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.

Conversion factors in metric

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

For example, "
$$k_{10}$$
" means 10^{3}

$$K = 10^{3}$$

$$Km = 10^{3}$$

$$Kg = 10^{3}$$

$$K_{2} = 10^{3}$$

$$K_{3} = 10^{3}$$

$$K_{4} = 10^{3}$$

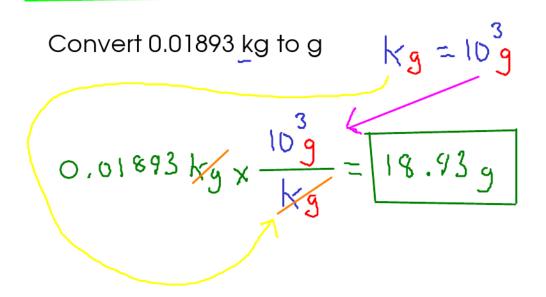
$$K_{5} = 10^{3}$$

$$K_{5} = 10^{3}$$

How do we actually USE a conversion factor?

Convert 15.75 m to ©m
$$Cm = 10^{-2} \text{m}$$
 If $X = 2$, then $\frac{X}{2} = \frac{1}{2}$

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



DRAG AND DROP

- Drag the part of the factor that you want to cancel out to the BOTTOM
- Then, drag the other half of the factor to the TOP

Convert 14500 mg to kg
$$mg = 10^{-3}$$
 $Kg = 10^{-3}$

Convert 0.147 cm² to m²
$$(m=10^{-2} \text{m})$$

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

$$(0.3000147 \text{ m}^2)$$

We have to convert BOTH PARTS of the squared unit, so we use the factor TWICE.

For CUBED units, apply the factors THREE times.

8.45 kg to mg
$$Kg = 10^3 g$$
 $Mg = 10^{-6} g$
8.45 kg $\times \frac{10^3 g}{Kg} \times \frac{Mg}{10^{-6}} = \frac{84500000000 mg}{8.45 \times 10^9 mg}$

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

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

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

$$\sqrt{m} = 10^{3}m$$

12.48 km x
$$\frac{10^3 \text{m}}{\text{Km}}$$
 x $\frac{\text{cm}}{10^{-2} \text{m}}$ x $\frac{\text{in}}{2.54 \text{ cm}}$ = $\frac{491300 \text{ in}}{4.913 \times 10^5 \text{ in}}$

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