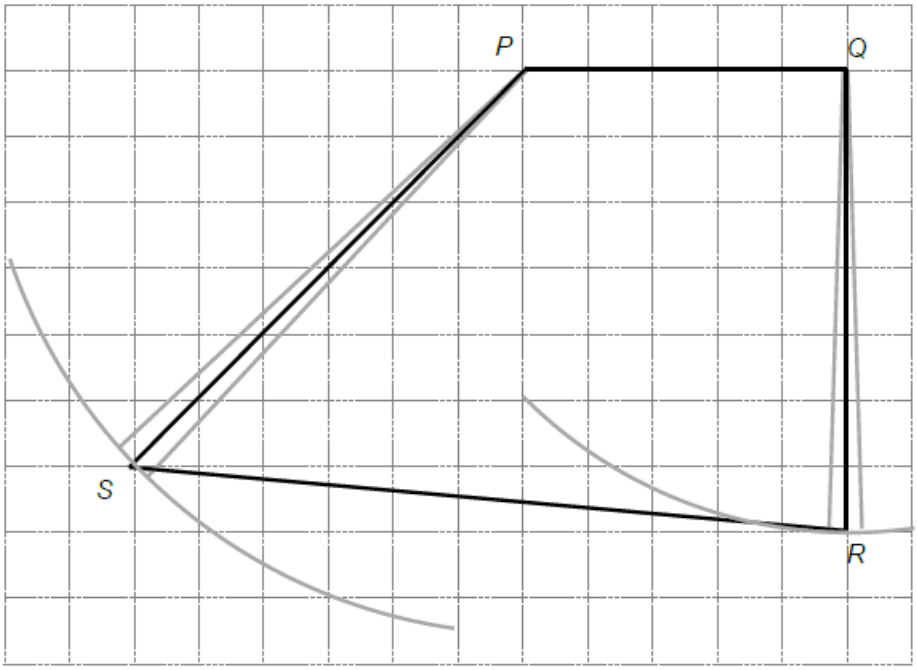
Question	Answer	Mark	Comments
1	**Alternative method 1: working in terms of π**		
	π (×) 4^2 (×) 10 or 160π or [502, 503]	M1	oe accept 3 or better for π accept 480 or 496
	$\frac{2}{3}$ (×) π (×) 6^3 or 144π or [452, 453]	M1	oe accept 3 or better for π accept 0.66 or 0.67 or better for $\frac{2}{3}$ accept 432 or 446(.4)
	160π and 144π or [502, 503] and [452, 453]	A1	oe values accept 480 and 432 or 496 and 446(.4)
	160π and 144π and cylinder or [502, 503] and [452, 453] and cylinder or cylinder is 16π greater	A1ft	ft correct decision for their 160π and their 144π with M1M1 scored accept 480 and 432 and cylinder or 496 and 446(.4) and cylinder
	Alternative method 2: working without π		
	4^2 (×) 10 or 160	M1	oe
	$\frac{2}{3}$ (×) 6^3 or 144	M1	oe accept 0.66 or 0.67 or better for $\frac{2}{3}$
	160 and 144	A1	oe values
	160 and 144 and cylinder	A1ft	ft correct decision for their 160 and their 144 with M1M1 scored
	Additional Guidance for this question is on the next page		

	Additional Guidance	
1	Better than 3 for π could be 3.1, 3.14, 3.142 or $\frac{22}{7}$	
	160π with incorrect method for hemisphere	M1M0A0A0
	144π with incorrect method for cylinder	M0M1A0A0
	160π and 144π with incorrect decision or no decision	M1M1A1A0
	160 and 144 with incorrect or no decision	M1M1A1A0
	Accept values given as fractions for the first A mark, but for the second A mark, they must have a common denominator. eg 160π and $\frac{432\pi}{3}$ and cylinder eg $\frac{480}{3}$ and $\frac{432}{3}$ and cylinder	 M1M1A1A0 M1M1A1A1
	Working with π for one value but not the other can only score M1 eg 160π and 144 (with or without a decision)	 M1 only
	Do not allow M1 for a correct formula as part of an incorrect formula eg $\frac{1}{3} \times \pi \times 4^2 \times 10$	 M0

2	Angle PQR = [88°, 92°] and line from Q = [6.8, 7.2] cm and angle QPS = [133°, 137°] and line from P = [8.3, 8.7] cm and complete quadrilateral	B4	B3 at least three of the four measuring criteria met B2 any two of the measuring criteria met B1 any one of the measuring criteria met Length of QR must be within 2 mm of the right-hand arc shown below Length of PS must be within 2 mm of the left-hand arc shown below
	Additional Guidance		
			
	Ignore labels if present		

3	triangular prism	B1	
	Additional Guidance		

Q	Answer	Mark	Comments
4	**Alternative method 1** Compares 70% of volume of hemisphere with volume of water		
	$\frac{4}{3} \times \pi \times 12^3$ or 2304π or [7216, 7239.2] or $\frac{2}{3} \times \pi \times 12^3$ or 1152π or [3581, 3638]	M1	oe eg $\frac{4}{3}\pi \times 1728$ allow without any multiplication signs eg $\frac{4}{3}\pi 12^3$
	0.7 × their 1152π or 806.4π or [2506, 2547]	M1dep	oe 0.7 × their [3581, 3638] or $\frac{4032}{5}\pi$ must be using volume of hemisphere
	325 × 8 or 2600	M1	oe
	[2506, 2547] and 2600 and Yes	A1	oe
	Alternative method 2 Works out volume of water as proportion of volume of hemisphere		
	$\frac{4}{3} \times \pi \times 12^3$ or 2304π or [7216, 7239.2] or $\frac{2}{3} \times \pi \times 12^3$ or 1152π or [3581, 3638]	M1	oe eg $\frac{4}{3}\pi \times 1728$ allow without any multiplication signs eg $\frac{4}{3}\pi 12^3$
	325 × 8 or 2600	M1	oe
	their 2600 ÷ their 1152π or [0.71, 0.73]	M1dep	oe eg their 2600 ÷ their [3581, 3638] or 72% dep on M2 must be using volume of hemisphere
	[71, 73](%) and Yes	A1	oe eg 0.72 and 0.7 and Yes

4 cont	**Alternative method 3** Works out time to fill 70% of volume of hemisphere		
	$\frac{4}{3} \times \pi \times 12^3$ or 2304π or [7216, 7239.2] or $\frac{2}{3} \times \pi \times 12^3$ or 1152π or [3581, 3638]	M1	oe eg $\frac{4}{3}\pi \times 1728$ allow without any multiplication signs eg $\frac{4}{3}\pi 12^3$
	0.7 × their 1152π or 806.4π or [2506, 2547] or their $1152\pi \div 325$ or [11, 11.2]	M1dep	oe 0.7 × their [3581, 3638] or $\frac{4032}{5}\pi$ or their [3581, 3638] ÷ 325 must be using volume of hemisphere
	0.7 × their $1152\pi \div 325$ or 0.7 × their [3581, 3638] ÷ 325 or [7.7, 7.84]	M1dep	oe their [2506, 2547] ÷ 325 or 0.7 × their [11, 11.2]
	[7.7, 7.84] and Yes	A1	oe

	Additional Guidance	
4 cont	Up to M3 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts	
	Allow 1.33(…) for $\frac{4}{3}$	
	Allow 0.66(…) or 0.67 for $\frac{2}{3}$	
	π may be seen as [3.14, 3.142] eg Alt 1 $\frac{2}{3} \times 3.14 \times 12^3$	M1
	If a number (or calculation) in terms of π is seen but π is subsequently omitted, treat as a miscopy for M marks eg Alt 1 1152π $0.7 \times 1152 = 806.4$ $325 \times 8 = 2600$ Yes	 M1 M1dep M1A0
	Yes cannot be implied by inequalities	
	Alts 1 and 2 $325\,cm^3 \times 8$ seen is M1 even if evaluated incorrectly $325^3 \times 8$ seen is M0 unless recovered to 2600	
	Do not allow misreads of the given formula unless recovered eg1 using 12^2 instead of 12^3 eg2 using $\frac{3}{4}$ instead of $\frac{4}{3}$	
	For $0.7 \times$ their 1152π, do not accept $70\% \times$ their 1152π unless recovered	

Q	Answer	Mark	Comments
5	triangular-based pyramid	B1	

Q	Answer	Mark	Comments
6	$\frac{1}{2} \times (14 + 20) \times 11$ or 187	M1	oe any correct method to find the area of the trapezium
	$\frac{1}{2} \times 10 \times 7$ or 35	M1	oe eg $\frac{1}{2} \times 10 \times 7 \times \sin 90$
	222	A1	
	Additional Guidance		
	Up to M2 may be awarded for correct work, with no or incorrect answer, even if this is seen amongst multiple attempts		
	Ignore Pythagoras' theorem, trigonometry or perimeter calculations		
	$14 \times 11 + \frac{1}{2} \times 6 \times 11$	M1	
	Missing brackets must be recovered eg1 $\frac{1}{2} \times 20 + 14 \times 11$ and 187 eg2 $\frac{1}{2} \times 20 + 14 \times 11$	 M1 M0	
	$20 \times 11 = 220$	M0M0A0	

Q	Answer	Mark	Comments
7a	Correct statement	B1	eg she used the height instead of the slant height or she used the vertical height or she used 12 (instead of 13)
	Additional Guidance		
	Check diagram		
	For 'vertical' accept anything that implies she has used the wrong height		
	Condone 'length' to mean 'height' or 'slant height'		
	12 or 13 circled on the diagram must be accompanied by a supporting statement		
	Indicates '12' in the calculation	B1	
	She should have done $\pi \times 5 \times 13$	B1	
	It should be 65π	B1	
	She used the wrong height / the (value of) l is wrong	B1	
	She hasn't used the slant height (she used the (vertical) height)	B1	
	She hasn't used the 13	B1	
	She hasn't used the 13 and should be $5 \times 12 \times 13 \times \pi$	B0	
	The multiplication used the wrong number(s)	B0	
	She hasn't used a value for π	B0	
	An incorrect statement with a correct statement eg she used 13 instead of 12 and didn't square the radius	B0	

Q	Answer	Mark	Comments
7b	$\pi \times 5 \times 5$ or 25π or $3 \times 5 \times 5$	M1	oe accept [3.14, 3.142] or $\frac{22}{7}$ for π
	75	A1	
	Additional Guidance		
	$\pi 25$	M1	

Q	Answer	Mark	Comments
7c	'More than' indicated or implied by statement and valid reason	B1	eg valid reasons 3.14 is greater (than 3) Beth's number is bigger (than Adam's) (the correct answer is) 78.5 (with their answer to (b) less than 78.5)
	Additional Guidance		
	If calculations are used, the outcomes must be correct		
	Accept 78 or 79 for 78.5 unless from incorrect working		
	'Less than' indicated		B0
	Do not penalise use of the same incorrect formula in (b) and (c) eg $3 \times 10 = 30$ in (b) and $3.14 \times 10 = 31.4$ in (c) with 'More than' ticked		B1
	Ignore a non-contradictory reason with a correct reason eg 3.14 is bigger than 3 and nearer the true value of pi		B1
	Acceptable reasons		
	Adam has rounded (pi) down / Adam only used 3		B1
	There is an extra 0.14 to multiply by		B1
	Her number has decimal places		B1
	Her number is to more significant figures		B1
	Non-acceptable reasons		
	3.14 will give a bigger answer / 3.14 is more accurate		B0