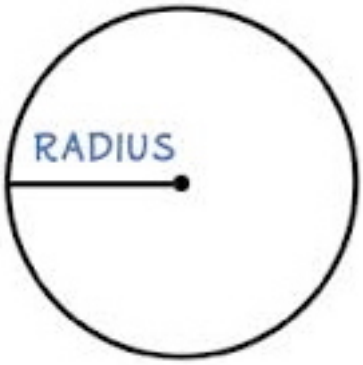
DETERMINING VOLUME OF 3-D SHAPES

Background Review:

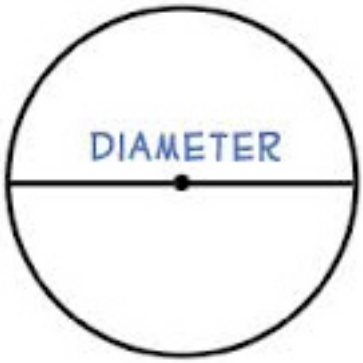
RADIUS (abbreviated "*r*") – The distance from the center point of a circle to any point on the circle's perimeter



The radius of a circle is half of the length of the diameter, so $r = \frac{d}{2}$

Ex. If the diameter of a circle is 6 cm, the radius would be 3 cm.

DIAMETER (abbreviated "*d*") – the length of a line segment that passes through the center of a circle dividing the circle into two equal halves.



The diameter of a circle is twice the length of the radius, so $d = 2 \times r$

Ex. If the radius of a circle is 8 cm, the diameter would be 16 cm.

CIRCUMFERENCE (abbreviated "*C*") – the entire distance around the outside of a circle

Pi, represented by the symbol "π", represents how many times longer a circle's circumference is than its diameter (approximately 3.14 times).

Therefore, the length of a circle's circumference is 3.14 times longer than its diameter, so $c = \pi \times d$

Formulae:

$r = \frac{d}{2}$ $\quad d = 2r$ $\quad c = \pi d$

$r = \frac{c}{2\pi}$ $\quad d = \frac{c}{\pi}$ $\quad c = 2\pi r$

Background Review (continued):

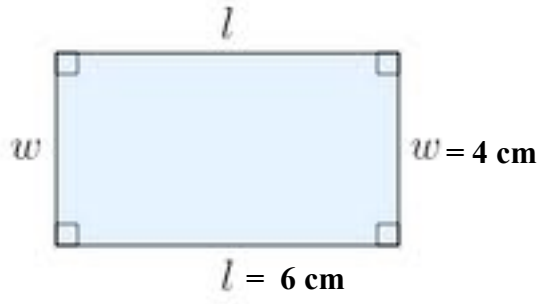
AREA (abbreviated "A") – the amount of space covered by a two dimensional shape

SQUARE / RECTANGLE: The area of a square or rectangle is calculated by multiplying its length by its width, so:

$$A = l \times w$$

For the rectangle below:

$A = l \times w$
$A = 6\text{ cm} \times 4\text{ cm}$
$A = 24\text{ cm}^2$

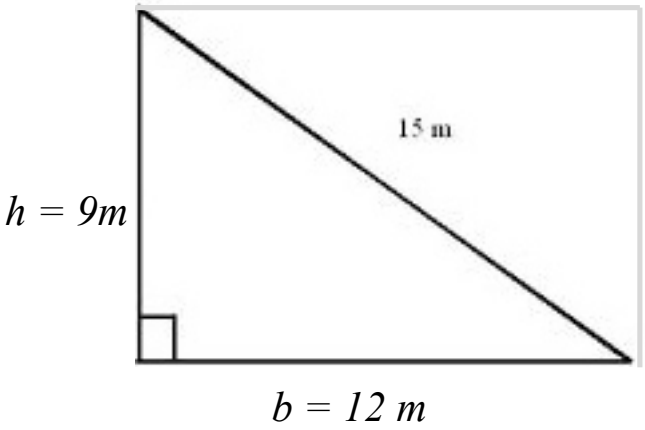


TRIANGLE: The area of a triangle is always half of the area of a rectangle with the same sized base (or length in the rectangle) and the same sized height (or width in the rectangle). As a result, we can calculate the area of a triangle using the formula:

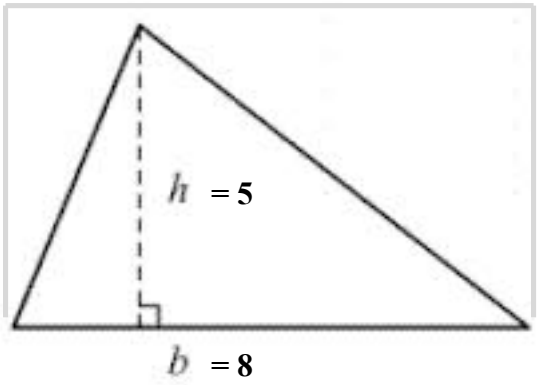
$$\mathbf{A} = \frac{1}{2} \times \boldsymbol{b} \times \boldsymbol{h}$$

Look at the triangle below. Its base is 12 m and its vertical height is 9 m. To calculate its area, we simply use the formula A = ½ x b x h to calculate its area:

A = ½ x b x h
A = ½ x 12m x 9m
A = 54m^2



In the example below, the base is marked '*b*' and the vertical height is marked '*h*'. We use the same formula to calculate the area of this triangle (A = ½ x b x h)



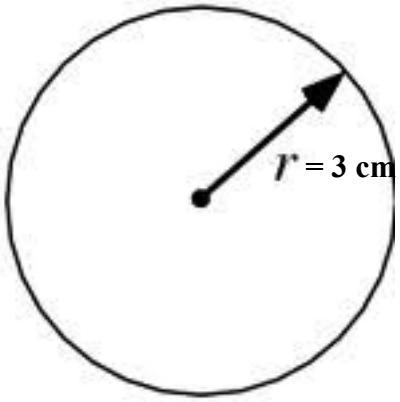
A = ½ x b x h
A = ½ x 8 x 5
A = 20 square units

NOTE: **In both triangles above, I have added light grey lines to show that triangles are indeed ALWAYS HALF OF A RECTANGLE.**

CIRCLE: The area of a circle is calculated by multiplying *Pi* by the square of the length of the circle's radius, so:

$A = \pi \times r^2$ So for the circle below:

A = π x r^2
A = 3.14 x (3 cm)^2
A = 3.14 x 9 cm^2
A = 28.26 cm^2



Calculating Volume of a 3-D Object:

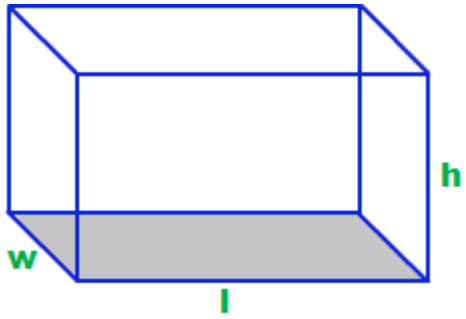
VOLUME (abbreviated "*V*") – the amount of space the object occupies.

To calculate the volume of a rectangular prism or a cylinder, one must multiply the area of the object's base by the height of the object.

RECTANGULAR PRISM: In a rectangular prism, the *base area* is calculated by multiplying length X width.

Therefore the formula for calculating the volume of a rectangular prism is:

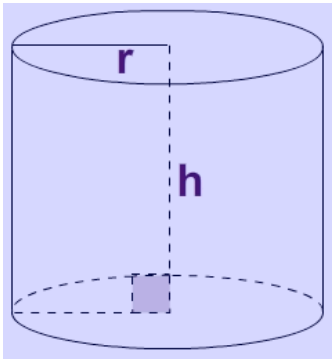
$$v = l \times w \times h$$



CIRCLE: In a cylinder, the base area is calculated by multiplying Pi by the square of the circle's radius.

Therefore, the formula for calculating the volume of a cylinder is:

$$v = \pi \times r^2 \times h$$



TRIANGULAR PRISM: In a triangular prism, we must use a slightly different formula. Since a triangular prism has half the volume of a rectangular prism with the same height, we can calculate the volume of a triangular prism using the formula:

$$v = \frac{1}{2} \times b \times h \times l$$