



# Measuring Weight and Temperature

Based on power point presentations by Pearson Education, Inc.  
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# Learning Objectives

1. Memorize units of weight in the U.S. Measuring System and use dimensional analysis to change units.
2. Memorize units of weight in the Metric Measuring System and use dimensional analysis to change units.
3. Convert to and from the Metric Measuring System.
4. Convert between Fahrenheit and Celsius Temperatures

# 1. Weight in the U.S. Measuring System

You must memorize the following measures.

Symbol	Unit	Meaning
1 oz	ounce	
1 lb	U.S. pound	16 oz
1 T	ton	2000 lb

**Please note that ounce is both a unit of weight and of liquid capacity!  
However, we usually try to say “fluid ounce” when discussing liquids.**

# Example 1: Change Units in the U.S. Measuring System

Change 76 ounces to U.S. pounds using dimensional analysis.

First, we'll write the original measure as the fraction  $\frac{76 \text{ oz}}{1}$ .

We memorized that 1 U.S. pound contains 16 ounces. We express this as a unit ratio in which the new unit of measure (lb) is in the numerator and the original unit of measure (oz) is in the denominator.

$$\frac{1 \text{ lb}}{16 \text{ oz}}$$

Now, we'll multiply the original measure in fraction form with the unit ratio:

$$\frac{76 \cancel{\text{oz}}}{1} \left( \frac{1 \text{ lb}}{16 \cancel{\text{oz}}} \right) = \frac{76(1) \text{ lb}}{16} = 4.75 \text{ lb}$$

We find that 76 ounces equal 4.75 U.S. pounds.

## 2. Weight in the Metric Measuring System

The milligram the gram, the metric pound, and the kilogram are the most commonly used metric measures. **You must memorize them.**

Symbol	Unit	Meaning
1 mg	milligram	
1 g	gram	1000 mg
1kg	kilogram	1000 g

### **Less commonly used metric units of weight:**

1 centigram (cg) = 10 milligrams (mg)

1 decigram (dg) = 10 centigrams (cg)

1 dekagram (dkg) = 10 grams (g)

1 hectogram (hg) = 10 dekagrams (dkg)

## Example 2: Change Units in the Metric Measuring System

Change 659 grams to kilograms using dimensional analysis.

First, we'll write the original measure as the fraction  $\frac{659 \text{ g}}{1}$ .

We memorized that 1 kilogram contains 1000 gram. We express this as a unit ratio in which the new unit of measure (kg) is in the numerator and the original unit of measure (g) is in the denominator.

$$\frac{1 \text{ kg}}{1000 \text{ g}}$$

Now, we'll multiply the original measure in fraction form with the unit ratio:

$$\begin{aligned} \frac{659 \text{ g}}{1} \left( \frac{1 \text{ kg}}{1000 \text{ g}} \right) &= \frac{659 \text{ kg}}{1(1000)} \\ &= 0.659 \text{ kg} \end{aligned}$$

We find that 659 grams equals 0.659 kilograms.

## 4. Convert to and from the Metric Measuring System

**You must memorize the following conversions.**

1 ounce (oz) $\approx$ 28.35 gram (g)
This is an approximation!
1 U.S. pound (lb) $\approx$ 453.59 gram (g)
This is an approximation!
1 kilogram (kg) $\approx$ 2.2 U.S. pounds (lb)
This is an approximation!

# Example 3: Convert to and from the Metric Measuring System

Change 3.4 U.S. pounds to kilograms using dimensional analysis.

First, we'll write the original measure as the fraction  $\frac{3.4 \text{ lb}}{1}$ .

We memorized that 1 kilogram is approximately equal to 2.2 U.S. pounds. We express this as a unit ratio in which the new unit of measure (kg) is in the numerator and the original unit of measure (lb) is in the denominator.

$$\frac{1 \text{ kg}}{2.2 \text{ lb}}$$

Now, we'll multiply the original measure in fraction form with the unit ratio:

$$\frac{3.4 \cancel{\text{ lb}}}{1} \left( \frac{1 \text{ kg}}{2.2 \cancel{\text{ lb}}} \right) \approx 1.55 \text{ kg}$$

We find that 3.4 U.S. pounds equal approximately 1.55 kilograms.



### 3. Convert between Fahrenheit and Celsius Temperatures

The U. S. temperature measure is called the **Fahrenheit scale**. Most European countries use the **Celsius scale**. The freezing point for water on the Fahrenheit scale is 32° F (degrees), and on the Celsius scale it is 0° C (degrees).

The formula for converting from a Fahrenheit temperature **F** to a Celsius temperature **C** is:

$$C = \frac{5}{9}(F - 32) \quad \text{An easy and quick approximation is to say } \frac{5}{9} \approx \frac{1}{2} .$$

The formula for converting from a Celsius temperature **C** to a Fahrenheit temperature **F** is:

$$F = \frac{9}{5}C + 32 \quad \text{An easy and quick approximation is to say } \frac{9}{5} \approx 2 .$$

## Example 4: Convert to and from Celsius

Change 212° Fahrenheit to Celsius.

Substitute 212 for  $F$  in the formula  $F = \frac{9}{5} C + 32$ .

$$C = \frac{5}{9}(212 - 32)$$

Using the *Order of Operations*, we'll work inside the parentheses first. That is,

$$C = \frac{5}{9}(180) = 100$$

We find that 212° F equals 100° C.

## Example 5: Convert to and from Celsius

Change 25° Celsius to Fahrenheit.

Substitute 25 for **C** in the formula  $F = \frac{9}{5} C + 32$ .

$$F = \frac{9}{5} (25) + 32$$

Using the *Order of Operations*, we'll multiply first. That is,

$$F = \frac{225}{5} + 32$$

Lastly, we add. The LCD is 5!

$$\begin{aligned} F &= \frac{225}{5} + \frac{160}{5} \\ &= \frac{385}{5} = 77 \end{aligned}$$

We find that 25° c equals 77° F.

## Example 6: Convert to and from Celsius

You are on a vacation in Italy. A thermometer at the Colosseum indicates  $35^{\circ}$  which is pretty much meaningless to you. You just know it's hot. You remember that you can approximate the Fahrenheit temperature by multiplying the Celsius temperature by 2 and then adding 32. Find the approximate Fahrenheit temperature.

$$**2(35) + 32 = 102**$$

Yikes, no wonder you are so hot. The temperature is  $102^{\circ}$  Fahrenheit. Time to get some gelato!

## Example 7: Convert to and from Celsius

Your friend is visiting from Germany. She sees a thermometer at a bank which indicates  $118^{\circ}$  which is pretty much meaningless to her. She just knows it's hot. You remember that you can approximate the Celsius temperature by subtracting 32 from the Fahrenheit temperature and then dividing the result by 2. Find the approximate Celsius temperature for your friend.

$$(118 - 32) = 86$$

$$86 \div 2 = 43$$

Your German friend is shocked. She knew it was hot, but  $43^{\circ}$  Celsius seems brutal to her. Time to get ice cream!