

## Lesson 25

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Glencoe Geometry Chapter 11.5, 11.6

### Volume: Prisms, Cylinders,

### Pyramids, and Cones

This week we look at the same solids as last time, we just add an extra dimension. Surface area is a two-dimensional quantity, while volume is a **three-dimensional** quantity.

Understanding today's lesson comes down again to **using the correct formula** and **finding the correct values** to plug into it.

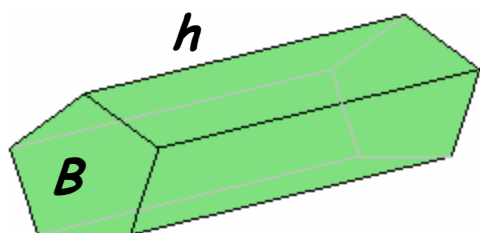
Depending on your teacher, you may have to **memorize** some of these formulas, but most of them will be found on a **formula chart**.

## Volume of a Right Prism

The Volume,  $V$ , of a Right Prism with a base area of  $B$  square units and a height of  $h$  units is given by

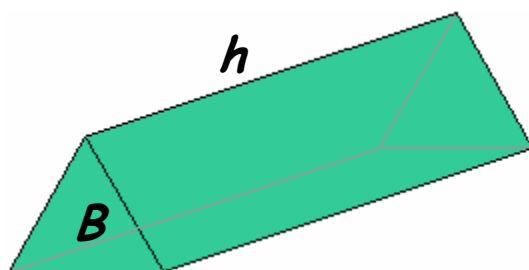
$$V = Bh$$

To use this formula, you must correctly identify and find the area of the base. These will vary from shape to shape, but the formula can be found on a chart.



Pentagonal prism

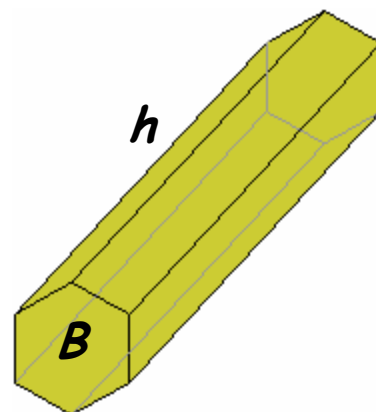
$$B = \frac{1}{2}Pa$$



Triangular prism

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

*\*CAUTION: This  $h$  is the height of the triangle, not the height of the prism. They are different quantities in different contexts represented by the same variable!!*

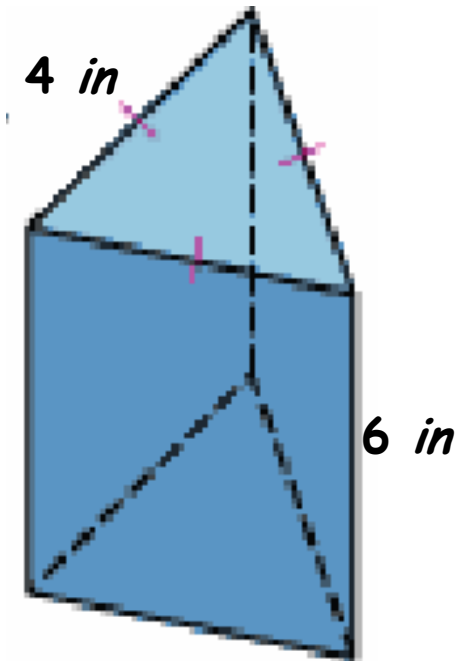


Hexagonal prism

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

## Example:

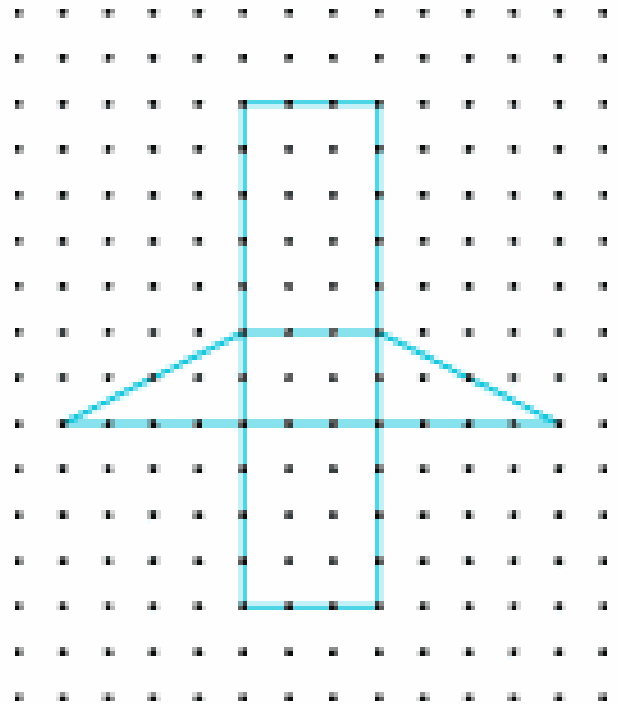
Find the Volume of the right, triangular prism.



Although the **Net** representation is more useful for finding **Surface Area**, we can also use it to find the **Volume**, we just must be more careful in identifying the base and height.

## Example:

Find the volume of the right triangular prism given the net of the solid.



### Volume of a Right Cylinder

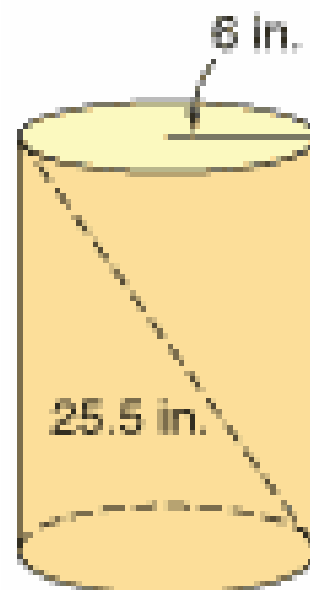
The Volume,  $V$ , of a Right Cylinder with a height of  $h$  units and a radius of  $r$  units is given by

$$V = \pi r^2 h$$

Notice as before that the Volume is just the **area of the base times the length** of a lateral side!!!

## Example:

Find the volume of the cylinder.



Formulas are also called **Literal Equations**, since they contain multiple variables (*Literal means "letters"*) and constants (like  $\pi$ ). We can use the formula to solve for ANY variable, as long as we know (or can find) all the others. This really increases the usefulness of the formulas. Here's what I mean . . .

## Example:

Tate is constructing a cylinder that can hold 90.8 cubic centimeters. If the diameter of the cylinder is 3.4 centimeters, what should the height measure?

Way to go, Tate!!

## Volume of a Right Circular Cone

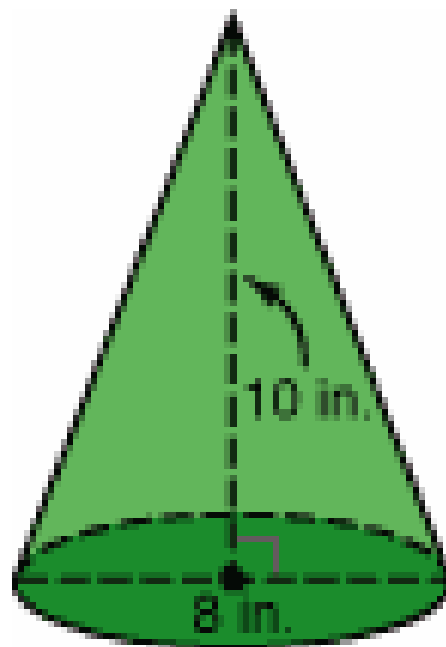
The Volume,  $V$ , of a Right Circular Cone with a height of  $h$  units and a base area of  $B$  square units is given by

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

You can think of the cone as being **one-third** of the volume of the smallest cylinder containing it.

### Example:

Find the volume of the cone.



## Volume of a Right Pyramid

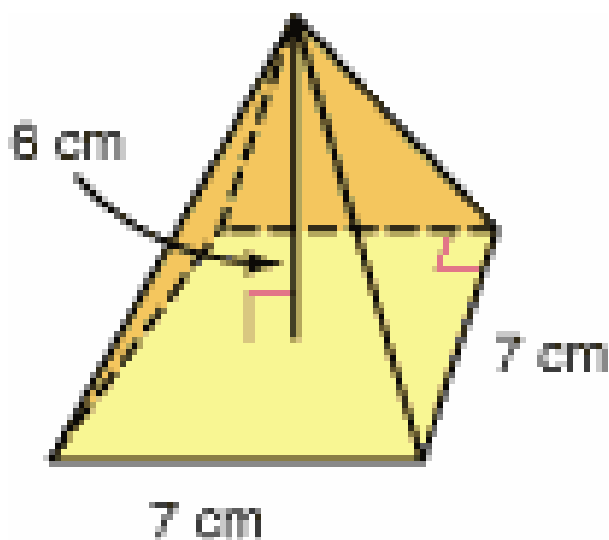
The Volume,  $V$ , of a Right Pyramid with a height of  $h$  units and a base area of  $B$  square units is given by

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

You can think of the pyramid as being **one-third** of the volume of the smallest prism containing it.

### Example:

Find the volume of the pyramid.



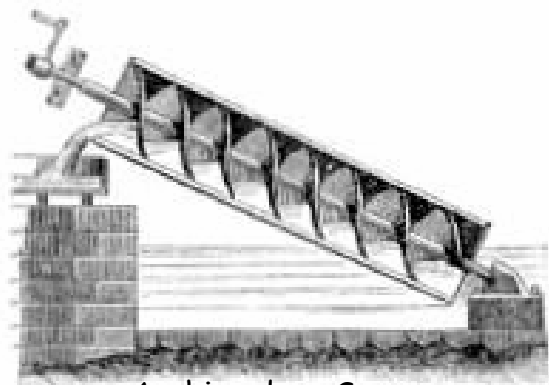


# Say What?!?!?



<http://design-crit.com/blog/images/archimedes.gif>

Regarded as one of the three greatest mathematicians and inventors of all time was **Archimedes** of Syracuse (287BC - 212BC). His inventions ranged from incredible war machines, the Archimedean screw, and the lever. He made lasting



Archimedean Screw  
Wikipedia.org

contributions in many mathematical fields including geometry (he gave the first estimate for  $\pi$  between  $3\frac{10}{71}$

and  $3\frac{10}{70}$ ) and calculus (he is known as the father of integral calculus even though he preceded Newton and Leibniz by almost 2000 years!!!).

Of all his remarkable discoveries, the one of which he was most proud was his discovery of the ratio of the volumes of a right cylinder and its inscribed sphere.



<https://www.math.nyu.edu/~ciorres/Archimedes/Tomb/Cicero.html>



<http://scidiv.bcc.ctc.edu/Math/ArchimedesTombstone.html>

He found that the ratio of the volumes of the cylinder to the sphere was a tidy **3:2**. In fact, he was so proud of this discovery, it was placed on his tombstone!!

*“Give me a place to stand, and I shall move the Earth.”—Archimedes*