CONVERSION BETWEEN SYSTEMS

You typically chose the scale for a measurement based on the thing you're measuring. You would typically measure a candy bar in inches or centimeters, but a piece of land in feet, meters, or miles, depending on how big it is.

You may find the need to convert from one measurement to another in order to do calculations. The nice thing is, you can use the same system for conversions whether you're converting between units in one system, or converting to a different system.

Conversions within the Metric System

Within the metric system, if you're just changing scale, you multiply or divide by an appropriate power of 10 to change from one unit to the other.

Prefix	kilo-	hecto-	deca-	base unit	deci-	centi-	milli-
Abbreviation	k	h	da		d	c	m
Magnitude	10^3	10^2	10^1	1	10^{-1}	10^{-2}	10^{-3}

If you're going to a smaller unit, multiply by 10 for each box you move down. If you're going to a larger unit, divide by 10 for each box,

So, if you want to change 3 g to mg, you multiply by 10^3; 3 g = 3000 mg.
If you want to change 3 mg to decagrams, you divide by 10^4; 3 mg = 0.0003 dg.

These kinds of conversions are usually within the same type of measurement (area, mass, etc.) If you're converting from something like cm^3 to mL, you need to know the conversion factor and you can do it like the section below. (1 cm^3 = 1 mL)

Conversions within the English System OR Between Systems

To start, you need some kind of conversion factor, like 1 foot = 12 inches. You're going to write your conversion factor as a ratio.

$$\frac{1\ ft}{12\ in} \text{ or } \frac{12\ in}{1\ ft}$$

Which version you pick depends on which way you're converting. You're going to set up a series of ratios so your units all cross out (except the ones you're converting to). Note that if you have square or cubic units, you'll need to square or cube the linear conversion factor.

So, for example: I want to convert a speed from ft/s to mph.

$$100\frac{ft}{s} * \frac{mi}{5280\ ft} * \frac{60\ s}{min} * \frac{60\ min}{hr} = \frac{100 * 60 * 60\ mi}{5280\ hr} = 68.18\ mi/hr$$

I need to go from feet to miles. I know there are 5280 feet per mile, and I want the feet on the bottom so it cancels the feet on top. I need to go from seconds to hours. There are 60 seconds per minute and 60 minutes per hour; again I set it up so my units cancel. I'm left (after units cancel) with miles per hour. Any conversion can be done this way, and it's a good way to make sure your units line up the way you want.