

CONVERTING UNITS OF MEASUREMENT

Chemists, biologists, physicists, architects, and doctors must all be acutely aware of measurements and must be proficient in converting back and forth. The system we typically use in America is “Standard Measurement.” Some important conversions in distance, liquid measure, and time are:

12 inches = 1 foot	8 ounces = 1 cup	60 seconds = 1 minute
3 feet = 1 yard	2 cups = 1 pint	60 minutes = 1 hour
5280 feet = 1 mile	2 pints = 1 quart	24 hours = 1 day
	4 quarts = 1 gallon	365 days = 1 year.

It is standard throughout the world (and in science in America) to use the metric system. Unlike standard measure, the metric system uses a base-10 system; each increasing measure is 10 times bigger than the one before. The unit of distance is a meter; of liquid measure, a liter; of weight and mass, a gram. The metric system uses the same measurements of time.

Instead of having new names (foot, yard, mile) for each type of measurement, the metric system uses prefixes to delineate how many (or what fraction of) each unit we are talking about. The prefixes are:

kilo-	hecto-	deka-	(unit)	deci-	centi-	milli
1000	100	10	1	.1	.01	.001

You should become acquainted with these measures so that we can compare the two systems with ease.

To convert from one unit of measure to another the easiest way is to use a proportion.

Example 1: How many feet are there in 228 inches?

Since we are dealing with feet and inches, we use the fact that 12 inches = 1 foot and set up the proportion:

$$\frac{12 \text{ inches}}{1 \text{ foot}} = \frac{228 \text{ inches}}{x \text{ feet}}$$
$$12x = 228$$
$$x = 19 \text{ feet}$$

We could have just divided but sometimes it is not so evident and it is better to have a system that works for all.

Example 2: How many millimeters are there in 678 meters?

Since we know that 1000mm = 1 meter, we can set up the proportion and solve for x.

$$\frac{1000 \text{ mm}}{1 \text{ m}} = \frac{x \text{ mm}}{678 \text{ meters}}$$
$$1x = 678000$$
$$x = 678000 \text{ meters}$$

Since the metric system uses base 10 we could have just moved the decimal point the number of places needed but sometimes students get confused as to which way to move the decimal point so if we know a method that works all of the time, we are in better shape.

Another way to do this problem is to use the conversion factor and multiply. We set up the problem so that there is the ability to simplify. Let's re-do example 1 this way. Since we are using feet and inches we know that 12 inches = 1 ft and we set it up as a ratio in a way such that we can “cancel” the inches.

$$234 \text{ inches} \cdot \frac{1 \text{ foot}}{12 \text{ inches}}$$

19

$$\cancel{234 \text{ inches}} \cdot \frac{1 \text{ foot}}{\cancel{12 \text{ inches}}} \text{ or } 19 \text{ feet}$$

Example 3: How many cups are in 120 pints?

Solution: Using the conversion factor method:

$$120 \text{ pints} \cdot \frac{2 \text{ cups}}{1 \text{ pint}}$$
$$120$$
$$\cancel{120 \text{ pints}} \cdot \frac{2 \text{ cups}}{\cancel{1 \text{ pint}}} \text{ or } 240 \text{ cups}$$

PRACTICE:

Convert: (1) 279 cm = ? m (2) 0.1080g = ? mg (3) 0.0827m = ? mm
 (4) 136 wk = ? yr (5) 7 qt = ? pt (6) 1.25 miles = ? ft

Answers: (1) 2.79 m (2) 108 mg (3) 82.7 m
 (4) 2 8/13 yr (5) 14 pt (6) 6600 ft