Lesson 8: Replacing Numbers with Letters

Classwork

Opening Exercise

$$4 + 0 = 4$$
$$4 \times 1 = 4$$
$$4 \div 1 = 4$$
$$4 \times 0 = 0$$
$$1 \div 4 = \frac{1}{4}$$

How many of these statements are true?

How many of those statements would be true if the number 4 was replaced with the number 7 in each of the number sentences?

Would the number sentences be true if we were to replace the number 4 with any other number?

What if we replaced the number 4 with the number 0? Would each of the number sentences be true?

What if we replace the number 4 with a letter g? Please write all 4 expressions below, replacing each 4 with a g.

Are these all true (except for $g = 0$) when dividing?

Example 1: Additive Identity Property of Zero

$$g + 0 = g$$

Remember a letter in a mathematical expression represents a number. Can we replace g with any number?

Choose a value for g, and replace g with that number in the equation. What do you observe?

Repeat this process several times, each time choosing a different number for g.

Will all values of g result in a true number sentence?

Write the mathematical language for this property below:

Example 2: Multiplicative Identity Property of One

$$g \times 1 = g$$

Remember a letter in a mathematical expression represents a number. Can we replace g with any number?

Choose a value for g, and replace g with that number in the equation. What do you observe?

Will all values of g result in a true number sentence? Experiment with different values before making your claim.

Write the mathematical language for this property below:

Example 3: Commutative Property of Addition and Multiplication

$$3 + 4 = 4 + 3$$
$$3 \times 4 = 4 \times 3$$

Replace the 3's in these number sentences with the letter a.

Choose a value for a, and replace a with that number in each of the equations. What do you observe?

Will all values of a result in a true number sentence? Experiment with different values before making your claim.

Now, write the equations again, this time replacing the number 4 with a variable, b.

Will all values of a and b result in true number sentences for the first two equations? Experiment with different values before making your claim.

Write the mathematical language for this property below:

Example 4

$$3 + 3 + 3 + 3 = 4 \times 3$$

$$3 \div 4 = \frac{3}{4}$$

Replace the 3's in these number sentences with the letter a.

Choose a value for a, and replace a with that number in each of the equations. What do you observe?

Will all values of a result in a true number sentence? Experiment with different values before making your claim.

Now, write the equations again, this time replacing the number 4 with a variable, b.

Will all values of a and b result in true number sentences for the equations? Experiment with different values before making your claim.

Problem Set

1. State the commutative property of addition using the variables a and b.

2. State the commutative property of multiplication using the variables a and b.

3. State the additive property of zero using the variable b.

4. State the multiplicative identity property of one using the variable b.

5. Demonstrate the property listed in the first column by filling in the third column of the table.

Commutative Property of Addition	$25 + c =$	
Commutative Property of Multiplication	$l \times w =$	
Additive Property of Zero	$h + 0 =$	
Multiplicative Identity Property of One	$v \times 1 =$	

6. Why is there no commutative property for subtraction or division? Show examples.