

SCIENTIFIC MEASUREMENT AND CONVERSION

● Converting Between U.S. Conventional and SI Measurements

In the United States, most people express distances in inches, feet, yards, or miles. Those units, along with the units we use for speed, volume, and other quantities, are known as the *U.S. Conventional System*.

Most scientists use a different system called the *Système Internationale* (SI). This system has units such as the meter, the kilogram, the second, and the kelvin. Each base unit measures a different quantity. For example, the meter measures length, and the kilogram measures mass.

The units of the two systems are different, but the quantities they represent do not change. The units have a fixed relationship to each other. You can use this relationship to convert a value from one system to the other. Table 1 lists some common U.S. System units and their SI equivalents.

Table 1 Conversions between U.S. and SI units

U.S. System	SI	U.S. System	SI
1 mi	1.6093 km	1 in.	2.54 cm
1 ft	0.3048 m	1 gal	3.7853 L
1 pt	0.4732 L	1 lb	4.448 N
1 mi/h	1.6093 km/h	1 qt	0.9463 L

Math Skills

How many kilometers are in a 5.44 mi bicycle race?

Solution

1. Locate the conversion factor for the units in question.

$$1 \text{ mi} = 1.6093 \text{ km}$$

2. Use the units you found in step 1 to make a fraction, with the units you are converting *into* on top. Now the units will cancel after you multiply. Because the top and bottom of the fraction are equal, the fraction is equal to one.

$$\frac{1.6093 \text{ km}}{1 \text{ mi}} = 1$$

3. Write the measurement you wish to convert, and multiply it by the fraction you found in step 2. Because the fraction is equal to one, it will not change the value of your original measurement.

$$5.44 \text{ mi} \times 1 = 5.44 \text{ mi} \times \frac{1.6093 \text{ km}}{1 \text{ mi}}$$

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● Converting Between U.S. Conventional and SI Measurements *continued*

4. Multiply through and cancel out any repeated units.

$$\frac{5.44 \cancel{\text{mi}} \times 1.6093 \text{ km}}{1 \cancel{\text{mi}}} = 8.754 \text{ 592 km}$$

5. Round to the correct number of significant figures. The original measurement has three significant figures, so the answer is rounded to 8.75 km.

Math Skills

Your friend from Europe is sending you a 20.5 N package. How much will it weigh in pounds?

Solution

1. Locate the conversion factor for the units in question.

$$1 \text{ lb} = 4.448 \text{ N}$$

2. Make a fraction with the units from step 1, putting the units you are converting to on top. Multiply this fraction by the quantity you wish to convert.

$$20.5 \text{ N} \times \frac{1 \text{ lb}}{4.448 \text{ N}}$$

3. Multiply through and cancel out any repeated units.

$$\frac{20.5 \text{ N} \times 1 \text{ lb}}{4.448 \text{ N}} = 4.608 \text{ 812 95 lb}$$

4. Round to the correct number of significant figures. The original measurement has three significant figures, so round the answer to 4.61 lb.

Practice

1. In Canada, you pass a speed limit sign that says 75 km/h. How fast can you drive in mi/h?
2. How many liters of milk are in 3.5 gal?
3. How many meters long is a 100 yd football field? (Note that 1 yd = 3 ft.)