TOPIC 8

LESSON 8.1b

First Among Equals

Objective

Reasoning with Equal Expressions

Warm-Up

Rewrite each number as an addition, subtraction, multiplication, or division expression. Use each operation once.

1. 26

2. 11

3. 30

4. 15

EXPLORE 2

Solutions from a Set

Equations come in many forms. Because expressions are either numeric or algebraic, equations can be made of just numbers or both numbers and variables.

Equations are statements—they may be always true, never true, or true only for one or more values of the variable.

Always True	Never True	True for certain values of the variable
$6 = 10 - 4$ $x = x$	$10 = 20$ $x = x + 2$	$x = 5$ $x + 2 = 12$

When you determine that an equation is never true, you can make it a true statement by using the symbol ≠. For example, 10 = 20 should be written as 10 ≠ 20.

1. Create at least five different kinds of equations using the list of expressions given.

Expressions
$6 - 2$
x
4
$2(x + 1)$
$0 - 8$
$2x$
$2x + 2$
8
$3x$
0

2. Identify your equations that are always true, never true, and those equations where you don't yet know whether they are true or false. Explain your reasoning.

A solution to an equation is any value for a variable that makes the equation true.

3. Sets of values are given. For each set, decide which value(s), if any, makes each of your equations from Question 1 true.
Show your work.

a. {1, 2, 3, 4}

b. {1, 3, 5, 7, 9}

c. {0}

4. Use the list of given expressions to write the type of equation described.

a. Write an equation with variables that has no possible solution. Explain why the equation has no solution.

b. Write an equation with variables that is true no matter what number is substituted for the variable. Explain why there are an infinite number of solutions.

EXPLORE 3

Using Properties of Equality

The **Addition Property of Equality** states that if two values a and b are equal, when you add the same value c to each, the sums are equal.

The **Subtraction Property of Equality** states that when you subtract the same value c from equal values a and b, the differences are equal.

Properties of Equality	For all numbers *a*, *b*, and *c*
Addition Property of Equality	If $a = b$, then $a + c = b + c$.
Subtraction Property of Equality	If $a = b$, then $a - c = b - c$.

1. Suppose you have the equation x = 15.

a. Use the Addition Property of Equality to write at least 3 equations that have the same solution.

b. Use the Subtraction Property of Equality to write at least 3 equations that have the same solution.

2. Suppose you have the equation x + 5 = 1 + 9.
a. Use the Addition Property of Equality to write at least 3 equations that have the same solution.

b. Use the Subtraction Property of Equality to write at least 3 equations that have the same solution.

The **Multiplication Property of Equality** states that if two values a and b are equal, when you multiply each by the same value c, the products are equal. The **Division Property of Equality** states that when you divide equal values a and b by the same value c, the quotients are equal. The Division Property of Equality is true only if c is not equal to 0.

Properties of Equality	For all numbers *a*, *b*, and *c*
Multiplication Property of Equality	If $a = b$, then $a \cdot c = b \cdot c$.
Division Property of Equality	If $a = b$ and $c \neq 0$, then $a \div c = b \div c$.

3. Suppose you have the equation x = 5.

a. Use the Multiplication Property of Equality to write at least 3 equations that have the same solution.

b. Use the Division Property of Equality to write at least 3 equations that have the same solution.

4. Suppose you have the equation $\frac{1}{2}x = 10$.

a. Use the Multiplication Property of Equality to write at least 3 equations that have the same solution.

b. Use the Division Property of Equality to write at least 3 equations that have the same solution.

5. Describe how you can check the solutions of the equations you wrote in Questions 1 and 3.

Name: _____ Date: _____ Class: _____

Homework HW

LESSON 8.1b

First Among Equals

Objective

Reasoning with Equal Expressions

Review

Graph each rate in the given pair on a coordinate plane. Explain whether or not the rates are equivalent.

1. $\frac{15 \text{ cups flour}}{8.25 \text{ cups sugar}}, \frac{5 \text{ cups flour}}{2.75 \text{ cups sugar}}$

2. $\frac{245 \text{ mi}}{3.5 \text{ h}}, \frac{150 \text{ mi}}{2 \text{ h}}$

Calculate each conversion.

3. 4 grams = _____ milligrams

4. 6400 ounces = _____ pounds

Determine each sum.

5. $\frac{6}{7} + 3\frac{1}{5}$

6. $1\frac{2}{3} + 4\frac{1}{4}$