

5.3 Unit Conversion

In the US, the American measurement system is used. In most other countries, the metric system is used. In this lesson, we will learn how to convert measurements within either the American or the metric system.

5.3.1 American System Conversions

We will start with yard, feet and inches. Everyone should memorize the following relationships:

- 1 yard = 3 feet
- 1 foot = 12 inches

There are three methods to do conversions. We will look at an example.

Example 5.3.1 Convert 12.3 feet to yards.

Solution Method 1: We will use proportion to solve this problem. Assume 12.3 feet is equivalent to x yards. First, we organize given information in a table:

| | Rate | Conversion |
|------|------|------------|
| feet | 3 | 12.3 |
| yard | 1 | x |

Now we can set up the proportion and then solve for x :

$$\begin{aligned}\frac{3 \text{ feet}}{1 \text{ yard}} &= \frac{12.3 \text{ feet}}{x \text{ yards}} \\ 3x &= 1 \cdot 12.3 \\ 3x &= 12.3 \\ \frac{3x}{3} &= \frac{12.3}{3} \\ x &= 4.1\end{aligned}$$

Conclusion: 12.3 feet is equivalent to 4.1 yards.

Method 2: We will use fraction multiplication to solve this problem. The rate can be written as either $\frac{3 \text{ feet}}{1 \text{ yard}}$ or $\frac{1 \text{ yard}}{3 \text{ feet}}$. Since the given number is 12.3 feet, we will use the rate $\frac{1 \text{ yard}}{3 \text{ feet}}$, so the unit "feet" will cancel:

$$\begin{aligned}12.3 \text{ feet} \cdot \frac{1 \text{ yard}}{3 \text{ feet}} \\ = \frac{12.3 \text{ feet}}{1} \cdot \frac{1 \text{ yard}}{3 \text{ feet}} \\ = \frac{12.3}{1} \cdot \frac{1 \text{ yard}}{3} \\ = \frac{12.3 \cdot 1}{1 \cdot 3} \text{ yards} \\ = \frac{12.3}{3} \text{ yards} \\ = 4.1 \text{ yards}\end{aligned}$$

Conclusion: 12.3 feet is equivalent to 4.1 yards.

Method 3: We will simply use multiplication/division to do this problem. It's given 1 yard = 3 feet. When we convert 12.3 feet to yards, the number will become smaller. That's

why we should use division:

$$\begin{aligned} & 12.3 \text{ feet} \\ & = 12.3 \div 3 \text{ yards} \\ & = 4.1 \text{ yards} \end{aligned}$$

Conclusion: 12.3 feet is equivalent to 4.1 yards.

When more than one conversions are involved in the same problem, it's easier to use the second or the third method in the example above. Look at the next example.

Example 5.3.2 Convert 4.7 yards to inches.

Solution Method 1: We will use fraction multiplication to solve this problem. We will use the rates $\frac{3 \text{ feet}}{1 \text{ yard}}$ and $\frac{12 \text{ inches}}{1 \text{ foot}}$, so the units feet and inches will cancel:

$$\begin{aligned} & 4.7 \text{ yards} \cdot \frac{3 \text{ feet}}{1 \text{ yard}} \cdot \frac{12 \text{ inches}}{1 \text{ foot}} \\ & \frac{4.7 \text{ yards}}{1} \cdot \frac{3 \text{ feet}}{1 \text{ yard}} \cdot \frac{12 \text{ inches}}{1 \text{ foot}} \\ & = \frac{4.7}{1} \cdot \frac{3}{1} \cdot \frac{12 \text{ inches}}{1} \\ & = 4.7 \cdot 3 \cdot 12 \text{ inches} \\ & = 169.2 \text{ inches} \end{aligned}$$

Conclusion: 4.7 yards is equivalent to 169.2 inches.

Method 2: We will simply use multiplication/division to do this problem. When we convert yards to inches, the number will become bigger, so we do multiplication twice:

$$\begin{aligned} & 4.7 \text{ yards} \\ & = 4.7 \cdot 3 \text{ feet} \\ & = 14.1 \text{ feet} \\ & = 14.1 \cdot 12 \text{ inches} \\ & = 169.2 \text{ inches} \end{aligned}$$

Conclusion: 4.7 yards is equivalent to 169.2 inches.

5.3.2 Metric System Conversions

Metric system conversions are easier, because the factor is always by the scale of 10. For example:

- 1 meter = 10 decimeters
- 1 decimeter = 10 centimeters
- 1 centimeter = 10 millimeters
- 1 meter = 100 centimeters
- 1 meter = 1000 millimeters
- 1 kilometer = 1000 meters
- 1 kilogram = 1000 grams
- 1 gram = 1000 milligrams

Understand the following:

- kilo- means 1000
- deci- means 10

- centi- means 100
- milli- means 1000

Because of this, the easiest method to convert metric system is to use multiplication/division. Let's look at a few examples.

Example 5.3.3 Convert 1,234 meters to kilometers.

Solution Since 1 kilometer = 1,000 meters, to change 1,234 meters to kilometers, the number will become smaller. We will do division:

$$\begin{aligned} & 1234 \text{ meters} \\ & = 1234 \div 1000 \text{ kilometers} \\ & = 1.234 \text{ kilometers} \end{aligned}$$

Conclusion: 1,234 meters is equivalent to 1.234 kilometers. ■

Example 5.3.4 Convert 0.32 meter to centimeters.

Solution Since 1 meter = 100 centimeters, to change 0.32 meters to centimeters, the number will become bigger. We will do multiplication:

$$\begin{aligned} & 0.32 \text{ meters} \\ & = 0.32 \cdot 100 \text{ centimeters} \\ & = 32 \text{ centimeters} \end{aligned}$$

Conclusion: 0.32 meter is equivalent to 32 centimeters. ■

5.3.3 Time Units Conversions

Everyone should know the following conversions:

- 1 week = 7 days
- 1 day = 24 hours
- 1 hour = 60 minutes
- 1 minute = 60 seconds

When doing time units conversions, we can use either fraction multiplication method or multiplication/division.

Example 5.3.5 Convert 3,024,000 seconds into weeks.

Solution Method 1: We will use fraction multiplication to solve this problem:

$$\begin{aligned} & 3024000 \text{ seconds} \cdot \frac{1 \text{ minute}}{60 \text{ seconds}} \cdot \frac{1 \text{ hour}}{60 \text{ minutes}} \cdot \frac{1 \text{ day}}{24 \text{ hours}} \cdot \frac{1 \text{ week}}{7 \text{ days}} \\ & = \frac{3024000 \text{ seconds}}{1} \cdot \frac{1 \text{ minute}}{60 \text{ seconds}} \cdot \frac{1 \text{ hour}}{60 \text{ minutes}} \cdot \frac{1 \text{ day}}{24 \text{ hours}} \cdot \frac{1 \text{ week}}{7 \text{ days}} \\ & = \frac{3024000}{1} \cdot \frac{1}{60} \cdot \frac{1}{60} \cdot \frac{1}{24} \cdot \frac{1 \text{ week}}{7} \\ & = \frac{3024000 \cdot 1 \cdot 1 \cdot 1 \cdot 1}{1 \cdot 60 \cdot 60 \cdot 24 \cdot 7} \text{ weeks} \\ & = \frac{3024000}{604800} \text{ weeks} \\ & = 5 \text{ weeks} \end{aligned}$$

Conclusion: 3,024,000 seconds is equivalent to 5 weeks.

Solution 2: We will simply use multiplication/division to do this problem. When we convert 3,024,000 seconds to weeks, the number will become smaller, so we will do divisions:

$$\begin{aligned} & 3024000 \text{ seconds} \\ &= 3024000 \div 60 \text{ minutes} \\ &= 50400 \text{ minutes} \\ &= 50400 \div 60 \text{ hours} \\ &= 840 \text{ hours} \\ &= 840 \div 24 \text{ days} \\ &= 35 \text{ days} \\ &= 35 \div 7 \text{ weeks} \\ &= 5 \text{ weeks} \end{aligned}$$

Conclusion: 3,024,000 seconds is equivalent to 5 weeks. ■