

Similar Shapes Mark Scheme

1	The ratio of scale factors for lengths, SF_L , and for volumes, SF_V , is $SF_V = (SF_L)^3$	[1] Use of scale factor relations
	The value of $SF_V = 8$ is given so, $8 = (SF_L)^3$	[1] Substituting volume scale factor
	$SF_L = \sqrt[3]{8} = 2$	[1] Finding length scale factor
	So the larger boxes height = $2x$	[1] Finding height in terms of x
2	From the heights the smaller wedge is half the size of the larger wedge so the base is, $16 \times \frac{1}{2} = 8 \text{ cm}$	[1] Finding scale factor to find the missing length
	Hence the volume of the smaller wedge is, $\frac{1}{2} \times 8 \times 6 \times 9$	[1] Calculation of the volume
	= 216 cm^3	[1] Final answer
3	$(4 \times 2 \times 5) + \left(\frac{1}{2} \times 1 \times 2 \times 5\right) = 40 + 5 = 45 \text{ cm}^3$	[1] Volume of original shape
	Scale factor = 0.5^3	[1] Scale factor for volume
	$45 \times 0.5^3 = \frac{45}{8} \text{ cm}^3$	[1] Volume of smaller shape
	$45 - \frac{45}{8} = 39.375 \text{ cm}^3$	[1] Original shape – smaller shape
	39.4 cm^3 (3 sf)	[1] Final answer
4	Surface Area = $4\pi r^2$	[1] Correct formula used
	SA larger: smaller is $4\pi(3x)^2 : 4\pi x^2$	[1] Ratio
	$9 : 1$	[1] Ratio simplified
5	$\frac{1}{3}\pi r^2 h = \frac{1}{3}\pi \times 8^2 \times 15$	[1] Attempt to work out the volume of the larger cone
	= 320π	[1] Correct value
	Smaller cone volume = $320\pi \times (0.75)^3$	[1] Use of cubic scale factor
	= 135π	[1] Final answer

Turn over ►

6	SA which means we need to square the length scale factor. $30 \div 10 = 3$ SA scale factor $3^2 = 9$	[1]
	Surface area of larger cylinder $9 \times 30\pi = 270\pi$	[1]
	Set up equation so solve for x $2\pi x(30) + 2\pi x^2 = 270\pi$	[1]
	Solve for x $2\pi x(30) + 2\pi x^2 = 270\pi$ $x^2 + 30x - 135 = 0$ $x = \frac{(\pm 12\sqrt{10})}{2}$ $x = 3.97 \text{ cm (2dp)}$	[1] Allow only positive solution for x

END