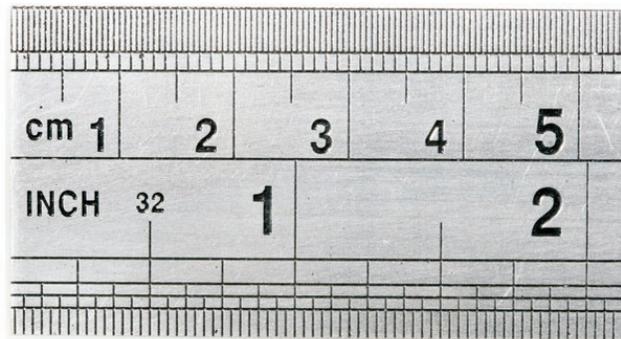


Conversions Between Metric and U.S. Standard Measurements

STANDARD UNITS are common in the United States, but elsewhere, the metric system is used. Ignorance of the metric system and how to convert between the two systems can put you at a significant disadvantage, especially since we live and participate in a global economy.



Objective:



Convert linear, area, and volume measure units between the U.S. standard and metric measurement systems.

Key Terms:



area measure

linear measure

square meter

centimeter

liter

volume measure

cubic centimeter

meter

cubic meter

square centimeter

Unit Conversion Between Measuring Systems

While there are many metric-to-standard and standard-to-metric conversion charts available online, you must commit some basic conversion calculations to memory. This E-unit will present information on how to convert between measurement systems for linear, area, and volume measures.

CONVERSION OF LINEAR MEASURE UNITS BETWEEN SYSTEMS

Linear measure is the measurement of a single distance or dimension. Linear measure is typically the length, width, and/or height of an object. Metric linear measure units are typically

expressed in meters and centimeters. A **meter** (m) is the base unit of metric linear measure and is slightly longer than a yard (3 feet $3\frac{1}{2}$ inches). A **centimeter** (cm) is a metric unit of linear measure equal to $\frac{1}{100}$ (0.010) of a meter.

Follow sequential steps for converting from one linear measurement system to the other. First find the U.S. standard-to-metric or metric-to-U.S. standard conversion factor for the desired linear measure units. Then multiply the given linear measure units by the conversion factor to obtain the equivalent linear measure units for the other measurement system.

The following are U.S. standard-to-metric linear measure conversion factors:

- ◆ 1 inch = 2.54 centimeters
- ◆ 1 foot = 30.48 centimeters
- ◆ 1 foot = 0.305 meters
- ◆ 1 yard = 0.914 meters

The following are metric-to-U.S. standard linear measure conversion factors:

- ◆ 1 centimeter = 0.394 inches
- ◆ 1 centimeter = 0.033 feet
- ◆ 1 meter = 3.281 feet
- ◆ 1 meter = 1.094 yards

CONVERSION OF AREA MEASURE UNITS BETWEEN SYSTEMS

Area measure is the measurement of the two-dimensional size of a flat surfaced object. Area measure is determined by multiplying the length of a flat surface by its width. Metric area measure units are typically expressed in square meters and square centimeters. A **square meter** (sq m) is a two-dimensional space equivalent to 1 meter in length by 1 meter in width. A **square centimeter** (sq cm) is a two-dimensional space equivalent to 1 centimeter in length by 1 centimeter in width.

Follow sequential steps for converting from one area measurement system to the other. First, the U.S. standard-to-metric or metric-to-U.S. standard conversion factor for the desired area measure units must be found. Then multiply the given area



FIGURE 1. Metric area measure units are typically expressed in square meters and square centimeters.

measure units by the conversion factor to obtain the equivalent area measure units for the other measurement system.

The following are U.S. standard-to-metric area measure conversion factors:

- ◆ 1 square inch = 6.452 square centimeters
- ◆ 1 square foot = 0.093 square meters
- ◆ 1 square yard = 0.836 square meters

The following are metric-to-U.S. standard area measure conversion factors:

- ◆ 1 square centimeter = 0.155 square inches
- ◆ 1 square meter = 10.764 square feet
- ◆ 1 square meter = 1.196 square yards



DIGGING DEEPER...

UNCOVERING ADDITIONAL FACTS: System Conversion Practice

Now that you have covered the basics, it is important to apply your new knowledge. You will be able to practice correctly converting given measures from one measurement system to the other measurement system. Convert linear, area, and volume measure units between the U.S. standard and metric measurement systems. Convert the given measuring system's units to the equivalent units of the other measuring system. You may use an online conversion tool to check your work. Remember to show your work on your paper. Turn in your work to your teacher.

TABLE 1. System Conversions

<i>U.S. Standard</i>	<i>Metric</i>
? feet	660 cm
? cubic feet	8-cubic meters
? cubic inches	45-cubic cm
? square inches	150-square cm
29-square inches	? square cm
220-cubic feet	? liters
125-square yards	? meters
92-cubic feet	? cubic meters

CONVERSION OF VOLUME MEASURE UNITS BETWEEN SYSTEMS

Volume measure is the measurement of the contents of a three-dimensional object. The volume measure of a cube or rectangular prism is determined by multiplying the length of the three-dimensional object by the object's width and then by the object's height. The volume measure of a cylinder is determined by multiplying the area of the circular face by the height.

Metric volume measure units are typically expressed in cubic meters, cubic centimeters, and liters. A **cubic meter** (cu m) is a three-dimensional space equivalent to 1 meter in length, 1 meter in width, and 1 meter in height. A **cubic centimeter** (cu cm) is a three-dimensional space equivalent to 1 centimeter in length, 1 centimeter in width, and 1 centimeter in height. A **liter** (l) is a three-dimensional space equal to 1000 cubic centimeters.

Follow sequential steps for converting from one volume measurement system to the other. First, the U.S. standard-to-metric or metric-to-U.S. standard conversion factor for the desired volume measure units must be determined. Multiply the given volume measure units by the conversion factor to obtain the equivalent volume measure units for the other measurement system.

The following are U.S. standard-to-metric volume measure conversion factors:

- ◆ 1 cubic inch = 16.387 cubic centimeters
- ◆ 1 cubic foot = 0.028 cubic meters
- ◆ 1 cubic yard = 0.765 cubic meters
- ◆ 1 liter = 1000 cubic centimeters
- ◆ 1 cubic foot = 28.317 liters

The following are metric-to-U.S. standard volume measure conversion factors:

- ◆ 1 cubic centimeters = 0.061 cubic inches
- ◆ 1 cubic meters = 35.315 cubic feet
- ◆ 1 cubic meters = 1.308 cubic yards
- ◆ 1 liter = 0.035 cubic feet



FIGURE 2. Metric volume measure units are typically expressed in cubic meters, cubic centimeters, and liters.

Summary:



Linear measure is the measurement of a single distance or dimension. Linear measure is typically the length, width, and/or height of an object. Metric linear measure units are typically expressed in meters and centimeters.

Area measure is the measurement of the two-dimensional size of a flat surfaced object. It is determined by multiplying the length of a flat surface by its width. Metric area measure units are typically expressed in square meters and square centimeters.

Volume measure is the measurement of the contents of a three-dimensional object. The volume measure of a cube or rectangular prism is determined by multiplying the length of the three-dimensional object by the object's width and then by the object's height. The volume measure of a cylinder is determined by multiplying the area of the circular face by the height. Metric volume measure units are typically expressed in cubic meters, cubic centimeters, and liters.

Checking Your Knowledge:



1. Convert 7 inches to centimeters.
2. Convert 140 meters to yards.
3. Convert 2400-square feet to square meters.
4. Convert 300-cubic inches to cubic centimeters.
5. Convert 12 liters to cubic centimeters.

Expanding Your Knowledge:



A certain machine has 225 cubic inches of displacement. How many cubic centimeters does the machine displace?

Web Links:



Metric Conversion Calculator

<http://www.metric-conversions.org/>

Metric Conversions

http://www.create.cett.msstate.edu/create/classroom/lplan_view.asp?articleID=4

Metric Conversion Made Easy

<http://www.lestout.com/article/travel/adventure-travel/metric-conversion-made-easy.html>