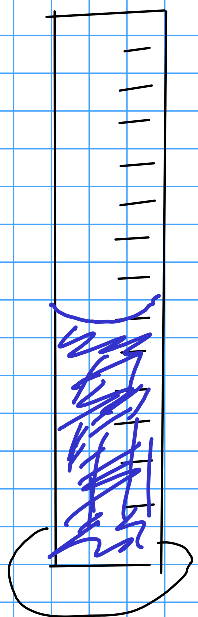
...of an object

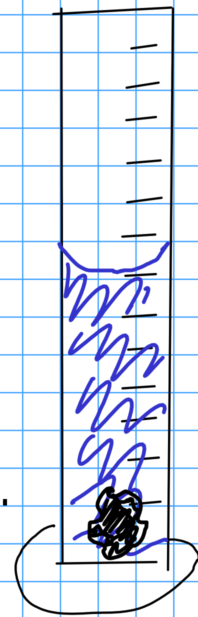
1) Measure mass of object

mass = 9.78 g



2) Partially fill cylinder with liquid, record volume.

volume = 25.0 mL



3) Put object into cylinder, record new volume

volume = 26.6 mL

4) Subtract to find volume of object

$$\begin{array}{r} 26.6 \text{ mL} \\ -\ 25.0 \text{ mL} \\ \hline 1.6 \text{ mL} \end{array}$$

5) Density = mass object / volume object

$$\text{Density} = \frac{9.78\ \text{g}}{1.6\ \text{mL}}$$

$$= 6.1\ \text{g/mL}$$

Converting from one unit to another

We will use the method of dimensional analysis, sometimes called the factor-label method.... or, the "drag and drop" method!

Dimensional analysis uses conversion factors to change between one unit and another

What's a conversion factor? A simple equality.

Example

12 in = 1 ft

Conversion factors in metric

In the metric system, conversion factors between units may always be made from the metric prefixes!

For example, "kilo-" means 10^3

$$k = 10^3$$

so

$$km = 10^3 m$$

$$kg = 10^3 g$$

$$kL = 10^3 L$$

$$ks = 10^3 s$$

Just apply the prefix to the base unit!

How do we actually USE a conversion factor?

$cm = 10^{-2} m$

DRAG
AND
DROP!

Convert 15.75 m to cm

$$15.75\,m \times \frac{cm}{10^{-2}\,m} = 1575\,cm$$

Put what you want to cancel on the bottom, then ...

... put what it equals on the top

Convert 0.01893 kg to g

$Kg = 10^{3} g$

$$0.01893\,kg \times \frac{10^{3}\,g}{Kg} = 18.93\,g$$

Convert 14500 mg to kg

$mg = 10^{-3} g$ $Kg = 10^{3} g$

$$14500 \, mg \times \frac{10^{-3} g}{mg} \times \frac{Kg}{10^{3} g} = 0.0145 \, Kg$$

Convert 0.147 mm to μm

$mm = 10^{-3} m$ $\mu m = 10^{-6} m$

μ ← micro-

$$0.147 \, mm \times \frac{10^{-3} m}{mm} \times \frac{\mu m}{10^{-6} m} = 147 \, \mu m$$

Convert 38.47 in to m, assuming 2.54 cm = 1 in

$2.54\ cm = in \qquad cm = 10^{-2}\ m$

$$38.47\ in \times \frac{2.54\ cm}{in} \times \frac{10^{-2}\ m}{cm} = 0.9771\ m$$

Even though English units are involved, we can solve this problem the same way we solved the previous problem where only metric units were used!