

Unit Conversion

What do you do if your friend from Germany asks how tall you are?

One thing that repeatedly comes up a lot in life is unit conversion. You may find yourself needing to convert feet to meters, teaspoons to cups, or pounds to kilograms. Often you know the relationship between the two, but may get confused as to whether to multiply or divide by the conversion factor. We will cover a sure fire method to do all kinds of conversions quickly and accurately.

Unit conversion is based on two simple math identities:

- 1) Anything divided by itself is 1.
- 2) Multiplying a quantity by 1 doesn't change its value.

Let's say you are 5 feet tall. We want to be able to tell our friend from Germany how tall we are in meters. Here is how you convert.

- a) Find a relationship between the two units involved.

$$1 \text{ meter} = 3.28 \text{ feet}$$

- b) Divide both sides of this equation by the unit you are converting from (feet in our example)

$$\frac{1 \text{ meter}}{3.28 \text{ feet}} = \frac{3.28 \text{ feet}}{3.28 \text{ feet}}$$

- c) From rule 1 above, we can replace the right side of the equation by 1. The result is our conversion factor.

$$\frac{1 \text{ meter}}{3.28 \text{ feet}} = 1$$

- d) Now that we have our conversion factor, multiply it by the number we want to convert (the 5 feet in our example). We can do this because of rule 2. Since this fraction is equal to 1, we are not going to change the value of the measurement. It will be the same height, just expressed in different units.

$$5 \text{ feet} \times \left(\frac{1 \text{ meter}}{3.28 \text{ feet}} \right) =$$

- e) Regroup the terms to line up the matching units.

$$\frac{5 \text{ feet}}{3.28 \text{ feet}} \times 1 \text{ meter} =$$

- f) Based on rule 1, the feet/feet = 1 so we can remove it because of rule 2.

$$\frac{5}{3.28} \times 1 \text{ meter} =$$

- g) Now, just do the math you have left to arrive at the value in the new units and you can now speak your friend's language.

1.52 meters

That seems like a lot of steps, but it goes really quick when you get use to it. Let's do one more. This time, let's use this method to convert unit multipliers. Let's convert 0.035 millimeters to micrometers.

$$1 \text{ millimeter} = 1000 \text{ micrometers}$$

$$1 = \frac{1000 \text{ micrometers}}{1 \text{ millimeter}}$$

$$0.035 \text{ millimeters} \times \frac{1000 \text{ micrometers}}{1 \text{ millimeter}} = 0.035 \times 1000 \text{ micrometers} = \mathbf{35 \text{ micrometers}}$$

This method will keep you straight when you decide whether or not to multiply or divide by your conversion factor.