Writing Equivalent Expressions

1. The **Commutative** Property states that changing the order of addends or factors does not change the sum or product.
2. The **Associative** Property states that changing the grouping of addends or factors does not change the sum or product.
3. The **Identity** Property of Addition states that the sum of any number and zero is that number.
4. The **Multiplication** Property of Zero states that the product of any number and zero is **zero**
5. The **Identity** Property of Multiplication states that the product of any number and **one** is that number.
6. Equivalent Expressions:

Equivalent expressions have the same value.

7. You can use **properties** to write equivalent expressions.

8. Simplify each expression below using properties.

7(10k)	3 + (5 + p)
$(7 \cdot 10)k = 70k$	$(3 + 5) + p = 8 + p$
Associative Property (move parentheses)	Associative Property
12 x m x 0	4 x w x 1
$12 \times m \times 0 = zero$	$4 \times w \times 1 = 4w$
Multiplication Property of zero	Identity property of Multiplication

Practice: Writing Equivalent Expressions

Simplify each expression using number properties.

#1

$5 + x + 9$

Commutative Property

$5 + 9 + x = \boxed{14 + x}$

#2

$12(3g)$

Associative Property

$(12 \cdot 3)g = \boxed{36g}$

#3

$14 \times n \times 1$

Identity of Mult

$14 \times n \times 1 = \boxed{14n}$

#4

$6 \times r \times 10$

$6 \times 10 \times r = \boxed{60r}$

Commutative Property

#5

$18 + (12 + w)$

$(18 + 12) + w = \boxed{30 + w}$

Associative Property

#6

$(1.5 + k) + 2.25$

$(1.5 + 2.25) + k = \boxed{3.75 + k}$

Commutative Property

#7

$0 \times d \times 11$

$0 \times d \times 11 = \boxed{Zero}$

Zero Property of Multiplication

#8

$11(9s)$

$(11 \cdot 9)s = \boxed{99s}$

Associative Property

Distributive Property — Multiply outside by inside

Name _____

Handwritten (left margin):
$11 - (3x + 2)$
$11 - 3x - 2$
$11 - 2 - 3x$
$9 - 3x$

1 Which expression is NOT equivalent to the expression $11 - (3x + 2)$?

- (A) $11 - 3x - 2$
- ● $11 - 3x + 2$
- (B) $9 - 3x$
- (D) $11 + (-3x - 2)$

2 Which expression is equivalent to $12x - 3(x + 2)$?

Handwritten: $12x - 3(x + 2)$ → $12x - 3x - 6$ → $9x - 6$

- (A) $12x + 6$
- (C) $9x + 6$
- (B) $12x - 6$
- ● $9x - 6$

3 Which pair of expressions is equivalent?

- ✗ (A) $4x - 2 + 5x$ and $7x   \quad (9x - 2)$
- ● (B) $(11 + 3x) - x$ and $11 + 2x \quad (2x)$
- ✗ (C) $12(x - 2)$ and $12x - 2 \quad (12x - 24)$
- ✗ (D) $9x(4)$ and $13x$

Handwritten:
$36x \neq 13x$
$(11 + 3x) - x$
$11 + (3x - x)$
$11 + 2x$

4 Which is an equivalent way to express $4z$?

- (A) z^4
- ● $z + z + z + z$
- (B) $4 + z$
- (D) $z \times z \times z \times z$

5 Which is an equivalent way to *write* the expression $4y^2$?

- ✗ $(4y)(4y) = 16y^2$
- ✗ $4y + y = 5y$
- ✗ $4y + 4y = 8y$
- ● $(2y)(2y) = 4y^2$

6 Select **all** the expressions that are equivalent to the given expression.

$2x - (-3x + 8y) + 8$

Handwritten:
$2x - (-3x + 8y) + 8$
$2x + 3x - 8y + 8$
$5x - 8y + 8$

- ✗ (A) $2x + (3x + 8y) + 8$
- ● $2x + (3x - 8y) + 8$
- ● $(2x + 3x) - 8y + 8$
- (D) $3x + 8$
- ● $5x - 8y + 8$

7 Place an X in the table to show which expressions are equivalent.

	$12x$	$2x - 1$	$-8x$	$11x - 9$	$11x - 2$
$3x - 2 + 8x = 11x - 2$					X
$4x - (2x + 1)\; 4x - 2x - 1 = 2x - 1$		X			
$11(x - 1) + 2\; 11x - 11 + 2 = 11x - 9$				X	
$4(3x) = 12x$	X				
$-13x + 5x = -8x$			X		

8 Select **all** the expressions that are equivalent to the given expression.

$3(x + 2) - x$

Ⓐ ~~x~~

Ⓑ 2x + ~~2~~

● 2(x + 3)

● 2x + 6
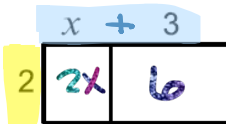
Ⓔ ~~x~~

(handwritten work)
$3(x + 2) - x$
$3x + 6 - x$
$3x - x + 6$
$2x + 6$

$2x + 6$

9 Use the distributive property to create 2 equivalent expressions that represent the area of the diagram.

(handwritten)
Area = length × width
= (x + 3) · 2

x + 3	
2	2x	6

Select the numbers and symbols from the list to complete the expressions.

Area as the sum of exactly two terms:

____2x____ + ____6____

Area as a product in which one factor is a sum:

____2____ × ____(x + 3)____

(x + 3)	2	2x	6x	6	3

Homework:

Third sheet in packet, due by next class

1 Which expression is equivalent to $12x - 3x$?

Ⓐ $x(12 - 3)$

Ⓑ $8x$

Ⓒ $3(3x - x)$

Ⓓ 9

2 What property allows the expression $5x + 7 - 2x$ to be equivalent to the expression $5x - 2x + 7$?

Ⓐ Commutative Property of Addition

Ⓑ Commutative Property of Multiplication

Ⓒ Associative Property of Addition

Ⓓ Distributive Property

3 Which expression is equivalent to the expression $(1 + 4x) + 2x$?

Ⓐ $7x$

Ⓑ $5x + 2x$

Ⓒ $1 + 6x$

Ⓓ $x(4 + 2)$

4 The expression $11x^3 - 6y + 2x^3$ is simplified as follows. Which property is NOT used to simplify the expression?

$11x^3 - 6y + 2x^3 = 11x^3 + 2x^3 - 6y$

$= x^3(11 + 2) - 6y$

$= x^3(13) - 6y$

$= 13x^3 - 6y$

Ⓐ Commutative Property of Addition

Ⓑ Commutative Property of Multiplication

Ⓒ Associative Property of Multiplication

Ⓓ Distributive Property

5 A taco costs $2.00, rice and beans cost $1.75, and drinks cost $2.25. There is also a delivery fee of $2.50. The expression $2n + 1.75n + 2.25n + 2.50$ gives the total cost, in dollars, for buying a taco, rice and beans, and a drink for n people. Which is another way to write this expression?

Ⓐ $8.50n$

Ⓑ $6n + 2.50$

Ⓒ $6n^3 + 2.50$

Ⓓ $n + 8.50$

6 The expression is simplified as follows.

$(y + 14x) - 5x - x^2$

$= y + (14x - 5x) - x^2$

$= y + x(14 - 5) - x^2$

$= y + x(9) - x^2$

$= y + 9x - x^2$

Select **all** the properties of operations that are used to simplify the expression.

   Ⓐ Commutative Property of Addition

   Ⓑ Commutative Property of Multiplication

   Ⓒ Associative Property of Addition

   Ⓓ Associative Property of Multiplication

   Ⓔ Distributive Property

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7 Use the distributive property to write $23y - (7x - 2y) + x$ without parentheses.

Write the correct terms to correctly complete the equivalent expression.

$23y$ _____ _____ $+ x$

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8 Simplify the expression $(2x + 3y) + y$ using the properties of operations.

Select the correct parts from the list to correctly complete the expression.

$(2x + 3y) + y =$ _____ $+$ _____

| 2x | 3x | 3y | 4y | 5xy | $3y^2$ |

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9 Place an X in the table to show which expressions are equivalent.

	$6(z + 5)$	$6z + 5z$	$2 + 6z + 3$
11z			
6z + 5			
6z + 30			

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10 Place an X in the table to show which expressions are equivalent.

	$6k + 5$	$5k$	$3k + 6$
3(k + 2)			
3k + 2k			
2 + 6k + 3			

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