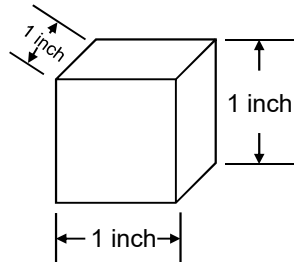
Math-2
Lesson 8-4:
Volumes of Spheres, Cylinders, Cones, Pyramids, and Prisms

What does "volume" mean?



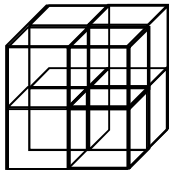
volume = (1 inch)(1 inch)(1 inch)

$$\text{volume} = 1\,\text{inch}^3$$

volume = 1 "cubic inch"

What is the "volume" of the shape?

"how many 1 inch cubes will fit in the shape."



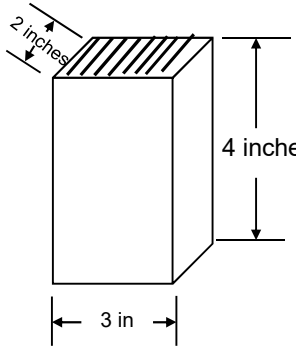
volume = 8 cubic inches

$$\text{volume} = 8\,\text{inch}^3$$

This "box" is called a "rectangular prism".

$$\text{volume}_{\text{rect. prism}} = a\text{rea of base} * \text{h}$$

What is the "volume" of the prism?

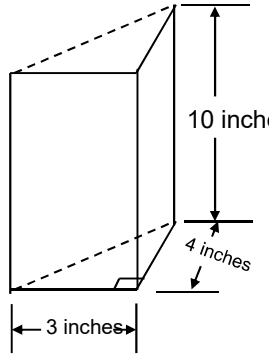


volume = (2 inch)(4 inch)(3 inch)

$$\text{volume} = 24\,\text{inch}^3$$

$$vol_{\text{prism}} = (\text{area of base} * \text{height})$$

What is the "volume" of the prism?



$$vol_{prism} = (\text{area of base} * \text{height})$$

What if the base is a triangle?

$$area_{triangle} = \frac{1}{2}(\text{base} * \text{height})$$

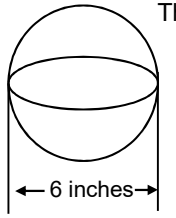
$$area_{triangle} = \frac{1}{2}(3\,\text{in} * 4\,\text{in})$$

$$area_{triangle} = 6\,\text{in}^2$$

$$vol_{prism} = (\text{area of base} * \text{height})$$

$$vol_{prism} = (6\,\text{in}^2)(10\,\text{in})$$

$$\text{volume} = 60\,\text{inch}^3$$



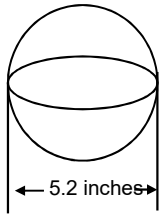
The volume of a sphere is….?

$$\text{volume}_{sphere} = \frac{4}{3}\pi\,r^3$$

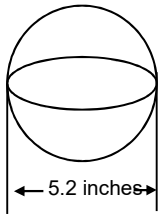
What part of the formula gives us the "cubic" units? → radius cubed

$$\text{volume} = \frac{4}{3}\pi\left(\frac{6}{2}\right)^3 \qquad \text{vol} = 36\pi\,\text{in}^3$$

$$\text{vol} \approx 113.1\,\text{in}^3$$

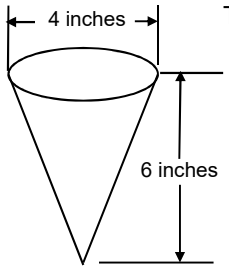


$$\text{volume} = \frac{4}{3}\pi(2.6)^3 \qquad \text{vol} = 73.6\,\text{in}^3$$



The volume of a sphere is….?

$$\text{volume}_{sphere} = \frac{4}{3}\pi\,r^3$$



The volume of a cone is….?

$$vol_{cone} = (\text{area of base} * \text{height})$$

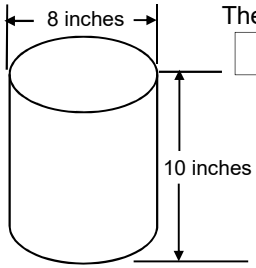
$$\text{volume}_{cone} = \frac{1}{3}\pi\,r^2 h$$

What part of the formula gives us the "cubic" units?

Radius squared * height

$$\text{volume} = \frac{1}{3}\pi(2)^2(6)$$

$$\text{volume} = 8\pi\,\text{in}^3$$



The volume of a cylinder is….?

$vol_{\text{cylinder}} = (\text{area of base} * \text{height})$

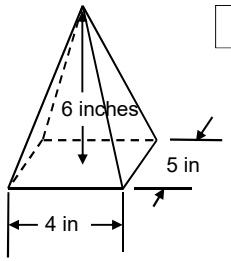
$$\text{volume}_{\text{cylinder}} = \pi\, r^2 h$$

$$\text{volume} = \pi(4)^2(10)$$

$$\text{volume} = 160\,\pi\ \text{in}^3$$

The volume of a pyramid is….?

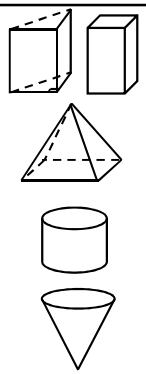
$vol_{\text{pyramid}} = (\text{area of base} * \text{height})$



$$\text{volume}_{\text{pyramid}} = \frac{1}{3}(\text{base area})h$$

$$\text{volume} = \frac{1}{3}(4\ \text{in} * 5\ \text{in}) * 6\ \text{in}$$

$$\text{volume} = 40\ \text{in}^3$$



$$\text{volume}_{\text{prism}} = (\text{area of base}) * \text{h}$$

$$\text{volume}_{\text{rectangular pyramid}} = \frac{1}{3}(\text{base area})h$$

$$\text{volume}_{\text{cylinder}} = (\text{area base}) * h$$

$$\text{volume}_{\text{cone}} = \frac{1}{3}(\text{area base}) * h$$

$$\text{surf. area}_{\text{sphere}} = 4\pi\, r^2$$

$$\text{volume}_{\text{sphere}} = \frac{1}{3} * 4\pi\, r^3$$

Where is the center of the circle?

$x^2 + y^2 = 25$ Has not been shifted left/right → center is (0, 0).

$(x+3)^2 + y^2 = 25$ Left 3 shift → center is (-3, 0)

$(x-5)^2 + (y+2)^2 = 25$ center is (5, -2)

What is the radius of the circle? $x^2 + y^2 = 25$

$x^2 + y^2 = r^2$ radius is 5

$(x-7)^2 + y^2 = 49$ radius is 7

$(x+2)^2 + y^2 = 64$ radius is 8

What is the center and radius of the circle?:

$$x^2 + y^2 - 6x + 8y = 0$$

Complete the square!

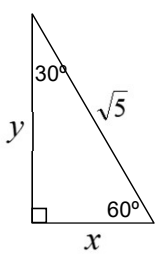
$$x^2 - 6x + 9 + y^2 + 8y + 16 = 0 + 9 + 16$$

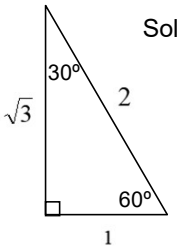
$$(x-3)^2 - 9 + (y+4)^2 - 16 = 0$$

Convert "perfect square trinomials" to "binomials squared then simplify.

$$(x-3)^2 + (y+4)^2 = 25 \qquad (h,k) = (3,-4) \quad r = 5$$

Problem solving using similar triangles.





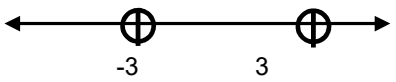
Solve using a proportion

$$\frac{x}{1} = \frac{\sqrt{5}}{2}$$

$$y = \sqrt{3} * \frac{\sqrt{5}}{2}$$

$$y = \frac{\sqrt{15}}{2}$$

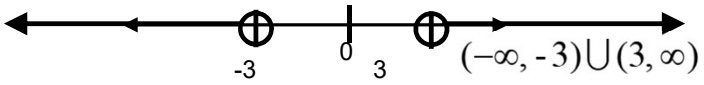
$x^2 - 9 > 0$ 0 = (x – 3)(x + 3)

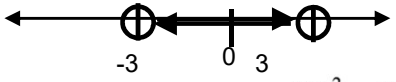


Find the boundary numbers: solve the equation:

-3 and 3 divide the solution from the "non-solution."

The solution is one of the two graphs below.





Pick an easy number to test. $(0)^2 - 9 > 0$

Zero IS NOT a solution, the top graph is the solution.