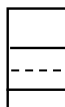
Paper: 1MA1/1H					
Question	Answer	Mark	Mark scheme	Additional guidance	
8 (a)	Proof	M1	for identifying angle A as common or for angle $AED = \text{angle } ACB$ or angle $ADE = \text{angle } ABC$ with appropriate reason(s) eg <u>corresponding angles</u> are equal or <u>co-interior angles</u> add up to 180 and <u>angles</u> on a straight <u>line</u> add up to 180	Statement can be implied by identifying a third pair of equal angles (no reason needed)	
		C1	for completing the proof by identifying a second pair of equal angles with appropriate reason(s) and a statement that the angles in each triangle are the same		
		P1	for a scale factor of 1.5 or $\frac{2}{3}$ oe or for $\frac{AE}{20} = \frac{18}{30}$ oe		
		P1	for a process to find the length of AE , eg $18 \div 1.5 (= 12)$ oe or $(AE =) \frac{20 \times 18}{30}$ oe or for a complete process to find the length of EC , eg $18 \times (1 - \frac{2}{3})$ oe		
		A1	cao		
9 (a)	Rotation 90° (anticlockwise) about $(-1, 0)$	B2	for rotation 90° (anticlockwise) about $(-1, 0)$	Accept 270° clockwise	
		(B1	for any 2 of the 3 aspects)	Award no marks if more than one transformation is given	
	(b)	Enlargement	B2	for correct enlargement with vertices at $(1,0)$, $(3,0)$, $(1,2)$	Award for clear intention, shading not needed
			(B1	for correct size and orientation but incorrect position or 2 out of 3 vertices correctly placed)	



Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
16 (a)	4.9	P1	for beginning to work with scale factors eg $\left(\frac{h}{12}\right)^3$ or $\left(\frac{12}{h}\right)^3$ or $\frac{90}{1350} \left(= \frac{1}{15}\right)$ or $\frac{1350}{90} (=15)$ or $90 : 1350$ oe	
		P1	for equating scale factors eg $\left(\frac{h}{12}\right)^3 = \frac{90}{1350}$ or $\left(\frac{12}{h}\right)^3 = "15"$ or for finding the linear scale factor, eg $\sqrt[3]{\frac{90}{1350}}$ or $\sqrt[3]{"15"} (=2.46(6...))$	
		P1	for a complete method eg $\sqrt[3]{12^3 \times \frac{90}{1350}}$ or $12 \times \sqrt[3]{\frac{90}{1350}}$ or $"\left(\sqrt[3]{"15"}\right)"$	
(b)	$(15)^{\frac{2}{3}}$	A1	for answers in the range 4.8 to 4.9	
		B1	for $15^{\frac{2}{3}}$ or $\left(\sqrt[3]{15}\right)^2$ or $\sqrt[3]{15^2}$ or $225^{\frac{1}{3}}$	If given in an acceptable form, then given as a decimal, isw and award
17	$\frac{2}{3}$	M1	for correct substitution, eg $1.5 = k^{-1}$ oe or $\frac{1}{1.5}$	
		A1	oe but not $\frac{1}{1.5}$	Accept rounded or truncated to 2dp or better



Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
3	18	M1	for listing factors of 72 and 90, at least 4 correct for each (with no more than 1 incorrect in each list), could be in factor pairs	Factors of 72: 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72 Factors of 90: 1, 2, 3, 5, 6, 9, 10, 15, 18, 30, 45, 90
		A1	OR for the prime factors of 72 (2, 2, 2, 3, 3) or 90 (2, 3, 3, 5) for 18 or 2×3^2 oe SC B1 for answer of 6 or 9 if M0 scored	2, 3^2 is not enough, it must be a product
4	sketch	M1	for sketch of a cylinder	Hidden edges may or may not be shown
		A1	sketch of cylinder, with dimensions shown	2 (cm) for radius or 4 (cm) for diameter and 5 (cm) for height
5	$c = -6$ $d = -1$	M1	for reflection in x-axis shown on diagram	Vertices (3, -2), (5, -2), (3, -5)
		A1	for $c = -6$ or $d = -1$	One correct value is M1A1 regardless of second value or diagram
		A1	for both $c = -6$ and $d = -1$	
			SCB2 for $c = -1$ and $d = -6$	

Paper: 1MA1/2H					
Question	Answer	Mark	Mark scheme	Additional guidance	
1	(a)	(2, 1)	B1	cao	Accept negative correlation Ignore any comment about strength Any numbers used in the description must be within tolerance
	(b)	Description	C1	correct description, eg as the amount of rainfall decreases the number of hours of sunshine increases	
	(c)	3 to 4	M1 A1	for a suitable line of best fit drawn, or for a point marked at (x, 7), or a horizontal line drawn from 7 across to (x, 7) where x is in the range 2.5 to 4 answer in the range 3 to 4	
2	Elevation	B2 (B1)	fully correct side elevation 5 high and 3 wide for a rectangle 5 high and 3 wide or correct side elevation in the wrong orientation)		
3	(a)	$6n + 1$	B2 (B1)	oe for $6n + c$ where c is an integer $\neq 1$ or is missing)	2, -4, -10, -16, -22, -28, -34, -40, -46, -52 May stop at -58 or ring if sequence continues
	(b)	Shown with supportive working	M1	for $8 - 6n = -58$ or $8 - 6 \times 11$ ($= -58$) or starts to list terms of the sequence, with at least 3 correct or any other valid method.	
			A1	shown with working or an explanation , eg Yes and 11 or 2, -4, -10, -16, ..., -52, -58	

Paper: 1MA1/3H				
Question	Answer	Mark	Mark scheme	Additional guidance
3 (a)	Explanation	C1	for explanation Acceptable examples The height of the rectangle / it should be less than 4 cm The 4 cm sides are wrong / too long The height of the rectangle should be $2.6\dots / \sqrt{7}$ She's drawn the slanted height / not used the perpendicular height The height is smaller / not 4 cm / wrong It should be shorter as the side is at an angle It should be on an angle, so the height is smaller The length / width / side is 4 cm not the height She's drawn the face / the length and side / width of the rectangle She's drawn the length and side / width not the (length and the) height Not acceptable examples The rectangle should be wider The rectangle should be 6 squares high It doesn't tell us the height It should be smaller It's the front not the side It's not on a slant / it should be on a slant It goes up at an angle / it doesn't go straight up The length of the prism is 4 cm The length / width / side of the rectangle is 4 cm Side elevation is at a slant (not straight up)	
(b)		M1 A1	for a 7 cm by 6 cm rectangle or for a 7 cm by n cm or m cm by 6 cm rectangle and dividing line which is parallel to the 7 cm or the m cm side for a fully correct plan	Accept any orientation Accept a freehand drawing

Paper: 1MA1/2H				
Question	Working	Answer	Mark	Notes
2 cont.			OR P1 for a process to find the maximum number of children, eg. $2600 \times 2 \div 7 (= 742(.8\dots))$ P1 for process to work out the total number of children, e.g. $117 \times 4 (= 468)$ A1 for 468 and 742(.8...) P1 for $\frac{468}{742(.8\dots)} \times 100 (= 63)$ or process to work out 60% of “742(.8...)” (= 445(.7...)) C1 for a correct conclusion supported by correct figures e.g. 63% or 468 and 445(.7...) [Where appropriate accept rounded or truncated values]	
3		Side elevation Front elevation	C2 for the side elevation (4 cm by 2 cm rectangle with a solid line drawn 1 cm from the 2 cm edge, and correct orientation) [C1 for the side elevation as a rectangle] C2 for the front elevation as a trapezium in correct orientation with base 4 cm, parallel sides 1 cm and 4 cm [C1 for the front elevation as a trapezium with two right angles] [Ignore incorrect or no labelling]	



Paper: 1MA1/1H				
Question	Answer	Mark	Mark scheme	Additional guidance
5 (a)	isosceles triangle, base 6 cm, height 4 cm	M1	for drawing an isosceles triangle or for drawing a triangle of base 6cm and height 4cm	Accept a freehand drawing Only a single triangle is acceptable; do not accept any attempted nets or 3-D diagrams
		A1	for a fully correct diagram	Condone a perpendicular drawn from base to vertex
	96 cm ²	M1	for a method to find the area of a triangular face eg $\frac{1}{2} \times 6 \times 5 (= 15)$	
		M1	(dep) for finding the total surface area eg $4 \times "15" + 6 \times 6$	
		A1	for a numerical answer of 96 SC B1 for an answer of 84 if M0 scored	Ignore incorrect or absent units for this mark [The SC is from: $4 \times \frac{1}{2} \times 6 \times 4 + 6 \times 6$]
		B1	cm ²	Ignore incorrect or absent numerical answer for this mark

