Study the following.

unit multiplier (**yoo**-nit **mul**-tuh-plye-ur) - a fraction that is equal to one, and contains units in the numerator and denominator. You multiply it, in conversion problems.

Examples:

$\dfrac{7 \text{ days}}{1 \text{ week}}$	$\dfrac{1 \text{ week}}{7 \text{ days}}$	$\dfrac{365 \text{ days}}{1 \text{ year}}$	$\dfrac{1 \text{ year}}{365 \text{ days}}$

To make a unit multiplier you take a relationship between units, and make it a fraction. For example the relationship between days and weeks is there are 7 days in one week. You can make two different unit multipliers using this relationship.

$$\frac{7 \text{ days}}{1 \text{ week}} \quad \text{or} \quad \frac{1 \text{ week}}{7 \text{ days}}$$

Say each word out loud and write it in the blank.

unit_____

multiplier_____

Write the definition in your own words.

unit multiplier

Write two sentences using "unit multiplier."

unit multiplier

1.

2.

Write two different unit multipliers for each of the following.

There are 52 weeks in one year.

There are 60 minutes in one hour.

In one minute there is 60 seconds.

In one year there are 365 days.

Write down 4 examples of unit multipliers using US or Metric units.

1.

2.

3.

4.

Study the following.

When studying fractions you learned that fractions with the same numerator and denominator equal one.

Examples: $\dfrac{4}{4} = 1$ $\dfrac{17}{17} = 1$

Solve

1. $\dfrac{3}{3} =$ 2. $\dfrac{54}{54} =$ 3. $\dfrac{153}{153} =$

Study the following.

When you have the same units in a numerator and denominator, that also equals one.

Example: $\dfrac{\text{weeks}}{\text{weeks}} = 1$

Solve

1. $\dfrac{\text{days}}{\text{days}} =$ 2. $\dfrac{\text{years}}{\text{years}} =$ 3. $\dfrac{\text{minutes}}{\text{minutes}} =$

Study the following.

Anything times 1 is itself.

Examples: $5 \times 1 = 5$ $99 \times 1 = 99$

Solve

1. $4 \times 1 =$
2. $6 \times 1 =$
3. $14 \times 1 =$

Study the following.

Anything divided by one is itself.

Examples: $\dfrac{2}{1} = 2$ $\dfrac{5}{1} = 5$ $\dfrac{\text{days}}{1} = \text{days}$

Solve

1. $\dfrac{5}{1} =$ 2. $\dfrac{17}{1} =$ 3. $\dfrac{\text{years}}{1} =$

4. $\dfrac{\text{minutes}}{1} =$ 5. $\dfrac{\text{seconds}}{1} =$

Study the following.

You can also write in a denominator of 1 to help you with other calculations.

Examples: $2 = \dfrac{2}{1}$ $47 = \dfrac{47}{1}$ $\text{seconds} = \dfrac{\text{seconds}}{1}$

Write with a denominator of 1.

1. $4 =$ 2. $85 =$ 3. $27 =$

4. $\text{days} =$ 5. $\text{hours} =$

Study the following.

When you are multiplying fractions, and you have the same number in one of the numerators as in one of the denominators, you can cross both numbers out and make them 1's.

This is sometimes called canceling.

Then multiply the remaining numbers across.

Example:
$$\frac{3}{8} \times \frac{5}{2} \times \frac{8}{7}$$

$$\frac{3}{\cancel{8}} \times \frac{5}{2} \times \frac{\cancel{8}}{7}$$

$$\frac{3}{1} \times \frac{5}{2} \times \frac{1}{7}$$

answer: $\dfrac{15}{14}$

Solve.

1. $\dfrac{4}{9} \times \dfrac{2}{3} \times \dfrac{7}{4} =$

2. $\dfrac{5}{2} \times \dfrac{1}{5} \times \dfrac{7}{3} =$

Study the following.

Canceling also applies to units.

Example: $\dfrac{14 \text{ days}}{1} \times \dfrac{1 \text{ week}}{7 \text{ days}}$

$\dfrac{14 \times 1}{1} \times \dfrac{1 \text{ week}}{7 \times 1}$

$\dfrac{14}{1} \times \dfrac{1 \text{ week}}{7} = \dfrac{14 \text{ weeks}}{7} = 2 \text{ weeks}$

Usually when you cancel units you just cross them out. You do not need to replace them with a 1.

Example:

$\dfrac{4 \text{ minutes}}{1} \times \dfrac{60 \text{ seconds}}{1 \text{ minute}} =$

$\dfrac{4 \text{ minutes}}{1} \times \dfrac{60 \text{ seconds}}{1 \text{ minute}} =$

$\dfrac{4}{1} \times \dfrac{60 \text{ seconds}}{1} = \dfrac{240}{1} \text{ seconds} = 240 \text{ seconds}$

Solve.

1. $\dfrac{48 \text{ hours}}{1} \times \dfrac{1 \text{ day}}{24 \text{ hours}} =$

2. $\dfrac{3 \text{ hours}}{1} \times \dfrac{60 \text{ minutes}}{1 \text{ hour}} =$

3. $\dfrac{120 \text{ minutes}}{1} \times \dfrac{1 \text{ hour}}{60 \text{ minutes}} =$

Study the following.

There are 4 steps to convert units of measure.

Step 1: Write down the original number with the units an numerator and a 1
   as denominator.
Step 2: Figure out the two possible unit multipliers.
Step 3: Select the unit multiplier that will result in the original units being
   canceled. Write it multiplied by step 1.
Step 4: Solve.

Example: Problem: Convert 21 days to weeks.

Step 1: $\dfrac{21 \text{ days}}{1}$

Step 2: $\dfrac{7 \text{ days}}{1 \text{ week}}$ or $\dfrac{1 \text{ week}}{7 \text{ days}}$

Step 3: $\dfrac{21 \text{ days}}{1} \times \dfrac{1 \text{ week}}{7 \text{ days}}$

Step 4: $\dfrac{21 \, \cancel{\text{days}}}{1} \times \dfrac{1 \text{ week}}{7 \, \cancel{\text{days}}} = \dfrac{21}{7} \text{ weeks} = 3 \text{ weeks}$

Convert 4 minutes to seconds, and show all 4 steps.

Step 1:

Step 2:

Step 3:

Step 4:

Convert 104 weeks to years, and show all 4 steps.

Step 1:

Step 2:

Step 3:

Step 4:

Convert 6 hours to minutes, and show all 4 steps.

Step 1:

Step 2:

Step 3:

Step 4:

Convert 180 hours to minutes, and show all 4 steps.

Step 1:

Step 2:

Step 3:

Step 4:

US Measurement Conversions.
Convert the following using steps 1 to 4.

1.   24 inches = _____ feet

2.   3 gallons = _____ quarts

3.   4 pounds = _____ ounces

4.   4 cups = _____ pints

5.   3 tons = _____ pounds

6.   18 feet = _____ yards

7.   2 miles = _____ feet

8.   6 pints = _____ quarts

9.   32 ounces = _____ pounds

10.   8000 pounds = _____tons

11.   16 quarts = _____gallons

12.   6 yards = _____feet

13.   72 inches = _____yards

14.   4 pounds = _____ounces

15.   8 pints = _____cups

16.   2 yards = _____inches

17.   5 quarts = _____pints

18.   48 inches = _____feet

Metric Measurement Conversions.
Convert the following using steps 1 to 4.

1. 6 centimeters = _____millimeters

2. 500 centimeters = _____meters

3. 2000 grams = _____kilograms

4. 7 liters = _____ milliliters

5. 2 kilometers = _____ meters

6. 40 millimeters = _____centimeters

7. 4 kiloliters = _____liters

8. 7000 liters = _____kiloliters

9. 2000 meters = _____kilometers

10. 4 centimeters = _____millimeters

11. 5 kilograms = _____grams

12. 4000 meters = _____kilometers

13. 5000 grams = _____kilograms

14. 6000 liters = _____kiloliters

15. 2 liters = _____milliliters

16. 2 meters = _____centimeters

17. 12 grams = _____milligrams

18. 400 centimeters = _____meters