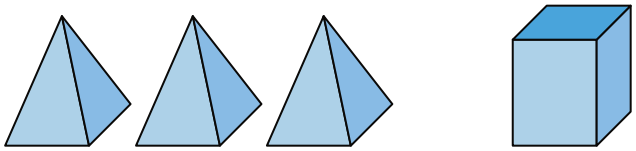
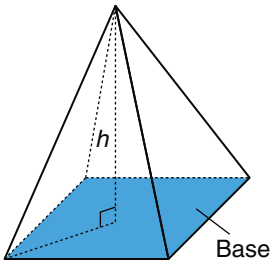
Connect the Ideas

The contents of three pyramids fit exactly into the prism.
These 3 volumes together… …are equal to this volume.

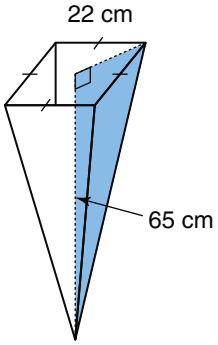


That is, the volumes of 3 pyramids are equal to the volume of the related prism.
So, the volume of a pyramid is one-third the volume of the related prism.



$V = \frac{1}{3}Bh$, where B is the area of the base of the pyramid and h is the height of the pyramid.

To calculate how much plaster is needed to fill this mould, we calculate the volume of the pyramid.
The base of the pyramid is a square with side length 22 cm.
So, the base area is: $B = 22 \times 22 = 484$
The height of the pyramid is: $h = 65$



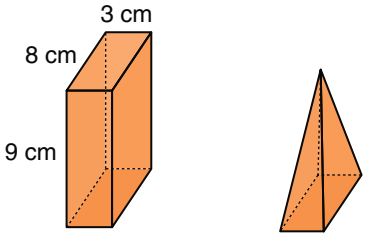
The volume of the pyramid is: $V = \frac{1}{3}Bh$

$$V = \frac{1}{3} \times 484 \times 65$$
$$\doteq 10\,486.67$$

The volume of plaster is about 10 487 cm^3.

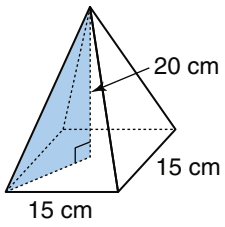
Practice

1. The prism and pyramid have the same base and height.
Determine each volume.

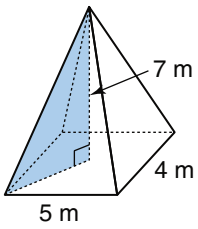


2. Determine the volume of each rectangular pyramid.

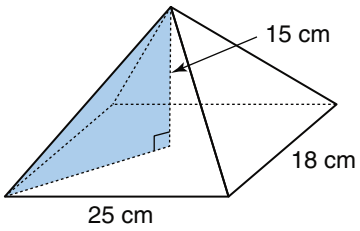
a)



b)

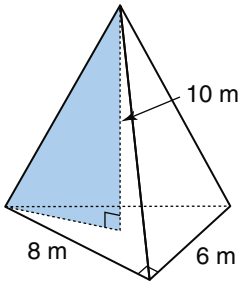


c)

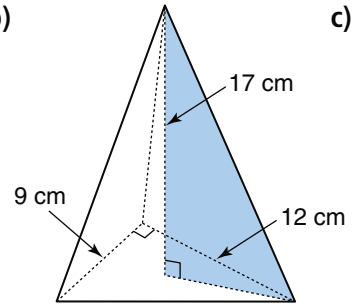


3. Determine the volume of each pyramid.

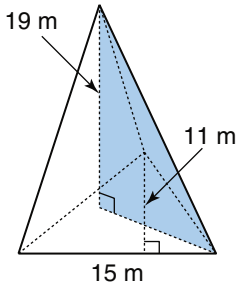
a)



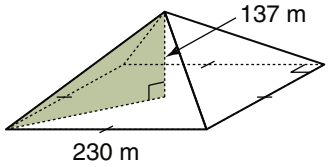
b)



c)



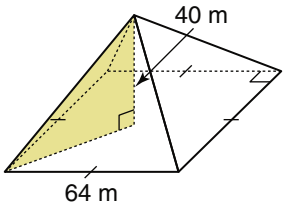
4. Pyramids have been constructed in many places around the world.
One of the most famous is the Great Pyramid of Giza.
It contains the burial chamber of Pharaoh Khufu.
Today, the pyramid is 137 m high.
When first constructed, it was 146.5 m high.



a) Sketch the original pyramid.
Label the sketch with the given measurements.

b) What volume of rock has been lost over the years?
Why do you think it has been lost?

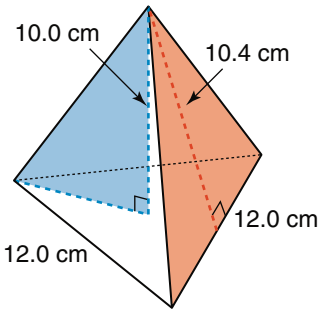
5. A pyramid in Pune, India, can hold 5000 people.



a) What is the volume of air per person in the pyramid?

b) How do you know your answer is reasonable?

6. **Assessment Focus** A package for a frozen treat is a triangular pyramid. All edge lengths are 12.0 cm.
Each triangular face has height 10.4 cm.



a) Calculate the volume of the pyramid.
Show your work.

b) The package lists its contents as 200 mL.
Why are the contents in millilitres different from the volume in cubic centimetres?

$1 \text{ cm}^3 = 1 \text{ mL}$