1	$\tan x = \frac{3.4}{4.7}$ oe eg $\cos x = \frac{4.7}{\sqrt{3.4^2+4.7^2}}$ oe			M1	or $\sin x = \frac{3.4\sin 90}{\sqrt{3.4^2+4.7^2}}$ oe
	$(x=)\tan^{-1}\left(\frac{3.4}{4.7}\right)$ oe eg $(x=)\cos^{-1}\left(\frac{4.7}{\sqrt{3.4^2+4.7^2}}\right)$			M1	or $(x=)\sin^{-1}\left(\frac{3.4\sin 90}{\sqrt{3.4^2+4.7^2}}\right)$ oe
		35.9	3	A1	accept 35.7 - 36.1
					Total 3 marks

2	eg $\frac{4}{AC} = \tan 35$ oe **or** $\frac{AC}{4} = \tan 55$ oe **or** $\frac{AC}{\sin 55} = \frac{4}{\sin 35}$ oe **or** $CH = \frac{4}{\sin 35}$ oe (= 6.97...) **and** $\frac{AC}{"6.97"} = \cos 35$ oe **or** $CH = \frac{4}{\sin 35}$ oe (=6.97...) **and** $AC^2 = 6.97^2 - 4^2$ oe			M1	A correct trig statement involving AC **or** trig and then Pythagoras involving AC
	$(AC=)\frac{4}{\tan 35}$ oe eg $(AC=)$ 4tan55 (= 5.71...) **or** $(AC=)\frac{4\sin 55}{\sin 35}$ **or** "6.97" × cos35 oe **or** $(AC=)\sqrt{"6.97"^2-4^2}$			M1	complete method to find AC
	$(BC=)\sqrt{"5.71"^2-5^2}$ (= 2.76...)			M1	complete method to find BC
	4 × 5 × "2.76..."			M1	method to find volume
		55.3	5	A1	accept 55.1 – 55.5
					Total 5 marks

3		$\cos 63 = \frac{24.3}{(PQ)}$ **or** $\sin 27 = \frac{24.3}{(PQ)}$ **or** $\frac{(PQ)}{\sin 90} = \frac{24.3}{\sin 27}$ **or** $\frac{\sin 90}{(PQ)} = \frac{\sin 27}{24.3}$ oe		3	M1 for a correct trigonometric ratio	M2 for $(RQ=)24.3\times\tan 63 (=47.6914..)$ **and** $(PQ=)\sqrt{"47.6914"^2+24.3^2}$ oe
		$(PQ=)\frac{24.3}{\cos 63}$ **or** $(PQ=)\frac{24.3}{\sin 27}$ **or** $(PQ)=\frac{24.3}{\sin 27}\times\sin 90$			M1 for a correct rearrangement for PQ	
			53.5		A1 Accept 53.5 - 53.53	
						Total 3 marks

4	$\sin 23° = \frac{"h"}{500}$ oe or $\cos 67° = \frac{"h"}{500}$ oe or $\frac{"h"}{\sin 23°} = \frac{500}{\sin 90°}$ or $\frac{\sin 23}{"h"} = \frac{\sin 90}{500}$ oe **or** $\cos 23° = \frac{"x"}{500}$ oe or $"x" = 500\cos 23°$ (= 460.25..) **and** $"h"^2 = 500^2 - ("460.25...")^2$ oe		3	M1	for a correct expression involving "h"
	"h" = 500 × sin 23° oe **or** $"h" = \sqrt{500^2 - ("460.25...")^2}$			M1	
		195. 4		A1	195 – 195.4
					Total 3 marks

5	e.g. $\sin 65 = \frac{16}{AB}$ **or** $\cos 25 = \frac{16}{AB}$ **or** $\frac{AB}{\sin 90} = \frac{16}{\sin 65}$ **or** $\tan 65 = \frac{16}{AD}$ **or** $\tan 25 = \frac{AD}{16}$ **or** $\frac{AD}{\sin 25} = \frac{16}{\sin 65}$		4	M1	for a correct trig ratio for AB **or** AD accept 180 – 90 – 65 for 25
	e.g. $(AB =)\frac{16}{\sin 65} (= 17.654\ldots)$ **or** $(AB =)\frac{16}{\cos 25} (= 17.654\ldots)$ **or** $(AB =)\frac{16\sin 90}{\sin 65} (= 17.654\ldots)$ **and** $(AD =)\frac{16}{\tan 65} (= 7.460\ldots)$ **or** $(AD) = 16 \times \tan 25 (= 7.460\ldots)$ **or** $(AD =)\frac{16\sin 25}{\sin 65} (= 7.460\ldots)$			M1	for finding AB **and** AD Allow use of Pythagoras $(AD =)\sqrt{"17.654..."^2 - 16^2} (= 7.460\ldots)$ or $(AB =)\sqrt{"7.460..."^2 + 16^2} (= 17.654\ldots)$
	("17.654…" × 2) + ("7.460…" × 2) oe			M1	for a complete method to find the perimeter
		50.2		A1	accept 49.6 – 50.6
					Total 4 marks

6	eg $\tan BAP = \frac{2}{5}$ or $\sin BAP = \frac{2}{\sqrt{5^2 + 2^2}}$ or $\frac{\sin BAP}{2} = \frac{\sin 90}{\sqrt{5^2 + 2^2}}$ $\cos BAP = \frac{5}{\sqrt{5^2 + 2^2}}$ or $\cos BAP = \frac{5^2 + (\sqrt{5^2 + 2^2})^2 - 2^2}{2 \times 5 \times \sqrt{29}}$		5	M1	for setting up a trig equation for angle BAP
	eg $(BAP =)\tan^{-1}\left(\frac{2}{5}\right) (= 21.8...)$ or $(BAP =)\sin^{-1}\left(\frac{2}{\sqrt{5^2 + 2^2}}\right)$ or $(BAP =)\sin^{-1}\left(\frac{2\sin 90}{\sqrt{5^2 + 2^2}}\right)$ $(BAP =)\cos^{-1}\left(\frac{5}{\sqrt{5^2 + 2^2}}\right)$ or $BAP = \cos^{-1}\left(\frac{5^2 + (\sqrt{5^2 + 2^2})^2 - 2^2}{2 \times 5 \times \sqrt{5^2 + 2^2}}\right)$			M1	for a complete method to find angle BAP (= 21.8….) [M2 for $90 - \tan^{-1}\frac{5}{2}$ ie 90 – 68.2]
	eg (int angle =) $(6-2) \times 180 \div 6 (= 120)$ **or** (ext angle =) $360 \div 6 (= 60)$			M1	**Indep** for a method to find the size of one interior **or** one exterior angle in a regular hexagon – **could be seen on diagram**
	eg "120" – "21.8" **or** 180 – "60" – "21.8"			M1	for a complete method to find angle PAF where all values have come from a correct method
		98.2		A1	accept 98.1 – 98.3
					Total 5 marks

7	$\cos 42 = \frac{x}{9.5}$ or $\tan 42 = \frac{9.5\sin 42}{x}$ or $\sin(90-42) = \frac{x}{9.5}$ or $\frac{x}{\sin(90-42)} = \frac{9.5}{\sin 90}$ or $9.5^2 - (9.5\sin 42)^2$		3	M1	a correct trig statement for x or correct Pythagoras for x^2
	$(x =)\ 9.5\cos 42$ or $(x =)\frac{9.5\sin 42}{\tan 42}$ or $(x =)9.5\sin(90-42)$ or $(x =)\frac{9.5\sin(90-42)}{\sin 90}$ or $(x =)\sqrt{9.5^2 - (9.5\sin 42)^2}$ or			M1	a fully correct calculation to find x
		7.1		A1	awrt 7.1
					Total 3 marks

8	$\tan'x' = \frac{30.7-6.2}{244}$ or $\tan'x' = \frac{244}{30.7-6.2}$ or $\sqrt{244^2 + '24.5'^2}\ \left(= \sqrt{60136.25} = 245.2...\right)$ **and** $\sin'x' = \frac{'24.5'}{'\sqrt{60136.25}'}$ or $\cos'x' = \frac{244}{'\sqrt{60136.25}'}$		3	M1 for suitable trig expression for their choice of variable x to represent either of the (non right-angle) angles in the triangle.
	$\tan^{-1}\left(\frac{'24.5'}{244}\right)$ or $90 - \tan^{-1}\left(\frac{244}{'24.5'}\right)$ or $\sqrt{244^2 + '24.5'^2}\ \left(= \sqrt{60136.25} = 245.2...\right)$ **and** $\sin^{-1}\left(\frac{'24.5'}{'\sqrt{60136.25}'}\right)$ or $\cos^{-1}\left(\frac{244}{'\sqrt{60136.25}'}\right)$ or $\cos^{-1}\left(\frac{'245.2...'^2 + '24.5'^2 - 244^2}{2\times'245.2...'\times'24.5'}\right)$			M1 using a suitable trig expression to find the angle of depression. **or** for using Pythagoras to find hypotenuse **and** a suitable trig expression to find the angle of depression.
		5.7		A1 answers in the range 5.65 to 5.75 SC B2 for 84.3 (or in the range 84.25 to 84.35) **or** 264.3 (or in the range 264.25 to 264.35) given as answer.
				Total 3 marks

9	$12 \times \tan 5$ (=1.05) **or** $\tan 5 = \frac{'y'}{12}$ **or** 12tan5 **or** $\tan 85 = \frac{12}{'y'}$ **or** $\frac{12}{\tan 85}$ $\frac{y}{\sin 5} = \frac{12}{\sin 85}$ oe **or** $(y =)$ 1.04986… oe		3	M1	oe correct expression using tan or the sine rule or $\sqrt{\left(\frac{12}{\cos 5}\right)^2 - 12^2}$ (= 1.04986…)
	$(AB =)$ 2.6 + "1.05" oe			M1	
		3.65		A1	allow awrt 3.65
					Total 3 marks

10	$\sin 52 = \frac{12 \div 2}{r}$ oe **or** $\frac{r}{\sin 90} = \frac{6}{\sin 52}$ oe **or** $\cos(90-52) = \frac{12 \div 2}{r}$ oe **or** $(r^2 =)(12 \div 2)^2 + \left(\frac{12 \div 2}{\tan 52}\right)^2$ oe $\left[r^2 = 6^2 + 4.687...^2\right]$ **or** $\frac{r}{\sin 38} = \frac{12}{\sin 104}$ oe		4	M1	A correct trig statement for the radius use of tan must also include a correct Pythagoras statement.
	$r = \frac{6}{\sin 52}$ (=7.614) oe **or** $r = \frac{6}{\cos 38}$ oe **or** $(r =)\sqrt{(12 \div 2)^2 + \left(\frac{12 \div 2}{\tan 52}\right)^2}$ $\left[r = \sqrt{6^2 + 4.687...^2}\right]$ oe **or** $\frac{12 \sin 38}{\sin 104}$ oe			M1	A correct method to find the radius of the circle use of tan must also use Pythagoras to find an expression for r
	(Area =) $\pi \times ("7.61...")^2$			M1	the radius must come from a completely correct method
	Correct answer scores full marks (unless from obvious incorrect working)	182		A1	Accept 181 - 183
					Total 4 marks

11	$\sin 32 = \frac{(BC)}{50}$ or $\cos 32 = \frac{(CD)}{50}$ or $\frac{(BC)}{\sin 32} = \frac{50}{\sin 90}$ oe or $\frac{(CD)}{\sin(90-32)} = \frac{50}{\sin 90}$ oe		6	M1
	$(BC =) 50 \sin 32 (= 26.4(959...))$ or $(BC =) \sqrt{50^2 - (50 \cos 32)^2} (= 26.4(959...))$ or $(BC =) \sqrt{50^2 - "42.4..."^2} (= 26.4(998...))$ or $(BC =) \frac{50}{\sin 90} \times \sin 32$ oe			M1 for finding *BC* or *AD* Can be written on the diagram
	$(CD =) 50 \cos 32 (= 42.4(024)\ldots)$ or $(CD =) \sqrt{50^2 - (50 \sin 32)^2} (= 42.4(024...))$ or $(CD =) \sqrt{50^2 - "26.4..."^2} (= 42.4(622...))$ or $(CD =) \frac{50}{\sin 90} \times \sin(90-32)$			M1 for finding *CD* or *BA* Can be written on the diagram
	$(r =)$"42.4(024…)" ÷ 2π (= 6.74(855…))			M1 for finding the radius of the cylinder
	$(V =) \pi \times$ "6.74(855…)"$^2 \times$ "26.4(959…)"			M1 dep on previous M mark for the use of $\pi r^2 h$
	Correct answer scores full marks (unless from obvious incorrect working)	3790		A1 allow answers in the range 3737 – 3794 Accept answers in standard form
				Total 6 marks

12	$\cos BAD = \frac{8}{14}$ **or** $\sin ABD = \frac{8}{14}$ **or** $\sin ABD = \frac{8\sin 90}{14}$ **or** $(BD =)\sqrt{14^2 - 8^2}\left(=\sqrt{132} = 2\sqrt{33} = 11.4(89...)\right)$		4	M1
	$BAD = \cos^{-1}\left(\frac{8}{14}\right)$ $(= 55.(15\ldots))$**or** $\cos^{-1}\left(\frac{14^2 + 8^2 - "11.489"^2}{2\times 14\times 8}\right)$ $BAD = \sin^{-1}\left(\frac{"11.489..."}{14}\right)$ $(= 55.(15\ldots))$ **or** $BAD = \tan^{-1}\left(\frac{"11.489..."}{8}\right)(= 55.(15\ldots))$ **or** $BAD = 180 - 90 - \sin^{-1}\left(\frac{8}{14}\right)(= 180 - 90 - 34.8... = 55.(15...)$ oe **or** $CAD = 180 - 38 - \sin^{-1}\left(\frac{8}{14}\right) - 90 \quad (= 180 - 38 - 34.8 - 90 = 17.2)$			M1
	$\tan("55.15..." - 38) = \frac{CD}{8}$ oe eg $\tan 17.2 = \frac{CD}{8}$ $\frac{CD}{\sin(55.1... - 38)} = \frac{8}{\sin(90 - (55.1... - 38)}$ oe			M1 A correct equation with CD being the only unknown value
	Correct answer scores full marks (unless from obvious incorrect working)	2.47		A1 2.44 – 2.48
				Total 4 marks