

CHAPTER 8: Measurement Relationships

8.5 Volume of a Cone

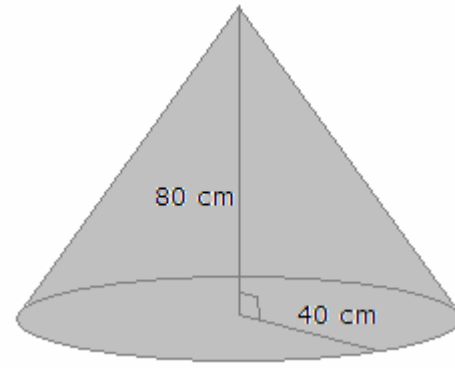
Volume of a Cone

The formula for the volume of a cone is $V = \frac{1}{3} \pi r^2 h$.

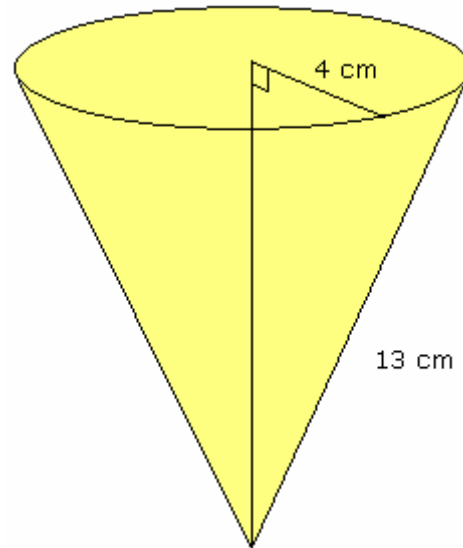
If you know the slant height s of a cone and the radius r , you can determine the height h using the Pythagorean theorem.

Example:

a) Randall bought two conical concrete markers for the entrance to his driveway. Each had a radius of 0.4 m and a height of 0.8 m. How much concrete was needed to make the markers?



b) Indira has purchased a 5 L bag of peanuts. She plans to pour the peanuts into conical cups with a radius of 4 cm and a slant height of 13 cm to sell at the town fair. How many cups can she fill?



Solution:

$$\begin{aligned} \text{a) } V &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \times \pi \times 0.4^2 \times 0.8 \\ &= 0.13 \text{ m}^3 \end{aligned}$$

The volume of concrete needed is $2 \times 0.13 = 0.26 \text{ m}^3$.

$$\begin{aligned} \text{b) } s^2 &= r^2 + h^2 \\ 13^2 &= 4^2 + h^2 \\ 169 &= 16 + h^2 \\ 169 - 16 &= 16 + h^2 - 16 \\ 153 &= h^2 \\ 12.4 \text{ cm} &= h \end{aligned}$$

$$\begin{aligned} V &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \times \pi \times 4^2 \times 12.4 \\ &= 207.8 \text{ cm}^3 \end{aligned}$$

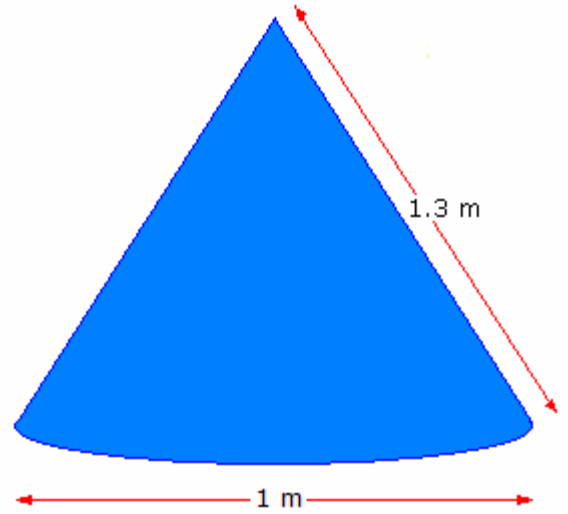
The bag holds 5 L or 5000 cm^3 of peanuts.

$$\frac{5000}{207.8} = 24.1$$

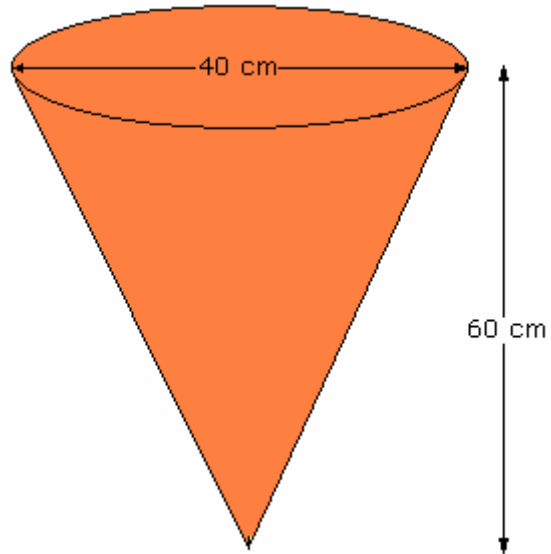
Indira can fill 24 cups completely.

Practice:

1. a) The recycling bin for cans in a school cafeteria was made in the shape of a cone with a diameter of 1 m and a slant height of 1.3 m. Find the volume of empty cans that the bin can hold.



b) While working on a road crew, Amanda was placing conical markers, each of which had a diameter of 40 cm and a height of 60 cm. Josh made a bet that he could drink all of the water that a marker could hold, if it was inverted and filled with water. How many litres of water would he need to drink?



Answers:

1. a) 0.31 m^3 b) 25.1 L