



GCSE MARKING SCHEME

SUMMER 2023

**GCSE
MATHEMATICS – NUMERACY
UNIT 2 – HIGHER TIER
3310U60-1**

INTRODUCTION

This marking scheme was used by WJEC for the 2023 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

WJEC GCSE MATHEMATICS - NUMERACY

SUMMER 2023 MARK SCHEME

Unit 2: Higher Tier	Mark	Comments
1. 1.34 $\times 8 \div 5$ or $\times 1.6$ (to convert miles to km) $\times 1000$ (to convert km to m) $\div 84$ (to find number of minutes) (Time correct to the nearest minute) 2(:) 26 p.m. or 14(:)26	M1 M1 M1 A2	May be seen in any order Allow $\times 1.61$ or $\times 1.609$ Do not accept $\times 1.5$ (= 2144 m) Accept embedded '$\times 1000$', e.g. sight of 1340, $(1.34 \times 1200 =) 1608$, $(1.34 \times 1500 =) 2010$ (i.e. $\times 1500$ is awarded M0 M1) (= 25.52...minutes) (Note: sight of $\div 0.084$ is equivalent to $\times 1000$ (M1) and $\div 84$ (M1)) Ignore further incorrect stages of working, provided they do not involve multiplication or division by 1.6, 1000 or 84 CAO A2 awarded only if there is no incorrect working Depends on M1 M1 M1 previously awarded, for rounding time to nearest minute and adding to 2 p.m. Allow 2.26 p.m. or 14.26(p.m.) Award A1 for any one of the following: 2(:) 25(.5...) p.m. or 14(:)25(5...) 2(:)26 or 2(:)26 a.m. or 02(:)26 or 02(:)26 p.m. 26 (minutes) - FT from M2 (or M3) for 'their correctly rounded time to the nearest minute' added to 2 p.m. expressed with p.m. or correct 24-hr notation, provided $1 < \text{'their whole number of minutes'} < 60$ - FT from M0 M1 M1 - for use of $\times 1500$m to give 2(:)24 p.m. or 14(:)24 - for $1.34 \times 1000 \div 84 = 15.952...$ to give 2(:)16 p.m. or 14(:)16 ** ** $84 \times 16 = 1344$ is awarded M0 M1 M1, with possible FT A1 for 2(:)16 p.m. or 14(:)16
1. <u>Alternative method:</u> 84 $\div 1.6$ (km to miles) $\div 1000$ (metres to km) $1.34 \div (84 \div 1.6 \div 1000)$ (time taken) (Time correct to the nearest minute) 2(:) 26 p.m. or 14(:)26	M1 M1 M1 A2	Initial 2 method marks may be in either order Or $\div 1.61$ or $\div 1.609$ $\div 1500$ is M0 M1 CAO. Answer space takes precedence A2 awarded only if there is no incorrect working Depends on M1 M1 M1 previously awarded, for rounding time to nearest minute and adding to 2 p.m. Allow 2.26 p.m. or 14.26(p.m.) A1 as shown above FT from M0 M1 M1 and M2 as shown above

Organisation and communication Writing	OC1 W1	For OC1, candidates will be expected to: • 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 For W1, candidates will be expected to: • 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.
2a(i) (Median group) $166 \leq h < 174$ Reason, e.g. '14th height'	B1 E1	Accept '166 to 174' or '166 – 174' or 'third group' or 'group 3' or similar Do not accept 9 or 14 or 170 Depends on B1 previously awarded or previous B0 was due to giving the answer '9', '14' or '170' E1 for clear indication that median height is the 14th Allow, e.g. sight of 14, 'middle person', 'middle height', 'by counting the frequencies, $\frac{1}{2}$ the people are taller', 'half the people are taller', '13.5(th) (musician)', 'total of 27 (people), the middle of that is in the group' Do not accept, e.g. 'middle group', 'in the middle', 'middle', 'middle number', 'groups are not specific', 'because the median (height) is 174'
2(a)(ii) Indicates unambiguously 'No' with a valid reason, such as 'only know the group' 'it doesn't show raw data' 'the actual heights are not given', 'the 3 people could be anywhere in the group 150cm to (less than) 158cm', 'no way of knowing individual heights'	E1	Ignore spurious additional comments Allow 'No' with, e.g. 'don't know the height of these 3 people', 'all 3 people could all be 155cm tall', 'everyone in group 150cm to 158cm could be 157cm', 'could all be taller than 154(cm)', '3 of them from 150 to 158 but not certain of height', 'we only know they are between 150 and 158', 'of the 3 people there may be, (but it is not certain)', '(data is) not specific', 'little chance as there are only 3 people in the group', 'the groups are not that specific', 'it's not specific enough', 'there is a possibility that there is one person shorter than 154cm as the midpoint is 154cm' Do not accept, e.g. 'everyone in the group 150cm to 158cm could be 158cm tall'

2(b) Midpoints 154, 162, 170, 178, (186,) 194 154×3 + 162×10 + 170×9 + 178×4 (+186×0) + 194×1 (= 462 + 1620 + 1530 + 712 + 0 + 194 = 4518) ÷ 27 167(.333.... cm) or equivalent	B1 M1 m1 A1	186×0 may not be seen FT 'their midpoints' or at the bounds of the appropriate groups, provided no more than one of 'their midpoints' lies outside the group ISW Treat an error of e.g. 186 × 0 written as 186, leading to total 4704, 4704 ÷ 27 = 174(.222....) as follows: B1 M1 m1 possible but A0 or equivalents on FT								
3. 1800 × 1.02 ²⁸ 3133 (steps) or 3134 (steps)	M2 A2	M1 for any one of the following: - sight of 1800 × 1.02 (1800 × 1.02 =) 1836 - from non-compound: (1800 + 36 × 28 =)1800 + 1008 (28 × 2% = 56% so) 1.56 × 1800 - a final answer of 2808 CAO A1 for 3133.8(... steps) If no marks, award SC1 for 1800 × 1.02 ²⁷ or 1800 × 1.02 ²⁹ or 3072.3(9...) or 3196.5(2...) OR SC2 for 3072 or 3073 (steps) or 3196 or 3197 (steps) respectively								
4(a) A1	B1									
4(b) 59.4 × 42(.0) ÷ (100 × 100) or 0.594 × 0.42 × 120 29.9376(g) or 29.94(g) or an answer in the range 29.8 (g) to 30 (g)	M2 m1 A1	For a product using the correct place value in the conversion of units (= 0.249(48 m ²) or 0.25 (m ²)) Do not accept use of 59 instead of 59.4 for M2 M1 for a calculation including the product of digits 59(.4) and 42(.0), which may include error(s) due to place value FT from M2 or M1 CAO. Statement answer space takes precedence If incorrect size of paper selected, award SC2 for the following answers, allow suitable rounding, or truncation at 1 or more decimal place(s): <table><tr><td>A0*</td><td>A1</td><td>A3</td><td>A4</td></tr><tr><td>119.993..(g)*</td><td>59.946...(g)</td><td>14.9688(g)</td><td>7.4844(g)</td></tr></table> *Paper size A0 appropriate working or 119.9(...) must be seen OR Award SC1 for the appropriate digits with a place value error	A0*	A1	A3	A4	119.993..(g)*	59.946...(g)	14.9688(g)	7.4844(g)
A0*	A1	A3	A4							
119.993..(g)*	59.946...(g)	14.9688(g)	7.4844(g)							

4(c) (Diagonal $A4^2 = 21^2 + 29.7^2$) Diagonal ² = 1323.09 or (Diagonal =) $\sqrt{1323.09}$ (Diagonal A4 =) 36 (cm) or 36.3(7... cm) or 36.4 (cm) (Diagonal A5) $36.37... \times 21(.0) \div 29.7$ or $36.37... \times 0.7(0....)$ or $36.37... \div (29.7 \div 21(.0))$ or $36.37... \div 1.4(1...)$ Answer in the range 25.2 (cm) to 26(cm)	M1 A1 A1 M1 A1	May be shown in further working FT from M1 for the correctly evaluated square root of 'their 1323.09' provided 'their answer' > 29.7 (cm) Must be from correct working FT 'their derived diagonal' or 'their stated diagonal' provided $\neq 21$ or $\neq 29.7$ Answer must be from correct working.																								
4(c) <u>Alternative method:</u> (Side of A5) $21(.0) \times 21(.0) \div 29.7$ or $21 \times 0.7(0...)$ or $21 \div 1.4(1...)$ or $29.7 \div 2$ Answer in the range 14.7 (cm) to 15(cm) (Diagonal $A5^2 = 21(.0)^2 + 14.848...^2$) Diagonal ² = 661.4775.... or (Diagonal =) $\sqrt{661.4775...}$ (Diagonal A5) Answer in the range 25.2 (cm) to 26(cm)	M1 A1 M1 A1 A1	May be shown in further working Must be from correct working FT 'their derived side of A5' or 'their stated side of A5' provided $\neq 21$ or $\neq 29.7$ Answer must be from correct working. FT from M1 for the correctly evaluated square root of 'their 661.4775...' provided 'their answer' > 21 (cm) Note: <table><tr><th>Side A5</th><th>Diagonal²</th><th>Answer, in cm</th></tr><tr><td>14</td><td>637</td><td>25.23...</td></tr><tr><td>14.7</td><td>657.09</td><td>25.63...</td></tr><tr><td>14.8</td><td>660.04</td><td>25.69.. or 25.7</td></tr><tr><td>14.84</td><td>661.2256</td><td>25.71...</td></tr><tr><td>14.85</td><td>661.5225</td><td>25.72...</td></tr><tr><td>14.9</td><td>663.01</td><td>25.748... or 25.75</td></tr><tr><td>15</td><td>666</td><td>25.8...</td></tr></table>	Side A5	Diagonal ²	Answer, in cm	14	637	25.23...	14.7	657.09	25.63...	14.8	660.04	25.69.. or 25.7	14.84	661.2256	25.71...	14.85	661.5225	25.72...	14.9	663.01	25.748... or 25.75	15	666	25.8...
Side A5	Diagonal ²	Answer, in cm																								
14	637	25.23...																								
14.7	657.09	25.63...																								
14.8	660.04	25.69.. or 25.7																								
14.84	661.2256	25.71...																								
14.85	661.5225	25.72...																								
14.9	663.01	25.748... or 25.75																								
15	666	25.8...																								
4(d) Sight of 84.15(cm) or 841.5(mm) and 59.45 (cm) or 594.5(mm) or equivalents in m <																										

5. (Length of the package, $x + y$) ($x =$) $17.5 \times \cos 34^\circ$ or ($x =$) $17.5 \times \sin 56^\circ$ AND ($y =$) $11.1 \times \cos 56^\circ$ or ($y =$) $11.1 \times \sin 34^\circ$ Sight of 14.5(08... cm) and 6.2(07.... cm) or for the sum of these: 20.7(... cm) or 21 (cm) (Volume =) $19 \times 6.7 \times (14.5(08...) + 6.2(07....))$ or $19 \times 6.7 \times 20.7$ or $19 \times 6.7 \times 21$ Answer in the range 2635 (cm³) to 2673.5 (cm³) AND Cost (£)14.85	M3 Or alternative full method M2 for any 1 of these statements correct or as appropriate from an alternative method OR M1 for .../17.5 = cos34° or .../17.5 = sin56°, or .../11.1 = cos56° or .../11.1 = sin34° A2 <u>Must be from correct working (not from $11.1^2 + 17.5^2$)</u> A1 for 14.5(08... cm) or 6.2(07.... cm) M1 FT 'their $x + y$' provided some use of trigonometry attempted previously (including incorrect use) and both $x > 0$ and $y > 0$. Award M1 for an unsupported correct volume, or 'their FT volume' provided FT criteria met A1 Answer space takes precedence FT from truncation or rounding FT for appropriate cost for 'their volume' provided it is $\leq 10\,000$ (cm³) FT is $127.3 \times$ 'their $x +$ their y' correctly evaluated <table><tr><th>Volume (cm³)</th><th>Cost</th></tr><tr><td>0 to 1000</td><td>£12.55</td></tr><tr><td>greater than 1000, up to 2000</td><td>£13.60</td></tr><tr><td>greater than 2000, up to 4000</td><td>£14.85</td></tr><tr><td>greater than 4000, up to 10 000</td><td>£16.25</td></tr></table> If 'y' not considered, possible M2, A1 then also award SC1 for a volume of 1845 (cm³) to 1847.2 (cm³) AND cost (£)13.6(0) If 'x' not considered, possible M2, A1 then also award SC1 for a volume of 789 (cm³) to 790.6 (cm³) AND cost (£)12.55 If no marks, award SC1 for an answer in the range 2635 (cm³) to 2673.5 (cm³) AND Cost (£)14.85 from use of 20.7...(cm) from $\sqrt{(11.1^2 + 17.5^2)}$	Volume (cm ³)	Cost	0 to 1000	£12.55	greater than 1000, up to 2000	£13.60	greater than 2000, up to 4000	£14.85	greater than 4000, up to 10 000	£16.25
Volume (cm ³)	Cost										
0 to 1000	£12.55										
greater than 1000, up to 2000	£13.60										
greater than 2000, up to 4000	£14.85										
greater than 4000, up to 10 000	£16.25										

6. (Surface area) $\pi \times 0.18 \times 2.5$ or equivalent 1.41 (m²) or 14100 cm²	M2 A2	<u>Accept equivalents in cm throughout</u> Must be the complete method M1 for any one of the following provided it is not embedded in further incorrect working: • $\pi \times 0.18$ (= 0.565... m) • $\pi \times 18$ cm (= 56.5... cm) • $\pi \times 18$ cm $\times$ 2.5 (m) • $\pi \times 0.18 \times 250$ cm • ** $\pi \times 0.18 \times 2.5 + (2 \times) \pi \times 0.09^2$ or equivalent Allow M1 for any one of the following provided it is not embedded in further incorrect working: • $\pi \times 2 \times 0.18 \times 2.5$ or $\pi \times 0.36 \times 2.5$ (= 2.827...) • $\pi \times \frac{0.18}{2} \times 2.5$ or $\pi \times 0.09 \times 2.5$ (= 0.706...) or equivalent Mark final answer. Must be correct to 3 significant figures. A1 for any one of the following: • 1.4(13... m²), correct but not to 3 sig. figs. • 1.4(... m²) from premature approximation • ** 1.44 (m²), from including 1 end • ** 1.46 (m²), from including 2 ends **No other FT allowed from M1
7(a) Frequency densities of 0.4, 0.28, 0.48, 0.16, 0.07 Correct bars drawn	B2 B1	If table is blank, check histogram B1 for any 3 correct FT their frequency densities provided B1 previously awarded
7(b) $\frac{3 \times 10 + 10 + 7 + 12 + 8 + 7}{5}$ (=50) or equivalent OR $6 + \frac{2 \times 10}{5}$ (=10) or equivalent (100 $\times$) $\frac{3/5 \times 10 + 10 + 7 + 12 + 8 + 7}{6 + 10 + 10 + 7 + 12 + 8 + 7}$ OR (100 $\times$) $\frac{60 - (6 + 2/5 \times 10)}{60}$ or (100) $\times$ $\frac{50}{60}$ = 83.3(3...) or 83$\frac{1}{3}$ (%)	B1 M1 A1	15$\times$0.4 may be used instead of 3/5$\times$10 40$\times$0.4 may be used instead of 3/5$\times$10 + 10 10$\times$0.4 may be used instead of 2/5 $\times$10 FT for a numerator /'their 6+10+10+7+12+8+7' where 44 < numerator < 54 for B0M1A0 If their denominator $\neq$ 60, then 6+10+10+7+12+8+7 or 5$\times$12 must be seen leading to their incorrect denominator If their fraction is for the number of months where there was less than 60mm rainfall, FT for a numerator /'their 6+10+10+7+12+8+7' where 6 < numerator < 16 for B0M1A0 provided an attempt is subsequently made to subtract this from 100% CAO. Accept 83 (%) from correct working

8(a)	$\frac{30}{360} \times \pi \times 400^2 \quad \text{or equivalent}$ $= 41\,866 \text{ to } 41\,893.4 \text{ (m}^2\text{)}$	M1 A1	Or $\frac{40000\pi}{3}$
8(b)	$\frac{\text{Angle}}{360} \times 2 \times \pi \times 400 = 1067.6$ $(\text{Angle} =) \frac{1067.6 \times 360}{2 \times \pi \times 400} \quad \text{or equivalent}$ $= 152.9 \text{ to } 153 \text{ (}^\circ\text{)}$	M1 m1 A1	May be implied in further work For isolating the angle If no marks, award SC1 for an answer of 305.8 to 306 (°) from using the calculation $\frac{1067.6 \times 360}{\pi \times 400}$
8(c) Valid reason e.g. 'More area to water the further away from the pivot you are', 'The outer tower will be moving faster' 'It has to cover a larger distance', 'The part closest to the pivot needs to deliver less water or it would flood'	E1	Ignore spurious additional comments Accept e.g. 'To cover more area' Allow e.g. 'So all the crops get the same amount of water' Do not accept e.g. 'The crops furthest away need more water', 'To keep up with the tower closest to the pivot as this doesn't move so far', 'So the water will spray at a constant speed'	

9(a) (Monthly rate $\Rightarrow$) 0.25% or 0.0025 $10\,000 \times 1.0025^n$ $10\,000 \times 1.0025^{20} \quad (= (£)10\,512(.055\dots))$ (Date $\Rightarrow$) 30th November 2024	B1 B1 M1 A1	B0 for 0.0025%. May be implied in further work For use of 'n' or for use of any value of n Allow (£)10 000 $\times$ 1.0025¹⁹ (= (£)10 485(.84...) or (£)10 486) with convincing work that over (£)10 500 will be reached in a months' time An answer of (n$\Rightarrow$) 20 (months) implies B1B1M1 provided no incorrect work seen CAO Allow 31st November 2024 or 1st December 2024 If only the first B1 awarded and using the calculation (10000$\times$1.03) $\times$ 1.0025⁸ or 10300 $\times$ 1.0025⁸, award a further SC1 for (£)10507(.81...) or (£)10508 AND 30th November (allowing 31st) or 1st December 2024 If no marks awarded and from using a multiplier of 1.03², award SC1 for (£)10 609 AND 31st May (allowing 30th) or 1st June (2023), OR If no marks awarded and from using a multiplier of 1.025², award SC1 for (£)10 506(.25) AND 31st May (allowing 30th) or 1st June (2023)
9(a) <u>Alternative method:</u> (Monthly rate $\Rightarrow$) 0.25% or 0.0025 $10\,000 \times 1.0025^n = 10\,500$ (Number of months $\Rightarrow$) $\frac{\log(10\,500/10\,000)}{\log 1.0025}$ or $\frac{\log 1.05}{\log 1.0025}$ or $\log_{1.0025}(1.05)$ (= 19.5(404...) or 20 months) (Date $\Rightarrow$) 30th November 2024	B1 B1 M1 A1	B0 for 0.0025%. May be implied in further work Or $1.0025^n = \frac{10\,500}{10\,000}$ or equivalent Implies previous B1B1 Note: The logs in the first 2 possibilities for M1 can be to any base An answer of (n$\Rightarrow$) 19.5(404...) or 20 (months) implies B1B1M1 provided no incorrect work seen CAO Allow 31st November 2024 or 1st December 2024 If no marks awarded and from using 1.03 instead of 1.0025, award SC1 for 1.6(506...) or 2 (months) AND 31st May (allowing 30th) or 1st June (2023), OR If no marks awarded and from using 1.025 instead of 1.0025, award SC1 for 1.9(759...) or 2 (months) AND 31st May (allowing 30th) or 1st June (2023)
9(b) (AER $\Rightarrow$) $\left(1 + \frac{0.03}{12}\right)^{12} - 1$ = 3.04 (%)	M1 A1	M0A0 if n $\neq$ 12 substituted into the AER formula Allow an answer of 3.04(...) % An unsupported 3.04% is awarded M1A1

10(a) Strategy of attempting to use the sine rule followed by 0.5absinC or right-angled trigonometry (left side =) $\frac{6.2 \times \sin 50}{\sin(180-50-35)}$ or $\frac{6.2 \times \sin 50}{\sin 95}$ = 4.76(...) or 4.77 or 4.8 (m) (Area of triangle =) $\frac{1}{2} \times 4.76(\dots) \times 6.2 \times \sin 35$ = 8.44 to 8.56 (m²) (Volume of room =) 67.5 to 68.5 (m³)	S1 M2 A1 M1 A1 B1	M1 for <u>left side</u> = $\frac{6.2}{\sin 50}$ or equivalent $\frac{6.2}{\sin(180-50-35)}$ FT 'their 4.76(...)' provided sine rule attempted Note: This calculation may come from use of right-angled trigonometry to find height = 4.76(...) x sin35 and then use of $\frac{1}{2} \times \text{base} \times \text{height}$ FT 'their 8.44 to 8.56' x 8 provided at least M1M1 (not M2M0) previously awarded
10(a) <u>Alternative method 1:</u> Strategy of attempting to use the sine rule followed by 0.5absinC or right-angled trigonometry (right side =) $\frac{6.2 \times \sin 35}{\sin(180-50-35)}$ or $\frac{6.2 \times \sin 35}{\sin 95}$ = 3.56(...) or 3.57 or 3.6 (m) (Area of triangle =) $\frac{1}{2} \times 3.56(\dots) \times 6.2 \times \sin 50$ = 8.44 to 8.56 (m²) (Volume of room =) 67.5 to 68.5 (m³)	S1 M2 A1 M1 A1 B1	M1 for <u>right side</u> = $\frac{6.2}{\sin 35}$ or equivalent $\frac{6.2}{\sin(180-50-35)}$ FT 'their 3.56(...)' provided sine rule attempted Note: This calculation may come from use of right-angled trigonometry to find height = 3.56(...) x sin50 and then use of $\frac{1}{2} \times \text{base} \times \text{height}$ FT 'their 8.44 to 8.56' x 8 provided at least M1M1 (not M2M0) previously awarded
10(a) <u>Alternative method 2:</u> Strategy of attempting to use the sine rule followed by 0.5absinC or right-angled trigonometry (left side =) $\frac{6.2 \times \sin 50}{\sin(180-50-35)}$ or $\frac{6.2 \times \sin 50}{\sin 95}$ OR (right side =) $\frac{6.2 \times \sin 35}{\sin(180-50-35)}$ or $\frac{6.2 \times \sin 35}{\sin 95}$ left side = 4.76(...) or 4.77 or 4.8 (m) AND right side = 3.56(...) or 3.57 or 3.6 (m) (Area of triangle =) $\frac{1}{2} \times 4.76(\dots) \times 3.56(\dots) \times \sin 95$ = 8.44 to 8.61 (m²) (Volume of room =) 67.5 to 68.5 (m³)	S1 M2 A1 M1 A1 B1	M1 for <u>left side</u> = $\frac{6.2}{\sin 50}$ or equivalent OR $\frac{6.2}{\sin(180-50-35)}$ M1 for <u>right side</u> = $\frac{6.2}{\sin 35}$ OR $\frac{6.2}{\sin(180-50-35)}$ M1 for correct full method to calculate their 2nd side using sine or cosine rules following an incorrect method to initially calculate the left or right side FT 'their 4.76(...)' AND 'their 3.56(...)' AND 'their 95' provided sine rule attempted twice or the sine rule followed by the cosine rule attempted FT 'their 8.44 to 8.5625' x 8 provided at least M1M1 (not M2M0) previously awarded Note: An area of e.g. 8.61 leads to a volume of 68.88 which is outside the acceptable range and is B0

10(b)(i) Strategy of attempting to use 3D Pythagoras $\frac{1^2 + 0.7^2}{\text{or } \sqrt{1^2 + 0.7^2}} \text{ OR } \frac{1^2 + 1.2^2}{\sqrt{1^2 + 1.2^2}} \text{ OR } \frac{0.7^2 + 1.2^2}{\sqrt{0.7^2 + 1.2^2}}$ $(\text{=1.22...}) \quad (\text{=1.56...}) \quad (\text{=1.389...})$ (Total length of lead =) $\sqrt{1^2 + 0.7^2 + 1.2^2} \quad (\times 2) \quad \text{or}$ $(= \sqrt{2.93} \quad (\times 2))$ (Total length of lead needed =) 3.4 to 3.5 (m)	S1 M1 M2 A1	Must be for carrying through an initial Pythagoras step from one plane into a second plane FT 'their 2.4 ÷ 2' May be embedded in further working Implies S1 and previous M1 Note: $\sqrt{2.93} = 1.71(1\dots)$ and may come from sight of $\sqrt{1.93 + 1}$ or $\sqrt{2.44 + 0.49}$ or $\sqrt{1.49 + 1.44}$ M1 for $1^2 + 0.7^2 + 1.2^2$ or $1 + 0.49 + 1.44$ Do not accept answers outside this range that round to 3.4 or 3.5 i.e. needs to come from $2 \times (\sqrt{2.89} \text{ to } \sqrt{3.0625})$
10(b)(ii) (Area of a curved surface =) $\pi \times 9.2 \times 30 \quad \text{OR} \quad \pi \times 8 \times 30$ (= 866.6 to 867.2 or 276π cm²) (= 753.6 to 754.1 or 240π cm²) (Area of a semicircular ring =) $\frac{\pi \times 9.2^2}{2} - \frac{\pi \times 8^2}{2} \quad \text{or equivalent}$ (= 32.4 to 32.43 or $10.3(2)\pi$ cm²) (Total surface area =) $\pi \times 9.2 \times 30 + \pi \times 8 \times 30 + 1.2 \times 30 + 1.2 \times 30 + \left(\frac{\pi \times 9.2^2}{2} - \frac{\pi \times 8^2}{2} \right) + \left(\frac{\pi \times 9.2^2}{2} - \frac{\pi \times 8^2}{2} \right)$ (= (866.6 to 867.2) + (753.6 to 754.1) + 36 + 36 + (32.4 to 32.43) + (32.4 to 32.43)) = 1756.9 to 1758.3 (cm²)	B1 B1 M2 A1	Or equivalents. Do not award if they go on to multiply by another length creating a volume May be implied by sight of double these values i.e. 64.8 to 64.86 or $20.6(4)\pi$ Do not award if they go on to multiply by another length creating a volume Must be 6 correct areas and no further incorrect areas added/subtracted M1 for the sum of 4 or 5 correct surface areas (Or $536.6(4)\pi + 72$) For an answer in this range only, and must come from M2

