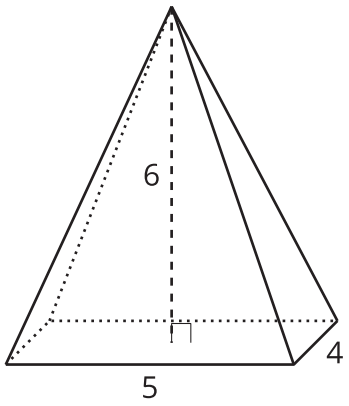
Unit 5, Lesson 14

Working with Pyramids

Let's use the pyramid volume formula to solve problems.

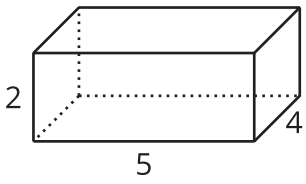
14.1 Volume Matching

Here is a pyramid.

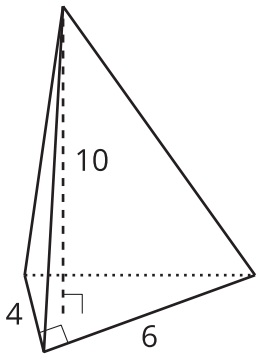


Which, if either, of these solids has the same volume as the pyramid?

A



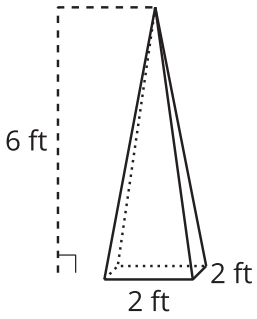
B



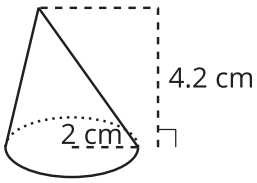
14.2 Practice with Pyramids

1. Calculate the volume of each solid. Round your answers to the nearest tenth if necessary.

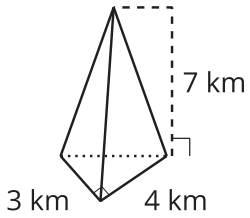
A



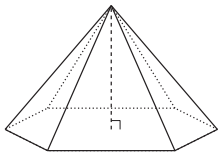
B



C



D: height 12 cm; area of base 32 cm^2



2. A particular cone has radius r and height h.
   a. Write an expression for the volume of this cone in terms of r and h.

   b. What is the height of a cone whose volume is 16π cubic units and whose radius is 3 units?

   c. What is the radius of a cone whose volume is 16π cubic units and whose height is 3 units?

Are you ready for more?

The Pyramid of Giza is 455 feet tall. The base is square with a 756-foot side length. How many Olympic-size swimming pool volumes of water can fit inside the Pyramid of Giza? Explain or show your reasoning.

14.3 An Icy Pyramid

A caterer is making an ice sculpture in the shape of a pyramid for a party. The caterer wants to use 11 liters of water, which makes about 720 cubic inches of ice. The sculpture must fit on a table with space around it for the food. The caterer needs to decide how large to make the base, which can be any shape. Draw and label the dimensions of 2 different pyramids that would work.

Lesson 14 Summary

We can work backward from a given volume to find possible dimensions for a cone or pyramid.

Suppose we want to find dimensions for a cone so it has a volume of 900π cubic inches. Start by substituting the volume into the pyramid volume formula to get $900\pi = \frac{1}{3}Bh$. The base of a cone is a circle, so we can write $900\pi = \frac{1}{3}\pi r^2 h$. Multiply both sides of the equation by 3 and divide both sides by π to get $2{,}700 = r^2 h$.

Now consider different possible values for r and h. If we can find a perfect square that divides evenly into 2,700, we can set the square root of that number to be the radius. The number 25 is a perfect square and divides into 2,700, so choose $r = 5$. Now $2{,}700 = 25h$. This tells us that if the pyramid's radius is 5 inches, its height is 108 inches because $2{,}700 \div 25 = 108$.

These aren't the only possible values. Suppose we set the radius to be 20 inches. Substitute this into the original equation and rearrange to find the value of h.

$$900\pi = \frac{1}{3}\pi(20)^2 h$$

$$900\pi = \frac{1}{3}\pi \cdot 400h$$

$$2{,}700 = 400h$$

$$6.75 = h$$

A height of 6.75 inches together with a radius of 20 inches gives the cone a volume of 900π cubic inches.