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

$$k_g = 10^3\ g$$

$$k_m = 10^3\ m$$

$$k_L = 10^3\ L$$

$$k_s = 10^3\ s$$

Just apply the prefix to the base unit!

How do we actually USE a conversion factor?

Convert 15.75 m to cm

$cm = 10^{-2} m$

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

* 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

$kg = 10^3 g$

$$0.0183\ kg \times \frac{10^3\ g}{kg} = 18.3\ g$$

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

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

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

When making a factor from a prefix, remember that you can only "apply" units that don't have their own exponent to each side!

$cm = 10^{-2} m$

Convert 0.147 cm^2 to m^2

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

$(0.0000147\ m^2)$

When converting a squared or cubed unit, use each factor two (squared) or three (cubed) times, because

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

8.45 kg to μg

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

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

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

88100 kHz to MHz

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

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

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

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

$2.54\ cm = 1\ in \qquad cm = 10^{-2}\ m$

$$38.47\ in \times \frac{2.54\ cm}{1\ in} \times \frac{10^{-2}\ m}{cm} = \boxed{0.9771\ m}$$

Convert 12.48 km to in

$2.54\ cm = 1\ in \qquad cm = 10^{-2}\ m \qquad km = 10^{3}\ m$

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