

Math Units of Measure 115

The United States is the only major country that has not converted to the metric system (the only other two nations which have not switched are Liberia and Burma).

There are two measuring systems used in the United States and internationally. For the most part, we use the English system in the United States. However, much of the rest of the world uses the metric system. Here are a few of the standard measurements used in the English system:

| Base Length | Volume | Mass | Temperature |
|----------------|---------------------|-----------------|------------------------|
| 12" = 1 foot | 2 cups = 1 pint | 16 oz = 1 lb | Water freezes at 32° F |
| 3' = 1 yard | 2 pints = 1 quart | 2000 lb = 1 ton | |
| 5280' = 1 mile | 4 quarts = 1 gallon | | F = Fahrenheit |

Working with tools, you may have found that most things are made somewhere else. The metric system of wrenches is used on all bicycles and many cars. The wrench system at the left comes in sizes 10 through 18 millimeters. An SAE or English wrench set would come in the sizes we have studied: 3/16, 1/8, 1/4, 5/16, 3/8, 1/2, 9/16, 5/8, 11/16 and 3/4 of an inch. Only four metric sizes can be interchanged with English sizes.



Note. Bing Images New Holland Wrench Set

| Metric | SAE | To convert multiply the SAE size by 25.4 |
|--------|----------|------------------------------------------|
| 8 | 5/16 in | |
| 11 | 7/16 in | (1/2 x 25.4 = 12.7 which will slip) |
| 12 | 15/32 in | (1/4 x 25.4 = 6.35 which will slip) |
| 15 | 19/32 in | (3/4 x 19.05 will work, pretty well) |

Can you see how the metric system is easier? Using the wrong set will strip the head of the bolt.

Convert:

| <u>SAE</u> | | <u>Metric</u> |
|------------|---|---------------|
| 3/16 | = | _____ |
| 3/4 | = | _____ |
| _____ | = | 18 |
| _____ | = | 9 |
| 1 1/2 | = | _____ |
| 3 | = | _____ |
| _____ | = | 50 |
| _____ | = | 130 |

The metric system is easier to understand than English units. It is based on the number 10, and it uses prefixes to annotate size in 10s (similar to how we count pennies and dollars. The metric system actually better matches our system of numbers (Arabic).

| Prefixes: | | | |
|---------------------------|---------------|---------------------|-----------------------|
| One thousandth = milli | | 1000x = kilo | |
| One hundredth = centi | | 100x= hecta | |
| One tenth = deci | | Ten times = deca | |
| Base Length | Volume | Mass | Temperature |
| Meter | liter | gram | Water freezes at 0° C |
| | | | C = Centigrade |

Thus, 1000 meters is a kilometer (0.6 miles) .001 meters is millimeter

10 liters is a deciliter .01 liter is centiliter

100 grams = hectogram .1 gram is decigram

From working with computers, you may be familiar with larger scales of the metric system: Kilobyte (10^3), megabyte (10^6), gigabyte (10^9) and terabyte (10^{12}).

In the metric system, the base units stay the same. This is improved over the English system in which we have inches, feet, cubits, yards, fathoms, rods, chains, furlongs, miles, nautical miles, and leagues.

The Metric System Length

1 in. = 2.54 cm.

39 inches = 1 meter

1 mile = 1.67 km

Volume

1 quart = .95 liters

1 gallon = 3.79 liters

Mass

1 pound = .45 kg

Temperature

$F^{\circ} = (C^{\circ} * 1.8) + 32^{\circ}$

$C^{\circ} = (F^{\circ} - 32^{\circ}) \div 1.8$

1. Which prefix is the smallest?
 - a. centi
 - b. hecto
 - c. kilo
 - d. milli

2. A woman has a body mass of 53 kg. What is her mass in grams?
 - a. 0.053
 - b. 5.3
 - c. 53
 - d. 53,000

3. In the English system, the base unit of length is the
 - a. foot.
 - b. liter.
 - c. meter.
 - d. mile.

4. In the metric system, the base unit of mass is the
 - a. gram.
 - b. liter.
 - c. ounce.
 - d. pound.

5. The liter is a unit of
 - a. length.
 - b. mass.
 - c. temperature.
 - d. volume.

6. What happens to a decimal place in the number when you are converting from a smaller metric unit to a larger unit?
- converting does not require a placement of decimal point
 - decimal place does not move at all
 - decimal place moves to the left
 - decimal place moves to the right
7. A marathon race is 26.2 miles long. How long is that in km?
8. What number does 6.3×10^{11} represent?
- 0.000000000063
 - 42
 - 630,000,000,000
 - 631011
9. What is the purpose of scientific notation?
- to complicate things
 - to measure things
 - to represent large numbers
 - to approximate numbers
10. Why is the metric system used most commonly in science?
- It can measure larger and smaller things than the English system.
 - It has been around the longest.
 - It is decimal based and therefore easier to convert units.
 - It is more accurate than the English system.

11. The metric was developed
- because the English system was not very accurate.
 - in order to standardize units of measurement.
 - to help scientists calculate very large and small numbers.
 - to help scientists convert numbers more easily.
12. Gas today in Switzerland is selling for \$4.74 per liter. How much is that per gallon?
13. The shot put is a track event which determines how far an athlete can throw a 12lb steel ball, but when they compete in the Olympics, US athletes are given a 7.26-kg ball (the international standard). How much, in pounds, does this shot put weigh?



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