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.

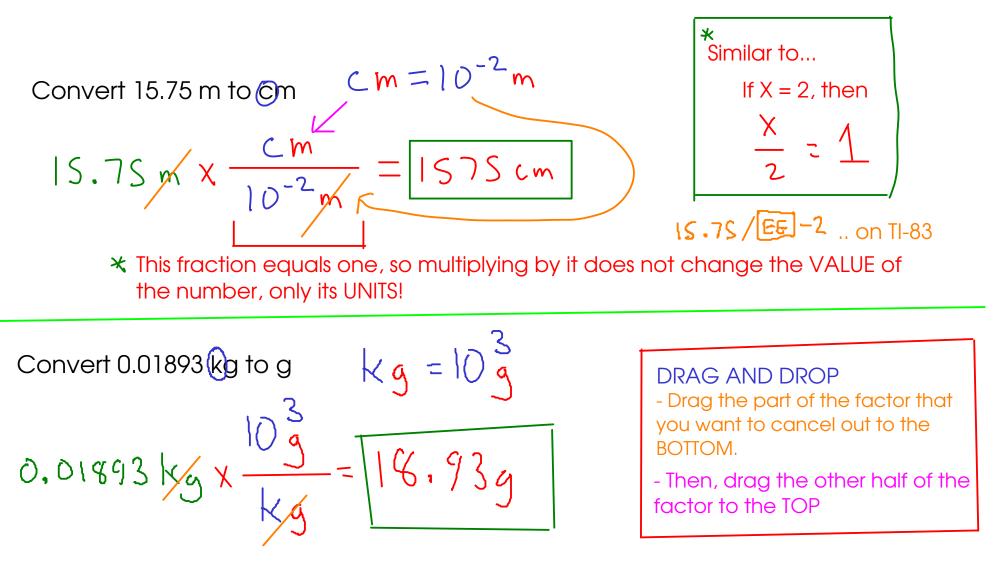
$$12 in = 1 f f$$

Conversion factors in metric

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

For example, "
$$K_{1}|_{0}$$
" means 10^{3}
 $K = 10^{3}$
 So
 $\frac{Km = 10^{3}m}{KL = 10^{3}L}$
 $\frac{Kg = 10^{3}g}{KS = 10^{3}S}$

How do we actually USE a conversion factor?



Convert 14500 mg tolkg mg =
$$10\frac{3}{9}$$
 kg = $10\frac{3}{9}$
14500 mg x $\frac{10\frac{3}{9}}{mg}$ x $\frac{kg}{10\frac{3}{9}}$ = 0.0145 kg

Convert 0.147
$$cm^2$$
 to m^2 $cm^2 \sqrt{m^2}$

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

For squared units, we have to convert BOTH parts of the unit, so we use each conversion factor twice. If you think of a squared unit as

$$Cm^2 = Cm \times Cm$$

... then using each factor twice should make sense. (For cubed units, use each factor THREE times!)

8.45 kg to mg
$$Kg = 10\frac{3}{9}$$
 $Mg = 10\frac{9}{9}$
8.45 kg to mg $\frac{10\frac{3}{9}}{Kg} \times \frac{Mg}{10\frac{9}{9}} = \frac{8450000000}{8.45 \times 10^{7} Mg}$

88100 kHz to MHz
$$k_{H2} = 10^{3} H_{2}$$
 $M_{H2} = 10^{6} H_{2}$ $H_{z} = \frac{1}{s} (frequency)$
 $\frac{10^{3} H_{2}}{k_{H2}} \times \frac{10^{3} H_{2}}{k_{H2}} = \frac{88.1 MH_{2}}{10^{6} H_{2}}$

Convert 38.47 in to m, assuming 2.54 cm = 1 in $2 \cdot 54$ cm = in

$$38.47 \text{ Kx} = \frac{2.54 \text{ Cm}}{\text{K}} \times \frac{10^{-2} \text{m}}{\text{Cm}} = 0.9771 \text{ m}$$

Convert 12.48 km to in 2.54 cm = 10 m $km = 10^{3} m$ $cm = 10^{-2} m$

12.48 km x
$$\frac{10^{3} \text{m}}{\text{km}} \times \frac{\text{cm}}{10^{-3} \text{m}} \times \frac{\text{in}}{2.54 \text{ gm}} = 491300 \text{ ln}$$

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

<u>Accuracy</u>

- 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