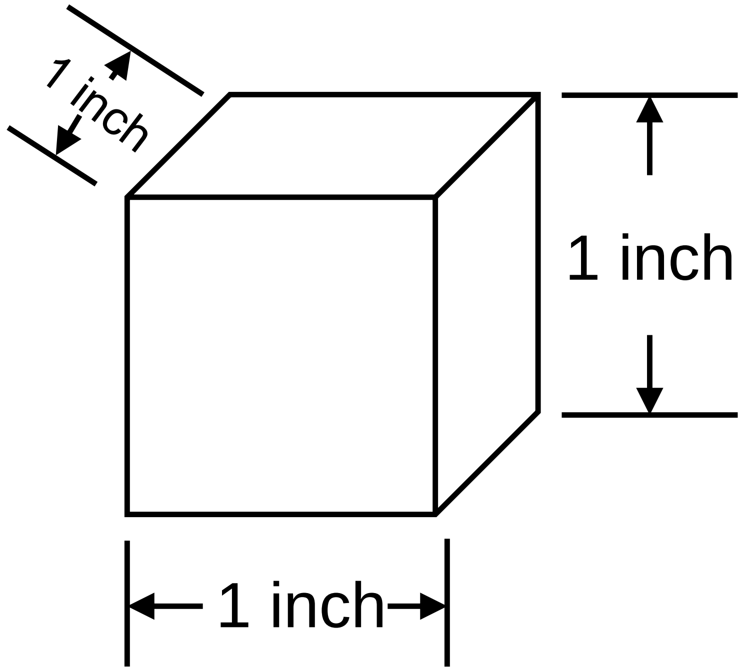
Math-2
Lesson 8-4:
Volumes of Spheres, Cylinders, Cones, Pyramids, and Prisms

What does "volume" mean?



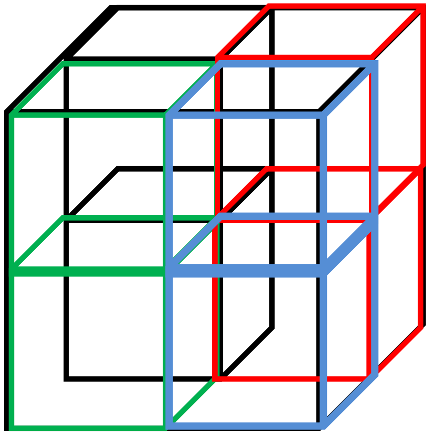
volume = (1 inch)(1 inch)(1 inch)

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

volume = 1 "cubic inch"

What is the "volume" of the shape?

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



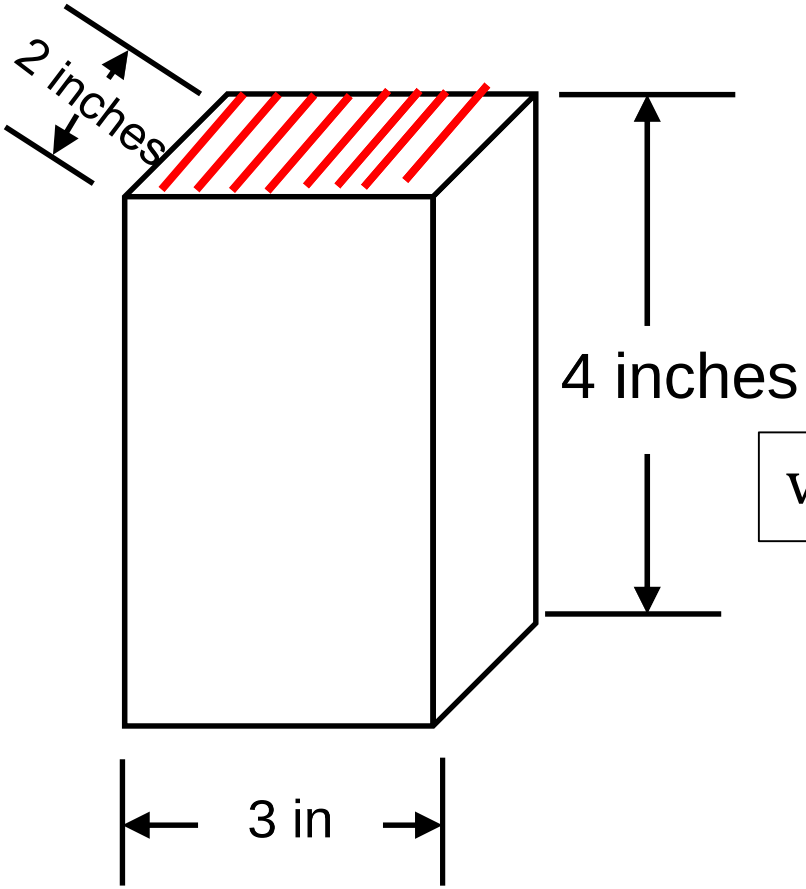
volume = 8 cubic inches

$$volume = 8\,inch^3$$

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

$$volume_{rect.\ prism} = area\ of\ base * h$$

What is the "volume" of the prism?

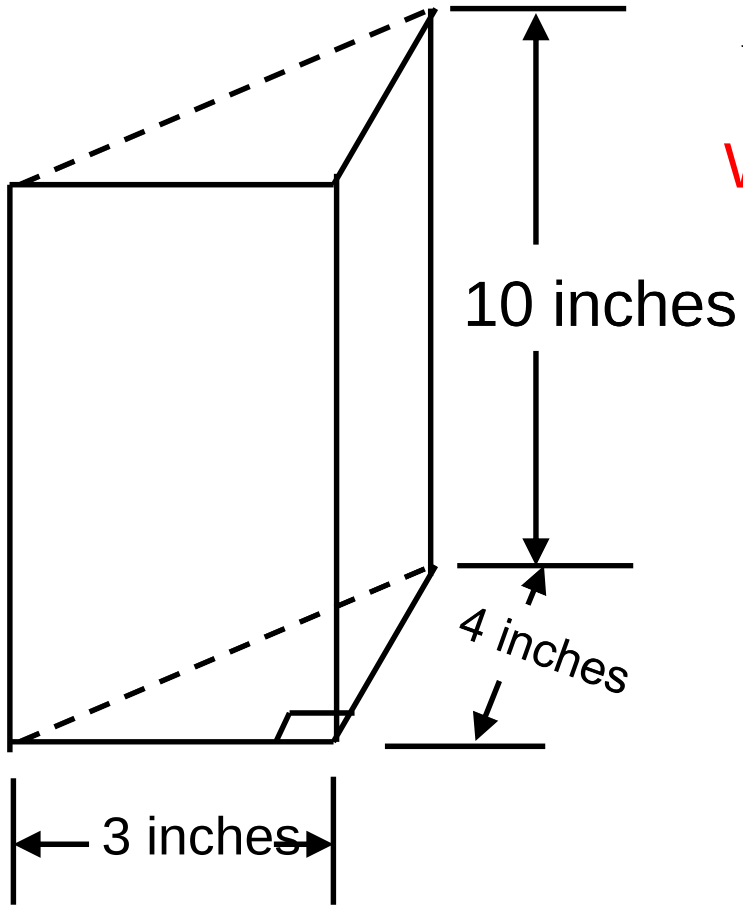


volume = (2 inch)(4 inch)(3 inch)

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

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

What is the “volume” of the prism?



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

What if the base is a triangle?

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

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

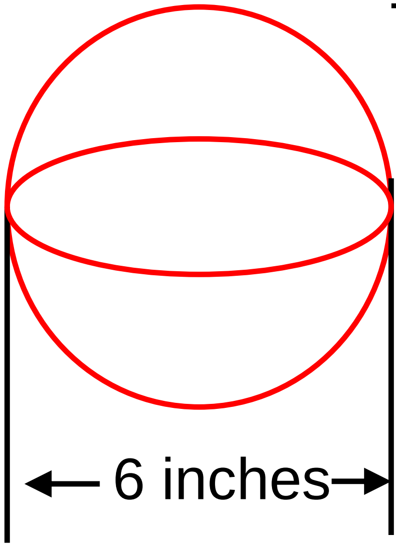
$$area_{triangle} = 6\text{ in}^2$$

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

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

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

The volume of a sphere is….?



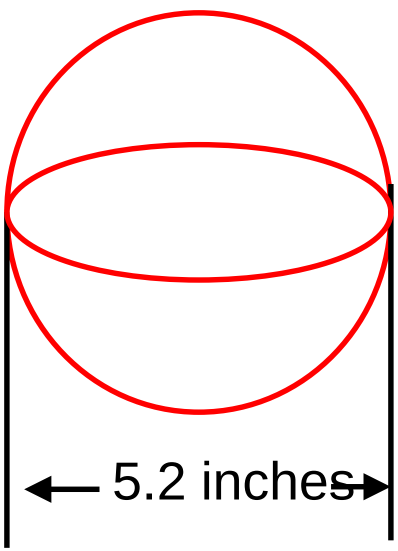
$$\text{volume}_{\text{sphere}} = \frac{4}{3}\pi r^3$$

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

$$\text{volume} = \frac{4}{3}\pi\left(\frac{6}{2}\right)^3$$

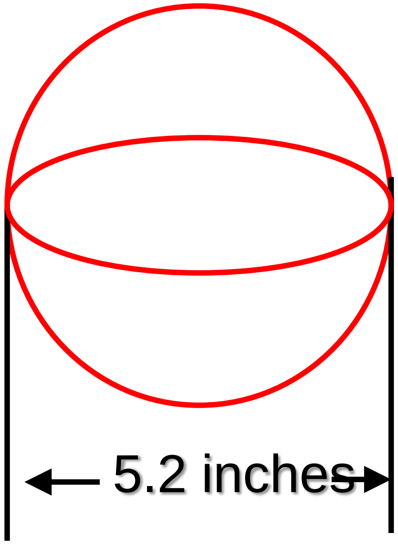
$$\text{vol} = 36\pi \text{ in}^3$$

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



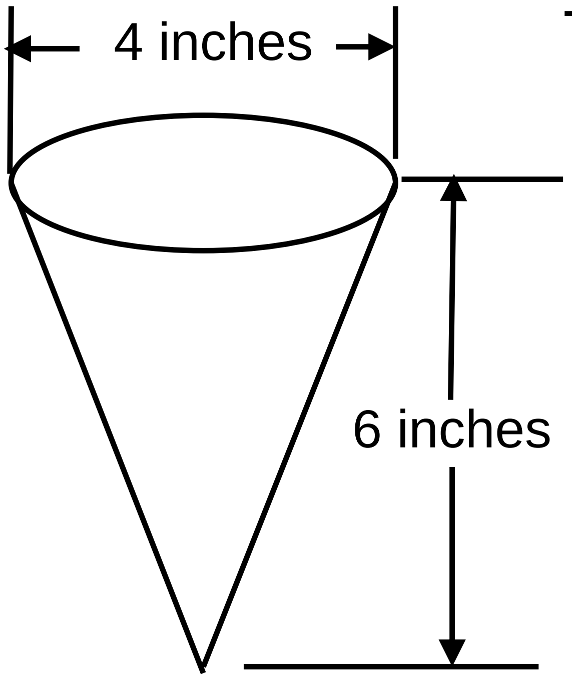
$$\text{volume} = \frac{4}{3}\pi(2.6)^3$$

$$\text{vol} = 73.6 \text{ in}^3$$



The volume of a sphere is….?

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



The volume of a cone is….?

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

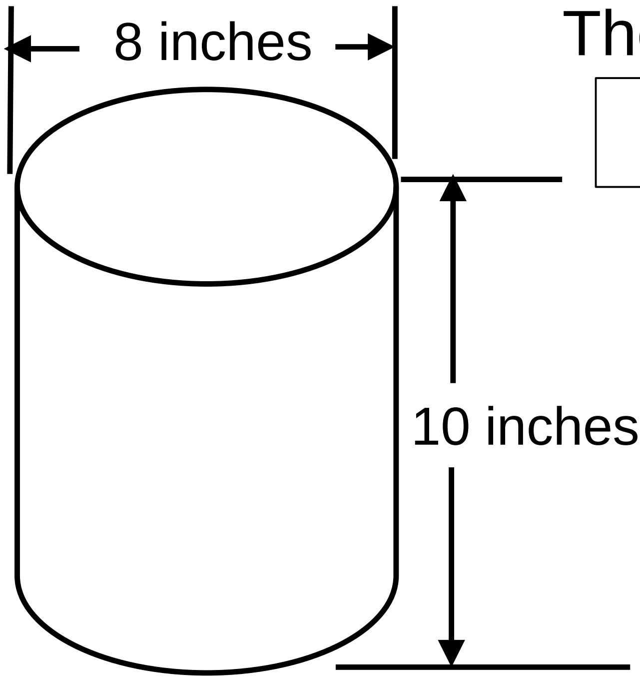
$$\text{volume}_{\text{cone}} = \frac{1}{3}\pi\, \text{r}^2 h$$

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….?

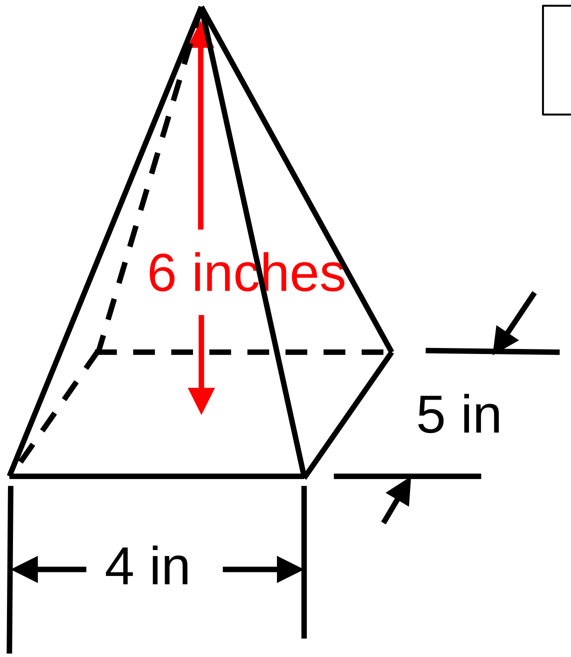
$$vol_{\text{cylinder}} = (\text{area of base} * \text{height})$$

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

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

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

The volume of a pyramid is….?

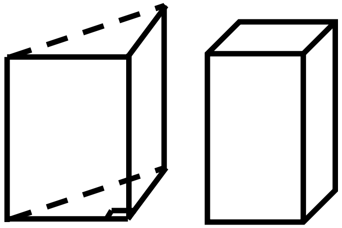


$$vol_{\text{pyramid}} = (\text{area of base} * \text{height})$$

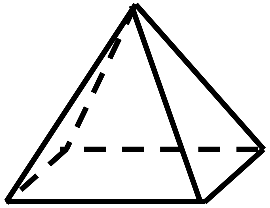
$$\text{volume}_{\text{pyramid}} = \frac{1}{3}(\text{ base area})h$$

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

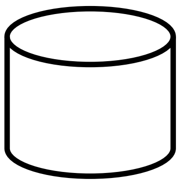
$$\text{volume} = 40 \text{ in}^3$$



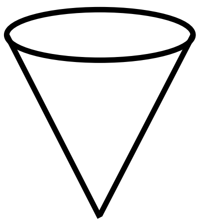
$$\text{volume}_{\text{prism}} = (\text{area of base}) * \text{h}$$



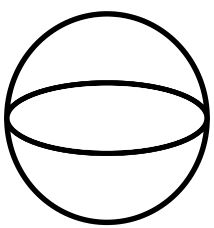
$$\text{volume}_{\text{rectangular pyramid}} = \frac{1}{3}(\text{base area})h$$



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



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



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

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

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!

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

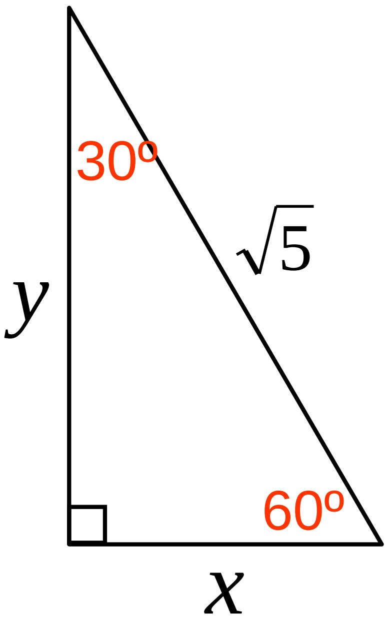
$$(x-3)^2 - 9 + (y+4)^2 - 16 = 0$$

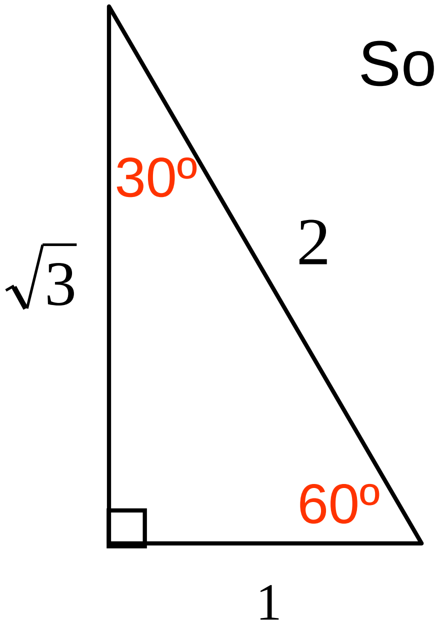
Convert "perfect square trinomials" to "binomials squared then simplify.

$$(h,k) = (3,-4) \quad \mathrm{r} = 5$$

$$(x-3)^2 + (y+4)^2 = 25$$

Problem solving using similar triangles.





Solve using a proportion

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

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

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

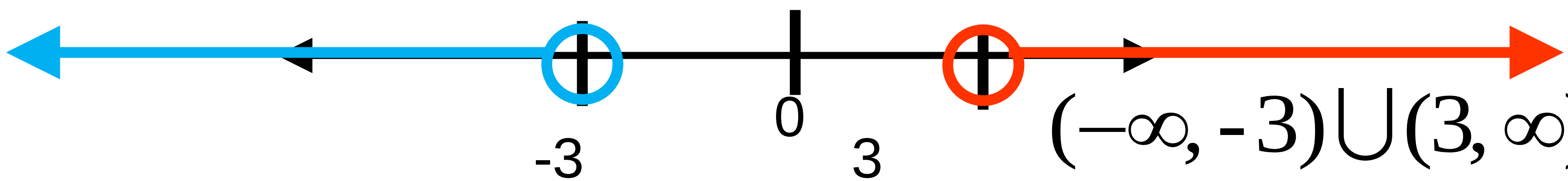
$x^2 - 9 > 0$

$0 = (x - 3)(x + 3)$

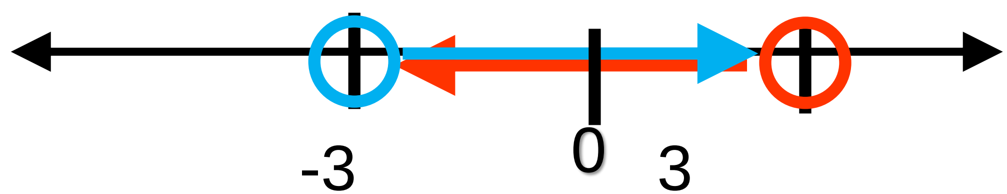
Find the boundary numbers: solve the equation:

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

The solution is one of the two graphs below.



$(-\infty, -3) \cup (3, \infty)$



Pick an easy number to test.

$(0)^2 - 9 > 0$

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