

REVISE

.wales

3.13 – Surface area & volume of 3D solids

Mark schemes for the 3.13 question pack

Spec 3.6.3 – Unit 3

SOLUTIONS · 2025 SPECIFICATION

Mark schemes for the 74 questions in the corresponding revise.wales question pack (341 marks total). Sources: legacy WJEC GCSE papers, WJEC SAM, and custom-authored mark schemes. Pack layout © revise.wales.

Autumn 2016		
1.		All lines and arcs must be of sufficient length to be able to select the correct region
Unambiguous straight line from midpoint, $\pm 2\text{mm}$, AD towards BC	B1	Intention of straight line with or without a ruler
Unambiguous angle bisector of $\hat{DAB} \pm 2^\circ$	B1	
Arc centre A with radius $3\text{cm} \pm 2\text{mm}$	B2	B1 for arc centre A of either insufficient length or tolerance $> \pm 2\text{mm}$ but $< \pm 5\text{mm}$, or for an arc with correct radius but centred at B Do not accept if arcs are included at C or D
Correct region indicated	B1	FT provided similar region with an attempt at the horizontal line and the sloping straight line from A, and provided at least B1 awarded for the arc

MULTIPLE CHOICE		
1(a)	$y = 5b/6x$	B1
1(b)	$2.6 \times 33.6/2.1$ or 2.6×16 41.6 (cm)	M1 A1 CAO <i>Award M1, A0 for an answer of 40.32 from PA ($33.6 \times 1.2 = 40.32$)</i>

<p>9(a) Volume of hemisphere = $\frac{2}{3} \times \pi \times 4 \cdot 8^3$ OR $\frac{2}{3} \times \pi \times (12r)^3$</p> <p>(Tot vol=) $\frac{2}{3} \pi \times 4 \cdot 8^3 + \pi \times 0 \cdot 4^2 \times 6 + \frac{1}{3} \pi \times 0 \cdot 4^2 \times 3 \cdot 6$ (231... + 3·0... + 0·6...)</p> <p>= 235 to 235·3 (mm³)</p> <p>No. of nails = $18\,000 \div 235(\cdot 3)$ or equivalent</p> <p>= 76</p>	<p>B1</p> <p>M2</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p>Allow for sight of 231·5 to 231·7</p> <p>M1 for summing 3 terms with any 2 correct, OR M1 for use of r in a correct method OR $74 \cdot 88\pi$. FT from M1</p> <p>Allow M1 for $18\,000 \div$ 'their 235(·3)' provided previous M1 at least awarded Needs to be a whole number, and be the result of rounding down their answer</p>
<p>9(b) True True False False</p>	<p>B2</p>	<p>B1 for 3 correct</p>

<p>10. $\frac{2}{3}\pi r^3 = \pi r^2 h$ or equivalent $\frac{2r}{3} = h$ or equivalent.</p> <p>(Height cyl. : Radius cyl. =) 2 : 3 or equivalent.</p>		<p>M1 A1 A1</p>	<p>Must be in terms of r, h. Allow inclusion of π, e.g. $2\pi r = 3\pi h$.</p> <p>If no other marks awarded allow SC1 for 3 : 2</p> <p>If working with a <u>whole</u> sphere, award SC2 for 4 : 3 OR SC1 for $4r/3 = h$</p>
---	--	------------------------------	---

<p>1(a) (£) $560 \div 7$ (= £ 80)</p> <p>$2 \times 560 \div 7$ OR $6 \times 560 \div 7$ OR $\frac{1}{3} \times (560 - 560 \div 7)$ OR $560 - 560 \div 7$ (Bryn) (£) 160 (Sophie) (£) 480</p>	<p>B1</p> <p>M1</p> <p>A1</p> <p>A1</p>	<p>CAO</p> <p>CAO</p> <p><i>Alternative: (Total prize money)</i> $560 \times 15 \div 7$ (=£1200) B1 $2 \times 1200 \div 15$ OR $6 \times 1200 \div 15$ M1 FT 'their $560 \times 15 \div 7$' (= 1200) (Bryn) (£) 160 A1 CAO (Sophie) (£) 480 A1 CAO</p> <p>If no marks, award SC1 only for either of the following answers (from initially $560 \div 15$)</p> <ul style="list-style-type: none"> • (Bryn) (£)74(.66...) or (£)75 • (Sophie) (£)222 or (£)223(.98) or (£) 224
<p>1(b) (2015 cost of hosting:) $6600 + 0.1 \times 6600$ (£7260)</p> <p>(2016 cost of hosting:) $7260 + 0.1 \times 7260$ (£7986)</p> <p>AND (2017 cost of hosting:) $7986 + 0.1 \times 7986$ (£8784.60)</p> <p>(2017 cost of hosting is) (£) 8784.6(0)</p> <p>Organisation and communication</p>	<p>B1</p> <p>M1</p> <p>A1</p> <p>OC1</p>	<p>For the appropriate method of repeatedly increasing by 10% from 2015 to 2017 FT 'their $6600 + 10\%$' calculation <u>with</u> 'their 7260' + 10% calculation <u>with</u> their 7986' + 10% calculation Allow intention with sight of rounding or truncation within working, e.g. (£)799 as 10% of (£)7986</p> <p>CAO</p> <p>Ignore any further working</p> <p><i>Alternative</i> Sight of 6600×1.1^3 M1 Full method to calculate 1.1^3 and multiply by 6600 m1 (For method not accuracy, allow arithmetic errors if intention clear.) (£) 8784.6(0) CAO A1</p> <p>If no marks, award SC1 for an answer of (£)8580 (from simple interest, as first B mark is embedded)</p> <p>For OC1, candidates will be expected to:</p> <ul style="list-style-type: none"> • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanations and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means

6.	(volume) Area Length None Area Volume		B3	<i>Must use the terminology given in the question.</i> B3 for all 5 correct. B2 for 3 or 4 correct. B1 for 2 correct. B0 otherwise.
----	--	--	----	---

<p>6. (Old fish tank contains) $60 \times 40 \times 45$</p> <p>(New fish tank maximum volume is) $\pi \times 25^2 \times 70$ Answer in range 137375 to 137500 (cm^3)</p> <p>Conclusion, e.g. '137 375 > 108 000', 'Elin can be certain as the volume of the new tank is greater' 'it fits'</p>	<p>B1</p> <p>M1</p> <p>A1</p> <p>B1</p>	<p>(108 000 cm^3)</p> <p>FT 'their new fish tank calculation' conclusion provided 108 000 (cm^3) seen and at least M1 previously awarded</p> <p><i>Alternative:</i> (To find new fish tank water level) (Old fish tank contains) $60 \times 40 \times 45$ B1 (New tank) $\pi \times 25^2 \times$ 'water level' M1 $60 \times 40 \times 45 = \pi \times 25^2 \times$ 'water level' m1 (Water level) 55.(...cm) with conclusion that contents will be certain to fit (55 cm must be correct) A1 Depends on all previous marks awarded</p>
<p>Organisation and communication</p>	<p>OC1</p>	<p>For OC1, candidates will be expected to:</p> <ul style="list-style-type: none"> • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanations and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means
<p>Writing</p>	<p>W1</p>	<p>For W1, candidates will be expected to:</p> <ul style="list-style-type: none"> • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc.

<p>11(a)</p> $\frac{1}{3}\pi \times 5^2 \times 12 \quad \text{and} \quad \pi \times 3^2 \times 4$ <p>(Vol remaining =) $\frac{1}{3}\pi \times 5^2 \times 12 - \pi \times 3^2 \times 4$</p> $= 100\pi - 36\pi \quad (= 64\pi \text{ cm}^3)$	<p>B2 M1 A1</p>	<p>Allow the use of numerical values of pi for the B2 and M1 marks</p> <p>B1 for either of these expressions FT use of $\frac{1}{3}\pi \times 10^2 \times 12$</p> <p>Convincing. Must be in terms of π.</p>
<p>11(b) (Slant length² =) $12^2 + 5^2$ Slant length² = 169 OR (Slant length =) $\sqrt{169}$ (Slant length =) 13 (cm) (Surface area =) $\pi \times 5^2 - \pi \times 3^2 + \pi \times 5 \times 13$</p> $= 81\pi \text{ (cm}^2\text{)}$	<p>M1 A1 A1 M2 A1</p>	<p>May be unsupported</p> <p>Allow the use of numerical values of pi FT 'their 13' provided Pythagoras attempted M1 for the appropriate addition/subtraction of 2 correct terms CAO. Must be in terms of π.</p>

19. Sight of $4\pi^2$ AND $6r^2$ Convincing argument, e.g. $4\pi \neq 6$, or $\pi = 1.5$ (or equivalent), which is not true.		A1 B1 E1	C.A.O. E1 depends on B1 having been awarded.
--	--	----------------	---

GCSE Mathematics Unit 1 Higher MS Summer 2017

1(a)(i) (Ysgol) Caewen and (Year Group) 10	B1	
1(a)(ii) FALSE TRUE FALSE TRUE TRUE	B3	All 5 correct B2 for any 4 correct B1 for any 3 correct
1(b)(i) 1480 (miles)	B2	B1 for sight of any one of <ul style="list-style-type: none"> • $200 \div 5$ • 40 (miles) in 1 year • 80 (miles in 2 years) B0 for an answer for 2018 as 1600 (miles) <i>Ignore statement of incorrect unit, such as km for miles</i>
1(b)(ii) Reason suggesting rate of increase not necessarily linear, e.g. 'unlikely to be a constant rate of increase', 'not a uniform pattern each year', 'they can vary', 'because there can be more one year than another year', 'it is a total over 5 years so the number each year can increase or decrease', 'not the same miles every time', 'there could be more routes in different years', 'don't know what will happen', 'because this is just an estimate based on previous data', 'cycling becoming more popular, rate may increase because of it' 'could have run out of money'	E1	Do not allow if additional incorrect statements are made Allow, e.g. 'because it can change', 'perhaps they have not built any more since 2016', 'cycling becoming more popular', 'January 2018 hasn't happened yet' Do not accept, e.g. 'because it is an estimate'

<p>1(a) Midpoints 2.5, 7.5, 15, (25,) 40</p> $10 \times 2.5 + 16 \times 7.5 + 4 \times 15 + 1 \times 40$ <p>Intention their $\sum fx / 31$ 7.9(0...cm)</p>	<p>B1</p> <p>M1</p> <p>m1</p> <p>A1</p>	<p>Midpoint of $20 \leq s < 30$ (25) is not required for B1</p> <p>25 + 120 + 60 + 40 (= 245) FT their midpoints, including bounds, provided they fall within the classes including upper bounds.</p> <p>FT if 1 slip in one of 'their midpoints', (and only one, including 25) used outside the tolerance of bounds for M1, m1 only</p> <p>(245/31) Following correct working Accept 8 cm from correct working</p>
<p>1(b) FALSE FALSE TRUE TRUE</p>	<p>B2</p>	<p>B1 for any 3 correct</p>
<p>1(c) $(28 \times 9 - 63) \div 27$ or equivalent</p> <p>7 (cm)</p>	<p>M2</p> <p>A1</p>	<p>M1 for sight of 28×9 or 252</p> <p>Allow M2, A1 for an unsupported answer of 7(cm) Award M0, A0 for an answer of 7(cm) from sight of $63 \div 9$</p>

1(a)(i) (Ysgol) Caewen and (Year Group) 10	B1	
1(a)(ii) FALSE TRUE FALSE TRUE TRUE	B3	All 5 correct B2 for any 4 correct B1 for any 3 correct
1(b)(i) 1480 (miles)	B2	B1 for sight of any one of <ul style="list-style-type: none"> • $200 \div 5$ • 40 (miles) in 1 year • 80 (miles in 2 years) B0 for an answer for 2018 as 1600 (miles) <i>Ignore statement of incorrect unit, such as km for miles</i>
1(b)(ii) Reason suggesting rate of increase not necessarily linear, e.g. 'unlikely to be a constant rate of increase', 'not a uniform pattern each year', 'they can vary', 'because there can be more one year than another year', 'it is a total over 5 years so the number each year can increase or decrease', 'not the same miles every time', 'there could be more routes in different years', 'don't know what will happen', 'because this is just an estimate based on previous data', 'cycling becoming more popular, rate may increase because of it' 'could have run out of money'	E1	Do not allow if additional incorrect statements are made Allow, e.g. 'because it can change', 'perhaps they have not built any more since 2016', 'cycling becoming more popular', 'January 2018 hasn't happened yet' Do not accept, e.g. 'because it is an estimate'

<p>1(a) Midpoints 2.5, 7.5, 15, (25,) 40</p> $10 \times 2.5 + 16 \times 7.5 + 4 \times 15 + 1 \times 40$ <p>Intention their $\sum fx / 31$ 7.9(0...cm)</p>	<p>B1</p> <p>M1</p> <p>m1</p> <p>A1</p>	<p>Midpoint of $20 \leq s < 30$ (25) is not required for B1</p> <p>25 + 120 + 60 + 40 (= 245) FT their midpoints, including bounds, provided they fall within the classes including upper bounds.</p> <p>FT if 1 slip in one of 'their midpoints', (and only one, including 25) used outside the tolerance of bounds for M1, m1 only</p> <p>(245/31) Following correct working Accept 8 cm from correct working</p>
<p>1(b) FALSE FALSE TRUE TRUE</p>	<p>B2</p>	<p>B1 for any 3 correct</p>
<p>1(c) $(28 \times 9 - 63) \div 27$ or equivalent</p> <p>7 (cm)</p>	<p>M2</p> <p>A1</p>	<p>M1 for sight of 28×9 or 252</p> <p>Allow M2, A1 for an unsupported answer of 7(cm) Award M0, A0 for an answer of 7(cm) from sight of $63 \div 9$</p>

<p>4.(a)</p> $35^2 = 21^2 + AB^2 \quad \text{OR} \quad (AB^2 =) 35^2 - 21^2$ $(AB^2 =) 784 \quad \text{or} \quad (AB =) \sqrt{784}$ $(AB =) 28(\text{cm})$ $(\text{Area ABC} =) \frac{21 \times 28}{2} = 294(\text{cm}^2)$	<p>M1 A1 A1</p> <p>M1 A1</p> <p>OC1</p> <p>W1</p>	<p><i>Work for 4(a) must be seen in 4(a) and not awarded retrospectively from work in 4(b).</i> In (a) allow correctly working in metres BUT final answer must be in cm^2.</p> <p>F.T. 'their784' if M1 gained and if <1225 0</p> <p>F.T. (21 × 'their stated or shown AB') / 2 AND (AB ≠ 35 and ≠ 21)</p> <p><u>Alternative method.</u> $\cos C = 21/35$ M1 $C = \cos^{-1} 0.6$ m1 $ACB = 53(.13..)(^\circ)$ A1 F.T. 'their 53°' $\text{Area ABC} = \frac{1}{2} \times 21 \times 35 \times \sin 53.13^\circ$ M1 $= 294(\text{cm}^2)$ A1 <i>Answer from a 'FT angle' must be correct to at least 1 dp. (Note using 53° leads to 293.498....)</i></p> <p>Organisation and Communication. For OC1, candidates will be expected to:</p> <ul style="list-style-type: none"> • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanation and working in a way that is clear and logical <p>Accuracy of writing. For W1, candidates will be expected to:</p> <ul style="list-style-type: none"> • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc
<p>4.(b)</p> <p>Use of 'Volume = area ABC × length'.</p> $(\text{Volume} =) 294 \times 200 \quad \text{OR} \quad 0.0294 \times 2$ $= 58800 \text{ cm}^3 \quad \text{OR} \quad 0.0588 \text{ m}^3.$	<p>M1</p> <p>m1</p> <p>A1</p>	<p><i>Work for 4(b) must be seen in 4(b).</i> Allow this M1 even if using 'mixed units'. Where 'area ABC' is that shown in 4(a) or calculated using 'their AB' from 4(a) AND the length is '2×10ⁿ'. (Note: using 'their AB' as an area is M0.)</p> <p>F.T. 'their area of ABC' OR 294 AND using 'consistent' units. Correct units must be shown. Mark final answer. An unsupported 588 × 10ⁿ implies M1.</p>

Second variable found	M1	
<p>10. (Volume of cube =) m^3 OR $m \times m \times m$ OR $m^2 \times m$</p> <p>(Volume of cylinder =) $\frac{\pi m^3}{4}$ OR $\frac{\pi \times m \times m \times m}{4}$ OR $\frac{\pi \times m^2 \times m}{4}$</p> <p style="text-align: right;">$k = 4$</p>	<p>B1</p> <p>B2</p> <p>B1</p>	<p>For sight of m^3 or equivalent.</p> <p>For sight of $\pi m^3/4$ or equivalent.</p> <p>B1 for $\pi \times \left(\frac{m}{2}\right)^2 \times m$.</p> <p>Also allow this B1 if brackets are missing.</p> <p>$m^3 : \frac{\pi m^3}{4}$ OR $4m^3 : \pi m^3$ OR $1 : \frac{\pi}{4}$</p> <p>all imply B1B2.</p> <p>Allow B1 if left as $4 : \pi$.</p> <p>F.T. only for $\pi m^3 / 2$ (giving $k = 2$ or $2 : \pi$)</p> <p><u>Note</u> : If a value is used for m then mark as above and penalise -1 from total mark gained.</p>

<p>10(a) height = $14 \times 20 \div 8$ or 14×2.5 or equivalent</p> <p style="text-align: center;">$= 35$ (cm)</p>	<p>M1</p> <p>A1</p>	<p>Allow M1 for $\frac{\text{height} = 20}{14 \quad 8}$ OR</p> <p>$\frac{\text{height} = 14}{20 \quad 8}$</p>
<p>10(b) (radius =) $15 \times 8 \div 20$ or 15×0.4 or equivalent</p> <p style="text-align: center;">$= 6$ (cm)</p> <p>(Volume =) $\frac{1}{3} \times \pi \times 6^2 \times 15$</p> <p style="text-align: center;">$= 180\pi$ (cm³) (ISW)</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p>e.g. $15 \times 14 \div 35$ FT 'their 35'</p> <p>FT 'their 6' provided previous M1 awarded</p> <p><i>Alternative methods:</i> <i>If candidates clearly work with similar volumes, then</i> B1 for $\frac{3}{4}$ or $\frac{4}{3}$ or equivalent B1 for $(\frac{3}{4})^3$ or $(\frac{4}{3})^3$ or equivalent M1 for $\frac{1}{3} \times \pi \times 8^2 \times 20 \times (\frac{3}{4})^3$ or equivalent A1 for 180π (cm³)</p> <p>OR</p> <p>FT 'their 35' throughout B1 for $\frac{15}{35}$ or $\frac{35}{15}$ or equivalent B1 for $(\frac{15}{35})^3$ or $(\frac{35}{15})^3$ or equivalent M1 for $\frac{1}{3} \times \pi \times 14^2 \times 35 \times (\frac{15}{35})^3$ or equivalent A1 for 180π (cm³)</p>

11. (Curved surface area of cone =) $\pi \times 11 \times 13$ (Curved surface area of cylinder =) $2 \times \pi \times 11 \times 17$ (Base of cylinder =) $\pi \times 11 \times 11$	M1 M1 M1	<i>($\sphericalangle C E T = 60$ AND) therefore equilateral</i> <i>E1</i> 143π or values between 449.02 and 449.306 374π or values between 1174.36 and 1175.108 121π or values between 379.94 and 380.182
(Total surface area=) Answer in the range $2003.3(\text{cm}^2)$ to $2004.6(\text{cm}^2)$ or $2005(\text{cm}^2)$ or $638\pi (\text{cm}^2)$	A1	CAO. Unsupported correct answer is awarded full marks.

Unit 1: Higher Tier Summer 2018		
<p>1(a) (Total area =) $15 \times 15 + 4 \times 5$ or $20 \times 4 + 11 \times 15$ or $20 \times 15 - 11 \times 5$ or equivalent (Volume = total area) $\times 0.2$</p> <p style="text-align: right;">(Volume =) 49 (m³)</p>	<p>M1</p> <p>M1</p> <p>A2</p>	<p><i>Note: check diagram for the area</i> Accept any correct area calculation</p> <p>Allow for 'their total area' $\times 0.2$ where 'their area' includes a product, or for one rectangular (or square) area $\times 0.2$</p> <p>FT from 1 measurement error in a sum or difference of two products, i.e. only one measurement incorrect within one product (M0 M1 A2 is possible to award)</p> <p>A1 for calculations with evaluated terms as shown (in bold and underlined)</p> <p>FT from M1, M0 (area $225 + 20$ or $80 + 165$ or $300 - 55$) <u>245</u>(m²),</p> <p>OR</p> <p>FT from M1, M1: for one area product correctly evaluated within 'their area' AND $\times 0.2$ correctly evaluated</p> <p><u>45</u> + $4 \times 5 \times 0.2$ (m³), or $15 \times 15 \times 0.2 +$<u>4</u>(m³), or <u>16</u> + $11 \times 15 \times 0.2$ (m³), or $20 \times 4 \times 0.2 +$<u>33</u>(m³), or <u>60</u> – $11 \times 5 \times 0.2$ (m³), or $20 \times 15 \times 0.2 -$<u>11</u> (m³)</p> <p>Accept implied correctly evaluated area product, e.g. $4 \times 5 + 15 \times 15 = 20 + 125 = 145$ With $145 \times 0.2 = 29$ (m³), award M1, M1, A1 (although 125 is incorrect)</p>
<p>Organisation and communication</p>	<p>OC1</p>	<p>For OC1, candidates will be expected to:</p> <ul style="list-style-type: none"> • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanations and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means
<p>Writing</p>	<p>W1</p>	<p>For W1, candidates will be expected to:</p> <ul style="list-style-type: none"> • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc.

1(b) $2/3 \times 6$ $\times 45$	OR $2/3 \times 45$ $\times 6$ or equivalent	M1	Allow sight of $2/3$ of 6 or $2/3$ of 45 (= 4×45 or 30×6 or $2/3 \times 270$) (= 180)
	+ 35	m1	Intention to add 35 Depends on M1 only
	(£) 215	A1	CAO

<p>5. $(QR^2 =) 1 \cdot 41^2 + 0 \cdot 89^2$ $(QR^2) = 2 \cdot 78(02)$ or $(QR) = \sqrt{2 \cdot 78(02)}$ $(QR =) 1 \cdot 66(\dots)(m)$ or $1 \cdot 67 (m)$ or $1 \cdot 7(m)$ OR $166 \cdot 7(\dots) \text{ cm}$ or 167cm</p>	M1 A1 A1	Allow 2·8 for 2·78. FT from M1 for the correctly evaluated square root of 'their 2.78(02)' provided their answer > 1.41 Allow working in centimetres but penalise -1 from any A marks gained if units not shown for final answer e.g. $QR^2 = 27802$ (A1), $QR = 166 \cdot 74$ (A1) then -1 BUT $QR = 166 \cdot 74 \text{ cm}$ OR 167 cm is M1A1A1.
<p><u>Alternative method.</u> Correct use of 'two-step' trigonometric relationship. $(QR =) 1 \cdot 66(\dots)(m)$ or $1 \cdot 67 (m)$ or $1 \cdot 7(m)$ OR $166 \cdot 7(\dots) \text{ cm}$ or 167cm</p>	M2 A1	A partial trigonometric method is M0. C.A.O.

	= 0.147 or equivalent. ISW	A1	
7.(a)	$x = 3.2 \times \frac{8.4}{5.6}$ OR $\frac{x}{3.2} = \frac{8.4}{5.6}$ or equivalent. $x = 4.8$	M1 A1	M1 for correct <u>use</u> of linear ratio.
7.(b)	$y = 6.3 \times \frac{5.6}{8.4}$ OR $\frac{y}{6.3} = \frac{5.6}{8.4}$ or equivalent. $y = 4.2$	M1 A1	M1 for correct <u>use</u> of linear ratio. FT a slip in the calculation (<u>not a misuse</u>) of the scale factor in part (a) if used again in (b).
7.(c)	Correct strategy of comparing corresponding ratio of lengths. Indicates that $\frac{3.9}{6.5} (= 0.6)$ is not equal to $\frac{5.6}{8.4} (= 0.666\dots)$ or equivalent.	S1 B1	Sight of $3.9 / 6.5$ (or $6.5 / 3.9$) along with any pair of corresponding lengths or scale factor used (or corresponding FT lengths from their answers in 7(a) or 7(b)). Allow using FT values from 7(a) or 7(b).
	<u>Alternative method 1</u> (If $CD = 3.9$ then) $RS = 3.9 \times 1.5$ = '5.85 (cm)' or/and 'which is not 6.5'	S1 B1	
	<u>Alternative method 2</u> (If $RS = 6.5$ then) $CD = 6.5 \times \frac{2}{3}$ = '4.3... (cm)' or/and 'which is not 3.9'	S1 B1	

	$(DE) = 7.6(\dots)(cm)$	ISW	A1	
10.	$(2m + 17)(2m - 17)$		B2	B1 for $(2m \dots 17)(2m \dots 17)$ OR B1 for $(2m + \sqrt{289})(2m - \sqrt{289})$ OR $4(m + 8.5)(m - 8.5)$ OR $(4m + 34)(m - 8.5)$ OR $(4m - 34)(m + 8.5)$. Mark final answer. Penalise -1 further work, e.g.

11. $13200 \times 460 \div 3$ $= 2.024(\text{m}^3)$ $\quad\quad\quad = 2024000 (\text{cm}^3)$	M1 A1 B1	solving an equation. Or equivalent. Strict FT of a correct conversion of their volume to m^3 .
<u>Alternative method</u> Sight of 1.32 AND 4.6 $1.32 \times 4.6 \div 3$ $= 2.024(\text{m}^3)$	B1 M1 A1	FT 'their 1.32' and 'their 4.6' from place value errors for M1A1.

1(a) 245°	B1	
1(b)(i) 17:30	B1	
1(b)(ii) 22:10	B1	

4.(a)	$3 \cdot 14 \times 10^2 \times 20$ or $\pi \times 10^2 \times 20$ $= 6280 \text{ (cm}^3\text{)}$	M1 A1	M1 A0 for 2000π Allow M1A1 if 6280 <u>seen</u> in 4(b).
4.(b)	6 (litres)	B1	A strict F.T. of 'their 6280' /1000 and truncated. Truncation is required for the B1.

<p>4(a) (Jade saves each week) 72×0.21 or $7.2(0) + 7.2(0) + 0.72$ (= £ 15.12)</p> <p>(Total savings 15.12) $\times 20$</p> <p>(£) 302.4(0)</p> <p>(Jade's father pays £350 – 302.40 =) (£) 47.6(0)</p> <p>Organisation and communication</p> <p>Writing</p>	<p>M1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>OC1</p> <p>W1</p>	<p>Do not accept '1512' without indication of pence, unless used correctly in working These 2 M marks can be awarded in either order, i.e. $72 \times 20 (=1440)$, followed by $\times 0.21$</p> <p>CAO</p> <p>FT 'their £302.40' provided</p> <ul style="list-style-type: none"> • a percentage calculation using 72 has been involved AND • provided their answer is < (£) 350 <p>For OC1, candidates will be expected to:</p> <ul style="list-style-type: none"> • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanations and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means <p>For W1, candidates will be expected to:</p> <ul style="list-style-type: none"> • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc.
<p>4(b)(i) $100 - \frac{3}{25} \times 100$ or $\frac{(25-3)}{25} \times 100$</p> <p>88(%)</p>	<p>M1</p> <p>A1</p>	<p>Or equivalent Allow M1 for 88/100</p> <p>If no marks, award SC1 for an answer of or sight of 12(%) provided it is not from incorrect working</p>
<p>4(b)(ii) $abc + \pi a^2 c$</p>	<p>B1</p>	
<p>4(c) $35 \times 9 \div 45$ or $35 \div 5$ or equivalent</p> <p>7 (cm) or 70 mm</p>	<p>M1</p> <p>A1</p>	<p>Allow with incorrect place value from conversion of units CAO. Do not accept an answer of:</p> <ul style="list-style-type: none"> • 70 without units (mm) • 7 or 70 with incorrect units

<p>5.</p> <p>One correct evaluation $5 \leq x \leq 6$ 2 correct evaluations $5.55 \leq x \leq 5.75$, one < 107, one > 107. 2 correct evaluations $5.65 \leq x \leq 5.75$, one < 107, one > 107.</p> <p>$x = 5.7$</p>	<p>B1 B1 M1 A1</p>	<p><i>Correct evaluation regarded as enough to identify if 'too high' or 'too low'. If evaluations not seen accept 'too high' or 'too low'.</i></p> <p>x $x^3 - 13x$ (or check $x^3 - 13x - 107=0$)</p> <p>5 60</p> <p>5.1 66.351</p> <p>5.2 73.008</p> <p>5.3 79.977</p> <p>5.4 87.264</p> <p>5.5 94.875</p> <p>5.6 102.816 5.55 98.803...</p> <p>5.7 111.093 5.65 106.912...</p> <p>5.8 119.712 5.655 107.326...</p> <p>5.9 128.679 5.75 115.359...</p> <p>6 138</p>
--	---	--

8.(a) 0.92 written on the 'Not a Saturday' branch. Sight of $1 - 0.15 - 0.45$ OR 0.4 or 0.40 $0.4(0)$ <u>on</u> both 'car' branches AND 0.15 AND 0.45 correctly shown <u>on</u> lower branches.	B1 B1 B1	Allow this B1 if shown on working lines.
8.(b) Sight of 0.08×0.15 OR 0.08×0.4 or equivalent. $(P(\text{Sat and 'plane or car'}) =) 0.08 \times 0.15 + 0.08 \times 0.4$ or equivalent $= 0.044$ or equivalent. ISW	B1 M1 A1	FT 'their P(car)' if <1 . 0.08×0.55 implies previous B1.
<u>Alternative method</u> $(P(\text{Sat and 'plane or car'}) =) 1 - (0.92 + 0.08 \times 0.45)$ or equivalent $= 0.044$ or equivalent. ISW	M2 A1	FT 'their 0.92'. M1 for intent $P(\text{Sat and 'plane or car'}) =$ $1 - P(\text{'not Saturday'}) - P(\text{'Saturday and train'})$

10.	1×9^{100}	1×10^{60}	1×9^{93}	9×10^{90}	9×10^{99}	B1	
-----	--------------------	--------------------	-------------------	--------------------	--------------------	----	--

12. (Curved surface area of hemisphere=) $2 \times \pi \times 29^2$ o.e.	M2	1682π or values between 5281.48 and 5284.844 M1 for sight $4 \times \pi \times 29^2$ or 3364π or values between 10562.96 and 10569.688.
(Area of base of hemisphere=) $\pi \times 29^2$	M1	841π or values between 2640.7 and 2642.422 Sight of $3 \times \pi \times 29^2$ implies M2 M1.
(Total surface area=) Answer in the range: $7922(\text{cm}^2)$ to $7927.3(\text{cm}^2)$ or $2523\pi (\text{cm}^2)$	A1	CAO. Unsupported correct answer is awarded full marks. SC2 for an unsupported $5 \times \pi \times 29^2$ (4205π or 13210.3...).

13. (Sector area =) $\frac{300}{360} \times \pi \times 12^2 (=120\pi)$	B1	Or equivalent Allow B1 for $\frac{300}{360} \times \pi \times 12^2 \times 2$
(Area of curved surface =) $\frac{300}{360} \times 2 \times \pi \times 12 \times 10 (=200\pi)$	B1	Or equivalent
$\frac{300 \times \pi \times 12^2}{360} + \frac{300 \times 2 \times \pi \times 12 \times 10}{360} + 2 \times 12 \times 10$	M2	Or equivalent M1 for summing at least 3 terms with the equivalent of 2 of these terms correct May be seen in stages
= $320\pi + 240$ (cm ²) or $80(4\pi + 3)$ (cm ²) or equivalent	A1	CAO Mark final answer

Unit 1. Higher tier		
<p>1.(a) For a method that produces 2 prime factors from the set {3, 3, 5, 7} before the 2nd error.</p> <p style="text-align: center;">3, 3, 5, 7</p> <p style="text-align: center;">$3^2 \times 5 \times 7$</p>	<p>M1</p> <p>A1</p> <p>B1</p>	<p>C.A.O. For sight of the four correct factors (ignore 1s)</p> <p>FT 'their primes' provided at least one index form used with at least a square.</p> <p>Allow $(3^2)(5)(7)$ and $3^2.5.7$</p> <p>Inclusion of 1 as a factor gets B0.</p>
<p>1.(b) $42 = 2 \times 3 \times 7$ or equivalent correct strategy.</p> <p style="text-align: center;">(HCF =) 21</p>	<p>M1</p> <p>A1</p>	<p>M1 for sight of 2, 3, 7 'together'. (Not for 2×21, 3×14 and 6×7.) (Not for <u>just</u> listing all factors 1,2,3,6,7,14,21.)</p> <p>M1A0 for 3×7.</p> <p>FT 'their answer to 1(a)' only if of equivalent difficulty (at least two common prime factors)</p>

2(a)(i) (Volume) $\pi \times 3.6^2 \times 9.3$ Answer in the range 378.4 (cm ³) to 378.7 (cm ³) or 379 (cm ³)	M1 A1	Mark final answer
2(a)(ii) 189 (g) or an answer in the range 189.2 (g) to 189.5 (g)	B1	Allow rounding or truncation to whole number or a number of decimal places FT, for a similar range, 'their 379' accurately divided by 2
2(b) (Height is) $9.3 \times 4.2 \div 3.6$ or $1.16666... \times 9.3$ or $9.3 \div (3.6 \div 4.2)$ or equivalent 10.85 (cm)	M1 A1	Allow M1 for 1.16×9.3 or 1.17×9.3 or $9.3 \div 0.85(7...)$ Allow answers in the inclusive range 10.78 (cm) to 10.95 (cm)

<p>2(c) Comparison of salt and sugar, e.g.</p> <ul style="list-style-type: none"> (Salt) $\frac{6}{1.85}$ AND (Sugar) $\frac{90}{11.7}$ (Salt)(100×) $\frac{1.85}{6}$ AND (Sugar)(100×) $\frac{11.7}{90}$ (Recommend) 1 : 15 AND (Beans) 1 : 11.7+1.85 <p>Conclusion SALT and an accurate calculation of comparison, e.g. 3(.24...) AND 7(.69...), 0.3(083...) AND 0.13, 30(.83....%) AND 13(%), 31(%) AND 13(%), 0.31 AND 0.13 1 : 15 AND 1 : 6(.32...)</p>	<p>B1</p> <p>B2</p>	<p>Or equivalent</p> <p>Ignore any units given</p> <p>Ignore any units given and any additional statements if SALT unambiguously concluded with appropriate calculations evaluated correctly</p> <p>Accept rounded or truncated answers</p> <p>Ignoring units, B1 for an accurate calculation of comparison, e.g. 3(.24...) AND 7(.69...), 0.3(083...) AND 0.13, 30(.83....%) AND 13(%), 31(%) AND 13(%), 1 : 15 AND 1 : 6(.32...) OR B1 for SALT with one of the two comparative values correct (i.e. as above with 'OR')</p>
<p>2(c) Alternative method 1:</p> <p>Conclusion SALT with evidence of a full method looking at the same number of portions, including ratio methods, e.g.</p> <p>1.85×3 (portions) ≈ 6 (g) AND 11.7×8 (portions) ≈ 90 (g)</p>	<p>B3</p>	<p>Allow approximately or similar words for '≈'</p> <p>B2 for evidence of, e.g. 1.85×3(portions) ≈ 6(g) and 11.7×8(portions) ≈ 90(g) OR B1 for evidence of, e.g. 1.85×3 (portions) ≈ 6 (g) or 11.7×8 (portions) ≈ 90 (g)</p>
<p>2(c) Alternative method 2:</p> <p>Full method with one calculated proportion, compared with same proportion of the other ingredient, e.g.</p> <ul style="list-style-type: none"> 31% salt with 0.31×90 13% sugar with 0.13×6 <p>Conclusion SALT and an accurate calculation of comparison, e.g.</p> <ul style="list-style-type: none"> 27.9 (g) (sugar which is > 11.7 g in a portion) 0.78 (g) (salt which is < 1.85 g in a portion) 	<p>B1</p> <p>B2</p>	<p>Ignore any units given and any additional statements if SALT unambiguously concluded with appropriate calculations evaluated correctly</p> <p>B1 for appropriate calculations evaluated correctly, with no or incorrect conclusion</p>

<p>5. Sight of any TWO of 30, 2 or 0.5 OR Sight of any TWO of 30, 8 or 0.5 as appropriate approximations.</p> <p style="text-align: center;">$\frac{30 \times 8}{0.5}$ or equivalent.</p> <p style="text-align: right;">= 480</p>	<p>B1</p> <p>M1</p> <p>A1</p>	<p><i>Final 01 may be awarded after 000000.</i></p> <p>Allow 30.2 for 30.</p> <p>Equivalent e.g. $\frac{30 \times 2 \times 2 \times 2}{\frac{1}{2}}$ or $\frac{30 \times 2^3}{0.5}$</p> <p>Must be seen, but allow if attempted calculation done in steps. M0 for exact calculation.</p> <p>C A O Allow 483.2 if 30.2 used</p>
--	-------------------------------	--

8.(a) 0.7 shown for 'Does not go on tour bus'. Use of $0.3 \times \dots = 0.24$ P(sees show) = 0.8 Second set of branches 0.8, 0.2, 0.8, 0.2	B1 M1 A1 A1	e.g. 23.8×10^{-3} or 0.0238. Allow M1A1 if 0.8 seen on one of the 'sees show' branches. FT 'their 0.8' only if M1 awarded. (0.24, 0.76, 0.24, 0.76 is MQAQAQ)
8.(b) 0.7×0.2 = 0.14 ISW	M1 A1	FT 'their values' if both between 0 and 1.

8(a) (radius =) $15 \times 33 \div (22 + 33)$ or $15 \times \frac{3}{5}$ (= 9) or equivalent	B2	Working MUST be shown here May be seen with appropriate tangent ratios If Pythagoras used, appropriate use of the scale factor would be needed Allow B1 for sight of $\frac{33}{55}$ or equivalent OR $\frac{55}{33}$ or equivalent
Sight of $\frac{1}{3} \times \pi \times 15^2 \times 55$ OR $\frac{1}{3} \times \pi \times 9^2 \times 33$	B1	(12952 to 12961 OR 2797.7 to 2800)
$\frac{1}{3} \times \pi \times 15^2 \times 55 - \frac{1}{3} \times \pi \times 9^2 \times 33$ $= 4125\pi - 891\pi (= 3234\pi \text{ (cm}^3\text{)})$	M1 A1	Accept values in the range 10154.7 to 10161.2 (cm ³)

<p>8(b) (Scale factor =) $\frac{28.6}{22}$ (=1.3) OR $\frac{22}{28.6}$ (=0.769...) (Volume factor =) $(\frac{28.6}{22})^3$ or 1.3^3 OR $(\frac{22}{28.6})^3$ or $0.769...^3$</p> <p>3234π $\times (\frac{28.6}{22})^3$ or $\div (\frac{22}{28.6})^3$ OR $\frac{3234\pi}{8 \times 1000} \times 1.75$</p> <p>= 22309 to 22324.3 (or $7105(.098)\pi$ to 7105.1π) OR = 2.22 to 2.26 (or 0.707π to 0.719π)</p> <p>$\frac{\times 1.75}{8 \times 1000}$ OR $\times (\frac{28.6}{22})^3$ or $\div (\frac{22}{28.6})^3$</p> <p>= 4.8(8...) to 4.96(...) (gallons)</p>	<p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p>Or 2.197 Or 0.455...</p> <p>Accept numerical values for 3234π (10154.7 to 10161.2)</p> <p>Allow use of the conversion 1 litre = 1.75 to 1.76 pints</p> <p>Allow use of the conversion 1 litre = 1.75 to 1.76 pints FT 'their derived 22309 to 22324.3' OR FT 'their 2.2(2...)' from use of 3234π</p> <p>Allow an answer of 5 (gallons) from correct working Allow 1.55π to 1.58π (gallons). Do not accept 1.6π</p> <p>Allow the conversion into gallons for the M1 mark from any of the following also</p> <p><u>1 pint = 567 to 570 ml</u> <u>1 gallon = 4.5 to 4.55 litres</u> $\div 8 \div (567 \text{ to } 570)$ $\div 1000 \div (4.5 \text{ to } 4.55)$</p> <p><u>1 litre = 0.219 to 0.22 gallons</u> $\div 1000 \times (0.219 \text{ to } 0.22)$</p>
<p>Alternative method: (Scale factor =) $\frac{28.6}{22}$ (=1.3) Dimensions of 19.5, 71.5, 11.7, 42.9</p> <p>$\frac{1}{3} \times \pi \times 19.5^2 \times 71.5 - \frac{1}{3} \times \pi \times 11.7^2 \times 42.9$ = 22 309 to 22 324.3 (cm³)</p> <p>$(22\ 309 \text{ to } 22\ 324.3) \times \frac{1.75}{8 \times 1000}$ = 4.8(8...) to 4.96(...) (gallons)</p>	<p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p>Allow B1 for any 3 correct dimensions</p> <p>(28456 to 28475) – (6146 to 6151)</p> <p>Or $7105(.098)\pi$ to 7105.1π</p> <p>Allow use of the conversion 1 litre = 1.75 to 1.76 pints FT 'their derived 22309 to 22324.3'</p> <p>Allow an answer of 5 (gallons) from correct working Allow 1.55π to 1.58π (gallons). Do not accept 1.6π</p> <p>Allow the conversion into gallons for the M1 mark from any of the following also</p> <p><u>1 pint = 567 to 570 ml</u> <u>1 gallon = 4.5 to 4.55 litres</u> $\div 8 \div (567 \text{ to } 570)$ $\div 1000 \div (4.5 \text{ to } 4.55)$</p> <p><u>1 litre = 0.219 to 0.22 gallons</u> $\div 1000 \times (0.219 \text{ to } 0.22)$</p>

8.(a) 0.7 shown for 'Does not go on tour bus'. Use of $0.3 \times \dots = 0.24$ P(sees show) = 0.8 Second set of branches 0.8, 0.2, 0.8, 0.2	B1 M1 A1 A1	e.g. 23.8×10^{-3} or 0.0238. Allow M1A1 if 0.8 seen on one of the 'sees show' branches. FT 'their 0.8' only if M1 awarded. (0.24, 0.76, 0.24, 0.76 is MOA0A0)
8.(b) 0.7×0.2 = 0.14 ISW	M1 A1	FT 'their values' if both between 0 and 1.

		Acceptance by shading out.
11.	$cx - 4x = d + 3$ or $-3 - d = 4x - cx$	B1 FT until 2 nd error provided equivalent difficulty. Collecting x terms.
	$x(c - 4) = d + 3$ or $-3 - d = x(4 - c)$	B1 Factorising.
	$x = (d + 3)/(c - 4)$ or $x = (-3 - d)/(4 - c)$ or equivalent	B1 Dividing. Mark final answer.

<p>16. $\frac{4\pi R^3}{3} = \frac{\pi r^3}{6}$</p> <p>$24R^3 = 3r^3$ or $R = \sqrt[3]{(\pi r^3/6)/(4\pi/3)}$ or $R^3 = (\pi r^3/6)/(4\pi/3)$ or equivalent</p> <p>$R = \frac{r}{2}$</p>	<p>M2</p> <p>m1</p> <p>A1</p>	<p>Equating volumes Award M1 for sight of: (Volume of cylinder =) $\pi r^2 \times h/6$ or equivalent $\frac{4\pi R^3}{3} = \frac{\pi r^3}{6}$ is awarded M1.</p> <p>Award m1 for clearing fractions AND cancelling π or for isolating R or for isolating R^3.</p> <p>FT if M1 awarded and if equivalent difficulty</p> <p>CAO</p>
--	-------------------------------	---

<p>17.(b) <i>Alternative method</i></p> $1 - \left[\left(\frac{96}{100} \times \frac{95}{99} \right) + \left(2 \times \frac{3}{100} \times \frac{96}{99} \right) + \left(2 \times \frac{1}{100} \times \frac{96}{99} \right) \right]$ $= \frac{12}{9900} \left(= \frac{1}{825} \right) \text{ ISW}$	<p>M2</p> <p>A1</p>	<p>M1 for sight of: $\left[\left(\frac{96}{100} \times \frac{95}{99} \right) + \left(2 \times \frac{3}{100} \times \frac{96}{99} \right) + \left(2 \times \frac{1}{100} \times \frac{96}{99} \right) \right]$ OR $1 - \left[\left(\frac{96}{100} \times \frac{95}{99} \right) + \left(\frac{3}{100} \times \frac{96}{99} \right) + \left(\frac{1}{100} \times \frac{96}{99} \right) \right]$</p> <p>Allow $1(.21\dots) \times 10^{-3}$ OR $0.001(21\dots)$ or equivalent. An unsupported answer of $0.00121(2\dots)$ gains M2A1. AO for $0.001(21\dots)\%$. SC1 for working with replacement leading to an answer of $12/10000$ ($3/2500$) OR $0.001(2)$ [may be unsupported].</p>
<p>18. $(\cos CAB =) (13^2 + 17^2 - 23^2) / (2 \times 13 \times 17)$ $(= -71/442 \text{ OR } -0.16(06\dots))$ $(CAB =) 99(.2\dots^\circ)$</p>	<p>M2</p> <p>A1</p>	<p>M1 for $23^2 = 13^2 + 17^2 - 2 \times 13 \times 17 \times \cos CAB$</p> <p>SC1 for the correct evaluation of either of the two other angles. $ABC = 33(.9\dots)$ and $ACB = 46(.8\dots)$.</p>
<p>19. Sight of $9x^2 - 6x - 6x + 4$ Sight of $x^2 + x + 2x + 2$ $8x^2 - 15x + 2 = 0$</p> $x = \frac{-(-15) \pm \sqrt{(-15)^2 - 4 \times 8 \times 2}}{2 \times 8}$ $x = \frac{15 \pm \sqrt{161}}{16}$ <p>$x = 1.73$ with $x = 0.14$ (answers to 2dp)</p>	<p>B1</p> <p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>A1</p>	<p>Or equivalent.</p> <p>Or equivalent.</p> <p>FT expansions of equivalent level of difficulty provided B1 previously awarded. '= 0' required, but may be implied by an attempt to use the quadratic formula or if $a = 8, b = -15, c = 2$ used in the quadratic formula.</p> <p>This substitution into the formula must be seen for M1. FT 'their derived quadratic equation' equated to zero of equivalent difficulty (a, b and c must be non-zero). Allow one slip in substitution for M1 only, but must be correct formula.</p> <p>Can be implied from at least one correct value of x evaluated.</p> <p>CAO for their quadratic equation but not if complex roots. M0A0A0 if trial and improvement used or for unsupported answers.</p>
<p>20. Volume scale factor: $(\sqrt{199/47})^3 (= 8.712\dots)$ OR $(\sqrt{47/199})^3 (= 0.114\dots)$ or equivalent.</p> <p>Volume of larger solid $350 \times (\sqrt{199/47})^3$ OR $350 \div (\sqrt{47/199})^3$ or equivalent.</p> <p>$3049(.305\dots \text{cm}^3)$</p>	<p>B2</p> <p>M1</p> <p>A1</p>	<p>May be seen in parts.</p> <p>Award B1 for a linear scale factor: $\sqrt{(199/47)} (= 2.057\dots)$ OR $\sqrt{(47/199)} (= 0.485\dots)$ or equivalent OR Award B1 for $(199/47)^3 (= 75.904\dots)$ OR $(47/199)^3 (= 0.013\dots)$.</p> <p>CAO. Not from premature approximation.</p>

<p>6.(a) 0.3 shown for 'Does not visit 'Erddig Gardens'. Use of $0.7 \times \dots = 0.28$ $P(\text{goes to 'Bersham Heritage Centre'}) = 0.4$ Second set of branches 0.4, 0.6, 0.4, 0.6</p>	<p>B1 M1 A1 A1</p>	<p>Implied by sight of 0.4 (on 'top branch' of the four on the right) F.T. 'their 0.4' BUT dependent on M1 gained. (i.e. MOAOAO for 0.28 and 0.72 on branches.)</p>
<p>6.(b) 0.7×0.6 $= 0.42$ ISW</p>	<p>M1 A1</p>	<p>F.T. $0.7 \times$ 'their 0.6' only if $0 <$ 'their 0.6' < 1 0.42 gains M1A1.</p>
<p>7. (area) Volume Length Volume None Area</p>	<p>B3</p>	<p><i>Must use the terminology given in the question.</i> B3 for all 5 correct. B2 for 3 or 4 correct. B1 for 2 correct. B0 otherwise.</p>
<p>8.(a) $(x + 7)(x - 3)$ $(x =) -7$ AND $(x =) 3$</p>	<p>B2 B1</p>	<p>B1 for $(x \dots 7)(x \dots 3)$. Strict F.T. from their <u>brackets</u>. Allow the following. B2 for $x + 7 (=0)$ AND $x - 3 (=0)$ (B1) $(x =) -7$ AND $(x =) 3$ (B1) B1 for $x - 7 (=0)$ AND $x + 3 (=0)$ (B0) $(x =) 7$ AND $(x =) -3$ (B1) FT B1 if only $(x =) -7$ AND $(x =) 3$ seen. (B1)</p>
<p>8.(b) Correct method for clearing <u>all three</u> fractions. Accurate clearing of fractions AND expansion of brackets on lhs. $24x = 36$ or equivalent. $x = \frac{36}{24}$ or equivalent</p>	<p>M1 A1 A1 A1</p>	<p>FT until 2nd error. May be seen in stages. Allow if all over a common denominator. May be seen in stages For collection of terms. FT from 'their $ax = b$' ONLY if M1 gained AND <u>no more than one previous error</u>. If no marks, allow SC1 for sight of $\frac{2(2x - 3) + 5(4x + 5)}{(10)}$ If FT answer is a whole number then it must be shown as an integer. Allow a correct embedded answer of 1.5 or $1\frac{1}{2}$ BUT penalise -1 if followed by $x \neq 1.5$ or $1\frac{1}{2}$. Note : An answer of 1.5 that is found without gaining M1 OR that is not embedded is zero marks.</p>
<p>9.(a) 40.5</p>	<p>B1</p>	
<p>9.(b) $(25.5 + 25.5 =)$ 51</p>	<p>B1</p>	
<p>9.(c) $(11.5 + 11.5 =)$ 23</p>	<p>B1</p>	

<p>Second variable found.</p> <p>7.(a) $20 \times 15 - \pi \times 4^2$ $\times 10$ $2497(\dots)$ OR $3000 - 160\pi$</p>	<p>A1 M1 m1 A1</p>	<p>Accept an answer between 2497 and 2498 inclusive OR 2500. SC1 for sight of $\pi \times 4^2 \times 10$ OR 160π (accept 502 to 503 inclusive).</p>
<p>7.(b) (Mass =) $2497(\dots) \times 2.4$ OR $2497(\dots) \times 0.0024$ $= 5993.6(\dots)(g)$ OR $5.9936(\dots)(kg)$ $6(kg)$</p>	<p>M1 A1 A1</p>	<p>F.T. 'their volume in (a)' Accept value truncated or rounded to a whole number. Ignore units. F.T. from 'their 5993.6..g' or 'their 5.9936..kg' ONLY if M1 awarded AND 'their 5993.6..g' > 500g or 'their 5.9936..kg' > 0.5kg If no marks awarded, allow SC1 for (Mass =) 'their volume' \times density, where density may have incorrect place value e.g. '2497(\dots) \times 0.024'</p>

<p>10. (Slant height of cone =) $\sqrt{(12^2 + 9^2)}$ $= 15 \text{ (cm)}$</p> <p>(Curved surface area of cone =) $\pi \times 9 \times 15$ $= 135 \pi \text{ (cm}^2\text{)}$</p> <p>(Curved surface area of hemisphere =) $\frac{1}{2} \times (4 \times \pi \times 8^2)$ or equivalent $= 128 \pi \text{ (cm}^2\text{)}$</p> <p>Cone (has the greater curved surface area)</p>	<p>M1 A1</p> <p>M1 A1</p> <p>M1 A1</p> <p>B1</p>	<p>Method for finding hypotenuse. Accept use of (3,4,5) x 3.</p> <p>F.T. 'their derived slant height' (not 12). ISW. [For reference, $135 \pi = 423.9$]</p> <p>SC1 for an answer of $108 \pi \text{ (cm}^2\text{)}$ [= 339.1(2)] (from taking 12 cm as the slant height)</p> <p>An answer of $216 \pi \text{ (cm}^2\text{)}$ [= 678.2(4)] (from including area of circle) gains M1 A1 SC1</p> <p>ISW. [$128 \pi = 401.9(2)$]</p> <p>SC1 for an answer of $256 \pi \text{ (cm}^2\text{)}$ [= 803.8(4)] (from omitting $\frac{1}{2}$) or for an answer of $192 \pi \text{ (cm}^2\text{)}$ [= 602.8(8)] (from including area of circle).</p> <p>Penalise -1 once only if any A or SC marks have previously been awarded for (correct) <u>decimal</u> answers.</p> <p>Do not accept an unsupported statement. F.T. 'their areas' provided at least M1 or SC1 awarded for <u>each</u> solid (regardless of any penalty for decimal answers). (For the cone, either M1 mark can contribute to this FT.)</p>
<p>Organisation and Communication.</p> <p>Accuracy of writing.</p>	<p>OC1</p> <p>W1</p>	<p>For OC1, candidates will be expected to:</p> <ul style="list-style-type: none"> • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanation and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means <p>For W1, candidates will be expected to:</p> <ul style="list-style-type: none"> • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc

<p>10.(a)(i) Correct reason given. e.g. 'An angle at the circumference subtended by a diameter is a right angle'. 'line AC is a diameter'</p>	<p>E1</p>	<p>Accept any correct unambiguous wording. The key word is 'diameter'. Allow eg 'angle in a semicircle is 90°', 'line AC goes through the centre', 'opposite a diameter' Do not accept 'because it's a right angle'.</p>
<p>10.(a)(ii) $\tan x = \frac{7.5}{4.7}$ $x = \tan^{-1}(7.5 / 4.7)$ or $\tan^{-1} 1.6$ or $\tan^{-1} 1.59(\dots)$ $= 57.9(\dots)^\circ$ or $57.8(\dots)^\circ$ or 58°</p>	<p>M1 m1 A1</p>	<p>Implies M1. C.A.O. <u>Alternative method to find x</u> A correct and complete method (using Pythagoras's theorem and a trigonometric relationship). M2 $x = 57.9(\dots)^\circ$ or $57.8(\dots)^\circ$ or 58° CAO A1</p>
<p>10.(b) $(y =) 58^\circ$ Correct circle theorem given. e.g. 'angles (at the circumference) subtended by the same chord (or arc) are equal', 'angles in the same segment (are equal)'.</p>	<p>B1 E1</p>	<p><u>Strict</u> FT of 'their x'. Accept any correct unambiguous wording. Allow eg 'angles on the same chord (are equal)' Do not accept e.g. 'they are equal' on its own.</p>
<p>11. 2^{400}</p>	<p>B2</p>	<p>B1 for $(2^{100})^4$ OR sight of 2^4</p>
<p>12. (Height =) $\frac{3 \times 5533}{825}$ OR $\frac{5533}{\frac{1}{3} \times 825}$ $= 20.1(2 \text{ cm})$ ----- <i>Alternative method (finding the radius first):</i> Use $A = \pi r^2$ to evaluate r or r^2. (Height =) $\frac{3 \times 5533}{\pi \times 16.2(05\dots)^2}$ OR $\frac{5533}{\frac{1}{3} \times \pi \times 16.2(05\dots)^2}$ OR $\frac{3 \times 5533}{\pi \times 262.6(\dots)}$ OR $\frac{5533}{\frac{1}{3} \times \pi \times 262.6(\dots)}$ $= 20.1(2\dots \text{ cm})$</p>	<p>M2 A1 M2 A1</p>	<p>M1 for $5533 = 1/3 \times \text{height} \times 825$ or equivalent. Allow an answer of 20(cm) from correct working. <i>Allow use of $\pi = 3.14, 3.142$ or $3.14(59\dots)$. When using the π button on the calculator, $r = 16.2(05\dots)$ OR $r^2 = 262.6(\dots)$.</i> <i>There will be no FT for any radius other than $r = 16\text{cm}$, from working seen.</i> M1 for $5533 = 1/3 \times \text{height} \times \pi \times 16.2(05\dots)^2$ or equivalent. Allow M1 for use of $r = 16$ (cm) Allow an answer of 20(cm) from correct working. Accept an answer in the range 20.10 to 20.143(cm) <u>FT base radius = 16 cm</u>: Allow an answer in the range 20.6(cm) to 20.65(cm) OR 21(cm) from correct working.</p>
<p>13.(a) $(2x + 9)(2x - 9)$</p>	<p>B2</p>	<p>B1 for $(2x \dots 9)(2x \dots 9)$</p>
<p>13.(b) $(7x - 4)(x + 2)$</p>	<p>B2</p>	<p>B1 for $(7x \dots 4)(x \dots 2)$</p>
<p>13.(c) $(x + 2)^2(x + 7)$ OR $(x + 2)(x + 2)(x + 7)$</p>	<p>B2</p>	<p>B1 for $(x + 2)^2(x + 2 + 5)$ OR $(x + 2)[(x + 2)^2 + 5(x + 2)]$ OR $(x + 7)(x^2 + 4x + 4)$ OR $(x + 2)(x^2 + 9x + 14)$. Allow B1 for $(x + 2)^2(x + k)$ where $k \neq 0, 2$ or 7.</p>
<p>14. $-\frac{1}{2}$ or equivalent</p>	<p>B2</p>	<p>B1 for -2 or $\frac{1}{2}$.</p>
<p>15. $2n^2 + 1$ or equivalent $= 20001$</p>	<p>B2 B1</p>	<p>B1 for sight of $2n^2$ OR for sight of consistent 2nd difference 4. FT from their $2n^2 \pm k$, where $k \neq 0$ OR from their $2n^2 \pm an$, where $a \neq 0$ OR from their $2n^2 \pm an \pm k$, where $a \neq 0, k \neq 0$. An unsupported answer of 20001 gains all 3 marks. If no marks, award SC1 for an unsupported answer of 20000.</p>

<p>8. Showing $4x + 3y = 19$ or equivalent. Showing $6x - y = 12$ or equivalent.</p> <p>A correct method to eliminate one variable e.g. 'equal coefficients AND appropriate addition or subtraction'. OR 'method of substitution'.</p> <p>First variable found, $x = 2\frac{1}{2}$ or $y = 3$. Second variable found</p>	<p>B1 B1 M1 A1 A1</p>	<p>$2x + 2x + 3y = 19$ is an equivalent answer.</p> <p><i>Workings must be shown for M1A1A1.</i> FT to solve for simultaneous equations if of equivalent difficulty. Allow one error in one term (not the term with equal coefficients.)</p> <p>C.A.O. for 'their equations'. FT substitution of their '1st variable' if M1 gained. If NO (i.e. none of the five) marks gained, allow SC1 for <u>both</u> answers of $x = 2\frac{1}{2}$ AND $y = 3$</p>
<p>9. <u>Enlargement</u> with scale factor $-\frac{1}{2}$ and centre $(1, 0)$</p>	<p>B3</p>	<p>Award B2 for reference to any two of 'enlargement', '$-\frac{1}{2}$' and 'centre $(1, 0)$'.</p> <p>Award B1 for reference to any one of 'enlargement', '$-\frac{1}{2}$' and 'centre $(1, 0)$'.</p> <p>If B0, award 1 mark for reference to 'enlargement' within a multi-stage transformation.</p>
<p>10. Sight of $20x^2 + 15x - 8x^2 + 4x$ or equivalent.</p> <p>Sight of denominator of $(2x - 1)(4x + 3)$</p> <p>$\frac{12x^2+19x}{(2x-1)(4x+3)}$ OR $\frac{12x^2+19x}{8x^2+2x-3}$</p>	<p>B2 B1 B1</p>	<p>Award B1 for sight of $5x(4x + 3) - 4x(2x - 1)$ OR three of the four terms correct.</p> <p>Must be seen or stated as the denominator.</p> <p>FT from one error in numerator. Note the numerator may be factorised as $x(12x + 19)$ Mark final answer.</p>
<p>11. (Area scale factor =) Sight of $(\frac{7}{5})^2 (= \frac{49}{25})$ OR $1 \cdot 4^2 (= 1 \cdot 96)$</p> <p>$\frac{49}{25} (< 2)$ or $1 \cdot 96 (< 2)$ AND 'No (Mari is not correct)'</p>	<p>B1 B1</p>	<p>Or equivalent Accept a method based on ratios e.g. $5^2 : 7^2 = 25 : 49 = 1 : \frac{49}{25}$</p> <p>Accept any equivalent statement. Accept $(\frac{7}{5})^2 < 2$ or $1 \cdot 4^2 < 2$ or equivalent. B0 if evaluation of $(\frac{7}{5})^2$ or $1 \cdot 4^2$ is incorrect.</p>
<p><u>Alternative method (using scale factor 2)</u></p> <p>$5^2 \times 2 (= 50)$</p> <p>$(7^2 =) 49 < 50$ AND 'No (Mari is not correct)'</p>	<p>B1 B1</p>	<p>Accept a method based on ratios e.g. $5^2 : 7^2 = 25 : 49 = \frac{25}{49} : 1$</p> <p>Accept any equivalent statement e.g. $\sqrt{49} < \sqrt{50}$ B0 if evaluation of 5^2 or 7^2 is incorrect.</p>
<p>12. $xw + 8w = 3y - 4$ or $4 - 3y = -xw - 8w$</p> <p>$w(x + 8) = 3y - 4$ or $4 - 3y = w(-x - 8)$</p> <p>$w = \frac{3y - 4}{x + 8}$ or $w = \frac{4 - 3y}{-x - 8}$ or equivalent</p>	<p>B1 B1 B1</p>	<p>Collecting w terms. F.T. until 2nd error provided equivalent difficulty</p> <p>Factorising. Accept $4 - 3y = -w(x + 8)$</p> <p>Dividing. Mark final answer.</p> <p>$\frac{4 - 3y}{x + 8} = -w$ only gains B1B1B0</p>

<p>15.</p> $\pi \times 3^2 \times h + \frac{2}{3} \times \pi \times 3^3 = 63\pi \quad \text{or equivalent}$ <p>Allow $\frac{\frac{4}{3} \times \pi \times 3^3}{2}$ for $\frac{2}{3} \times \pi \times 3^3$.</p> $9\pi h = 63\pi - 18\pi \quad \text{or } h = \frac{63\pi - 18\pi}{9\pi}$ <p>or equivalent e.g. $\frac{45\pi}{9\pi} = 5 \text{ (cm)}$</p> <p>(Total height =) 8 (cm)</p>	<p>M2 (Using 'h' as height of cylinder) M1 for summing 2 terms and equating to 63π, with 1 term being correct</p> <p>M1 may be implied by a subtraction or seen in stages e.g. $9\pi h = 27\pi$ from $63\pi - 36\pi$ or $9\pi h = 36\pi$ from $63\pi - 27\pi$ or $9\pi h = 57\pi$ from $63\pi - 6\pi$ (using incorrect evaluations for volume of hemisphere)</p> <p>Allow the use of $\pi = 3 \cdot 14$.</p> <p>m1 Isolating the term in h. FT from M1 or M2.</p> <p>A1 C.A.O.</p> <p>B1 FT 'their 5' + 3 provided M1m1 or M2m1 awarded</p> <p>If no marks, award SC1 for 18π for the volume of the hemisphere (but NOT from a calculation for surface area) OR SC2 for 45π for the volume of the cylinder.</p>
<p><u>Alternative method</u></p> $\pi \times 3^2 \times (H - 3) + \frac{2}{3} \times \pi \times 3^3 = 63\pi \quad \text{or equivalent}$ <p>Allow $\frac{\frac{4}{3} \times \pi \times 3^3}{2}$ for $\frac{2}{3} \times \pi \times 3^3$.</p> $9\pi(H - 3) = 63\pi - 18\pi$ <p>or equivalent e.g. $9\pi H = 63\pi - 18\pi + 27\pi$</p> $(H =) \frac{63\pi - 18\pi + 27\pi}{9\pi} \quad \text{or equivalent e.g. } \frac{72\pi}{9\pi}$ <p>(Height of object =) 8 (cm)</p>	<p>M2 (Using 'H' as total height of object) M1 for summing 2 terms and equating to 63π, with 1 term being correct. M1 may be implied by a subtraction or seen in stages.</p> <p>Allow the use of $\pi = 3 \cdot 14$.</p> <p>m1 Isolating the term in (H - 3). FT from M1 or M2.</p> <p>A1 FT from M1m1 or M2m1.</p> <p>A1 C.A.O.</p> <p>If no marks, award SC1 for 18π for the volume of the hemisphere (but NOT from a calculation for surface area) OR SC2 for 45π for the volume of the cylinder OR SC2 for an appropriate volume of 72π.</p>
<p>16. (a) $3\sqrt{2}$</p>	<p>B1</p>
<p>16. (b) 2</p>	<p>B1</p>
<p>16. (c) $9\sqrt{3}$</p>	<p>B1</p>

<p>17. 218° and 322° with no other values</p>	<p>B2</p>	<p>B1 for either angle. Check diagram. Ignore extra (correct or incorrect) values outside the required range. Penalise -1 for each extra value within range (beyond 2 attempts). If no marks, SC1 for accurate evaluations from consistent use of $180+n$ AND $360-n$ (with n acute). Method must be seen for this mark.</p>
<p>18. (a) $\frac{1}{7} \times \frac{3}{6} \times \frac{2}{5}$ or equivalent $8/210 (= 4/105)$</p>	<p>M1 A1</p>	<p>Penalise once only throughout for a repeated error in calculating the denominator (of 210) ISW</p>
<p>18. (b) $1 - P(3, 3, 3)$ $1 - \frac{1}{7} \times \frac{3}{6} \times \frac{2}{5}$ $\frac{186}{210} (= \frac{93}{105} = \frac{62}{70} = \frac{31}{35})$</p>	<p>M1 M1 A1</p>	<p>ISW If no other marks, award SC1 for an answer of $\frac{279}{343}$ (from working 'with replacement') OR SC1 for sight of $\frac{1}{7} \times \frac{3}{6} \times \frac{2}{5}$</p>
<p><u>Alternative method</u> $(P(\text{total}10)+P(\text{total}11)+P(\text{total}12)+P(\text{total}13)+P(\text{total}14)=)$ $P(3,3,4) \times 3 + P(3,3,5) \times 3 + P(3,4,5) \times 6$ $+ P(3,5,5) \times 3 + P(4,5,5) \times 3$ $= \frac{1}{7} \times \frac{3}{6} \times \frac{1}{5} \times 3 + \frac{1}{7} \times \frac{3}{6} \times \frac{2}{5} \times 3 + \frac{1}{7} \times \frac{1}{6} \times \frac{2}{5} \times 6 + \frac{1}{7} \times \frac{2}{6} \times \frac{1}{5} \times 3 + \frac{1}{7} \times \frac{2}{6} \times \frac{1}{5} \times 3$ $\frac{186}{210} (= \frac{93}{105} = \frac{62}{70} = \frac{31}{35})$</p>	<p>M1 M1 A1</p>	<p>M0 if orderings are not considered ISW If no marks awarded, award SC1 for the correct method for calculating any individual total, e.g. $P(\text{total } 10) = \frac{1}{7} \times \frac{3}{6} \times \frac{1}{5} \times 3$ or equivalent For information only: $P(10) = \frac{36}{210} (= \frac{6}{35})$ $P(11) = \frac{72}{210} (= \frac{12}{35})$ $P(12) = \frac{48}{210} (= \frac{8}{35})$ $P(13) = \frac{24}{210} (= \frac{4}{35})$ $P(14) = \frac{6}{210} (= \frac{1}{35})$ OR award SC1 for a calculation leading to an answer of $\frac{54}{210}$ (from adding probabilities without accounting for different ordering) OR award SC1 for an answer of $\frac{279}{343}$ (from working 'with replacement').</p>

<p>3. (Diameter =) $24.8 \div 2 \times 3$ OR (Radius =) $24.8 \div 2 \times 3 \div 2$ or equivalent</p> <p>(Diameter =) 37.2 (cm) OR (Radius =) 18.6 (cm)</p> $\pi \times \left(\frac{37.2}{2}\right)^2 \times 24.8 \quad \text{or} \quad \pi \times 18.6^2 \times 24.8$ $= 27000 \text{ (cm}^3\text{)}$	<p>M1</p> <p>A1</p> <p>M1</p> <p>A2</p>	<p>Sight of 1086 to 1087 (cm²) (base area calculated with radius 18.6) OR 4345 to 4348 (cm²) (base area calculated with diameter) implies first M1 A1. If diameter AND radius given and radius \neq 18.6 either:</p> <ul style="list-style-type: none"> award M1A0 (for sight of diameter = 37.2) if their stated radius is then used to find the volume of the cylinder (2nd M mark is awarded) or award M1A1 (for sight of diameter = 37.2) if their incorrect radius is not used to find the volume of the cylinder (2nd M mark is not awarded). <p>May be seen in parts. Accept $3.14 \times 18.6^2 \times 24.8$ or equivalent. FT 'their stated radius' OR 'their stated diameter', provided it is halved at the appropriate stage.</p> <p>For A2, must be correct to 2sf. A1 for an answer between 26940 and 26960 (cm³) inclusive.</p> <p><u>Note:</u> (Diameter =) $24.8 \div 5 \times 3$ OR (Radius =) $24.8 \div 5 \times 3 \div 2$ M0 (Diameter =) 14.88 (cm) OR (Radius =) 7.44 (cm) A0</p> $\pi \times 7.44^2 \times 24.8 \quad \text{M1}$ $4300 \text{ (cm}^3\text{)} \quad \text{A2}$ <p>A1 for answer between 4310 and 4314 (cm³) inclusive</p> <p>If M0 (2nd M mark) then award SC1 for an answer of either:</p> <ul style="list-style-type: none"> 110000 (cm³) (from use of $\pi \times 37.2^2 \times 24.8$ rounded correctly) OR 17000 (cm³) (from use of $\pi \times 14.88^2 \times 24.8$ rounded correctly). <p>FT 'their stated diameter' correctly rounding to 2sf for this SC1.</p>
---	---	--

<p>9. (Area of circular face=) $\pi \times 34^2 (= 1156\pi)$</p> <p>(Curved surface area of hemisphere=) $2 \times \pi \times 34^2$ o.e.</p> <p>(Total surface area=) $3468 \pi \text{ (cm}^2\text{)}$ or answers in the range: $10889.4 \text{ (cm}^2\text{)}$ to $10896.6 \text{ (cm}^2\text{)}$</p>	<p>M1</p> <p>M2</p> <p>A1</p>	<p>Accept values between 3629.8 and 3632.2 if $\pi \times 34^2$ or 1156π not seen.</p> <p>2312π or values between 7259.6 and 7264.4 M1 for sight of $4 \times \pi \times 34^2$ or 4624π or values between 14519 and 14529.</p> <p>Sight of $3 \times \pi \times 34^2$ implies M1 M2.</p> <p>CAO. Mark final answer. Allow an answer of 10900 from correct working.</p> <p>If no marks awarded, award SC2 for an unsupported $5 \times \pi \times 34^2$ (5780π or values between 18 149 and 18 160.8).</p>
---	-------------------------------	---

<p>17. <u>Method using the linear scale factor</u></p> <p>(Linear scale factor=) $\sqrt[3]{\frac{4913}{8000}}$ OR $\frac{\sqrt[3]{4913}}{\sqrt[3]{8000}}$ (= 0.85 or $\frac{17}{20}$)</p> <p>(Height of Solid B=) $\sqrt[3]{\frac{4913}{8000}} \times 30$ = 25.5 (cm)</p>	<p>B1</p> <p>M1</p> <p>A1</p>	<p>Or equivalent.</p> <p>F.T. their derived linear scale factor (from $\sqrt[3]{}$)</p> <p>CAO.</p>
<p>17. <u>Alternative method using the linear scale factor</u></p> <p>(Linear scale factor=) $\sqrt[3]{\frac{8000}{4913}}$ OR $\frac{\sqrt[3]{8000}}{\sqrt[3]{4913}}$ (= 1.17647... or $\frac{20}{17}$)</p> <p>(Height of Solid B=) $30 \div \sqrt[3]{\frac{8000}{4913}}$ = 25.5(cm)</p>	<p>B1</p> <p>M1</p> <p>A1</p>	<p>Or equivalent.</p> <p>F.T. their derived linear scale factor (from $\sqrt[3]{}$)</p> <p>CAO</p>
<p>17. <u>Method using the volume scale factor</u></p> <p>$\frac{h^3}{30^3} = \frac{4913}{8000}$ (=0.614...)</p> <p>(Height of solid B=) $\sqrt[3]{30^3 \times \frac{4913}{8000}}$ OR $\sqrt[3]{30^3 \div \frac{8000}{4913}}$ = 25.5 (cm)</p>	<p>B1</p> <p>M1</p> <p>A1</p>	<p>Must include $\frac{h^3}{30^3}$ or equivalent, e.g. $\left(\frac{h}{30}\right)^3 = \frac{4913}{8000}$</p> <p>CAO</p>
<p>17. <u>Alternative method using the volume scale factor</u></p> <p>$\frac{30^3}{h^3} = \frac{8000}{4913}$ (=1.628...)</p> <p>(Height of solid B=) $\sqrt[3]{30^3 \div \frac{8000}{4913}}$ OR $\sqrt[3]{30^3 \times \frac{4913}{8000}}$ = 25.5 (cm)</p>	<p>B1</p> <p>M1</p> <p>A1</p>	<p>Must include $\frac{30^3}{h^3}$ or equivalent, e.g. $\left(\frac{30}{h}\right)^3 = \frac{8000}{4913}$</p> <p>CAO</p>

Unit 2: Higher Tier	Mark	Comments				
<p>1.</p> <p>(Tax at 22%) 0.22×15000 or $0.22 \times (25000 - 10000)$ or equivalent</p> <p>(Tax at 35%) 0.35×3000 or $0.35 \times (28000 - 25000)$ or equivalent</p> <p>(Total tax due $3300 + 1050 =$ 4350 (euros)</p> <p>(Tax still owed $4350 - 3600 =$) 750 (euros)</p>	<p>M2</p> <p>M2</p> <p>A2</p> <p>B1</p>	<p>Ignore £ for € throughout M1 for appropriate sight of $25000 - 10000 (= €15000)$</p> <p>M1 for $28000 - 25000 (= €3000)$</p> <p>CAO A1 for sight of 3300 (euros) or 1050 (euros)</p> <p>FT for positive answers only, 'their derived $4350' - 3600$, provided $3300 + \dots$ or $\dots + 1050$ seen, i.e. sum of two amounts with at least one amount correct</p> <p><u>If no marks, for special cases award one of the following:</u></p> <table border="1" data-bbox="852 667 1422 913"> <tr> <td data-bbox="852 667 1289 801"> $(0.22 \times (28000 - 3600 - 10000) =)$ $(0.22 \times (24400 - 10000) =)$ $(0.22 \times 14400 =)$ <p style="text-align: right;">(€) 3168</p> </td> <td data-bbox="1289 667 1422 801"> <p>SC2</p> </td> </tr> <tr> <td data-bbox="852 801 1289 913"> $0.22 \times (28000 - 3600 - 10000)$ or $0.22 \times (24400 - 10000)$ or 0.22×14400 </td> <td data-bbox="1289 801 1422 913"> <p>SC1</p> </td> </tr> </table>	$(0.22 \times (28000 - 3600 - 10000) =)$ $(0.22 \times (24400 - 10000) =)$ $(0.22 \times 14400 =)$ <p style="text-align: right;">(€) 3168</p>	<p>SC2</p>	$0.22 \times (28000 - 3600 - 10000)$ or $0.22 \times (24400 - 10000)$ or 0.22×14400	<p>SC1</p>
$(0.22 \times (28000 - 3600 - 10000) =)$ $(0.22 \times (24400 - 10000) =)$ $(0.22 \times 14400 =)$ <p style="text-align: right;">(€) 3168</p>	<p>SC2</p>					
$0.22 \times (28000 - 3600 - 10000)$ or $0.22 \times (24400 - 10000)$ or 0.22×14400	<p>SC1</p>					
<p>Organisation and communication</p> <p>Writing</p>	<p>OC1</p> <p>W1</p>	<p>For OC1, candidates will be expected to:</p> <ul style="list-style-type: none"> • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanations and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means <p>For W1, candidates will be expected to:</p> <ul style="list-style-type: none"> • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc. 				

Unit 1: Higher Tier	Mark	Comments
<p>1(a) (North orchard, number of pear trees is) $3 \times 35 + (4 + 3)$ or 3×5 or equivalent 15 (pear trees)</p> <p>(West orchard number of pear trees is 2×15) 30 (pear trees)</p> <p>(West orchard number of cherry trees is) $11 \times 30 \div 5$</p> <p>66 (cherry trees)</p>	<p>M1</p> <p>A1</p> <p>B1</p> <p>M1</p> <p>A1</p>	<p>FT 'their derived 15'</p> <p>FT 'their derived number of pear trees' Allow M1 for a final answer of 88 (cherry trees from use of 40 apple trees as pear trees), but A0</p> <p>FT answer must be evaluated correctly and lead to a whole number</p>
<p>Organisation and communication</p> <p>Writing</p>	<p>OC1</p> <p>W1</p>	<p>For OC1, candidates will be expected to:</p> <ul style="list-style-type: none"> • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanations and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means <p>For W1, candidates will be expected to:</p> <ul style="list-style-type: none"> • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc.
<p>1(b) (Mass of apples to make juice) 5280 $\div 6$ $\div 2.2$ 400 (kg)</p> <p>(Number of litres of juice produced) $400 \times 2 \div 5$ or $2 \div (5 \div 400)$ or $2 \times \frac{400}{5}$</p> <p>160 (litres)</p>	<p>M1</p> <p>M1</p> <p>A2</p> <p>M1</p> <p>A1</p>	<p>Method may be seen in either order M0 for statement '1/6 of 5280' without calculation</p> <p>Ignore incorrect units given May be seen or implied in later working</p> <p>A1 for any one of the following:</p> <ul style="list-style-type: none"> • $(5280 \div 2.2 =) 2400$ • $(5280 \div 6 =) 880$ • a correct evaluation of 'their 2400' $\div 6$ • a correct evaluation of 'their 880' $\div 2.2$ <p>FT 'their derived 400(kg)' (not 5280) If 'their derived 400' is used as g (rather than kg) allow M1 for 'their derived 400' $\times 2 \div 5000$ or $2 \div (5000 \div \text{'their derived 400'})$, but A0</p>
<p>1(b) <u>Alternative method</u></p> <p>(Mass of apples used to make juice) $5280 \div 6$ 880 (lbs)</p> <p>(Mass of apples in 2 litres) 5×2.2 11 (lbs)</p> <p>(Number of litres of juice produced) $2 \times 880 \div 11$ 160 (litres)</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p>FT 'their derived 880' and 'their derived 11'</p>

1(c) $3 \times 48 \div 8$ or equivalent

18 (cm)

M1
A1

4(a) $\sqrt{\frac{25}{\pi}}$ or $\frac{5}{\sqrt{\pi}}$ or $\frac{\sqrt{25}}{\sqrt{\pi}}$ or equivalent	B2	ISW Accept $\sqrt{(25 \div \pi)}$ or $5 \div \sqrt{\pi}$ or $\sqrt{25} \div \sqrt{\pi}$ For B1 accept π given as 3.1(4...) B1 for sight of any of the following: <ul style="list-style-type: none"> • $\pi \times \text{radius}^2 = 25$ • $r^2 = 25 / \pi$ • $\pi r^2 = 25$ • $\sqrt{25} / \pi$ • $\sqrt{25} \div \pi$ • $5/\pi$
4(b)(i) $500 \times 60 \div 4$ or equivalent 7500 (cm ³ per minute)	M1 A1	May be seen in stages Answer given within the statement takes precedence

4(b)(ii) $500 \div (2 \times 25)$ or equivalent

10 (cm)

M1
A1

May be seen in stages

6.	(Volume)	'	<i>Must use the terminology given in the question.</i> B3 for all 5 correct. B2 for 3 or 4 correct. B1 for 2 correct. B0 otherwise.
	Area		
	None		
	Volume		
	Length		
	None		

<p>7(a) Strategy of using Pythagoras in 2 different planes to calculate the vertical height</p> $115^2 + 115^2 \text{ OR } \frac{230^2 + 230^2}{4} \text{ OR } 217^2 - 115^2$ <p>(Vertical height =)</p> $\sqrt{217^2 - (115^2 + 115^2)} \text{ OR } \sqrt{217^2 - \frac{230^2 + 230^2}{4}}$ $(\text{=}\sqrt{20639})$ $= 143.6(627\dots) \text{ to } 143.7 \text{ (m)}$ <p>(Volume of pyramid =)</p> $\frac{1}{3} \times 230 \times 230 \times 143.6(627\dots)$ $= 2533254(.034) \text{ (m}^3\text{)}$	<p>S1</p> <p>M1</p> <p>M2</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p>Or their square roots Note: $115^2 + 115^2$ and $\frac{230^2 + 230^2}{4} = 26450$, and $\sqrt{115^2 + 115^2}$ and $\frac{\sqrt{230^2 + 230^2}}{2} = 162.6(3\dots)$</p> <p>Awarding of M2 or M1 here implies previous S1M1 M1 for $217^2 - (115^2 + 115^2)$ or M1 for $217^2 - \frac{230^2 + 230^2}{4}$ or equivalent, or M1 for $217^2 = h^2 + (115^2 + 115^2)$ or M1 for $217^2 = h^2 + \frac{230^2 + 230^2}{4}$ or equivalent</p> <p>Allow 144 (m) provided no incorrect work seen</p> <p>FT 'their derived 143.6(627...)'</p> <p>Allow answers of 2530000 to 2534000 A height of:</p> <ul style="list-style-type: none"> • 143.6 leads to 2532146(.667) (m³) • 143.66 leads to 2533204(.667) (m³) • 143.7 leads to 2533910 (m³) • 144 leads to 2539200 (m³), allowing answers of 2539000 to 2540000
<p>7(b)(i) $\frac{A}{1+\tan 58} = b^2$ OR $\frac{A}{1+\tan 58} = 12^2$ OR $\frac{A}{1+\tan 58} = 144$</p> <p>(A =) $b^2(1 + \tan 58)$ OR (A =) $12^2(1 + \tan 58)$ OR (A =) $144(1 + \tan 58)$</p> <p>(A =) 374.4(481...) (cm²)</p>	<p>B1</p> <p>B1</p> <p>B1</p>	<p>Note: $1 + \tan 58(^\circ) = 2.6(00334\dots)$</p> <p>Implies previous B1</p> <p>Implies previous B1B1</p>
<p>7(b)(ii) (Area factor =) $\left(\frac{31.5}{15}\right)^2$ OR $\left(\frac{15}{31.5}\right)^2$ or 2.1^2 OR $0.476\dots^2$ (= 4.41) (= 0.2267...)</p> <p>(Area of large souvenir to be painted =)</p> $400 \times \left(\frac{31.5}{15}\right)^2 \text{ OR } 400 \times \left(\frac{15}{31.5}\right)^2$ $= 1764 \text{ (cm}^2\text{)}$	<p>B1</p> <p>M1</p> <p>A1</p>	<p>May be implied in further working</p>

<p>9.(a)</p> $400 \times \frac{5}{4} \times \frac{3}{2} \quad \text{OR}$ $400 \times 1.25 \times 1.5 \quad \text{OR}$ $50 \times 5 \times 3$ <p style="text-align: right;">= 750 (ice creams)</p>	<p>M2</p> <p>A1</p>	<p><u>A table method altering all 3 at the same time is M0</u></p> <p>M1 for $400 \times 5/4 (= 500)$ or $400 \times 3/2 (= 600)$ or equivalent e.g. <table style="display: inline-table; border-collapse: collapse; vertical-align: middle;"> <thead> <tr> <th style="text-align: left; padding-right: 10px;"><u>Ice creams</u></th> <th style="text-align: left; padding-right: 10px;"><u>Hours</u></th> <th style="text-align: left; padding-right: 10px;"><u>Shops</u></th> <th></th> </tr> </thead> <tbody> <tr> <td>500</td> <td>5</td> <td>2</td> <td>or</td> </tr> <tr> <td>600</td> <td>4</td> <td>3</td> <td>or</td> </tr> <tr> <td>50</td> <td>1</td> <td>1</td> <td></td> </tr> </tbody> </table> </p> <p>CAO</p>	<u>Ice creams</u>	<u>Hours</u>	<u>Shops</u>		500	5	2	or	600	4	3	or	50	1	1	
<u>Ice creams</u>	<u>Hours</u>	<u>Shops</u>																
500	5	2	or															
600	4	3	or															
50	1	1																
<p>9(b) (Volume of half cone =) $\frac{1}{6} \times \pi \times 3^2 \times h$</p> <p>(Volume of half hemisphere =) $\frac{1}{3} \times \pi \times 3^3$</p> $\frac{1}{6} \times \pi \times 3^2 \times h = \frac{1}{3} \times \pi \times 3^3 \quad \text{or equivalent}$ <p style="text-align: right;">h = 6 (m)</p> $(x^2 =) 6^2 + 3^2$ <p style="text-align: center;">x² = 45 or (x =) $\sqrt{45}$</p> <p style="text-align: right;">(x =) $3\sqrt{5}$ (m)</p>	<p>B1</p> <p>B1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>B2</p>	<p>or equivalent e.g. $\frac{9\pi}{6} \times h$</p> <p>or equivalent e.g. 9π</p> <p>FT their volumes provided B1 previously awarded and the incorrect volume is a multiple of the correct one</p> <p>Note: An equation using <u>consistent multiples</u> of these expressions that, when correctly solved, would give the answer of 6(m) implies the previous B1 marks e.g. a cone equated to a hemisphere, $\frac{1}{3}\pi \times 3^2 \times h = \frac{2}{3}\pi \times 3^3$ is awarded B1B1M1 and possible A1, but a cone equated to a sphere, $\frac{1}{3}\pi \times 3^2 \times h = \frac{4}{3}\pi \times 3^3$ is awarded B0B0M0A0</p> <p>Allow an unsupported answer of h = 6 (m) for B1B1M1A1 May be seen in further working</p> <p>FT 'their derived 6'</p> <p>For B2, FT 'their derived 45 (their x, not their h)' provided their surd can be written in the form $a\sqrt{b}$ B1 for writing 45 as a product of 2 or more factors where one of the factors OR the product of a pair of their factors is a square number e.g. 9×5, $3 \times 3 \times 5$, OR B1 for writing $\sqrt{45}$ as a product of 2 or more factors where one of the factors OR the product of a pair of their factors <u>gives</u> a whole number e.g. $\sqrt{3} \times \sqrt{3} \times \sqrt{5}$, $\sqrt{9} \times \sqrt{5}$</p>																

<p>11. (Curved surface area of cone + curved surface area of hemisphere =)</p> $\pi \times 8 \times 17 + \frac{4 \times \pi \times 8^2}{2}$ <p>(Total surface area =) Answer in the range 828.9 (cm²) to 829.512 (cm²) or 830 (cm²) or 264π (cm²)</p>	<p>M2</p> <p>A1</p>	<p>May be seen in parts. If M2 not awarded, award M1 for any of the following:</p> <ul style="list-style-type: none"> • $\pi \times 8 \times 17$ • sight of 136π or a value between 427 and 427.312 • $4/2 \times \pi \times 8^2$ • sight of 128π or a value between 401.9 and 402.2 <p>CAO</p>
---	---------------------	---

16. $\left(\frac{1}{3}\pi r^2 h = \pi r^2 \times \frac{3r}{2}\right)$ or equivalent	M1	Correct expression for volume of cylinder
$2\pi r^2 h = 3\pi r^2 \times 3r$ or equivalent	M1	Equating volumes AND one further step to find h e.g.
$\frac{1}{3}h = \frac{3r}{2}$ or equivalent	OR	<ul style="list-style-type: none"> • clearing fractions • cancelling π or r^2 or both • isolating h (unsimplified)
$h = \frac{3\pi r^2 \times 3r}{2\pi r^2}$ or equivalent	OR	
$h = \frac{9r}{2}$ or equivalent	A1	<p>Correct simplified expression.</p> <p>Award full marks for a correct answer, provided no incorrect working seen.</p>

8. (Length) Area None Length Volume Lenath	B3	<i>Must use the terminology given in the question.</i> B3 for all 5 correct. B2 for 3 or 4 correct. B1 for 2 correct. B0 otherwise.
--	----	---

<p>12. (Volume of sphere =) 36π (cm³)</p> <p>(Volume of cone =) 300π (cm³)</p> <p style="text-align: center;">3 : 25</p>	<p>B1</p> <p>B1</p> <p>B2</p>	<p>Allow 113.04 (from using $\pi = 3.14$).</p> <p>Allow 942 (from using $\pi = 3.14$).</p> <p>Accept absence of π (in <u>both</u> expressions).</p> <p>If neither volume has been correctly evaluated, award SC1 for at least one correct volume calculation: $\frac{4}{3} \times \pi \times 3^3$ OR $\frac{1}{3} \times \pi \times 10^2 \times 9$ (allowing the use of $\pi = 3.14$). Calculations may be seen in stages.</p> <p>B1 for partially simplified ratio in the form a : b where a, b are integers (with π eliminated and fractions or decimals cleared) or B1 for $3\pi : 25\pi$.</p> <p>FT 'their volumes' if possible (provided at least B1 or SC1 already awarded).</p> <p>An answer of 24 : 25 (from $288\pi : 300\pi$, using 6 cm for radius of sphere) is awarded B1 FT B2.</p>
<p>12. <u>Alternative method</u> (without explicitly calculating volumes):</p> <p>$\frac{4}{3} \times \pi \times 3^3$ OR $\frac{1}{3} \times \pi \times 10^2 \times 9$ or equivalent</p> <p>$4 \times \pi \times 3^3 : \pi \times 10^2 \times 9$ or equivalent OR $\frac{4}{3} \times 3^3 : \frac{1}{3} \times 10^2 \times 9$ or equivalent</p> <p style="text-align: center;">3 : 25</p>	<p>B1</p> <p>B1</p> <p>B2</p>	<p>Calculation for at least one volume (allowing the use of $\pi = 3.14$). Calculations may be seen in stages.</p> <p>Accept absence of π (in <u>both</u> expressions).</p> <p>Both calculations correct AND one further step (clearing fractions OR eliminating π). Ratio may be implied.</p> <p>B1B0 for partially simplified ratio in the form a : b where a, b are integers (with π eliminated and fractions or decimals cleared) or B1B0 for $3\pi : 25\pi$ or B0B1 for one error in calculation of integers followed by correct simplification e.g. $12:300 = 1:25$.</p> <p>FT 'their volumes' if possible (provided at least B1 already awarded).</p> <p>An answer of 24 : 25 (from $288\pi : 300\pi$, using 6 cm for radius of sphere) is awarded B0 B1 FT B2.</p>

Unit 1: Higher Tier	Mark	Comments
<p>1(a)(i) Correct statement of Pythagoras' theorem</p> <ul style="list-style-type: none"> • $(\text{Height}^2 =) 50^2 - (60 \div 2)^2$ • $(\text{Height}^2 =) 50^2 - 30^2$ • $50^2 = \text{height}^2 + (60 \div 2)^2$ • $50^2 = \text{height}^2 + 30^2$ <p>Correct stage of evaluation</p> <ul style="list-style-type: none"> • $(\text{Height}^2 =) 2500 - 900$ • $(\text{Height}^2 =) 1600$ • sight of $\sqrt{1600}$ • $(\text{Height} =) \sqrt{(50^2 - 30^2)}$ <p style="margin-left: 40px;"> $(\text{Height} =) \sqrt{1600}$ $(\text{Height} =) 40 \text{ mm}$ or $\text{Height}^2 = 1600$ $(\text{Height} =) 40 \text{ mm}$ or $1600 = 40^2$ $(\text{Height} =) 40 \text{ mm}$ </p>	<p>M1</p> <p>A1</p> <p>A1</p>	<p><u>Clear indication that all measurements have been converted to 3cm, 5cm, 4cm may be awarded all marks</u></p> <p>Working must be seen Allow M1 A1 for a slip in the initial notation then corrected at this evaluation stage</p> <p>Mark final answer A0 for an incorrect statement, e.g. $\sqrt{1600} = 40^2$</p>
<p>1(a)(i) <u>Alternative method 1</u></p> <p>Identifies the relationship '3, 4, 5' and relates to the given (right-angled) triangle, e.g. sight of</p> <ul style="list-style-type: none"> • 3, 4, 5 and 30(mm), 40(mm), 50(mm) • 3cm, 4cm, 5cm • 3, 4, 5 and 'x 10' • 30, 40, 50 and '+ 10' <p>AND a statement or conclusion, e.g.</p> <ul style="list-style-type: none"> • Pythagorean triple • Right-angled triangle • 3, 4, 5 triangle means it would be 30, 40, 50 triangle 	<p>B3</p>	<p>For B3 there must be an accompanying statement or conclusion</p> <p>B2 for identifying the relationship '3, 4, 5' and relates to the given(right-angled) triangle</p> <ul style="list-style-type: none"> • without a conclusion or statement, or • with an incorrect conclusion or statement <p>B1 for sight of any one of the following:</p> <ul style="list-style-type: none"> • '3, 4, 5' • 30 (mm) and 40 (mm) appropriately indicated on the diagram • A right-angled triangle drawn (with or without 90° indicated) appropriately labelled 30 (mm), 40 (mm) and 50 (mm)
<p>1(a)(i) <u>Alternative method 2</u></p> <p>Assuming height as 40mm with use of 50mm or 30mm within a correct statement of Pythagoras' Theorem, e.g.</p> <ul style="list-style-type: none"> • $((\frac{1}{2} \text{ base})^2 =) 50^2 - 40^2$ • $50^2 = 40^2 + x^2$ • $((\text{hypotenuse})^2 =) 40^2 + 30^2$ <p>Correct stage of evaluation, e.g.</p> <ul style="list-style-type: none"> • $((\frac{1}{2} \text{ base})^2 = 50^2 - 40^2 =) 900$ • $(\frac{1}{2} \text{ base} =) \sqrt{900}$ • $((\text{hypotenuse})^2 = 40^2 + 30^2 =) 2500$ • $(\text{hypotenuse} =) (\frac{1}{2} \text{ base} =) \sqrt{2500}$ <p>Appropriate full evaluation, e.g.</p> <ul style="list-style-type: none"> • $(\frac{1}{2} \text{ base} =) 30 \text{ (mm)}$ • $(\text{hypotenuse} =) 50 \text{ (mm)}$ 	<p>M1</p> <p>A1</p> <p>A1</p>	<p><u>Clear indication that all measurements have been converted to 3cm, 5cm, 4cm may be awarded all marks</u></p> <p>Working must be seen</p> <p>Mark final answer</p>
<p>1(a)(ii) (Volume) $\frac{1}{2} \times 60 \times 40 \times 20$ or equivalent</p> <p style="margin-left: 100px;">$24000 \text{ (mm}^3\text{)}$ $(> 20000 \text{ mm}^3)$</p>	<p>M2</p> <p>A1</p>	<p>M1 for sight of area of X-section possibly in stages, $\frac{1}{2} \times 60 \times 40$ or $\frac{1}{2} \times 30 \times 40 + \frac{1}{2} \times 30 \times 40$ (= 1200 mm²)</p> <p>CAO</p>

<p>1(b) Sight of or implication that: $5 \times \text{number of people} + 105 =$ $207 + 3 \times \text{number of people}$ or $5x + 105 = 207 + 3x$</p> <p>$(5 - 3) \times \text{number of people} = 207 - 105$</p> <p>or number of people = $\frac{207-105}{5-3}$</p> <p>or $5x - 3x = 207 - 105$ or $2x = 102$</p> <p style="text-align: right;">51 (people)</p>	<p>M1 Implication includes attempt to balance costing for the same number of people ≥ 3 at each venue, e.g.</p> <ul style="list-style-type: none"> • (10 people) $5 \times 10 + 105$ with $207 + 3 \times 10$ • (110, 115,) 120 with (210, 213,) 216 <p>m1 Includes correctly evaluated trial to attempt to balance costing for the same number of people at each venue provided</p> <p>‘their trial for $30 \leq \text{the number of people} \leq 70$’, e.g. correct costing for both venues for 40 people as (FH) (£)305 and (ML) (£)327</p> <p>From M1, allow 1 slip in the rearrangement of ‘their equation’ provided ‘their equation’ is then simplified to $ax = b$, where $a \neq 0$ and $b \neq 0$</p> <p>Sight of cost (£)360 for each venue implies M1 m1</p> <p>A1 CAO</p> <p>If no marks, award SC1 for finding the number of (whole) people for the same cost at each venue, provided the cost is $> (\pounds) 220$, e.g.</p>
---	---

<p>2. (a) (Area =) $\frac{7.4 + 9.1}{2} \times 5.7$ or equivalent</p> <p style="text-align: right;">$\times 15.6$</p> <p>Allow an answer from 733 to 734 (cm³) inclusive.</p>	<p>M1</p> <p>m1</p> <p>A1</p>	<p>(= 47.025)</p> <p>May be seen in stages.</p> <p>Allow M1 for correct intent <u>seen</u>. e.g.</p> <p>$7.4 + 9.1 \times 5.7 \div 2$</p> <p>CAO</p> <p>Note: 733.59 or 733.6 (cm³)</p>
<p>2. (b) 733.59×19.3</p> <p style="text-align: right;">14158.287 (g)</p> <p>Allow an answer from 14.1 to 14.2 (kg) inclusive.</p>	<p>M1</p> <p>A1</p> <p>B1</p>	<p>FT 'their volume from (a)' $\times 19.3$</p> <p>FT 'their 14158.287' $\div 1000$</p> <p>Allow 14 from correct working.</p> <p>Note: 14.158(287) or 14.16 or 14.2 (kg)</p>
<p>2. (b) <u>Alternative method (converting to g first)</u></p> <p style="text-align: right;">0.0193 (kg/cm³)</p> <p style="text-align: right;">733.59×0.0193</p> <p>Allow an answer from 14.1 to 14.2 (kg) inclusive</p>	<p>B1</p> <p>M1</p> <p>A1</p>	<p>FT 'their volume from (a)' and FT 'their 0.0193' provided a place value error has been made.</p> <p>Allow 14 from correct working.</p> <p>Note: 14.158(287) or 14.16 or 14.2 (kg)</p>

13.	2×10^4	B1	
14. (Area scale factor =)	$(855/225)^2$ OR $(225/855)^2$	B1	$3 \cdot 8^2 = 14 \cdot 44$ OR $(19/5)^2$ OR $361/25$ OR $(5/19)^2$ OR $25/361$ or equivalent.
	$5300 \times (855/225)^2$ OR $5300 \div (225/855)^2$	M1	
	$= 76532(\text{cm}^2)$	A1	CAO

Unit 1: Higher Tier	Mark	Comments
<p>1. (Number of adult Welsh spectators)</p> $7200 \times \frac{110}{360} \times 6 \div (6 + 5)$ <p style="text-align: right;">1200</p>	<p>M2</p> <p>A2</p>	<p>M1 for any one of the following:</p> <ul style="list-style-type: none"> • $7200 \times \frac{110}{360}$ (=2200) • $7200 \times 6 \div (6 + 5)$ (=3927.2727....) • $110 \times 6 \div (6 + 5)$ (=60) • 'their number of Welsh spectators' $\times 6 \div (6 + 5)$ <p>A1 for any one of the following <u>correctly evaluated</u>:</p> <ul style="list-style-type: none"> • $(7200 \times \frac{110}{360} =) 2200$ • $(7200 \div 360 =) 20$ and $(110 \times 6 \div 11 =) 60$ • 'their $7200 \times \frac{110}{360}$' $\times 6 \div 11$ • 'their $7200 \times 6 \div 11$' $\times \frac{110}{360}$ • 'their $110 \times 6 \div 11$' $\times 20$ • 'their number of Welsh spectators' $\times 6 \div 11$
<p>Organisation and communication</p> <p>Writing</p>	<p>OC1</p> <p>W1</p>	<p>For OC1, candidates will be expected to:</p> <ul style="list-style-type: none"> • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanations and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means <p>For W1, candidates will be expected to:</p> <ul style="list-style-type: none"> • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc.

Unit 1: Higher Tier	Mark	Comments
<p>2. (Area of triangle <i>ABC</i> or area of cross-section =)</p> $\frac{9 \times 10}{2} = 45 \text{ (cm}^2\text{)}$ <p>(Volume of prism =) $45 \times 20 = 900 \text{ (cm}^3\text{)}$</p>	<p>M1 A1 M1 A1</p>	<p>May be seen in later working.</p> <p>FT 'their area of cross section'. CAO</p> <p>An unsupported answer of $900 \text{ (cm}^3\text{)}$ is awarded M1A1M1A1.</p>
<p>2. <u>Alternative method</u></p> <p>(Volume of prism =) $\frac{9 \times 10 \times 20}{2} = 900 \text{ (cm}^3\text{)}$</p>	<p>M2 A2</p>	<p>CAO</p> <p>A1 for sight of $1800/2$ or 9×100 or 90×10 or 45×20 or equivalent (i.e. one step left to carry out)</p>
<p>2. Organisation and Communication.</p> <p>Accuracy of writing.</p>	<p>OC1 W1</p>	<p>For OC1, candidates will be expected to:</p> <ul style="list-style-type: none"> • represent their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanation and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means <p>For W1, candidates will be expected to:</p> <ul style="list-style-type: none"> • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc

Unit 2: Higher Tier	Mark	Comments
<p>4.</p> <p>(Volume of tank =) $70 \times 40 \times 30$ $= 84000 \text{ (cm}^3\text{)}$</p> <p>(Volume of cylinder =) $\pi \times 10^2 \times 30$ $= 9424(\cdot 7 \dots \text{cm}^3)$ or $3000 \pi \text{ (cm}^3\text{)}$</p> <p>(Capacity = $84000 - 9424(\cdot 7 =)$ $74575(\dots \text{cm}^3)$</p> <p>$74\cdot 575(\dots \text{litres})$</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>B1</p> <p>B1</p>	<p>Answer line takes precedence. May be seen in stages.</p> <p>May be seen in stages.</p> <p>Accept answers between 9420 and 9426 inclusive.</p> <p>Accept answers between 74574 and 74580 inclusive. FT 'their derived volume of tank' – 'their derived volume of cylinder', provided:</p> <ul style="list-style-type: none"> • M1 previously awarded • π used when calculating the volume of the cylinder • 'their derived volume of tank' > 'their derived volume of cylinder'. <p>FT 'their volume/capacity in cm^3 + 1000.</p> <p>Award B1 for a final answer of</p> <ul style="list-style-type: none"> • 74·6 (litres) • 74·5 (litres) • 74·58 (litres) • 74·57 (litres) • 75 (litres) • 74 (litres) provided from correct workings. <p>This final B1 can be awarded if the volume of the cylinder and tank are converted to litres correctly before the subtraction.</p> <p>An unsupported final answer of $74575(\dots \text{cm}^3)$ is awarded M1A1M1A1B1B0.</p> <p>Unsupported answers in the above list is awarded M1A1M1A1B1B1.</p>
<p>4. <u>Alternative method</u></p> <p>(Interior base area of container =) $70 \times 40 - \pi \times 10^2$ $= 2485(\cdot 8 \dots \text{cm}^2)$ (cm²) or $2800 - 100\pi$</p> <p>(Capacity of container =) $2485(\cdot 8 \dots) \times 30$ $74575(\dots \text{cm}^3)$</p> <p>$74\cdot 575(\dots \text{litres})$</p>	<p>M2</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>B1</p>	<p>Award M1 for an appropriate 70×40 OR $\pi \times 10^2$ <u>within a subtraction</u></p> <p>CAO Accept answers between 2485·8 and 2486 inclusive.</p> <p>FT 'their derived base area', provided at least M1 previously awarded.</p> <p>Accept answers between 74574 and 74580 inclusive.</p> <p>FT 'their volume/capacity in cm^3 + 1000.</p> <p>Award B1 for a final answer of</p> <ul style="list-style-type: none"> • 74·6 (litres) • 74·5 (litres) • 74·58 (litres) • 74·57 (litres) • 75 (litres) • 74 (litres) provided from correct workings.

Unit 1: Higher Tier	Mark	Comments
<p>6(a)(i)</p> <p>(Total volume =)</p> $\frac{2}{3} \times \pi \times 6^3 + \pi \times 3^2 \times 9 \quad \text{or equivalent}$ $= 144\pi \qquad \qquad \qquad (= 81\pi)$ $= 225\pi \text{ (mm}^3\text{)}$	<p>M2</p> <p>A2</p>	<p>Allow values of π from 3.14 to 3.142 for M marks only</p> <p>M1 for $\frac{2}{3} \times \pi \times 6^3$ (+ ...)</p> <p>Allow M1 for $\frac{4}{3} \times \pi \times 6^3 + \pi \times 3^2 \times 9$ or equivalent</p> <p>CAO</p> <p>A1 for sight of 144π OR</p> <p>A1 for an answer of 369π (from use of $4/3 \times \pi \times 6^3$) OR</p> <p>A1 for a fully correct method but with an answer of 225 (omitting π)</p> <p>If no marks awarded,</p> <p>SC2 for an answer of 1476π from <u>consistent</u> use of diameters as their radii</p> <p>OR</p> <p>SC1 for $\frac{2}{3} \times \pi \times 12^3 + \pi \times 6^2 \times 9$ or equivalent</p> <p>OR</p> <p>SC1 for $(\frac{1}{3} \times \pi \times 6^3 + \pi \times 3^2 \times 9 =) 153\pi$</p>
<p>6(a)(ii) (Reduction in volume =) $9\pi \text{ (mm}^3\text{)}$</p> <p>(Fractional reduction =)</p> $\frac{9(\pi)}{225(\pi)} \text{ or } \frac{1}{25} \text{ or equivalent}$	<p>B1</p> <p>B1</p>	<p>from $\pi \times 3^2 \times (9 - 8)$</p> <p>OR $\pi \times 3^2 \times 9 - \pi \times 3^2 \times 8$ or $81\pi - 72\pi$</p> <p>Implies previous B1</p> <p>ISW</p> <p>FT 'their 225π' and 'their $\pi \times 3^2 \times 9 - \pi \times 3^2 \times 8$' and both are multiples of π</p> <p>If no marks awarded,</p> <p>SC1 for a numerator of 'their 225π' - 9π, which may be embedded in a final answer of e.g. $216/225$ or $24/25$ if correct work seen in part (a)(i)</p> <p>Must be from a reduction of 9π in their volume. ISW</p>
<p>6(b) Complete method</p> <p>e.g. $100x = 16.111\dots$, $1000x = 161.111\dots$ AND an attempt to subtract both sides</p> $\frac{145}{900} \text{ or } \frac{1595}{9900} \text{ or } \frac{16095}{99900} \text{ or equivalent}$ $\frac{29}{180}$	<p>M1</p> <p>A1</p> <p>A1</p>	<p>Allow A1 for</p> <p>e.g. $(10x - x =) 1.45/9$, $(100x - x =) 15.95/99$ etc</p> <p>FT from M1A0 provided at least 1 stage of simplification required</p>

<p>12.(a) $\sqrt{113^2 - 72^2 - 84^2}$</p> <p style="text-align: right;">= 23 (cm)</p>	<p>M3</p> <p>A1</p>	<p>May be seen in stages. <i>(If the answer is completed in stages, then any arithmetic errors in intermediate answers can be ignored, allowing for a FT for any remaining M marks).</i> M2 for $113^2 - 72^2 - 84^2 (= 529)$. M1 for the correct method of finding a length in a triangle, which may be embedded in incorrect working, e.g.:</p> <ul style="list-style-type: none"> • $84^2 + 72^2 (= 12240)$ ($\sqrt{12240} = 110.63\dots$) • $113^2 - 84^2 (= 5713)$ ($\sqrt{5713} = 75.58\dots$) • $113^2 - 72^2 (= 7585)$ ($\sqrt{7585} = 87.09\dots$) • $113^2 + 84^2 + 72^2$ • $113^2 + 84^2 - 72^2$ • $113^2 - 84^2 + 72^2$ <p>CAO Allow answers in the range 22.6(cm) to 23.2(cm) provided OA^2 is in the range 510.76 to 538.24.</p>
<p><u>12(a) Alternative method</u> A correct multi-step method, involving a trigonometric method leading to a correct answer.</p> <p style="text-align: right;">= 23 (cm)</p>	<p>M3</p> <p>A1</p>	<p>M2 for a correct multi-step method leading to $OA^2 (= 529)$. M1 for a method leading to:</p> <ul style="list-style-type: none"> • $(AC =) 110.63\dots(\text{cm})$ OR $(AC^2 =) 12240$ • $(OB =) 75.58\dots(\text{cm})$ OR $(OB^2 =) 5713$ • $(OD =) 87.09\dots(\text{cm})$ OR $(OD^2 =) 7585$ <p>CAO Allow answers in the range 22.6(cm) to 23.2(cm) provided OA^2 is in the range 510.76 to 538.24.</p>
<p>12.(b). $84 \times 72 \times 23 \div 3$</p> <p style="text-align: right;">= 46 368(cm³)</p>	<p>M1</p> <p>A1</p>	<p>May be seen stages. Or equivalent. FT 'their derived height' from 12(a).</p>

Unit 1: Higher Tier	Mark	Comments
<p>1. (Change to MVR) 360×20 7200 (MVR)</p> <p>(Only 500 and 1000 notes, so can buy) 7000 (MVR)</p> <p>(Cost to Gerallt for 7000 MVR is) $7000 \div 20$ OR $360 - (7200 - 7000) \div 20$ $(\pounds) 350$</p>	<p>M1 A1 A1 M1 A1</p>	<p>If not stated, may be implied by 7000 (MVR)</p> <p>FT provided M1 previously awarded</p> <p>FT 'multiple of 500 MVR' provided > 500</p> <p>Depends only on previous M1 awarded</p> <p>If final M0 A0, award SC1 for $(\pounds)10$ from $200 \div 20$</p>
<p>1. <u>Alternative method</u> Considers unambiguously 14 multiples of $\pounds25$ or 7 multiples of $\pounds50$ or equivalent, e.g.</p> <ul style="list-style-type: none"> • 500 MVR = $\pounds25$ and 14×25 • 1000 MVR = $\pounds50$ and 7×50 <p>(Considers nearest multiple of $\pounds25 < \pounds360$) $(\pounds)350$</p> <p>(Buys) 350×20 or 7×1000 or 14×50 or equivalent 7000 (MVR)</p>	<p>M2 A1 M1 A1</p>	<p>M1 for any one of the following:</p> <ul style="list-style-type: none"> • 500 MVR = $\pounds25$ • 1000 MVR = $\pounds50$ <p>FT 'their 350' provided < 360 and it is a multiple of 25</p>
<p>Organisation and communication</p> <p>Writing</p>	<p>OC1 W1</p>	<p>For OC1, candidates will be expected to:</p> <ul style="list-style-type: none"> • present their response in a structured way • explain to the reader what they are doing at each step of their response • lay out their explanations and working in a way that is clear and logical • write a conclusion that draws together their results and explains what their answer means <p>For W1, candidates will be expected to:</p> <ul style="list-style-type: none"> • show all their working • make few, if any, errors in spelling, punctuation and grammar • use correct mathematical form in their working • use appropriate terminology, units, etc.

<p>7(a) (AER =) $(1 + 0.0026)^{12} - 1$ or equivalent</p> <p style="text-align: center;">$= 3.16(500\dots)$ or 3.17 or 3.2 (%)</p>	<p>M1</p> <p>A1</p>	<p>e.g.</p> $\left(1 + \frac{12 \times 0.0026}{12}\right)^{12} - 1 \text{ or } \left(1 + \frac{0.0312}{12}\right)^{12} - 1$
<p>7(b) $AER = \left(1 + \frac{2.48 \div 100}{4}\right)^4 - 1 =$</p> <p style="text-align: center;">$(= 0.025(03\dots)$ or 2.5(03\dots) (%))</p> <p>(Amount in account after 10 years =)</p> $3000 \times (1 + 0.025(03\dots))^{10}$ <p style="text-align: center;">$= (\pounds)3841.43(752\dots)$ or $(\pounds)3841.44$</p> <p>(Percentage increase =)</p> $\frac{3841.43(752\dots) - 3000}{3000} (\times 100)$ <p>or</p> $\frac{3841.43(752\dots) - 1}{3000} (\times 100)$ <p style="text-align: center;">$= 28(.04)$ to 28.05 (%)</p>	<p>M1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p>The -1 may be implied in further working</p> <p>FT 'their derived 0.025(03\dots)' provided it comes from the AER formula with $1 < n \leq 12$</p> <p>CAO. Must come from M1M1 Accept $(\pounds)3840.25$ from the use of the multiplier 1.025 provided M1M1 previously awarded</p> <p>FT 'their 3841.43(752\dots)' provided at least one M1 previously awarded</p> <p>An amount in the account after 10 years of $(\pounds)3840.25$ leads to 28(.008) (%)</p> <p>If no marks awarded, SC1 for an answer of 27.7(58\dots) or 27.8% from use of $\frac{3000 \times (1.0248)^{10} - 3000}{3000} \times 100$ or $((1.0248)^{10} - 1) \times 100$ or equivalent</p>
<p>7(b) <u>Alternative method 1:</u></p> <p>(Quarterly rate =) $\frac{2.48}{4}$ (%) or $\frac{2.48+100}{4}$</p> <p style="text-align: center;">$(= 0.62(\%)$ or 0.0062)</p> <p>(Amount in account after 10 years =)</p> $3000 \times \left(1 + \frac{2.48+100}{4}\right)^{10 \times 4} \text{ or } 3000 \times 1.0062^{40}$ <p style="text-align: center;">$= (\pounds)3841.43(752\dots)$ or $(\pounds)3841.44$</p> <p>(Percentage increase =)</p> $\frac{3841.43(752\dots) - 3000}{3000} (\times 100)$ <p>or</p> $\frac{3841.43(752\dots) - 1}{3000} (\times 100)$ <p style="text-align: center;">$= 28(.04)$ to 28.05 (%)</p>	<p>M1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p>May be implied in further working</p> <p>FT 'their 0.0062' provided it comes from 2.48(+100) /n provided $1 < n \leq 12$</p> <p>Allow $3000 \times \left(1 + \frac{2.48+100}{n}\right)^{10 \times n}$ provided their value of n has been used consistently and $1 < n \leq 12$</p> <p>CAO. Must come from M1M1</p> <p>FT 'their 3841.43(752\dots)' provided at least one M1 previously awarded</p>

<p>7(b) <u>Alternative method 2:</u></p> $AER = \left(1 + \frac{2.48 \div 100}{4}\right)^4 - 1 =$ <p style="text-align: center;">(= 0.025(03...) or 2.5(03...) (%))</p> <p>(Percentage increase =) $(1 + 0.025(03...))^{10} - 1$</p> <p style="text-align: right;">= 28(.04) to 28.05 (%)</p>	<p>M1</p> <p>M3</p> <p>A1</p>	<p>The -1 may be implied in further working</p> <p>FT 'their 0.025(03...)' provided it comes from $\left(1 + \frac{2.48+100}{n}\right)^n - 1$ where n has been used consistently and $1 < n \leq 12$ M2 for $(1 + 0.025(03...))^{10}$</p> <p>CAO. Must come from M1M3</p>
<p>7(b) <u>Alternative method 3:</u></p> <p>(Quarterly rate =) $\frac{2.48}{4}$ (%) or $\frac{2.48+100}{4}$</p> <p style="text-align: center;">(= 0.62(%) or 0.0062)</p> <p>(Percentage increase =) $(1 + 0.0062)^{10 \times 4} - 1$</p> <p style="text-align: right;">= 28(.04) to 28.05 (%)</p>	<p>M1</p> <p>M3</p> <p>A1</p>	<p>FT 'their 0.0062' provided it comes from $2.48(+100) / n$ provided $1 < n \leq 12$ Allow $\left(1 + \frac{2.48+100}{n}\right)^{10 \times n} - 1$ provided their value of n has been used consistently and $1 < n \leq 12$ M2 for $(1 + 0.0062)^{10 \times 4}$</p> <p>CAO</p>

<p>8. (Area of top or bottom =) $\pi \times 10^2 (\times 2)$</p> <p>(Curved surface area =) $2 \times \pi \times 10 \times \text{height}$ or equivalent (e.g. $62.8(31\dots) \times h$)</p> <p>(Height =) $\frac{1570.8 - \pi \times 10^2 \times 2}{2 \times \pi \times 10} (= \frac{942.48}{62.83})$</p> <p>or $\frac{1570.8}{2 \times \pi \times 10} - 10$ or equivalent</p> <p>Answer between 14.99 and 15.02 (cm) inclusive</p>	<p>M1</p> <p>M1</p> <p>M2</p> <p>A1</p>	<p>May be seen or implied in later working. Award M1 for sight of an appropriate answer between either:</p> <ul style="list-style-type: none"> • 314 and 314.2 (cm²) inclusive • 628 and 628.4 (cm²) inclusive. <p>May be seen or implied in later working.</p> <p>Award M2 for isolating the height term. FT for M2 or M1 for 'their $\pi \times 10^2 \times 2$ and 'their $\pi \times 20$', provided that:</p> <ul style="list-style-type: none"> • π used when calculating the areas • 'their $\pi \times 10^2 \times 2 < 1570.8$' (including using radius = 5cm and diameter = 10cm). <p>Award M1 for equating the three areas to 1570.8 but not isolating the height term e.g.</p> <ul style="list-style-type: none"> • $\pi \times 10^2 \times 2 + \pi \times 20 \times \text{height} = 1570.8$ • $200\pi + 20\pi \times \text{height} = 1570.8$ • $628.32 + 62.83 \times \text{height} = 1570.8$ • $62.83 \times \text{height} = 942.48$ • $20\pi \times \text{height} = 942.48$ • $2\pi \times 10(10 + \text{height}) = 1570.8$ <p>CAO.</p>
---	---	---

<p>9(a)(i) Sight of $\frac{150 \times 2 \times \pi \times 3}{360}$ OR $\frac{300 \times 2 \times \pi \times 3}{360}$ $(= 2.5\pi)$ $(= 5\pi)$</p> <p>(Length of wire =) $(2 \times) \frac{150 \times 2 \times \pi \times 3}{360} + (2 \times) 24 + 38$ or equivalent $= 5\pi + 86$ (cm)</p>	<p>B1</p> <p>M1</p> <p>A2</p>	<p>Or equivalents</p> <p>Mark final answer</p> <p>A1 for sight of any one of the following:</p> <ul style="list-style-type: none"> $\frac{1800\pi + 86}{360}$ or equivalent $5\pi + \dots$ $2.5\pi + \dots$ or $5\pi/2 + \dots$ provided an attempt has been made to add the 3 straight pieces
<p>9(a)(ii) e.g. $10x = 1.333\dots$, $100x = 13.333\dots$ AND an attempt to subtract both sides $= \frac{12}{90}$ or $\frac{132}{990}$ or $\frac{1332}{9990}$ or equivalent $= \frac{2}{15}$</p>	<p>M1</p> <p>A1</p> <p>A1</p>	<p>Allow A1 for e.g. 1.2/9</p> <p>FT from M1A0 provided of equivalent difficulty</p>
<p>9(a)(ii) <i>Alternative method:</i> $\frac{1}{10} + \frac{3}{90}$ or equivalent $= \frac{12}{90}$ or equivalent $= \frac{2}{15}$</p>	<p>M1</p> <p>A1</p> <p>A1</p>	<p>FT from M1A0 provided of equivalent difficulty</p>
<p>9(b) Statements required:</p> <ul style="list-style-type: none"> Number the hangers from (0)1 to 80 Consider successive 2-digit numbers Do not use numbers outside the range e.g. Do not use 00 and 81 – 99, OR Use the numbers (0)1 to 80 Ignore repeats <p>(Clothes hangers chosen =) 29, (0)7, (0)1, 30, 55, 79, 26, 30, 12</p>	<p>E2</p> <p>B1</p>	<p>All 4 needed for E2 E1 for any 2 or 3 correct statements</p> <p>Allow an equivalent numbering system e.g. (0)0 to 79 Their numbering system can be implied by the range of numbers they state they will choose from</p> <p>Allow the 2nd statement to be implied by their numbering of the hangers (from 01) AND their use of 2-digit numbers in their answer OR 2-digit numbers used in their answer with 07 and 01 seen</p> <p>Do not allow 'Use numbers less than 81' if they have numbered the hangers from 01 to 80, without stating that 00 will not be used</p> <p>ISW Answer space takes precedence</p>
<p>9(c) (Scale factor =) $\sqrt{1.44}$ or 1.2</p> <p>(Height of larger hanger =) $\sqrt{1.44} \times 9$ or 1.2×9 $= 10.8$ (cm)</p>	<p>B1</p> <p>M1</p> <p>A1</p>	<p>FT 'their $\sqrt{1.44}$' CAO</p>

<p>11. (Volume scale factor=)</p> $(23/11)^3 \text{ OR } 23^3/11^3 \text{ OR } 12167/1331 (=9.14\dots)$ $(23/11)^3 \times 107$ $= 978(\cdot 1\dots \text{cm}^3)$	<p>B1 M1 A1</p>	<p>Accept an answer in the range: 976.8(...cm³) to 980(cm³)</p> <p>Allow an answer of: 990(·9...cm³) OR 991(cm³) from sight of 2·1³×107</p>
<p><u>Alternative method</u></p> $(11/23)^3 \text{ OR } 11^3/23^3 \text{ OR } 1331/12167 (=0.109\dots)$ $107 \div (11/23)^3$ $= 978(\cdot 1\dots \text{cm}^3)$	<p>B1 M1 A1</p>	<p>Accept an answer in the range: 976.8(...cm³) to 980(cm³)</p> <p>Allow an answer of: 967(·5...cm³) OR 968(cm³) from sight of 107÷0.48³</p>

<p>12. (Slant height of cone $\Rightarrow \sqrt{6^2 + 8^2}$)</p> <p style="text-align: center;">$= 10$ (cm)</p> <p>(Curved surface area of cone \Rightarrow)</p> <p style="text-align: center;">$\pi \times 6 \times 10$</p> <p style="text-align: center;">$= 60\pi$ (cm²) or equivalent</p> <p style="text-align: center;">$(\pi r^2 = \pi \times 6 \times 10)$</p> <p style="text-align: center;">$r^2 = 60$ or $r = \sqrt{60}$ or equivalent</p> <p style="text-align: center;">$(r \Rightarrow) 2\sqrt{15}$</p>	<p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p> <p>M1</p> <p>A1</p>	<p>Method for finding hypotenuse. Accept use of (3,4,5) x 2.</p> <p>FT 'their derived slant height' (not 8). CAO [For reference, $60\pi = 188.4$] 60π may be implied by later working (e.g. sight of $r^2 = 60$)</p> <p>For calculating the total surface area of the cone, award M1 A1 SC1 for an answer of 96π (cm²) [= 301(.44)] (from including the area of the base of the cone)</p> <p>Isolating r^2 or r. FT for 'their $r^2 = 60$' or 'their $r = \sqrt{60}$' from $\pi r^2 =$ 'their 60π'</p> <p>FT from $r^2 = k$, provided equivalent difficulty (with r in the form $a\sqrt{b}$, where a and b are integers, and b is as small as possible).</p> <p>SC1 for $r = \sqrt{6L}$ (where $L =$ slant height)</p> <p>Note: after M0A0M0A0 for use of 8 as the slant height $r^2 = 48$ or $r = \sqrt{48}$ M1 $(r \Rightarrow) 4\sqrt{3}$ A1</p>
--	--	--

11.	Sight of $4(x+2)(x+9)$	B1	
	$(x+2)(x+9) = 912/4$ OR $4(x^2+2x+9x+18) = 912$	M1	
	$x^2 + 11x - 210 = 0$	A1	Must be in this form. Correct intermediate steps required before A1 awarded.
	$(x+21)(x-10) = 0$	M1	F.T. from equivalent level of quadratic.
	$x = 10$ or $x = -21$	A1	Must have both solutions.
	Dimensions (4cm), 12(cm) and 19(cm)	A1	
	Statement about ignoring $x = -21$ as it leads to negative lengths	EI	
	Organisation and communication	OC1	
	Accuracy of writing	W1	
		9	

End of solutions