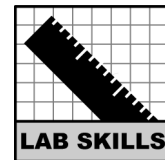


Name: _____

Date: _____



10.1 Calculating Volume

How do you find the volume of a three dimensional shape?

Volume is the amount of space an object takes up. If you know the dimensions of a solid object, you can find the object's volume. A two dimensional shape has length and width. A three dimensional object has length, width, and height. This investigation will give you practice finding volume for different solid objects.

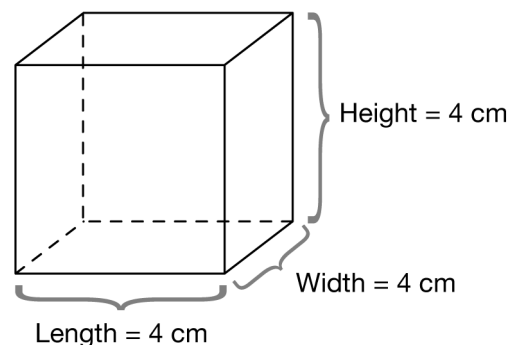
Materials

- Pencil
- Calculator

Calculating volume of a cube

A cube is a geometric solid that has length, width and height. If you measure the sides of a cube, you will find that all the edges have the same measurement. The volume of a cube is found by multiplying the length times width times height. In the picture each side is 4 centimeters so the problem looks like this:

$$V = l \times w \times h$$



Example:

$$\text{Volume} = 4 \text{ centimeters} \times 4 \text{ centimeters} \times 4 \text{ centimeters} = 64 \text{ centimeters}^3$$

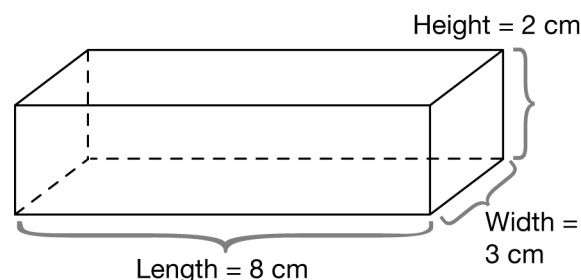
Stop and think

- What are the units for volume in the example above?
- In the example above, if the edge of the cube is 4 inches, what will the volume be? Give the units.
- How is finding volume different from finding area?
- If you had cubes with a length of 1 centimeter, how many would you need to build the cube in the picture above?

Calculating volume of a rectangular prism

Rectangular prisms are like cubes, except not all of the sides are equal. A shoebox is a rectangular prism. You can find the volume of a rectangular prism using the same formula given above ($V = l \times w \times h$.)

Another way to say it is to multiply the area of the base times the height.

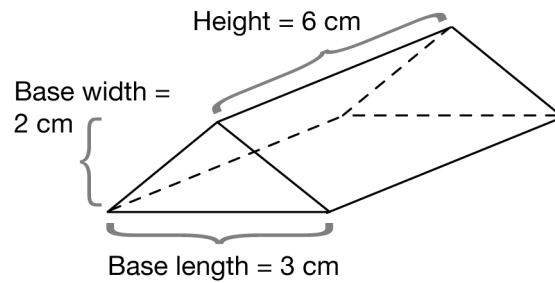


- Find the area of the base for the rectangular prism pictured above.
- Multiply the area of the base times the height. Record the volume of the rectangular prism.
- PRACTICE:** Find the volume for a rectangular prism with a height 6 cm, length 5 cm, and width 3 cm. Be sure to include the units in all of your answers.



Calculating volume of a triangular prism

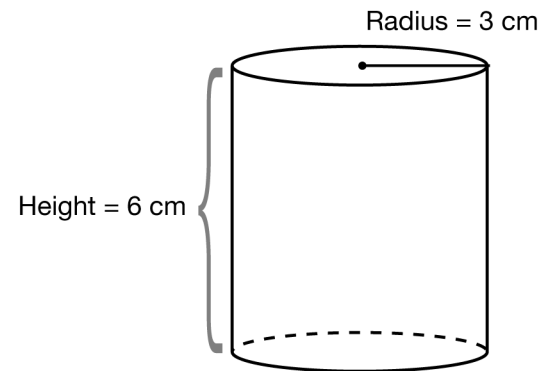
Triangular prisms have three sides and two triangular bases. The volume of the triangular prism is found by multiplying the area of the base times the height. The base is a triangle.



1. Find the area of the base by solving for the area of the triangle: $B = \frac{1}{2} \times l \times w$.
2. Find the volume by multiplying the area of the base times the height of the prism:
 $V = B \times h$. Record the volume of the triangular prism shown above.
3. PRACTICE: Find the volume of the triangular prism with a height 10 cm, triangular base width 4 cm, and triangular base length 5 cm.

Calculating volume of a cylinder

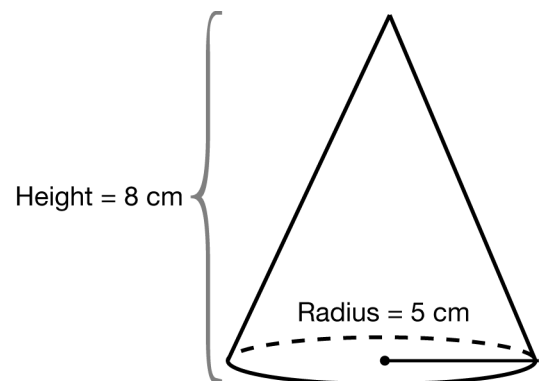
A soup can is a cylinder. A cylinder has two circular bases and a round surface. The volume of the cylinder is found by multiplying the area of the base times the height. The base is a circle.



1. Find the area of the base by solving for the area of a circle: $A = \pi \times r^2$.
2. Find the volume by multiplying the area of the base times the height of the cylinder: $V = A \times h$. Record the volume of the cylinder shown above.
3. PRACTICE: Find the volume of the cylinder with height 8 cm and radius 4 cm.

Calculating volume of a cone

An ice cream cone really is a cone! A cone has height and a circular base. The volume of the cone is found by multiplying $\frac{1}{3}$ times the area of the base times the height.



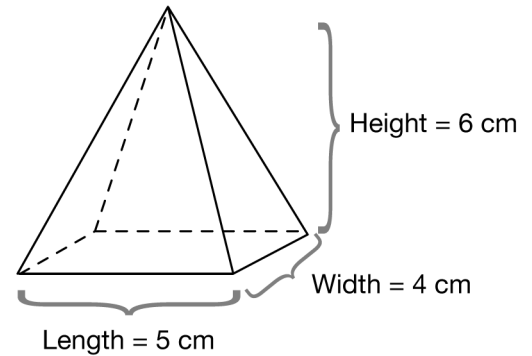
1. Find the area of the base by solving for the area of a circle:
 $A = \pi \times r^2$.
2. Find the volume by multiplying $\frac{1}{3}$ times the area of the base times the height:
 $V = \frac{1}{3} \times A \times h$. Record the volume of the cone shown above.
3. PRACTICE: Find the volume of the cone with height 8 cm and radius 4 cm. Contrast your answer with the volume you found for the cylinder with the same dimensions. What is the difference in volume? Does this make sense?



Calculating the volume of a rectangular pyramid

A pyramid looks like a cone. It has height and a rectangular base. The volume of the rectangular pyramid is found by multiplying $\frac{1}{3}$ times the area of the base times the height.

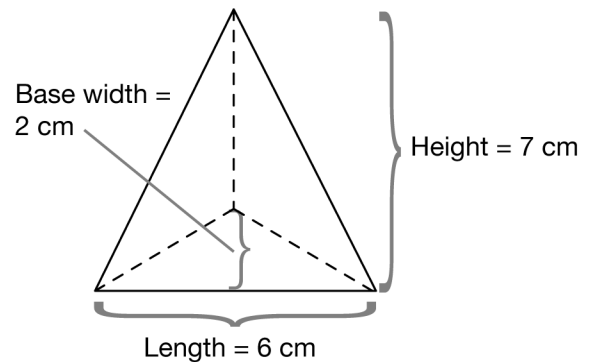
- Find the area of the base by multiplying the length times the width: $A = l \times w$.
- Find the volume by multiplying $\frac{1}{3}$ times the area of the base times the height:
 $V = \frac{1}{3} \times A \times h$. Record the volume of the rectangular pyramid shown above.
- PRACTICE:** Find the volume of a rectangular pyramid with height 10 cm and width 4 cm and length 5 cm.
- EXTRA CHALLENGE:** If a rectangular pyramid had a height of 8 cm and a width of 4 cm, what length would it need to have to give the same volume as the cone in practice question 3 above?



Calculating volume of a triangular pyramid

A triangular pyramid is like a rectangular pyramid, but its base is a triangle. Find the area of the base first. Then calculate the volume by multiplying $\frac{1}{3}$ times the area of the base times the height.

- Find the area of the base by solving for the area of a triangle:
 $B = \frac{1}{2} \times l \times w$.
- Find the volume by multiplying $\frac{1}{3}$ times the area of the base times the height:
 $V = \frac{1}{3} \times A \times h$. Find the volume of the triangular pyramid shown above.
- PRACTICE:** Find the volume of the triangular pyramid with height 10 cm and whose base has width 6 cm and length 5 cm.



Calculating volume of a sphere

To find the volume of a sphere, you only need to know one dimension about the sphere, its radius.

- Find the volume of a sphere: $V = \frac{4}{3}\pi r^3$. Find the volume for the sphere shown above.
- PRACTICE:** Find the volume for a sphere with radius 2 cm.
- EXTRA CHALLENGE:** Find the volume for a sphere with diameter 10 cm.

