

Chapter 18

CONVERTING MEASUREMENTS

Sometimes, we want to change one type of measurement unit (such as inches) to another unit (such as feet). This is called **CONVERTING MEASUREMENTS**.

STANDARD SYSTEM of MEASUREMENT

In the U.S., we use the **STANDARD SYSTEM** of measurement. Here are some standard system measurements and their equivalent units:



Length

12 inches (in) = 1 foot (ft)

3 feet (ft) = 1 yard (yd)

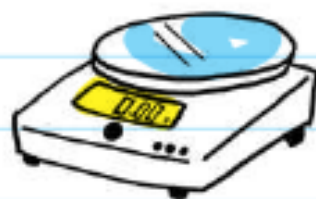
1,760 yards (yd) = 1 mile (mi)



Weight

1 pound (lb) = 16 ounces (oz)

1 ton (t) = 2,000 pounds (lb)



Capacity

1 tablespoon (tbsp) = 3 teaspoons (tsp)

1 fluid ounce (oz) = 2 tablespoons (tbsp)

1 cup (c) = 8 fluid ounces (oz)

1 pint (pt) = 2 cups (c)

1 quart (qt) = 2 pints (pt)

1 gallon (gal) = 4 quarts (qt)

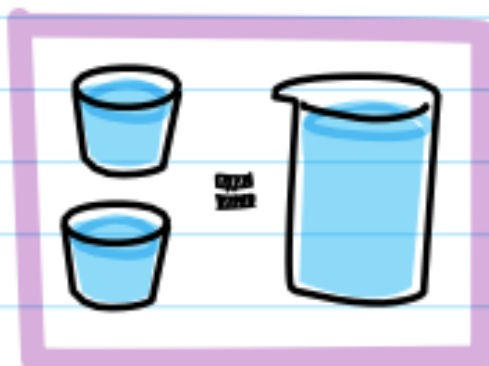
When converting between measurements, set up a proportion and solve.

EXAMPLE: How many quarts are there in 10 pints?

We already know that 1 quart is the same as 2 pints, so we use this ratio:

$$\frac{x \text{ quarts}}{10 \text{ pints}} = \frac{1 \text{ quart}}{2 \text{ pints}}$$

We cross multiply to find the answer is 5 quarts.



EXAMPLE: How many pints are there in 64 fluid ounces?

We can use ratios and proportions, and repeat this process until we end up with the right units. We already know that there are 8 fluid ounces in 1 cup, so we change from fluid ounces to cups first.

$$\frac{x \text{ cups}}{64 \text{ fluid ounces}} = \frac{1 \text{ cup}}{8 \text{ fluid ounces}}$$

We cross multiply to find the answer is 8 cups.

Next, we change 8 cups to pints.

We already know that there are 2 cups in 1 pint, so we set up another proportion:

$$\frac{x \text{ pints}}{8 \text{ cups}} = \frac{1 \text{ pint}}{2 \text{ cups}}$$

MAKE SURE YOUR
UNITS ALWAYS MATCH
HORIZONTALLY.

We cross multiply to find the answer is 4 pints.



METRIC SYSTEM of MEASUREMENT



Most other countries use the **METRIC SYSTEM** of measurement. Here are some metric system measurements and their equivalent units:

WE ALSO USE THE METRIC SYSTEM IN SCIENCE CLASS!

Length

10 millimeters (mm) = 1 centimeter (cm)

100 centimeters (cm) = 1 meter (m)

1,000 meters (m) = 1 kilometer (km)



Weight

1,000 milligrams (mg) = 1 gram (g)

1,000 grams (g) = 1 kilogram (kg)

When converting between measurements, set up a proportion and solve.

EXAMPLE: How many centimeters are there in 2 kilometers?

We can use ratios and proportions because we already know that there are 1,000 meters in 1 kilometer:

$$\frac{x \text{ meters}}{2 \text{ kilometers}} = \frac{1,000 \text{ meters}}{1 \text{ kilometer}}$$

We cross multiply to find the answer is **2,000** meters.

Next, we change **2,000** meters to centimeters.

We already know that there are **100** centimeters in **1** meter, so we set up another proportion:

$$\frac{x \text{ centimeters}}{2,000 \text{ meters}} = \frac{100 \text{ centimeters}}{1 \text{ meter}}$$

We cross multiply to find the answer is **200,000** cm.

CONVERTING BETWEEN MEASUREMENT SYSTEMS

Sometimes, we want to change one type of measurement unit (such as inches) to another unit (such as centimeters).

When we change units from the standard system to the metric system or vice versa, we are **CONVERTING BETWEEN MEASUREMENT SYSTEMS**.

Here are some of the **COMMON CONVERSIONS OF STANDARD TO METRIC**:

Length

1 inch (in) = 2.54 centimeters (cm)

3.28 feet (ft) = 1 meter (m) (approximately)

1 yard (yd) = 0.9144 meter (m)

1 mile (mi) = 1.61 kilometers (km) (approximately)

Weight

1 ounce (oz) = 28.349 grams (g) (approximately)

1 pound (lb) = 453.592 grams (g) (approximately)

1 pound (lb) = 0.454 kilograms (kg) (approximately)

Capacity

1 fluid ounce (fl oz) = 29.574 milliliters (ml) (approximately)

1 pint (pt) = 473.177 milliliters (ml) (approximately)

1 pint (pt) = 0.473 liters (l) (approximately)

1 gallon (gal) = 3.785 liters (l) (approximately)

When converting between measurement systems, just set up a proportion and solve.

EXAMPLE: How many gallons are in 12 liters?

First, set up a proportion with the unknown quantity as x .

$$\frac{1 \text{ gallon}}{3.785 \text{ liters}} = \frac{x \text{ gallons}}{12 \text{ liters}}$$

Next, use cross products to find the missing number.

$$3.785x = 12$$

(Divide both sides by 3.785 to isolate x on one side of the equal sign.)

x = approximately 3.17 gallons

So, there are roughly 3 gallons in 12 liters!



CHECK YOUR KNOWLEDGE

For 1 through 8, fill in the blanks.

1. 26 feet = ____ inches
2. ____ gallons = 24 quarts
3. 30 teaspoons = ____ fluid ounces
4. ____ millimeters = 0.08 kilometers
5. 30 centimeters = ____ inches
6. 4.5 miles = ____ feet
7. ____ grams = 36 ounces
8. 5.25 pints = ____ liters
9. While hiking a trail that is 7 miles long, you see a sign that says, "Distance you've traveled: 10,000 feet." How many feet remain in the hike?
10. Mount Everest, on the border of Nepal, is 8,848 meters tall, while Chimborazo in Ecuador is 6,310 meters tall. What is the difference in elevation between the two mountains in feet?

CHECK YOUR ANSWERS



1. 312
2. 6
3. 5
4. 80,000
5. Approximately 11.81
6. 23,760
7. Approximately 1,020.564
8. Approximately 2.48325
9. 26,960
10. Approximately 8,325.64