# Lesson 5.3 Properties of Operations

**Objective:** To identify and use mathmatical properties to simplify algebraic expressions

## Properties of Operations

Watch

**Words** The **Commutative Property** states that the order in which numbers are added or multiplied does not change the sum or product.

| | Addition | Multiplication |
|---|---|---|
| Symbols | $a + b = b + a$ | $a \cdot b = b \cdot a$ |
| Examples | $6 + 1 = 1 + 6$ | $7 \cdot 3 = 3 \cdot 7$ |

**Words** The **Associative Property** states that the way in which numbers are grouped when they are added or multiplied does not change the sum or product.

| | Addition | Multiplication |
|---|---|---|
| Symbols | $a + (b + c) = (a + b) + c$ | $a \cdot (b \cdot c) = (a \cdot b) \cdot c$ |
| Examples | $2 + (3 + 8) = (2 + 3) + 8$ | $3 \cdot (4 \cdot 5) = (3 \cdot 4) \cdot 5$ |

A **property** is a statement that is true for any number. The following properties are also true for any numbers.

| Property | Words | Symbols | Examples |
|---|---|---|---|
| **Additive Identity** | When 0 is added to any number, the sum is the number. | $a + 0 = a$<br>$0 + a = a$ | $9 + 0 = 9$<br>$0 + 9 = 9$ |
| **Multiplicative Identity** | When any number is multiplied by 1, the product is the number. | $a \cdot 1 = a$<br>$1 \cdot a = a$ | $5 \cdot 1 = 5$<br>$1 \cdot 5 = 5$ |
| **Multiplicative Property of Zero** | When any number is multiplied by 0, the product is 0. | $a \cdot 0 = 0$<br>$0 \cdot a = 0$ | $8 \cdot 0 = 0$<br>$0 \cdot 8 = 0$ |

Cut out Pg. 368

**Ex.1** Name the property shown by the statement.

$$2 \cdot (5 \cdot n) = (2 \cdot 5) \cdot n$$

Associative property of Multiplication

Ex. 2 State whether the following conjecture is true or false. If false, provide a counter example.

Division of whole number is communative.

$15 \div 3 = 3 \div 15$

$15 \overline{)3.0}$ $\quad 0.2 = 2/10 = 1/5$

$5 \neq 1/5$

False. We found a counter example that is $15 \div 3 \neq 3 \div 15$.

Ex. 3 Simplify each expression. Justify each step.

$(7+g)+5$

$= (g+7)+5$ communative +

$= g+(7+5)$ Associative +

$= g+12$ Simplify