

EXPERIMENTING SKILLS

Using the International System of Units (SI)

In the United States, few people besides scientists use the International System of Units (known as **SI** for *Système Internationale d'Unités*) regularly. SI is becoming more common for two reasons.

- Once you learn and practice SI, it is easier to use than the standard English system.
- As communication systems and businesses become increasingly global, there is a growing need for a worldwide standard measurement system.

These are reasons why students are required to learn SI in school. We already use SI for many things. For instance, most beverages are sold in 2 L or 3 L bottles. What other items are measured with SI units?

Match 'Em Up!

Match the SI unit with the dimension that it measures:

- | | |
|---------------------------|-----------|
| 1. _____ meter | a. volume |
| 2. _____ gram | b. area |
| 3. _____ liter | c. mass |
| 4. _____ square kilometer | d. length |

Match the SI prefix with its meaning:

- | | |
|-------------------------|-------------------|
| 5. _____ <i>nano-</i> | e. one-tenth |
| 6. _____ <i>centi-</i> | f. one thousand |
| 7. _____ <i>micro-</i> | g. one-thousandth |
| 8. _____ <i>kilo-</i> | h. one-millionth |
| 9. _____ <i>deci-</i> | i. one-billionth |
| 10. _____ <i>milli-</i> | j. one-hundredth |

Help is on the way!
 An SI Conversion Chart is provided for you in the [Appendix](#).

Remember

As you read, watch for words such as *nanosecond*, *kilocalorie*, *milliliter*, and *micrometer*.

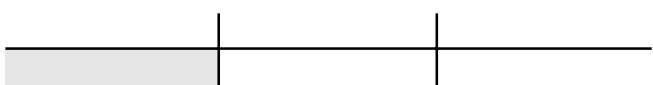
Using the International System (SI), continued

Conversions

Convert between SI and English units with the following factors :

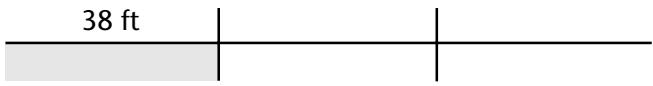
mass	volume	distance
1 lb = 454 g	1 gal = 3.78 L	1 ft = 0.305 m
1 g = 0.0022 lb	1 L = 0.26 gal	1 m = 3.28 ft

There is a handy method of doing conversions based on this figure:

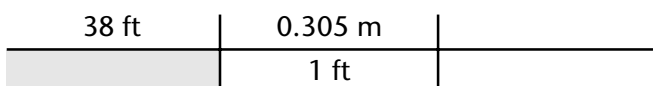


Here's an example: How many centimeters is 38 ft?

Step 1: Put the known quantity in the upper-left space, as follows:

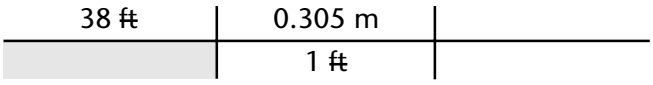


Step 2: Put a conversion factor (also called an *equality*) in the next set of boxes to the right. Make sure that the units match diagonally. We started with feet on top, so we'll put feet on the bottom when we fill in the conversion factor, as follows:



Note: There are two conversion factors listed above for feet and meters. You can use either one as long as you put feet on the bottom.

Step 3: Cross out, or cancel, the units that appear on both the top and the bottom, as follows:

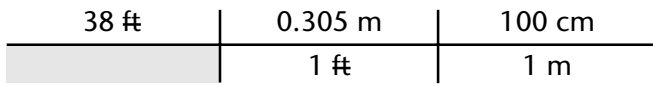


Step 4: Now ask, "Is the unit that's **not crossed out** the one I want?"

- If the answer is yes, then continue to Step 5.
- If the answer is no, return to Step 2.

For our example, the unit that's left is meters. We're looking for centimeters, so we'll return to Step 2.

Step 2: Remember to match units diagonally.



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Step 3: Cross out the matching units.

38 ft	0.305 m	100 cm
1 ft	1 m	1 m

Step 4: Is the unit that's **not crossed out** the one I want? Yes, we've got centimeters, so we're ready to solve the problem.

Step 5: To solve the problem, multiply the numbers on the top row:

$$38 \times 0.305 \times 100 = 1,159$$

Then multiply all of the numbers on the bottom row:

$$1 \times 1 = 1$$

Now, divide the top row's product by the bottom row's product:

$$1,159 \div 1 = 1,159$$

The answer is **1,159 cm!**

Your Turn

The following problems will help you practice your metric-to-metric, English-to-SI, and SI-to-English conversions. Be sure to show your work.

1. How many meters is 1,602 ft?

2. How many pounds is 12 g?

3. How many gallons is 0.2 L?

4. How many deciliters is 5 L? (Hint: How many deciliters are in 1 L?)

5. How many meters is 63.9 cm?

