

Chapter 12

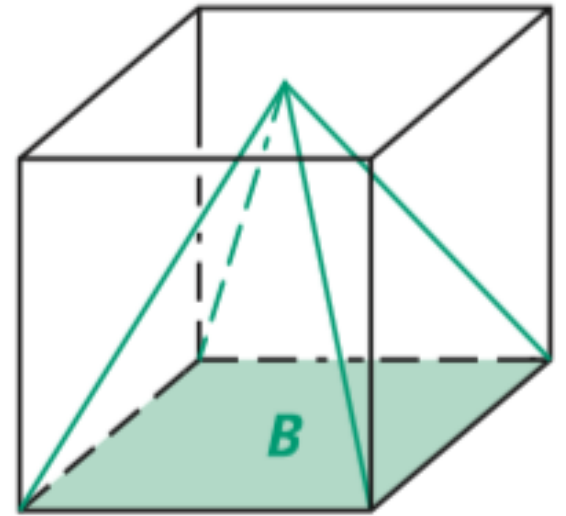
Surface Area and Volume

Section 5

Volume of Pyramids and Cones

GOAL 1: Finding Volumes of Pyramids and Cones

In Lesson 12.4, you learned that the volume of a prism is equal to Bh , where B is the area of the base and h is the height. From the figure at the right, it is clear that the volume of the pyramid with the same base area B and the same height h must be less than the volume of the prism. The volume of the pyramid is one third the volume of the prism.



Rect: $\frac{1}{3}(l \times w \times h)$

Tri: $\frac{1}{3}(\frac{1}{2}bh)h$

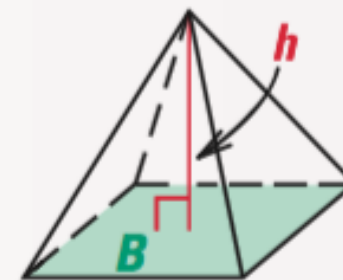
height of \triangle height of pyramid

$(\frac{1}{3} \times \frac{1}{2} \times l \times w \times h)$

THEOREMS

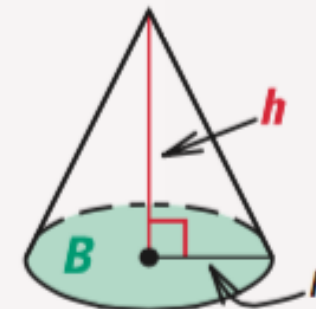
THEOREM 12.9 *Volume of a Pyramid*

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



THEOREM 12.10 *Volume of a Cone*

The volume V of a cone is $V = \frac{1}{3}Bh = \frac{1}{3}\pi r^2 h$, where B is the area of the base, h is the height, and r is the radius of the base.



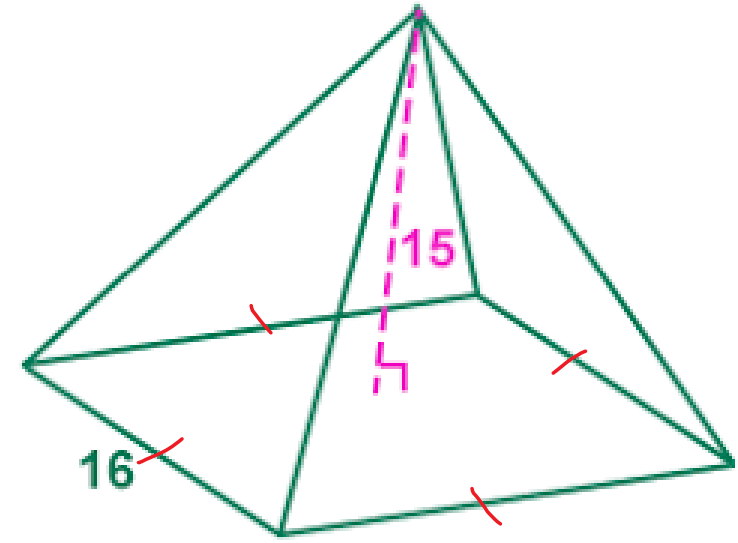
Example 1: Finding the Volume of a Pyramid

Find the volume of the pyramid with the **regular** base.

$$\left(\frac{1}{3}\right)(l \times w \times h)$$

$$\left(\frac{1}{3}\right)(16 \times 16 \times 15)$$

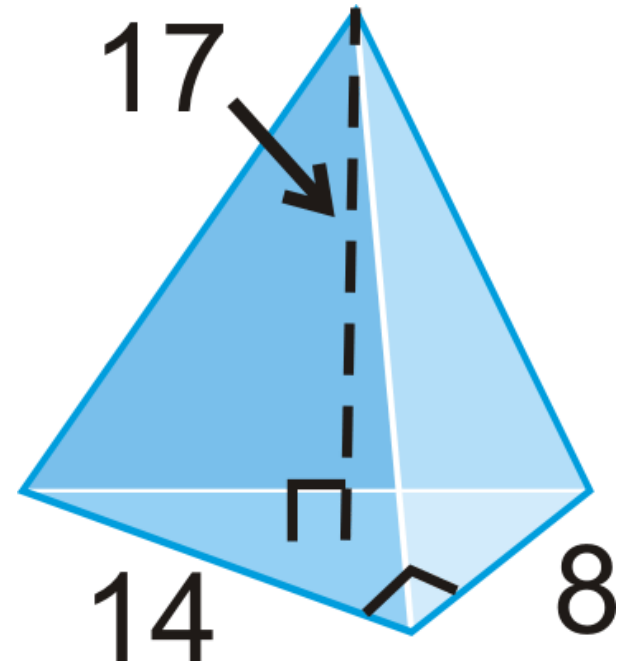
1280 units cubed



$$\left(\frac{1}{3}\right)\left(\frac{1}{2}bh\right)h$$

$$\left(\frac{1}{3}\right)\left(\frac{1}{2} \times 14 \times 8\right)(17)$$

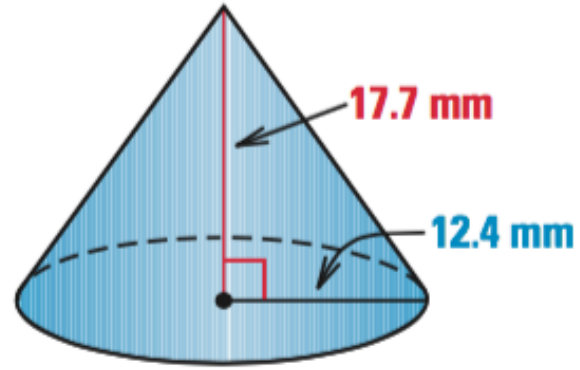
317.3 units cubed



Example 2: Finding the Volume of a Cone

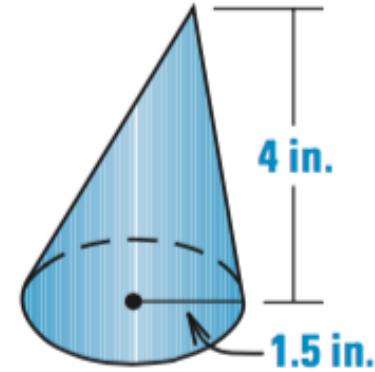
Find the volume of each cone.

a. Right circular cone



$$\left(\frac{1}{3}\right)(3.14)(12.4^2)(17.7)$$
$$2848.6 \text{ mm}^3$$

b. Oblique circular cone



$$\left(\frac{1}{3}\right)(3.14)(1.5^2)(4)$$
$$9.42 \text{ in}^3$$

Example 3: Using the Volume of a Cone

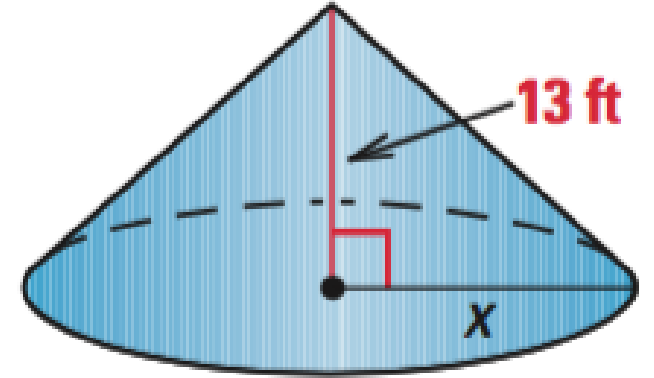
Use the given measurements to solve for x.

$$2614 = \left(\frac{1}{3}\right)(3.14)(x^2)(13)$$

$$\frac{2614}{13.61} = \frac{13.61 x^2}{13.61}$$

$$\sqrt{192.1} = \sqrt{x^2}$$

$$13.9 \text{ ft} = x$$

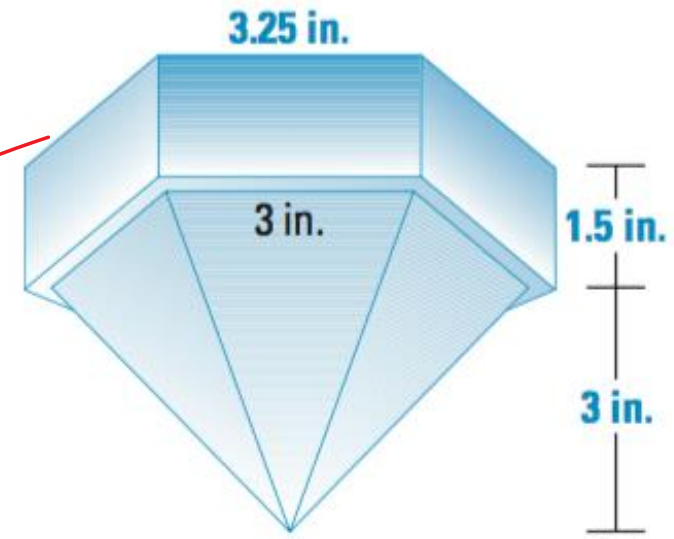


$$\text{Volume} = 2614 \text{ ft}^3$$

GOAL 2: Using Volume in Real-Life Problems

Example 4: Finding the Volume of a Solid

NAUTICAL PRISMS A nautical prism is a solid piece of glass, as shown. Find its volume.



Example 5: Using the Volume of a Cone



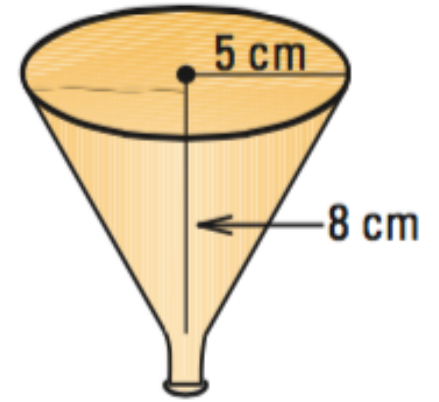
AUTOMOBILES If oil is being poured into the funnel at a rate of 147 milliliters per second and flows out of the funnel at a rate of 42 milliliters per second, estimate the time it will take for the funnel to overflow. (1 mL = 1 cm³)

$$\left(\frac{1}{3}\right)(3.14)(5^2)(8)$$

$$209.3 \text{ mm}^3$$

$$I - O \rightarrow 147 - 42 = 105$$

$$209.3 / 105 \approx 2 \text{ seconds}$$



EXIT SLIP