

Frustums Mark Scheme		
1	Top Cone: $r = 4, h = 35 - 15 = 20$ $V = \frac{\pi \times 4^2 \times 20}{3} = \frac{320}{3}\pi$	[1] Volume of a cone: $V = \frac{(\pi r^2 h)}{3}$
	Bigger Cone: $r = 7, h = 35$ $V = \frac{\pi \times 7^2 \times 35}{3} = \frac{1715}{3}\pi$	[1] Volume of total shape calculated
	Volume of Frustum: bigger cone - smaller cone $\frac{1715}{3}\pi - \frac{320}{3}\pi = 465\pi$	[1] Correct answer
	$= 1460.84 \text{ cm}^3$ (2dp)	[1] Correct answer to 2dp
2	Curved Surface Area of Small Cone: $r = 4, l = 23.3 - 14 = 9.3$ $SA = \pi \times 4 \times 9.3 = 37.2\pi$	[1] Curved Surface Area: $SA = \pi r l$
	Curved Surface Area of Big Cone: $r = 10, l = 23.3$ $SA = \pi \times 10 \times 23.3 = 233\pi$	[1] Correct curved surface area
	Frustum Curved Surface Area = Big Cone - Small Cone $SA = 233\pi - 37.2\pi = 195.8\pi$	[1] Frustum curved surface area
	Areas of top and bottom: $\text{Top} = \pi r^2 = \pi \times 4^2 = 16\pi$ $\text{Bottom} = \pi r^2 = \pi \times 10^2 = 100\pi$	[1] Area of the two circles
	Total Surface Area $195.8\pi + 16\pi + 100\pi = 979.55 \text{ cm}^2$ ($\pm 1\text{cm}$)	[1] All areas correctly added together
3	Volume of Small Pyramid $a = 5, h = 8.75$ $V = \frac{5^2 \times 8.75}{3} = \frac{875}{12}$	[1] Squared Based Pyramid $V = \frac{a^2 h}{3}$
	Volume of Full Pyramid $a = 9, h = 7 + 8.75 = 15.75$ $V = \frac{9^2 \times 15.75}{3} = \frac{1701}{4}$	[1] Volume of full pyramid
	Total Volume = Full Pyramid - Small Pyramid $\frac{1701}{4} - \frac{875}{12} = 352.33 \text{ m}^3$	[1] Volume of frustum

Turn over ►

4	<p><i>Volume of Full Pyramid</i></p> $\text{volume of pyramid} = \frac{lwh}{3}$ $l = 7$ $w = 7$ $h = 14$ $\text{volume of pyramid} = \frac{7 \times 7 \times 14}{3} = \frac{686}{3}$	[1] Volume of large pyramid
	<p><i>Volume of Small Pyramid</i></p> $\text{volume of pyramid} = \frac{lwh}{3}$ $l = 2$ $w = 2$ $h = 14 - 10 = 4$ $\text{volume of pyramid} = \frac{2 \times 2 \times 4}{3} = \frac{16}{3}$	[1] Volume of small pyramid
	<p><i>frustum volume = full pyramid – small pyramid</i></p> $= \frac{686}{3} - \frac{16}{3} = \frac{670}{3} \text{ cm}^3$	[1] Volume of frustum
5	3:7 or 3/7	[1] Ratio of bases
	<p>Height of smaller cone is</p> $10 \times \frac{3}{7} = \frac{30}{7}$	[1] Height of smaller cone
	<p>Height of remaining frustum is,</p> <p><i>larger cone height – smaller cone height</i></p> $10 - \frac{30}{7} = \frac{40}{7} = 5.71 \text{ cm}$	[1] Height of frustum
6	3:12 or 1/4	[1] Ratio of bases
	<p>Slant height of smaller cone is</p> $15 \times \frac{1}{4} = \frac{15}{4}$	[1] Slant height of smaller cone
	<p>Slant height of remaining frustum is,</p> <p><i>larger cone slant height – smaller cone slant height</i></p> $15 - \frac{15}{4} = 11.25 \text{ cm}$	[1] Calculation of frustum height gives x

Turn over ►

7	<i>base area : equilateral triangle area</i> $= \frac{1}{2} \times 11 \times \frac{11\sqrt{3}}{2}$	[1] Area of base
	<i>Volume of Full Pyramid:</i> <i>volume = $\frac{1}{3} \times \text{base area} \times \text{height}$</i> $= \frac{1}{3} \times \frac{1}{2} \times 11 \times \frac{11\sqrt{3}}{2} \times 20 = 349.297 \dots$	[1] Volume of full pyramid
	<i>equilateral triangle area = $\frac{1}{2} \times 7 \times \frac{7\sqrt{3}}{2}$</i> <i>volume = base area \times height</i> $= \frac{1}{3} \times \frac{1}{2} \times 7 \times \frac{7\sqrt{3}}{2} \times 14 = 99.016 \dots$	[1] Volume of small pyramid
	<i>frustum volume = full pyramid – small pyramid</i> $= 349.297 - 99.016 = 250.28 \text{ cm}^3$	[1] Final answer

END