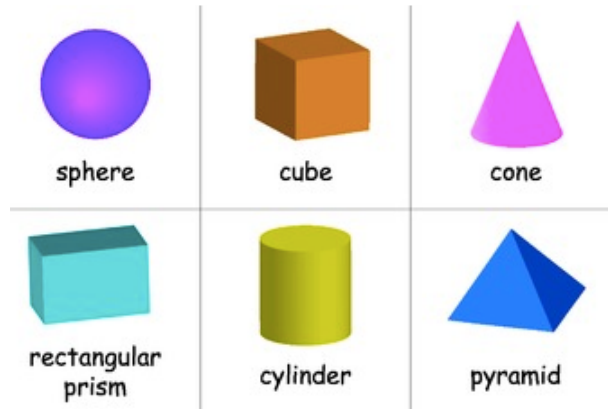


# VOLUME Instructional Sheet

The **VOLUME** is the space occupied by a 3 dimensional shape or solid.  
Here are some solids that you should be familiar with:



A **cylinder** is like a water bottle. When you fill it with water, the volume of water is measured in litres (L) or millilitres (mL). ***The volume of liquid is measured with litres or millilitres, and 1000mL = 1L***

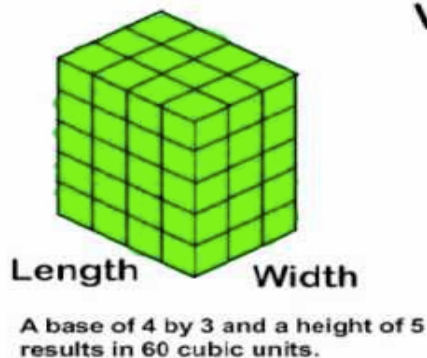
**We are just going to focus on calculating the volume of a rectangular prism (like a box).**

To calculate the volume, you just need to calculate the area (floor space) of the box, then calculate the height. Think of the volume of a rectangular prism or box as the many layers of the floor (base) area stacked on top of each other.

*This rectangular prism is made up of small cubes.*

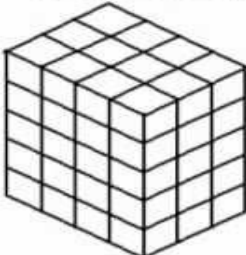
- On the top (or bottom base) layer, there are 12 cubes (  $4 \times 3 = 12$  )
- There are 5 layers of 12 cubes
- Therefore, there are 60 cubes in total (  $5 \times 12 = 60$  )

**Volume** = base layer x height  
= length x width x height  
=  $L \times W \times H$

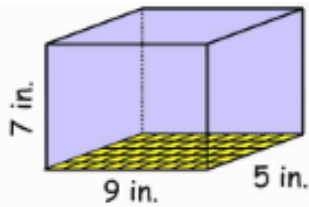


$$V = L \cdot W \cdot H$$

↓   ↓   ↓

$$4 \cdot 3 \cdot 5 = 60 \text{ u}^3$$


Let's look at another example,



Multiplying the length and width of a rectangular prism gives the area of the prism's base.

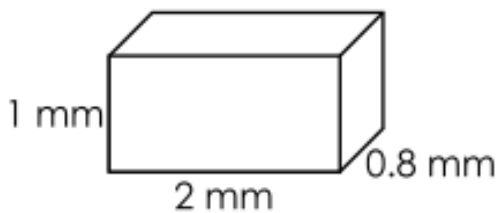
Notice that the bottom of the prism is covered with 45 square units. We have to multiply by the prism's height to turn the square units into cubic units.

- The bottom area covers 45 square inches ( $9 \times 5 = 45$ ).
- Now multiply it by the height ( $45 \times 7 = 315$ )
- The volume of this rectangular prism is 315 cubic inches

***Volume = Length x Width x Height***

Let's look at two other examples,

Example 1 (millimetres)

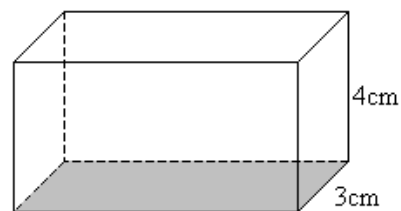


$$\begin{aligned} \text{Volume} &= \text{length} \times \text{width} \times \text{height} \\ &= 2\text{mm} \times 0.8\text{mm} \times 1\text{mm} \end{aligned}$$

***Volume = 1.6 mm cubed or 1.6 mm<sup>3</sup>***

Example 2

(Volume = 72 cm<sup>3</sup>)



length = ?

$$\begin{aligned} \text{length} \times \text{width} \times \text{height} &= \text{Volume} \\ \text{length} \times 3 \text{ cm} \times 4 \text{ cm} &= 72 \text{ cm}^3 \\ \text{length} \times 12 \text{ cm}^2 &= 72 \text{ cm}^3 \end{aligned}$$

$$? \times 12 = 72$$

***Length = 6 cm***

**Volume can be expressed in a number of units that are connected:**

- litres (L) and millilitres (mL) for liquid volume, remember 1000mL = 1L
- millimetres (mm), centimetres (cm), and metres (m) cubed for non-liquid space
  - these units are cubed (mm<sup>3</sup>, cm<sup>3</sup>, m<sup>3</sup>) compared to area which is squared (ie. cm<sup>2</sup>)
  - remember 10mm = 1cm and 1000mm = 1m, 100cm = 1m
- in fact, 1mL of water = 1 cm<sup>3</sup> and 1L of water = 1000 cm<sup>3</sup> ...COOL, for us Math Nerds!