Objectives: Unit Exchange

Materials:

Teacher notes and script. *(This page and next.)*

Flash cards of conversions. *(Copy for each student – There are 3 sets. The 2 pages need to be copied back-to-back to make one set.)*

Student note sheet. *(Two pages – copy back-to-back. Copy for each student.)*

Scissors

Previous Knowledge Needed: Ratios, proportions

Important Concepts/Methods: To change between units of measure.

Script:

Have each student cut out flash cards and give them 2 minutes to study the different ratios.

You have learned that: $x \cdot 1 =$ __1x__

The x is a variable. A variable can be any number.

So $382 \cdot 1 =$ _382__ and 12 miles $\cdot$ 1 = _12 miles__(label) Anything times 1 is equal to itself.

You also learned that: $1/1 =$ _1__ and $5/5 =$ __1__ and $10/(5 \cdot 2) =$ __1___

Anything divided by itself or by something that is equal to itself is equal to 1.
Therefore, if two things are equal and you make a fraction out of them (divide one by the other), it will always equal 1.

By combining these 2 statements, it should be clear that if you multiply something by a fraction made from two things that are equal to each other, you are not changing the value of the number that you started with.

12 inches = 1 foot Therefore, if you multiply something by 12 inches/1 foot, you will have something that is equal to what we started with. You have simply converted it to a different unit - same length, different measuring units. Example:

$$\frac{4 \text{ feet}}{} \left| \frac{12 \text{ inches}}{1 \text{ foot}} \right. = 48 \text{ inches}$$

Since 4 feet is equal to 48 inches, you simply multiplied by a form of 1, and in the process, you changed the units (inches to feet). Since there was a foot on the top and a foot on the bottom, they cancel each other out just like numbers do leaving inches as the unit that labels the answer.

Start with 60 inches and use the same method to convert to feet. Fill in the blank.

60 inches X ———— = 5 feet

$$\frac{60 \text{ inches}}{} \left| \frac{1 \text{ foot}}{12 \text{ inches}} \right. = 5 \text{ feet}$$

HINT: 12 inches belongs on the bottom so that inches can cancel.

It is okay to put the inches on top and the feet on the bottom or the other way around, but the 12 stays with the inches whether it is on the top or the bottom.

If there are 3 feet in one yard, convert 27 feet to yards using this set up.

$$\frac{27 \text{ feet}}{\quad} \left| \frac{1 \text{ yard}}{3 \text{ feet}} \right. = 9 \text{ yards}$$

Now try a two step unit cancellation problem. How many inches are there in 6 yards? Do both conversions in one problem. Start with the 6 yards and convert them to feet, then convert to inches.

$$\frac{6 \text{ yards}}{\quad} \left| \frac{3 \text{ feet}}{1 \text{ yard}} \right| \frac{12 \text{ inches}}{1 \text{ foot}} = 216 \text{ inches}$$

Make sure that you cancel anything that is on the top and the bottom, and solve the problem.

Have students cut-out their flashcards looking at the unit conversions. Have them practice quiz-quiz-trade for 3-5 minutes (students work in partners to quiz a person on two flashcards, then they trade roles). Have students sort their cards into two piles – "I know these cards well" and "I don't know these cards very well." Have the students continue to quiz-quiz-trade with their partner on only the "I don't know these cards very well" stack for another 3 minutes.

Using your flash cards to help set-up the conversions, solve the following problems.

1. How many inches in 7 feet?
$$\frac{7\ \cancel{feet}}{1} \times \frac{12 inches}{1\ \cancel{foot}} = (7 \times 12) inches = 84 inches$$

2. How many yards are there in 51 feet?
$$\frac{51\ \cancel{feet}}{1} \times \frac{1 yard}{3\ \cancel{feet}} = \frac{51}{3} yards = 17 yards$$

3. How many miles are there in 5000 feet?
$$\frac{5000\ \cancel{feet}}{1} \times \frac{1 mile}{5280\ \cancel{feet}} = \frac{5000}{5280} miles = \frac{125}{132} miles = 0.95 miles$$

4. How many inches are there in 3 yards?
$$\frac{3\ \cancel{yards}}{1} \times \frac{3\ \cancel{feet}}{1\ \cancel{yard}} \times \frac{12 inches}{1\ \cancel{foot}} = (3 \times 3 \times 12) inches = 108 inches$$

5. How many ounces are there in 4 cups?
$$\frac{4\ \cancel{cups}}{1} \times \frac{8 ounces}{1\ \cancel{cup}} = (4 \times 8) ounces = 32 ounces$$

6. How many quarts are in 5 gallons?
$$\frac{5\ \cancel{gallons}}{1} \times \frac{4 quarts}{1\ \cancel{gallon}} = (5 \times 4) quarts = 20 quarts$$

7. How many quarts are in 36 cups?
$$\frac{36\ \cancel{cups}}{1} \times \frac{1 quart}{4\ \cancel{cups}} = \frac{36}{4} quarts = 9 quarts$$

Common Mistakes:
Students have a hard time with proportions. They also have a hard time with the first ratio not having anything under the ratio. You might want to put a 1 under so that they have a better understanding that there are two ratios there.

Student Problems: The 7 problems at the bottom of the student worksheet.

Unit Conversions

Name:_____

You have learned that: $x \cdot 1 =$ _____

The x is a variable. A variable can be any number.

So $382 \cdot 1 =$ _____ and 12 miles $\cdot$ 1 = _____ (label)

Anything times 1 is equal to itself.

You also learned that:

$1/1 =$ _____ and $5/5 =$ _____ and $10/(5 \cdot 2) =$ _____

Anything divided by itself or by something that is equal to itself is equal to 1. Therefore, if two things are equal and you make a fraction out of them (divide one by the other), it will always equal 1.

By combining these 2 statements, it should be clear that if you multiply something by a fraction made from two things that are equal to each other, you are not changing the value of the number that you started with.

12 inches = 1 foot. Therefore, if you multiply something by 12 inches/1 foot, you will have something that is equal to what we started with. You have simply converted it to a different unit - same length, different measuring units. Example:

$$\frac{4 \text{ feet}}{} \left| \frac{12 \text{ inches}}{1 \text{ foot}} \right. = 48 \text{ inches}$$

Since 4 feet is equal to 48 inches, you simply multiplied by a form of 1, and in the process, you changed the units (inches to feet). Since there was a foot on the top and a foot on the bottom, they cancel each other out just like numbers do leaving inches as the unit that labels the answer.

Start with 60 inches and use the same method to convert to feet. Fill in the blank.

$$60 \text{ inches} \times \frac{\quad}{\quad} = 5 \text{ feet}$$

$$\frac{60 \text{ inches}}{} \left| \frac{\quad}{\quad} \right. =$$

HINT: 12 inches belongs on the bottom so that they can cancel.

It is okay to put the inches on top and the feet on the bottom or the other way around, but the 12 stays with the inches whether it is on the top or the bottom .

If there are 3 feet in one yard, convert 27 feet to yards, using this set up.

$$\frac{\quad}{\quad} \left| \frac{\quad}{\quad} \right. =$$

Now try a two step unit cancellation problem.

How many inches are there in 6 yards? Do both conversions in one problem.
Start with the 6 yards and convert them to feet, then convert to inches.

$$\frac{6 \text{ yards}}{} \left| \frac{3 \text{ feet}}{1 \text{ yard}} \right. \left| \frac{12 \text{ inches}}{1 \text{ foot}} \right. =$$

Make sure that you cancel anything that is on the top and the bottom and solve the problem.

FLASH CARD TIME!!!!

Using your flash cards to help you, solve the following problems:

1. How many inches in 7 feet?

$$\frac{7 \text{ feet}}{} \left| \frac{\text{Conversion?}}{} \right. = \text{inches}$$

2. How many yards are there in 51 feet?

$$\frac{51 \text{ feet}}{} \left| \frac{\text{Conversion?}}{} \right. = \text{yards}$$

3. How many miles are there in 5000 feet?

$$\frac{5000 \text{ feet}}{} \left| \frac{\text{Conversion?}}{} \right. = \text{miles}$$

4. How many inches are there in 3 yards?

$$\frac{3 \text{ yards}}{} \left| \frac{\text{Conversion}}{} \right. \left| \frac{\text{Conversion}}{} \right. = \text{inches}$$

5. How many ounces are there in 4 cups?

$$\frac{4 \text{ cups}}{} \left| \frac{\text{Conversion}}{} \right. \left| \frac{\text{Conversion (if needed)}}{} \right. = \text{ounces}$$

6. How many quarts are in 5 gallons?

$$\frac{5 \text{ gallons}}{} \left| \frac{\text{Conversion}}{} \right. \left| \frac{\text{Conversion (if needed)}}{} \right. = \text{quarts}$$

7. How many cups are in 3 quarts?

$$\frac{3 \text{ quarts}}{} \left| \frac{\text{Conversion}}{} \right. \left| \frac{\text{Conversion (if needed)}}{} \right. = \text{cups}$$

Student Note Sheet

1 foot	1 yard	1 mile	1 yard
12 inches	3 feet	5280 feet	36 inches

1 gallon	1 quart	1 cup	1 gallon
4 quarts	4 cups	8 ounces	16 cups

36 inches	5280 feet	3 feet	12 inches
1 yard	1 mile	1 yard	1 foot

16 cups	8 ounces	4 cups	4 quarts
1 gallon	1 cup	1 quart	1 gallon