QUICK REVIEW: MULTIPLYING FRACTIONS

In multiplication of fractions, it is not necessary to find a common denominator. Simply multiply straight across, top and bottom:

\[
\frac{5}{7} \times \frac{3}{4} = \frac{15}{28}
\]
QUICK REVIEW: MULTIPLYING FRACTIONS

It is also possible at times to reduce the numbers by cross canceling. Numbers diagonally across from each other in the problem can be divided by a common factor:

\[
\frac{4}{9} \times \frac{3}{8}
\]

In this problem, 4 and 8 can both be divided by 4, and 3 and 9 can both be divided by 3, so we cross cancel:

\[
\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}
\]
QUICK REVIEW:
CONVERTING IN THE METRIC SYSTEM

- The above line represents the easiest way to convert units within the metric system.
- In the center is the basic unit; we use grams here, but it could be liters (l) or meters (m). Going to the left, the units get larger; going to the right, the units get smaller.
- The convenient thing about the metric system is that it corresponds to decimal/place values in our number system (tenths, hundredths, thousandths, etc.). This means that changing from one unit to another is simply a matter of moving the decimal point left or right.
- We start out on the line with the unit we have, and count the number of places we move to get to the unit we want. We then move the decimal point the same number of places in the same direction, and the conversion is done.
QUICK REVIEW: CONVERTING IN THE METRIC SYSTEM

For example, let’s say we need to change 12 grams into milligrams. We start at grams on our line, and count over to milligrams:

We moved three places to the right, so we move the decimal point three places to the right. If we don’t see the decimal point, we always assume it to be at the end of the number, so we have:

So 12 grams would equal 12,000 milligrams.

(One important direct conversion to remember is that one cubic centimeter (cc) is equal to one milliliter.)
### METRIC PREFIXES

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<tr>
<th>Prefix</th>
<th>Symbol</th>
<th>Multiplier</th>
<th>Exponential</th>
<th>Scientific Notation</th>
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A unit conversion factor is a fraction whose numerator and denominator are equivalent measures. Some common unit conversion factors are given below. You can also use the reciprocal of these.

<table>
<thead>
<tr>
<th>1 ft</th>
<th>1 yd</th>
<th>1 mi</th>
<th>1 lb</th>
<th>1 pt</th>
<th>1 qt</th>
<th>1 gal</th>
<th>1 hr</th>
<th>1 min</th>
<th>1 m</th>
<th>1 km</th>
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<tbody>
<tr>
<td>12 in.</td>
<td>3 ft</td>
<td>5,280 ft</td>
<td>16 oz</td>
<td>2 c</td>
<td>2 pt</td>
<td>4 qt</td>
<td>60 min</td>
<td>60 s</td>
<td>100 cm</td>
<td>1,000 m</td>
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</tbody>
</table>
DIMENSIONAL ANALYSIS

• In dimensional analysis, we let the units tell us how to set up the problem.
• Units will cancel out, just like canceling when you multiply fractions.

\[
\frac{ml}{mg} \times mg = \frac{ml \times mg}{mg}
\]

Keeping this in mind, there are some general rules for setting up the problems:
• The supply/given amounts always go one over the other in the division part of the formula.
• The unit in the supply amount you want to be left with always goes on top.
DIMENSIONAL ANALYSIS

Example:
The order is for 600mg of Mannitol IV. The vial available contains 12,500 mg in 50 ml. How many ml should be administered?

Notice we turn the two measurements from the available medication into the first fraction, and we make sure the unit we want to be left with is on the top. Now we multiply and cross cancel, both numbers AND units.

Simplifying the numbers gives us 2.4, and ml is the only unit left. So we need to take 2.4 ml of the solution in the vial for the proper dosage.
DIMENSIONAL ANALYSIS

Dimensional analysis can also be used in basic conversions. By keeping the units straight, it is easy to see whether we wind up multiplying or dividing by the conversion factor simply do to the placement of the numbers.

We want to convert 50 kg into grams. We know that there are 1000 grams in one kilogram (this is our conversion factor). Thus, we set the problem up like this:

\[
\frac{50 \text{ kg}}{\cancel{1 \text{ kg}}} \times \frac{1000 \text{ g}}{\cancel{1 \text{ kg}}} = \frac{5000 \text{ g}}{1 \text{ kg}}
\]

Again, we group the two measurements that are related to each other (in this case the conversion factor) into a fraction, and place the unit we want to be left with on top of that fraction. Units cancel, and we do the math:

\[
50 \text{ kg} \times \frac{1000 \text{ g}}{1 \text{ kg}} = 5000 \text{ g}
\]
EXAMPLE PROBLEMS

► How many minutes are in 2.5 h?

\[
2.5 \text{ h} \times \frac{60 \text{ min}}{1 \text{ h}} = 150 \text{ min}
\]

► A bucket contains 4.65 L water. How many gallons of water is that?

\[
4.65 \text{ L} \times \frac{1.057 \text{ qt}}{1 \text{ L}} \times \frac{1 \text{ gal}}{4 \text{ qt}} = 1.23 \text{ gal}
\]

For more information on Unit Conversions
http://oakroadsystems.com/math/convert.htm
EXAMPLE PROBLEMS

One bag of apples weighs 64 ounces. How many pounds does it weigh?

\[
64 \text{ oz} \times \frac{1 \text{ lb}}{16 \text{ oz}} = \frac{64 \times 1 \text{ lb}}{16} = 4 \text{ lb}
\]

Darren drank 2 liters of water. How many milliliters of water did he drink?

\[
2 \text{ L} \times \frac{1000 \text{ mL}}{1 \text{ L}} = \frac{2 \times 1000 \text{ mL}}{1} = 2000 \text{ mL}
\]
EXAMPLE PROBLEMS

Convert 50 miles per hour to meters per second (m/sec). Round answer to the nearest hundredth.

Conversions:
1 mile = 1.60934 kilometer
1 hour = 60 minutes
1 kilometer = 1000 meters
1 minute = 60 seconds

We are left with meters on top and seconds on the bottom exactly as we wanted. Doing the math, we get 22.35194444... Round to the hundredths place, and we have 22.35 m/sec.
An international group of zookeepers with successful breeding programs made the following animal exchanges last year. Using the same bartering system, how many oryxes can a zoo obtain in exchange for 15 flamingos?

| 3 oryxes = 1 tiger | 2 flamingos = 1 anteater |
| 1 camel = 6 anteaters | 5 lemurs = 1 rhino |
| 1 rhino = 4 monkeys | 3 lemurs = 1 camel |
| 3 monkeys = 1 tiger | 1 rhino = 4 oryxes |

**Step 1**  
*Given* 15 flamingos  
*Need* oryxes

**Step 2**  
*Plan* flamingos $\rightarrow$ anteaters $\rightarrow$ camels $\rightarrow$ lemurs $\rightarrow$ rhinos $\rightarrow$ oryxes

**Step 3**  
*Conversion Factors*

$$
(15 \text{ flamingos}) \left( \frac{1 \text{ anteater}}{2 \text{ flamingos}} \right) \left( \frac{1 \text{ camel}}{6 \text{ anteaters}} \right) \left( \frac{3 \text{ lemurs}}{1 \text{ camel}} \right) \left( \frac{1 \text{ rhino}}{5 \text{ lemurs}} \right) \left( \frac{4 \text{ oryxes}}{1 \text{ rhino}} \right) =
$$

**3 oryxes**
1. If there are 5 grams of a medication in 3 ml of solution, how many ml are needed if 35 grams are required?

2. The doctor orders 7500 units of medication. The vial reads 10,000 units per ml. How many ml are needed?

3. The doctor orders 2500 mg of medication; the bottle reads 5 grams per liter. How many ml should be given?

4. 0.5 g of a medication is required; the tablets available are marked 250 mg per tablet. How many tablets must be given?

5. A dose of 500 mcg is ordered; the strength available is 2000 mcg per ml. How much should be administered?

6. A dose of 300 mcg is required; the medication is available in a 50 ml bottle containing 5 mg of medication. How much should be administered?
DIMENSIONAL ANALYSIS - ANSWERS

1. If there are 5 grams of a medication in 3 ml of solution, how many ml are needed if 35 grams are required? 21 ml

2. The doctor orders 7500 units of medication. The vial reads 10,000 units per ml. How many ml are needed? 0.75 ml

3. The doctor orders 2500 mg of medication; the bottle reads 5 grams per liter. How many ml should be given? 5 ml

4. 0.5 g of a medication is required; the tablets available are marked 250 mg per tablet. How many tablets must be given? 2 tablets

5. A dose of 500 mcg is ordered; the strength available is 2000 mcg per ml. How much should be administered? 0.25 ml

6. A dose of 300 mcg is required; the medication is available in a 50 ml bottle containing 5 mg of medication. How much should be administered? 3 ml
Questions

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http://www.daytonastate.edu/asc/ascsciencehandouts.html