

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

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4	<p>Volume of Full Pyramid</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>Volume of Small Pyramid</p> $\text{volume of pyramid} = \frac{lwh}{3}$ $l = 2$ $w = 2$ $h = 14 \times \frac{2}{7} = 4$ $\text{volume of pyramid} = \frac{2 \times 2 \times 4}{3} = \frac{16}{3}$	[1] Volume of small pyramid
	<p>frustum volume = full pyramid – small pyramid</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>larger cone height – smaller cone height</p> $10 - \frac{30}{7} = \frac{40}{7} = 5.71 \text{ cm}$	[1] Height of frustum
6	3: 12 or ¼	[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>larger cone slant height – smaller cone slant height</p> $15 - \frac{15}{4} = 11.25 \text{ cm}$	[1] Calculation of frustum height gives x

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7	base area : equilateral triangle area = $\frac{\sqrt{3}}{4}a^2$ where $a = 11$ $\text{area} = \frac{121\sqrt{3}}{4}$	[1] Area of base
	Volume of Full Pyramid: $\text{volume} = \frac{1}{3} \times \text{base area} \times \text{height}$ $= \frac{121\sqrt{3}}{12} \times 20 = \frac{605\sqrt{3}}{3}$	[1] Volume of full pyramid
	equilateral triangle area = $\frac{\sqrt{3}}{4}a^2$ $a = 7$ $\text{area} = \frac{49\sqrt{3}}{4}$ height = 14 $\text{volume} = \frac{1}{3} \times \text{base area} \times \text{height}$ $= \frac{49\sqrt{3}}{12} \times 14 = \frac{343\sqrt{3}}{6}$	[1] Volume of small pyramid
	frustum volume = full pyramid – small pyramid $= \frac{605\sqrt{3}}{3} - \frac{343\sqrt{3}}{6}$ $= \frac{289\sqrt{3}}{2} \text{ cm}^3 = 250.28 \text{ cm}^3$	[1] Final answer

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