Lesson 8: Replacing Numbers with Letters

Classwork

Opening Exercise

$$4+0=4$$

$$4×1=4$$

$$4÷1=4$$

$$4×0=0$$

$$1÷4=\frac{1}{4}$$

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

$$g×1=g$$

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

$$3+4=4+3$$

$$3×4=4×3$$

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

$$3+3+3+3=4×3$$

$$3÷4=\frac{3}{4}$$

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 | $$l×w=$$ |  |
| Additive Property of Zero | $$h+0=$$ |  |
| Multiplicative Identity Property of One | $$v×1=$$ |  |

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