

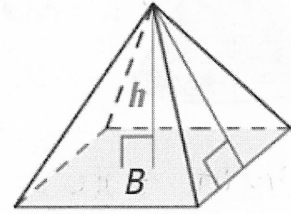
Chapter 12.5: Volume of Pyramids and Cones

Volume of a Pyramid (Theorem 12.9):

The volume V of a pyramid is

$$V = \frac{1}{3} B h$$

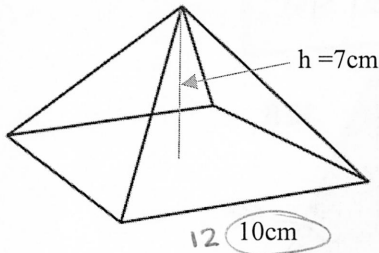
where B is the area of the base and h is the height.



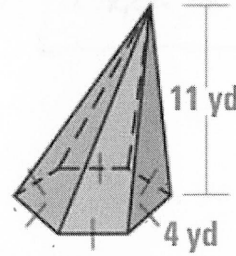
Base Area formula will depend on the shape of the base.

Example #1: Find the volume of the pyramid with the regular base. Round answers to the nearest hundredth.

a.)



≅ Sides & angles



$$\begin{aligned} \text{Base Area} &= (12)(12) \\ &= 144 \text{ cm}^2 \end{aligned}$$

$$V = \frac{1}{3} (144)(7)$$

$$V = 336 \text{ cm}^3$$

$$\text{Base Area} = \frac{1}{2} a P \Rightarrow B = \frac{1}{2} (2\sqrt{3})(24)$$

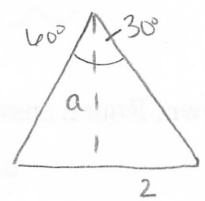
$$P = 4(6)$$

$$P = 24 \text{ yd}$$

$$B \approx 41.57 \text{ yd}^2$$

$$V = \frac{1}{3} (41.57)(11)$$

$$V \approx 152.42 \text{ yd}^3$$



Special Δ

$$a = 2\sqrt{3} \text{ yd}$$

$$\text{or } \tan 30^\circ = \frac{2}{a}$$

$$a = \frac{2}{\tan 30^\circ}$$

$$a \approx 3.46 \text{ yd}$$

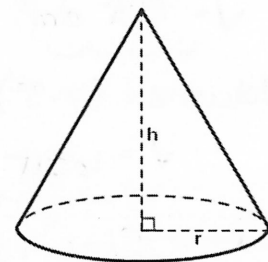
Volume of a Cone (Theorem 12.10):

The volume V of a cone is

$$V = \frac{1}{3} B \cdot h \rightarrow V = \frac{1}{3} (\pi r^2) h$$

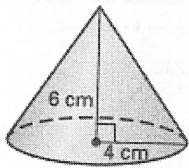
πr² (everytime)

where B is the area of the base, h is the height, and r is the radius of the base.



Example #2: Find the volume of each cone. Round answers to the nearest hundredth.

a.)

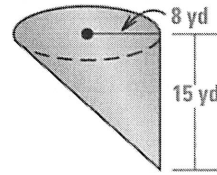


$$V = \frac{1}{3}(\pi \cdot 4^2)(6)$$

$$V = 32\pi \text{ cm}^3 \leftarrow \text{Exact}$$

$$V \approx 100.53 \text{ cm}^3 \leftarrow \text{Approx}$$

b.)

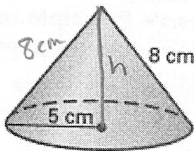


$$V = \frac{1}{3}(\pi \cdot 8^2)(15)$$

$$V = 320\pi \text{ yd}^3$$

$$V \approx 1005.31 \text{ yd}^3$$

c.)



$$h^2 + 5^2 = 8^2$$

$$h = \sqrt{8^2 - 5^2}$$

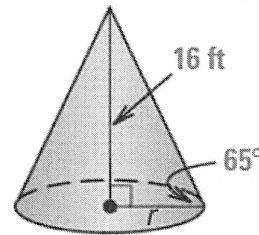
$$h = \sqrt{39} \leftarrow \text{Exact}$$

$$h \approx 6.24 \leftarrow \text{Approx}$$

$$V = \frac{1}{3}(\pi \cdot 5^2)(\sqrt{39})$$

$$V \approx 32.70 \text{ cm}^3$$

d.)



$$\tan 65^\circ = \frac{16}{r}$$

$$r = \frac{16}{\tan 65^\circ}$$

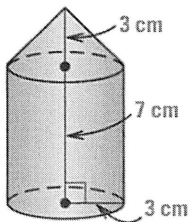
$$r \approx 7.46$$

$$V = \frac{1}{3}(\pi \cdot 7.46^2)(16)$$

$$V \approx 932.68 \text{ ft}^3$$

Example #3: Find the volume of the solid shown. Round answers to the nearest hundredth.

a.)



$$\text{Cone Volume} = \frac{1}{3}(\pi \cdot 3^2)(3)$$

$$V = 9\pi \text{ cm}^3$$

$$\text{Cylinder Volume} = (\pi \cdot 3^2)(7)$$

$$V = 63\pi \text{ cm}^3$$

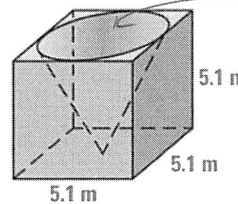
$$\text{Total Volume} = \text{Cone} + \text{Cylinder}$$

$$V = 9\pi + 63\pi$$

$$V = 72\pi \text{ cm}^3$$

$$V \approx 226.19 \text{ cm}^3$$

b.)



$$d = 5.1$$

$$r = 2.55$$

$$\text{Cube Volume} = 5.1^3$$

$$V = 132.651 \text{ m}^3$$

$$\text{Cone Volume} = \frac{1}{3}(\pi \cdot 2.55^2)(5.1)$$

$$V = 34.73 \text{ m}^3$$

$$\text{Total Volume} = \text{Cube} - \text{Cone}$$

$$V = 132.651 - 34.73$$

$$V \approx 97.92 \text{ m}^3$$