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

$$kg = 10^3 g$$

$$km = 10^3 m$$

$$kL = 10^3 L$$

$$ks = 10^3 s$$

Just apply the prefix to the base unit!

How do we actually USE a conversion factor?

Convert 15.75 m to cm

$cm = 10^{-2} m$

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

* 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 0.0183 kg to g

$Kg = 10^{3} g$

$$0.0183\,k\cancel{g} \times \frac{10^{3}\,g}{K\cancel{g}} = \boxed{18.3\ g}$$

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

$m g = 10^{-3} g \qquad kg = 10^{3} g$

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

Convert 0.147 cm^2 to m^2

$cm = 10^{-2} m$

When you make a conversion factor from a prefix, you can only apply units that don't have an exponent to each side!

$$0.147\ c\cancel{m}^{\cancel{2}} \times \frac{10^{-2}\ m}{c\cancel{m}} \times \frac{10^{-2}\ m}{c\cancel{m}} = \boxed{1.47 \times 10^{-5}\ m^2}$$

$(0.0000147\ m^2)$

When converting squared or cubed units, you will use each factor two (squared) or three (cubed) times!

$cm^2 = cm \times cm \qquad cm^3 = cm \times cm \times cm$

8.45 kg to μg

$kg = 10^3 g$ $\quad$ $\mu g = 10^{-6} g$

$$8.45\,k\cancel{g} \times \frac{10^3\,\cancel{g}}{k\cancel{g}} \times \frac{\mu g}{10^{-6}\,\cancel{g}} = \boxed{8450000000\,\mu g}$$

$(8.45 \times 10^9\,\mu g)$

88100 kHz to MHz

$kHz = 10^3 Hz$ $\quad$ $MHz = 10^6 Hz$

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

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

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

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

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

Convert 12.48 km to in

$2.54\,cm = in$ $\qquad cm = 10^{-2}\,m$ $\qquad km = 10^{3}\,m$

$$12.48\,\cancel{km} \times \frac{10^{3}\,\cancel{m}}{\cancel{km}} \times \frac{\cancel{cm}}{10^{-2}\,\cancel{m}} \times \frac{in}{2.54\,\cancel{cm}} = \boxed{491300\,in}$$

Accuracy and Precision

- two related concepts that you must understand when working with measured numbers!

Accuracy

- how close a measured number is to the CORRECT (or "true") value of what you are measuring

- "Is it right?"

- checked by comparing measurements against a STANDARD (a substance or object with known properties)

Precision

- how close a SET of measured numbers are to EACH OTHER

- "Can I reproduce this?"

- checked by repeated measurements