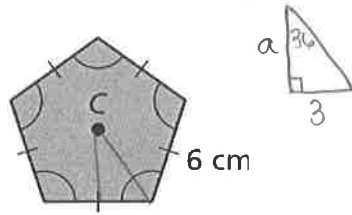


Key

### 11.6 - Volume of Pyramids

Find the area of the figure.



$$A = \frac{1}{2} a \cdot n s$$

$$a = \frac{3}{\tan 36}$$

$$n = 5$$

$$s = 6$$

$$m\angle C = \frac{360}{5} = 72$$

$$\frac{\tan 36}{1} = \frac{3}{a}$$

$$\frac{a \tan 36}{\tan 36} = \frac{3}{\tan 36}$$

$$A = \frac{1}{2} \left( \frac{3}{\tan 36} \right) (5) (6) = \boxed{61.9 \text{ cm}^2}$$

Use the given information to write the standard equation of the circle.

1. The center is (-3, 9), and the measure of the diameter is 6 units.

$$D = 6$$

$$r = 3$$

$$(x+3)^2 + (y-9)^2 = 3^2$$

$$(x+3)^2 + (y-9)^2 = 9$$

2. The center is (-11, -3), and a point on the circle is (1, 2).

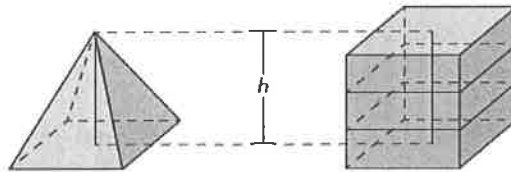
$$r = \sqrt{(-11-1)^2 + (-3-2)^2}$$

$$= \sqrt{169}$$

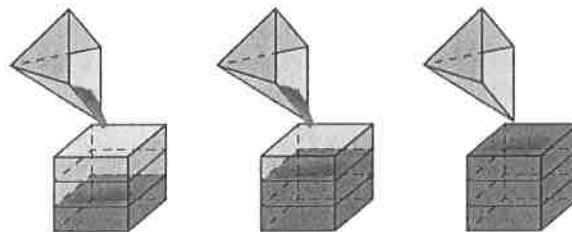
$$r = 13$$

$$(x+11)^2 + (y+3)^2 = 169$$

The pyramid and the prism have the same height and the same square base.



When the pyramid is filled with sand and poured into the prism, it takes three pyramids to fill the prism.



Use this information to write a formula for the volume V of a pyramid.

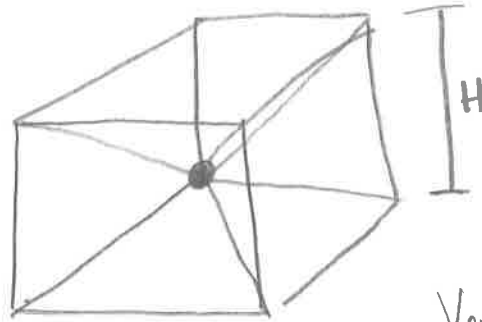
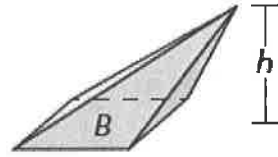
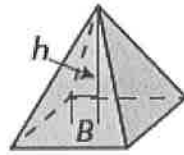
$$V = \frac{1}{3} Bh$$

### Volume of a Pyramid

The volume  $V$  of a pyramid is

$$V = \frac{1}{3}Bh$$

where  $B$  is the area of a base and  $h$  is the height.



Six Congruent Pyramids  
Form one Cube

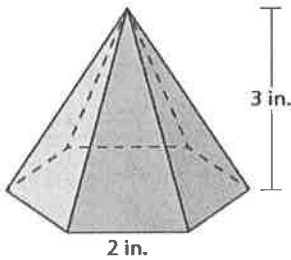
$H$  = height of cube

$h$  = height of pyramid  
( $H = 2h$ )

$$V_{\text{cube}} = BH$$

$$V_{\text{pyramid}} = \frac{BH}{6} = \frac{B(2h)}{6} = \frac{Bh}{3}$$

Find the volume of each pyramid.



$$V = \frac{1}{3}Bh$$

$$B = \frac{1}{2}a \cdot ns$$

$$V = \frac{1}{3}(\frac{1}{2}a \cdot ns)h$$

$$a = \frac{1}{\tan 30}$$

$$n = 4$$

$$s = 2$$

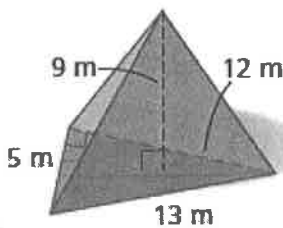
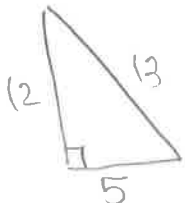
$$m\angle C = \frac{360}{6} = 60$$

$$V = \frac{1}{3}(\frac{1}{2}(\frac{1}{\tan 30})(6)(2))(3)$$

$$V = 10.4 \text{ in}^3$$

$$\frac{\tan 30}{1} = \frac{1}{a}$$

$$\frac{a \tan 30}{\tan 30} = \frac{1}{\tan 30}$$



$$V = \frac{1}{3}Bh$$

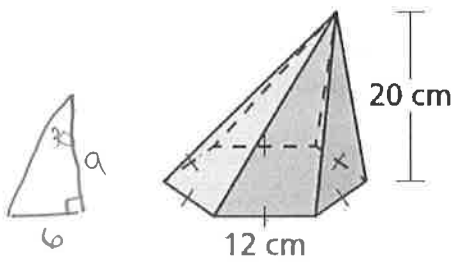
$$B = \frac{1}{2}bh$$

$$V = \frac{1}{3}(\frac{1}{2}bh) \cdot h$$

$$V = \frac{1}{3}(\frac{1}{2})(5)(12)(9)$$

$$V = 90 \text{ m}^3$$

Find the volume of the pyramid.



$$a = \frac{6}{\tan 30}$$

$$n = 6$$

$$S = 12$$

$$m\angle C = \frac{360}{6} = 60$$

$$V = \frac{1}{3} Bh$$

$$B = \frac{1}{2} a \cdot ns$$

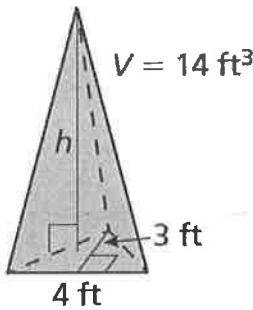
$$V = \frac{1}{3} (\frac{1}{2} a ns) h$$

$$V = \frac{1}{3} (\frac{1}{2} \cdot \frac{6}{\tan 30} \cdot 6 \cdot 12) (20)$$

$$V = 2494.2 \text{ cm}^3$$

$$\tan 30 = \frac{6}{a} \quad \frac{a \tan 30 = 6}{\tan 30 \quad \tan 30}$$

Find the height of the triangular pyramid.



$$V = \frac{1}{3} Bh$$

$$B = \frac{1}{2} bh$$

$$b = 4$$

$$h = 3$$

$$h = h$$

$$V = 14$$

$$14 = \frac{1}{3} (\frac{1}{2} (4)(3)) h$$

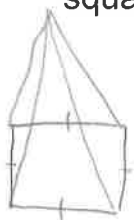
$$14 = \frac{1}{3} (6) h$$

$$\frac{14}{2} = \frac{2h}{2}$$

$$7 = h$$

$$h = 7 \text{ ft}$$

Originally, Khafre's Pyramid had a height of about 144 meters and a volume of about 2,218,800 cubic meters. Find the side length of the square base.



$$V = \frac{1}{3} Bh$$

$$B = s^2$$

$$V = 2,218,800$$

$$s = s$$

$$h = 144$$

$$\frac{2,218,800}{144 \cdot \frac{1}{3}} = \frac{\frac{1}{3} (s)^2 (144)}{144 \cdot \frac{1}{3}}$$

$$\sqrt{46,225} = \sqrt{s^2}$$

$$215 = s$$

$$215 \text{ m}$$

The volume of a square pyramid is 75 cubic meters and the height is 9 meters. Find the side length of the square base.

$$V = \frac{1}{3} Bh$$

$$B = s^2$$

$$V = 75$$

$$s = s$$

$$h = 9$$

$$75 = \frac{1}{3} (s^2) (9)$$

$$\frac{75}{3} = \frac{3s^2}{3}$$

$$\sqrt{25} = \sqrt{s^2}$$

$$5 = s$$

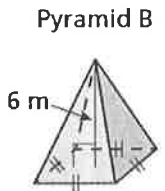
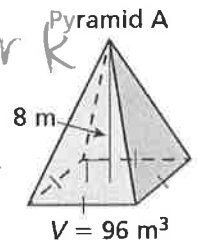
$$5 \text{ m}$$

Pyramid A and pyramid B are similar. Find the volume of pyramid B.

scale factor  $k$

$$\frac{\text{height B}}{\text{height A}} = \frac{6}{8}$$

$$k = \frac{3}{4}$$



$$\frac{\text{Volume B}}{\text{Volume A}} = k^3$$

$$k = \frac{3}{4} \rightarrow \left(\frac{3}{4}\right)^3 = \frac{27}{64}$$

$$\frac{\text{Volume B}}{96} \times \frac{27}{64}$$

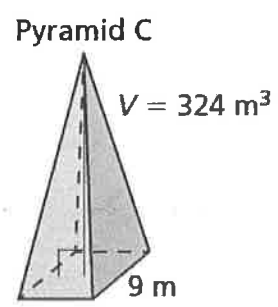
$$\frac{64x}{64} = \frac{2592}{64}$$

$$V_B = 40.5 \text{ m}^3$$

Pyramid C and pyramid D are similar. Find the volume of pyramid D.

$$\frac{\text{Side D}}{\text{Side C}} = \frac{3}{9}$$

$$k = \frac{1}{3}$$



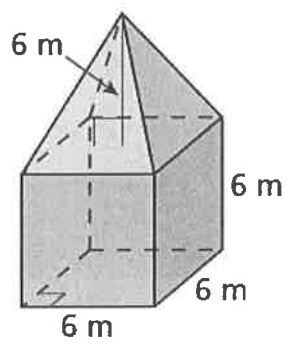
$$\frac{V_D}{V_C} = \left(\frac{1}{3}\right)^3$$

$$\frac{V_D}{324} \times \frac{1}{27}$$

$$\frac{27V_D}{27} = \frac{324}{27}$$

$$V_D = 12 \text{ m}^3$$

Find the volume of the composite solid.



$$V_{\text{solid}} = V_{\text{cube}} + V_{\text{pyramid}}$$

$$= s^3 + \frac{1}{3}Bh$$

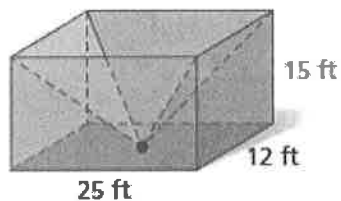
$$= s^3 + \frac{1}{3}s^2 \cdot h$$

$$= (6)^3 + \frac{1}{3}(6)^2(6)$$

$$= 216 + 72$$

$$V = 288 \text{ m}^3$$

Find the volume of the composite solid.



$$\begin{aligned}V_{\text{solid}} &= V_{\text{prism}} - V_{\text{pyramid}} \\&= lwh - \frac{1}{3}Bh \\&= lwh - \frac{1}{3} \cdot l \cdot w \cdot h \\&= 25(12)(15) - \frac{1}{3}(25 \cdot 12 \cdot 15) \\&= 4500 - 1500\end{aligned}$$

$$V = 3000 \text{ ft}^3$$

Homework:

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