

Feb26, 2012 Math 5A Notes

HW: pages 16-24 all.

Multiplying whole numbers

Multiplying whole numbers starts with a solid knowledge of a [multiplication table](#)

I may never say this enough! The more you know your multiplication table, the easier it is going to be for you to perform multiplication.

When numbers are multiplied, each number is called a factor. The result of multiplying numbers is called a product

$$\begin{array}{r} 5 \text{ ————— factor} \\ \times 2 \text{ ————— factor} \\ \hline 10 \text{ ————— product} \end{array}$$

The easiest multiplication we can perform is the one with one digit because all we need is a good remembrance of a multiplication table.

Look at the following multiplication problems. You can get your answer right off a multiplication table. Note that $0 \times 6 = 0$. In fact, any number times $0 = 0$.

$$\begin{array}{r} 6 \\ \times 5 \\ \hline 30 \end{array} \quad \begin{array}{r} 3 \\ \times 8 \\ \hline 24 \end{array} \quad \begin{array}{r} 0 \\ \times 6 \\ \hline 0 \end{array} \quad \begin{array}{r} 8 \\ \times 8 \\ \hline 64 \end{array}$$

Multiplying a two-digits number by a one-digit may be a little bit more fun.

The following is a multiplication of two-digit by a one digit (46×7)

Study this example carefully!

$$\begin{array}{rcl}
 46 & = & 4 \text{ tens and } 6 \text{ ones} \\
 \times 7 & = & \times \quad \quad \quad 7 \text{ ones} \\
 \hline
 & & 28 \text{ tens and } 42 \text{ ones} \\
 & & 32 \text{ tens and } 2 \text{ ones} = 322
 \end{array}$$

Notice that when the product of the ones is greater than 9, you must rename the tens and ones.

In our example above, 42 ones were renamed 4 tens and 2 ones. Then, the 4 tens are added to the 28 tens in the tens column to get 32 tens.

It can be time-consuming to write the tens and the ones when doing multiplication. You can also do the following:

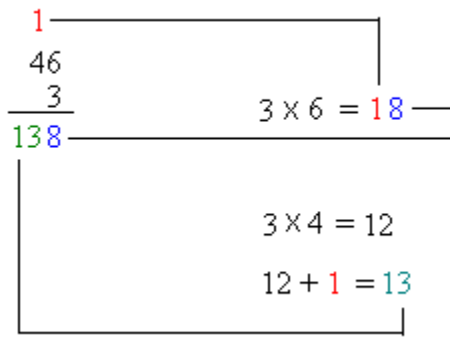
$$\begin{array}{rcl}
 46 & & \\
 \times 7 & & \\
 \hline
 42 & & \\
 + 280 & & \\
 \hline
 322 & &
 \end{array}
 \quad
 \begin{array}{rcl}
 7 \times 6 & = & 42 \\
 7 \times 40 & = & 280 \\
 \hline
 & & 322
 \end{array}$$

We add these two products

There is even a shorter way to multiply with renaming. Generally, that is how we perform multiplication.

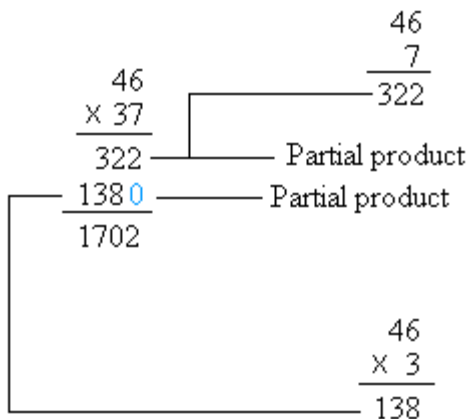
$$\begin{array}{rcl}
 & 4 & \\
 46 & & \\
 \times 7 & & \\
 \hline
 322 & &
 \end{array}
 \quad
 \begin{array}{l}
 7 \times 6 = 42 \\
 7 \times 4 = 28 \\
 28 + 4 = 32
 \end{array}$$

Study also the next example:



Sometimes, you multiply by a factor that contains two or more digits.

For example, multiply 46 by 37. Look at the way it is done below and notice that you already performed the multiplication for 46×7 and 46×3



Why did we put a 0 beneath the 2? Because there is no value for the ones place(value smaller than 9. Multiplying 3 by 6 gave us 18 and 18 is bigger than 9.

Use this multiplication calculator below to practice

Metric conversions (Metric System) –value denoted by their prefixes; all powers of 10



King Henry Drinks Much Dark Chocolate Milk

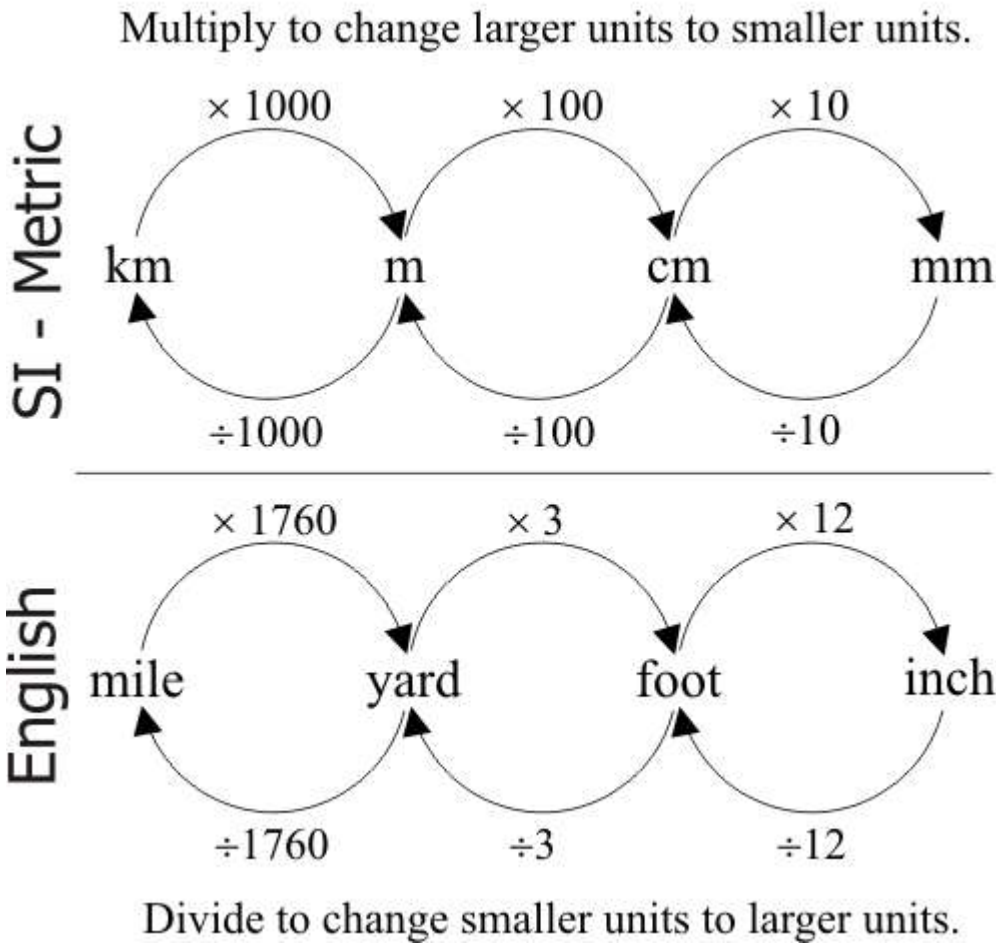
Metric Prefixes

Metric prefixes are pretty easy to understand and very handy for metric conversions. You don't have to know the nature of a unit to convert, for example, from *kilo-unit* to *mega-unit*. All metric prefixes are powers of 10. The most commonly used prefixes are highlighted in the table.

Prexis	Symbol	Factor
yotta	Y	$10^{24} = 1,000,000,000,000,000,000,000,000$
zetta	Z	$10^{21} = 1,000,000,000,000,000,000,000$
exa	E	$10^{18} = 1,000,000,000,000,000,000$
peta	P	$10^{15} = 1,000,000,000,000,000$
tera	T	$10^{12} = 1,000,000,000,000$
giga	G	$10^9 = 1,000,000,000$
mega	M	$10^6 = 1,000,000$
kilo	k	$10^3 = 1,000$
hecto	h	$10^2 = 100$
deka	da	$10^1 = 10$
deci	d	$10^{-1} = 0.1$
centi	c	$10^{-2} = 0.01$
milli	m	$10^{-3} = 0.001$
micro	μ	$10^{-6} = 0.000,001$
nano	n	$10^{-9} = 0.000,000,001$
pico	p	$10^{-12} = 0,000,000,000,001$
femto	f	$10^{-15} = 0.000,000,000,000,001$
atto	a	$10^{-18} = 0.000,000,000,000,000,001$
zepto	z	$10^{-21} = 0.000,000,000,000,000,000,001$

yocto	y	$10^{-24} = 0.000,000,000,000,000,000,001$
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Most people even in the countries where metric system is used only know the most important metric prefixes like 'kilo' and 'milli'. They are very handy for understanding metric conversions. The prefixes like 'zepto' or 'yotta' are very specific and used mostly in science.





The English system of measurement

grew out of the creative way that people measured for themselves. Familiar objects and parts of the body were used as measuring devices. For example, people measured shorter distances on the ground with their feet.

They measured longer distances by their paces (a "mile" was a thousand paces). They measured capacities with common household items such as cups, pails, and baskets. The word *gallon* comes from an old name for a pail.

Unfortunately, these creative measuring devices allowed for different measurements to be obtained when different people measured the same items. Eventually, a standard was set so that all measurements represented the same amount for everyone.

<p>Length:</p> <p>12 inches (in) = 1 foot (ft) 3 feet = 1 yard (yd) 5280 feet = 1 mile (mi)</p>	<p>Capacity:</p> <p>3 teaspoons (tsp) = 1 tablespoon (tbsp) 16 tbsp = 1 cup (c) 8 ounces (oz) = 1 c 2 c = 1 pint (pt) 2 pt = 1 quart (qt) 4 qt = 1 gallon (gal)</p>
<p>Weight:</p> <p>16 ounces (oz) = 1 pound (lb) 2000 lb = 1 ton</p>	

Conversions

Sometimes you need to convert from one unit of measure to another similar unit. How many inches are in 3 feet? How many ounces in 5 pounds?



Proportions will help you make conversions when working with measurements.

Create a unit **conversion ratio**, which is always equal to 1:

$$\frac{12''}{12''} = \frac{1'}{12''}$$

$$\frac{\text{NewUnits}}{\text{OldUnits}} = \frac{1'}{12''} \leftarrow \begin{array}{|c|} \hline \text{conversion} \\ \hline \text{ratio} \\ \hline \end{array}$$

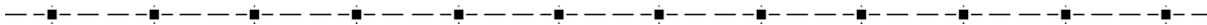


Example 1: How many yards are in 15 feet?

There are 3 feet in one yard, so the **conversion ratio** is 1 yd / 3 ft:

$$\frac{? \text{ yards}}{15 \text{ ft}} = \frac{1 \text{ yd}}{3 \text{ ft}}$$

Solving algebraically gives an answer of **5 yards**.



Example 2: How many cups in one gallon?

There is no direct connection from cups to gallons. There are, however, 4 cups in one quart and 4 quarts in one gallon. So the **conversion ratio** could be:

$$\frac{? \text{ cups}}{4qt(1gal)} = \frac{4c}{1qt}$$

Solving algebraically gives an answer of **16 cups**.

