

11.6 Volumes of Pyramids and Cones with work

11.6 Volume of Pyramids and 11.7 Cones



What is the difference between the height and slant height? Which one is visible in these pictures? Draw and label.

Mar 5-1:30 PM

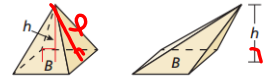
Core Concept

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.



Core Concept

Volume of a Cone

The volume V of a cone is

$$V = \frac{1}{3}Bh = \frac{1}{3}\pi r^2h$$

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



May 4-2:15 PM

Example 1:
Find the volume of the pyramid.

$$V = \frac{1}{3}Bh = \frac{1}{3}(4^2)(2.4) = 12.8 \text{ m}^3$$

Practice:

1. $V = \frac{1}{3}Bh = \frac{1}{3}(4^2)(9) = 48 \text{ m}^3$

2. $V = \frac{1}{3}(13^2)(4\sqrt{6}) = 48\sqrt{6} \text{ m}^3 \approx 151.78 \text{ m}^3$

3. $V = \frac{1}{3}(6^2)(12) = 144 \text{ cm}^3$

4. $V = \frac{1}{3}(12^2)(20) = 960 \text{ cm}^3$

5. $V = \frac{1}{3}(6^2)(6\sqrt{3}) = 72\sqrt{3} \text{ cm}^3$

6. $V = \frac{1}{3}(12^2)(20) = 960 \text{ cm}^3$

7. $V = \frac{1}{3}(12^2)(20) = 960 \text{ cm}^3$

8. $V = \frac{1}{3}(12^2)(20) = 960 \text{ cm}^3$

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Example 3: 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.

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

$$46,225 = s^2$$

$$s = 215 \text{ m}$$

Example 4:
Find the height of the triangular pyramid.

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

$$384 = \frac{1}{3}(\frac{1}{2}(24)(8))h$$

$$2304 = 192h$$

$$h = 12 \text{ m}$$

Example 5:
Find the volume of a regular hexagonal pyramid with a base edge length of 2 cm and a height equal to the area of the base.

$$B = \frac{1}{2}aP = \frac{1}{2}(\sqrt{3})(12) = 6\sqrt{3}$$

$$V = \frac{1}{3}(6\sqrt{3})(6\sqrt{3}) = 12\sqrt{9} = 36 \text{ cm}^3$$

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

$$V = \frac{1}{3}Bh = \frac{1}{3}(s^2)(h)$$

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

$$225 = 9s^2$$

$$s^2 = 25$$

$$s = 5 \text{ m}$$

4. Find the height of the triangular pyramid.

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

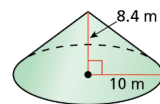
$$24 = \frac{1}{3}(\frac{1}{2}(6)(3))h$$

$$24 = \frac{1}{6}(18)h = 3h$$

$$8 \text{ m} = h$$

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Example 5: Find the volume of the cone.



$$V = \frac{1}{3}Bh = \frac{1}{3}\pi r^2h$$

$$= \frac{1}{3}\pi(10)^2(8.4)$$

$$= 280\pi \text{ m}^3$$

$$\approx 879.646 \text{ m}^3$$

Example 6:

Caleb gets a scoop of ice cream in a cone, and Keegan gets a scoop in a cylindrical cup. Each container has a height of 8 cm and a radius of 4 cm. Each scoop of ice cream has an approximate volume of 268 cm³. If the ice creams melt, who would have the bigger mess on their hands?

Move picture to check answer



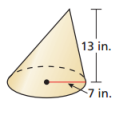
Caleb's cone holds about 134 cm³ which is less than the volume of the ice cream (268 cm³) which means his hands would get very sticky from over flowing ice cream. Keegan's cup holds 402 cm³ which leaves room to spare.

What do you notice about these 2 volumes??

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Practice:
5. Find the volume of the cone.



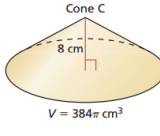

$$V = \frac{1}{3}Bh = \frac{1}{3}\pi r^2 h$$

$$= \frac{1}{3}\pi (7)^2 (13)$$

$$= \frac{1}{3}\pi (637)$$

$$\approx 212.333\pi \approx 667.065 \text{ in}^3$$

6. Cone C and cone D are similar. Find the volume of cone D.

$$\left(\frac{2}{8}\right)^3 = \frac{x}{384\pi} \Rightarrow \frac{8}{512} = \frac{x}{384\pi}$$

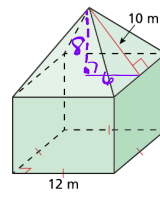
$$512x = 3072\pi$$

$$x = 6\pi$$

$$V = 6\pi \text{ cm}^3$$

Mar 9-7:26 AM

Example 7:
Find the volume of the composite solid.



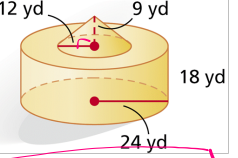
$$V = \Delta + \square$$

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

$$= \frac{1}{3}(12)(12)(8) + (12)^2(9)$$

The volume is 1680 cubic meters.

Practice 7:
Find the volume of the composite solid.



$$V = \square + \Delta$$

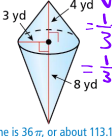
$$= Bh + \frac{1}{3}Bh$$

$$= \pi(24)^2(18) + \frac{1}{3}\pi(12)^2(12)$$

$$\approx 10,800\pi \text{ yd}^3$$

$$\approx 33,929.201 \text{ yd}^3$$

Example 8: Find the volume of the solid.



$$V = \Delta + \square$$

$$= \frac{1}{3}\pi r^2 h + \pi r^2 h$$

$$= \frac{1}{3}\pi(3)^2(4) + \pi(3)^2(8)$$

The volume is 36π , or about 113.10 cubic yards.

May 4-2:28 PM

HW: pg. 639 and pg. 645

A: 9, 15, 19, 23, 25 - 29 and 17, 19, 21

B: 3, 7, 9, 13, 15, 17, 23, 26 - 29 and 5, 9, 11, 13, 15, 19

C: 1 - 19 (o), 26 - 29 and 1 - 21 (o)

ANSWERS:

26. 12.9 28. 5.8

Mar 8-2:33 PM