

# Convert Measurements



## Getting the Idea

The tables below show some conversions for units of **length** in both the **customary system** and the **metric system**.

### Customary Units of Length

1 foot (ft) = 12 inches (in.)
1 yard (yd) = 3 feet
1 yard = 36 inches
1 mile (mi) = 5,280 feet
1 mile = 1,760 yards

### Metric Units of Length

1 centimeter (cm) = 10 millimeters (mm)
1 meter (m) = 100 centimeters
1 meter = 1,000 millimeters
1 kilometer (km) = 1,000 meters

You can convert measurements using equivalent ratios.

## Example 1

Nancy ran 8 miles. How many yards did she run?

**Strategy** Set up equivalent ratios and cross multiply.

**Step 1** Write a ratio that compares yards to miles.

$$\frac{\text{yards}}{\text{miles}} = \frac{1,760}{1}$$

**Step 2** Write a ratio that compares the unknown length to the length you know.

Let  $y$  represent the number of yards.

$$\frac{\text{yards}}{\text{miles}} = \frac{y}{8}$$

**Step 3** Set up equivalent ratios using the two ratios.

$$\frac{1,760}{1} = \frac{y}{8}$$

**Step 4** Cross multiply.

$$1,760 \times 8 = 1 \times y$$

$$14,080 = y$$

**Solution** Nancy ran 14,080 yards.

The tables below show conversions among units of **weight** and **mass**.

### Customary Units of Weight

$$1 \text{ pound (lb)} = 16 \text{ ounces (oz)}$$

$$1 \text{ ton (T)} = 2,000 \text{ pounds}$$

### Metric Units of Mass

$$1 \text{ gram (g)} = 1,000 \text{ milligrams (mg)}$$

$$1 \text{ kilogram (kg)} = 1,000 \text{ grams}$$

$$1 \text{ metric ton (t)} = 1,000 \text{ kilograms}$$

## Example 2

How many grams are equal to 5 kilograms?

**Strategy** Set up equivalent ratios and cross multiply.

**Step 1**

Write a ratio that compares grams to kilograms.

$$\frac{\text{grams}}{\text{kilograms}} = \frac{1,000}{1}$$

**Step 2**

Write a ratio that compares the unknown mass to the mass you know.

Let  $g$  represent the number of grams.

$$\frac{\text{grams}}{\text{kilograms}} = \frac{g}{5}$$

**Step 3**

Set up equivalent ratios using the two ratios.

$$\frac{1,000}{1} = \frac{g}{5}$$

**Step 4**

Cross multiply.

$$1,000 \times 5 = 1 \times g$$

$$5,000 = g$$

**Solution** There are 5,000 grams in 5 kilograms.

Compound units can be used to express measurements. For example, you may express a weight in ounces, or you may express the same weight using pounds and ounces.

### Example 3

A newborn baby weighed 133 ounces. What is the baby's weight in pounds and ounces?

**Strategy**     **Set up equivalent ratios and cross multiply.**

**Step 1**

Write a ratio that compares ounces to pounds.

$$\frac{\text{ounces}}{\text{pounds}} = \frac{16}{1}$$

**Step 2**

Write a ratio that compares the unknown weight to the weight you know.

Let  $p$  represent the number of pounds.

$$\frac{\text{ounces}}{\text{pounds}} = \frac{133}{p}$$

**Step 3**

Set up equivalent ratios using the two ratios.

$$\frac{16}{1} = \frac{133}{p}$$

**Step 4**

Cross multiply.

$$16 \times p = 1 \times 133$$

$$16p = 133$$

$$16p \div 16 = 133 \div 16$$

$$p = 8 \text{ R}5$$

The remainder is the additional number of ounces. There are 5 ounces.

**Solution**     **The newborn baby weighed 8 pounds 5 ounces.**

The tables below shows conversions among units of **capacity**.

### Customary Units of Capacity

1 <b>cup</b> (c) = 8 <b>fluid ounces</b> (fl oz)
1 <b>pint</b> (pt) = 2 cups
1 <b>quart</b> (qt) = 2 pints
1 <b>gallon</b> (gal) = 4 quarts

### Metric Units of Capacity

1 <b>liter</b> (L) = 1,000 <b>milliliters</b> (mL)
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## Example 4

A fishbowl has a capacity of 192 fluid ounces. How many quarts is that?

**Strategy** Set up equivalent ratios and cross multiply.

**Step 1** Find the number of fluid ounces in a quart.

$$1 \text{ cup} = 8 \text{ fluid ounces}$$

$$2 \text{ cups} = 16 \text{ fluid ounces} = 1 \text{ pint}$$

$$4 \text{ cups} = 32 \text{ fluid ounces} = 2 \text{ pints} = 1 \text{ quart}$$

There are 32 fluid ounces in a quart.

**Step 2** Write a ratio that compares fluid ounces to quarts.

$$\frac{\text{fluid ounces}}{\text{quarts}} = \frac{32}{1}$$

**Step 3** Write a ratio that compares the capacity you know to the unknown capacity.

Let  $q$  represent the number of quarts.

$$\frac{\text{fluid ounces}}{\text{quarts}} = \frac{192}{q}$$

**Step 4** Set up equivalent ratios using the two ratios.

$$\frac{32}{1} = \frac{192}{q}$$

**Step 5** Cross multiply.

$$32 \times q = 1 \times 192$$

$$32q = 192$$

$$32q \div 32 = 192 \div 32$$

$$q = 6$$

**Solution** The capacity of the fishbowl is 6 quarts.



## Coached Example

**A basketball player is 78 inches tall. What is his height in feet?**

Write a ratio that compares inches to feet. Remember, 12 inches = 1 foot.

$$\frac{\text{inches}}{\text{feet}} = \frac{\quad}{1}$$

Write a ratio that compares the height you know to the unknown height.

Let  $f$  represent the height in feet.

$$\frac{\text{inches}}{\text{feet}} = \frac{\quad}{f}$$

Set up equivalent ratios using the two ratios.

$$\frac{\quad}{\quad} = \frac{\quad}{\quad}$$

Solve. Show your work.

The remainder is the additional number of \_\_\_\_\_. The remainder is \_\_\_\_\_, so there are \_\_\_\_\_ additional inches.

1 foot = 12 inches, so 6 inches = \_\_\_\_\_ foot.

**The basketball player is \_\_\_\_\_ feet tall.**