Name _____

Date _____ Pd _____

PROPERTIES OF OPERATIONS

Mathematical expressions can be written numerically, algebraically, and verbally. We can use the properties of operations to generate equivalent expressions.

COMMUTATIVE PROPERTY

The commutative property allows you to change the order of the numbers without changing the solution. The commutative property only applies to _____ and
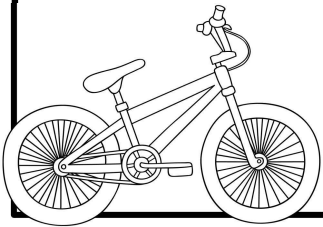
_____.

ADDITION	MULTIPLICATION
$p + r + s = r + p + s$	$p \cdot r = r \cdot p$
Prove it...if p = 12, r = 5, s = 2	Prove it...if p = 12, r = 5

a. Give an example to show why subtraction is NOT commutative.

ASSOCIATIVE PROPERTY

The associative property allows you to group different sets of numbers together without changing the solution. The associative property only applies to _____ and

_____.

ADDITION	MULTIPLICATION
$(p + r) + s = p + (r + s)$	$(p \cdot r) \cdot s = p \cdot (r \cdot s)$
Prove it...if p = 12, r = 5, s = 2	Prove it...if p = 12, r = 5, s = 2

b. Give an example to show why division is NOT associative.

IDENTITY PROPERTY

The identity property allows a number to be added to or multiplied by _____ changing the number. The identity property only applies to _____ and _____.

ADDITION	MULTIPLICATION
p + 0 = p	p · 1 = p
Prove it...if p = 12	Prove it...if p = 12

INVERSE PROPERTY

When a number is multiplied or added to its inverse, it returns to its identity.

For addition, a number added to _____ will result in 0.
For multiplication, a number multiplied by _____ will result in 1.

ADDITION	MULTIPLICATION
p + (-p) = 0	when $p \neq 0$, $p \cdot \dfrac{1}{p} = 1$
Prove it...if p = 12	Prove it...if p = 12

Use your understanding of the properties of operations to complete 1-2.

1. For a-f, apply the given property to generate an equivalent expression or equation.

    a. 18 + q + 7 → commutative property of addition → _____

    b. 15 + b = 0 → inverse property of addition → _____

    c. 7 · 8 · 3 → commutative property of multiplication → _____

    d. 11 + 24 + 9 → commutative property of addition → _____

    e. (6 + 5) + 8 → associative property of addition → _____

    f. 35(r) → multiplicative identity property → _____`

2. Grady lists three different expressions below. Determine which expression is not equivalent to the others.

a + b + c	c + b + a	a (b) + a(c)

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PROPERTIES OF OPERATIONS

Answer the questions below. Be sure to show your work.

1. Which example shows the associative property of multiplication? A. $a(b + c) = ab + ac$ B. $(a + b) + 9 = a(b + 9)$ C. $(a \cdot b) \cdot 5 = a \cdot (b \cdot 5)$ D. $(a \cdot b) \cdot 5 = (a \cdot \frac{1}{5}) \cdot b$	2. Which example does NOT show the commutative property of addition? A. $4 + x = x + 4$ B. $ab = ba$ C. $a + b = b + a$ D. $3x + 4y = 4y + 3x$

3. Complete the table below to show an equivalent expression.

ORIGINAL EXPRESSION	PROPERTY	EQUIVALENT EXPRESSION
$15 + 0$	Additive Identity	
$4 \cdot 6 \cdot 7$	Commutative Property	
$9 + (5 + 3)$	Associative Property	
$11 \cdot 1$	Identity Property	
$\frac{1}{4} \cdot \frac{4}{1}$	Inverse Property	
$9 + (-9)$	Inverse Property	

4. Describe how you know that $(8 + 9) + 3$ is equivalent to $8 + (9 + 3)$. What is the benefit to using this property? _____ _____ _____ _____ _____	5. Describe how you know that $9 + 7 + 1$ is equivalent to $9 + 1 + 7$. What is the benefit to using this property? _____ _____ _____ _____ _____