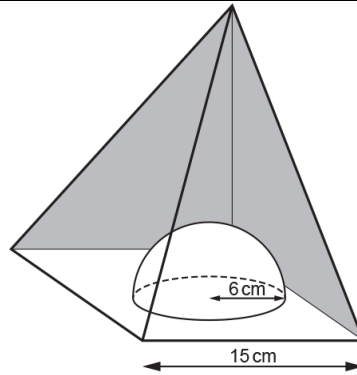**a)**

An ornament is made from a solid glass square-based pyramid.
The base has side length 15cm.
A hemisphere with radius 6cm is cut out of the base of the pyramid.
This reduces the volume of glass contained in the ornament by 30%.

Calculate the perpendicular height of the pyramid.
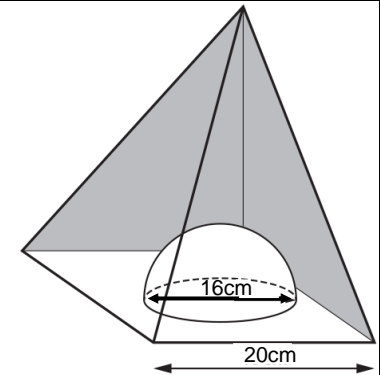

6 cm

15 cm

b)

An ornament is made from a solid glass square-based pyramid.
The base has side length 20cm.
A hemisphere with diameter 16cm is cut out of the base of the pyramid.
This reduces the volume of glass contained in ornament by 25%.

Calculate the perpendicular height of the pyramid.

16cm

20cm

| What is the volume of the 'full' pyramid?	$V_{pyramid} = \dfrac{1}{3} \times area\ of\ base\ \times perp.\ height$ $= \dfrac{1}{3} \times 15^2\ \times x = 75x$	What is the volume of the 'full' pyramid?	$V_{pyramid} = \dfrac{1}{3} \times area\ of\ base\ \times perp.\ height$ $= \dfrac{1}{3} \times 20^2\ \times x = \dfrac{400}{3}x$
What is the volume of the hemisphere?	$V_{sphere} = \dfrac{4}{3}\pi r^3 = \dfrac{4}{3} \times \pi \times 6^3 = 288\pi$ $V_{hemisphere} = \dfrac{288\pi}{2} = 144\pi$	What is the volume of the hemisphere?	$V_{sphere} = \dfrac{4}{3}\pi r^3 = \dfrac{4}{3} \times \pi \times 8^3 = \dfrac{2048\pi}{3}$ $V_{hemisphere} = \dfrac{2048\pi}{3} \div 2 = \dfrac{1024\pi}{3}$
What is the relationship between the two volumes?	$V_{hemisphere} = 30\%\ of\ V_{pyramid}$ $144\pi = \dfrac{3}{10} \times 75x$ $144\pi = \dfrac{225x}{10}$	What is the relationship between the two volumes?	$V_{hemisphere} = 25\%\ of\ V_{pyramid}$ $\dfrac{1024\pi}{3} = \dfrac{1}{4} \times \dfrac{400}{3}x$ $\dfrac{1024\pi}{3} = \dfrac{100x}{3}$
What is the perpendicular height, x?	$x = \dfrac{144\pi \times 10}{225} = 20.10619298297\ \dots$ $20.11cm$	What is the perpendicular height, x?	

BACKWARD FADED MATHS

c)
An ornament is made from a solid glass square-based pyramid.
The base has side length 12cm.
A hemisphere with diameter 8cm is cut out of the base of the pyramid.
This reduces the volume of glass contained in ornament by 40%.

Calculate the perpendicular height of the pyramid.
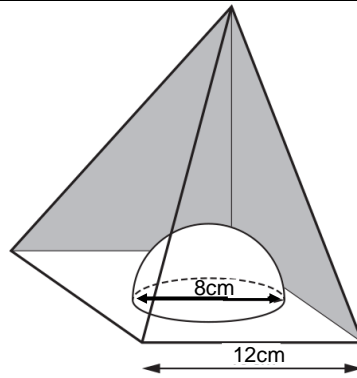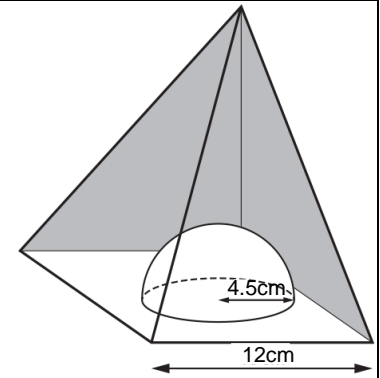
d)
An ornament is made from a solid glass square-based pyramid.
The base has side length 12cm.
A hemisphere with radius 4.5cm is cut out of the base of the pyramid.
This reduces the volume of glass contained in the ornament by 20%.

Calculate the perpendicular height of the pyramid.

What is the volume of the 'full' pyramid?	$V_{pyramid} = \frac{1}{3} \times area\ of\ base\ \times perp.height$ $= \frac{1}{3} \times 12^2 \times x = 48x$
What is the volume of the hemisphere?	$V_{sphere} = \frac{4}{3}\pi r^3 = \frac{4}{3} \times \pi \times 4^3 = \frac{256\pi}{3}$ $V_{hemisphere} = \frac{256\pi}{3} \div 2 = \frac{128\pi}{3}$
What is the relationship between the two volumes?	
What is the perpendicular height, x?	

BACKWARD FADED MATHS