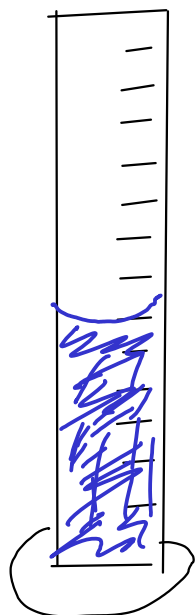


...of an object



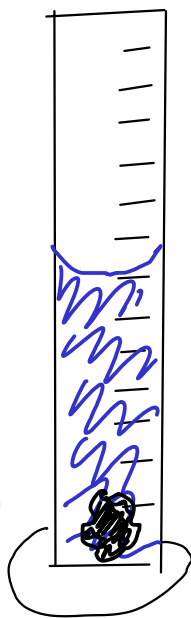
1) Measure mass
of object

$$\text{mass} = 9.78 \text{ g}$$



2) Partially fill cylinder
with liquid, record volume.

$$\text{volume} = 25.0 \text{ mL}$$



3) Put object into cylinder, record new
volume

$$\text{volume} = 26.6 \text{ mL}$$

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

$$12 \text{ in} = 1 \text{ ft}$$

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

$$k_m = 10^3 m$$

$$k_L = 10^3 L$$

$$k_g = 10^3 g$$

$$k_s = 10^3 s$$

Just apply the prefix to the base unit!

How do we actually USE a conversion factor?

Convert 15.75 m to cm

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

$\text{cm} = 10^{-2} \text{ m}$

* Similar to...

If $X = 2$, then

$$\frac{X}{2} = 1$$

15.75 / [EE]-2 .. on TI-83

* This fraction equals one, so multiplying by it does not change the VALUE of the number, only its UNITS!

Convert 0.01893 kg to g

$$\text{kg} = 10^3 \text{ g}$$

$$0.01893 \cancel{\text{kg}} \times \frac{10^3 \text{ g}}{\cancel{\text{kg}}} = 18.93 \text{ g}$$

DRAG AND DROP

- Drag the part of the factor that contains the unit you want to get rid of (cancel out) to the BOTTOM.

- Then, drag the other half of the factor to the TOP

Convert 14500 mg to kg $\text{mg} = 10^{-3} \text{g}$ $\text{kg} = 10^3 \text{g}$

$$14500 \text{mg} \times \frac{10^{-3} \text{g}}{\text{mg}} \times \frac{\text{kg}}{10^3 \text{g}} = \boxed{0.0145 \text{kg}}$$

Convert 0.147 cm² to m²

$$0.147 \text{cm}^2 \times \frac{10^{-2} \text{m}}{\text{cm}} \times \frac{10^{-2} \text{m}}{\text{cm}} =$$

$$\text{cm} = 10^{-2} \text{m}$$

Tip: Don't make metric conversion factors out of squared or cubed base units!

When converting squared and cubed units, use each conversion factor two (squared) or three (cubed) times. Remember that

$$\text{cm}^2 = \text{cm} \times \text{cm}$$

$$\text{cm}^3 = \text{cm} \times \text{cm} \times \text{cm}$$

... and it should make sense.

8.45 kg to mg $\text{kg} = 10^3 \text{g}$ $\text{mg} = 10^{-6} \text{g}$

$$8.45 \cancel{\text{kg}} \times \frac{10^3 \cancel{\text{g}}}{\cancel{\text{kg}}} \times \frac{\text{mg}}{10^{-6} \cancel{\text{g}}} = \boxed{8450000000 \text{ mg}}$$

$8.45 \times 10^9 \text{ mg}$

88100 kHz to MHz

$\text{Hz} = \text{s}^{-1}$ (Frequency)

$\text{kHz} = 10^3 \text{Hz}$

$\text{MHz} = 10^6 \text{Hz}$

$$88100 \cancel{\text{kHz}} \times \frac{10^3 \cancel{\text{Hz}}}{\cancel{\text{kHz}}} \times \frac{\text{MHz}}{10^6 \cancel{\text{Hz}}} = \boxed{88.1 \text{ MHz}}$$