Properties of Operations

Reporting Category Patterns, Functions, and Algebra

Topic Identifying properties of operations

Primary SOL 8.15c The student will identify properties of operations used to solve an equation.

Related SOL 8.15a, b

Materials
- Properties of Operations Chart (attached)
- Scissors
- Glue or tape
- Examples of Properties activity sheet (attached)
- Round Robin Cards (attached)

Vocabulary

commutative property of addition, commutative property of multiplication, associative property of addition, associative property of multiplication, additive identity, multiplicative identity, multiplicative property of zero (earlier grades)

distributive property, inverse property for addition and multiplication (8.15)

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)
1. Distribute copies of the Properties of Operations Chart. Lead a class discussion on the meaning of each property, and develop a definition of each for students to write in the appropriate boxes.
2. Distribute scissors, glue or tape, and copies of the Examples of Properties activity sheet. Instruct students to cut out the examples and glue or tape them in the appropriate "Examples" boxes in their charts.
3. Direct students to complete their charts by creating their own examples to demonstrate the properties.
4. Cut out the attached Round Robin Cards, and display them around the room. Have students go to each card, determine which property it demonstrates, and record their answers on a sheet of paper.
5. Lead a class discussion regarding the Round Robin examples to clarify any confusion and assess students' understanding.

Assessment
- **Questions**
  - What is similar among the commutative property of multiplication, associative property of multiplication, and distributive property? What is different?

- **Journal/Writing Prompts**
  - Solve the equation $3(x + 4) = 21$, and identify which properties you used for each step.

Extensions and Connections (for all students)
- Have each student draw a visual representation of an assigned property.
- Have students create examples demonstrating why the commutative property and associative property do not work for subtraction or division.
- Discuss the meanings of the words *commutative* and *associative* in the real world. (commute, associate)
- Provide students with the solutions of various equations, and have them identify the property applied for each step.

Strategies for Differentiation
- Provide students with a word bank of all the properties.
- Divide the class in half. Give each student in one half a card listing the name of a property, and give each student in the other half a card showing an example of a property. Have students find the cards that match.
- Start with examples that are only numeric and progress to algebraic examples.

Properties of Operations Chart

Name _____ **Date** _____

Property	Definition	Example	Example	Your own example
Commutative Property of Addition				
Commutative Property of Multiplication				
Associative Property of Addition				
Associative Property of Multiplication				
Identity Property of Addition				
Identity Property of Multiplication				
Inverse Property of Addition				
Inverse Property of Multiplication				
Multiplicative Property of Zero				
Distributive Property				

Examples of Properties

Copy on cardstock, and cut out.

$ab = ba$	$c \cdot 1 = c$
$3(x) = x(3)$	$(xy)z = x(yz)$
$x + -x = 0$	$(3 + a) + b = 3 + (a + b)$
$6(ab) = (6a)b$	$a(b + c) = ab + ac$
$\dfrac{1}{y} \cdot y = 1$	$8 \times 0 = 0$
$2 + 5y = 5y + 2$	$4 + (x + y) = (4 + x) + y$
$3(4 + 2) = 3(4) + 3(2)$	$7 \times 1 = 7$
$\dfrac{1}{5} \cdot 5 = 1$	$3 + 0 = 3$
$p + 0 = p$	$y(0) = 0$
$3x + 4 = 4 + 3x$	$9 + -9 = 0$

Round Robin Cards

$8(x + 4) = 8(x) + 8(4)$

$4 \cdot x = x \cdot 4$

$4 + (3 + 2) = 4 + (2 + 3)$

$ab(0) = 0$

$4 \times 7 \times 1 = 4 \times 7$

$5 \cdot (4 \cdot 2) = (5 \cdot 4) \cdot 2$

$0 = 3 + -3$

$(6 + x) + y = 6 + (x + y)$

$\dfrac{1}{7} \cdot 7 = 1$

$gh + 0 = gh$