

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## THE COMMUTATIVE AND ASSOCIATIVE PROPERTIES COMMON CORE ALGEBRA I



Numbers combine through the **operations** of addition, subtraction, multiplication, and division to produce other numbers. Sometimes, how they combine is dictated by **convention**, like with the **order of operations**. Other times, though, properties about numbers exist simply due to how these operations work.

**Exercise #1:** Add the following numbers **without** using a calculator. Hint: Although **order of operations** tells us we should add from left to right, think about an easier way to sum these numbers. Show how you summed them.

$$3+9+4+2+7+1+6+8$$

Addition and multiplication have two very important properties with very technical names. The next exercise will review these properties.

**Exercise #2:** Fill in the missing blanks for each property.

(a) **Commutative Property of Addition:**

$8+4$  gives the same sum as \_\_\_\_\_. Both sums equal \_\_\_\_\_.

(b) **Commutative Property of Multiplication:**

$6\times 3$  gives the same product as \_\_\_\_\_. Both products equal \_\_\_\_\_.

(c) **Associative Property of Addition:**

The sum  $(3+5)+9$  gives the same result as the sum \_\_\_\_\_.

Both sums are equal to \_\_\_\_\_

(d) **Associative Property of Multiplication:**

The product  $(2\cdot 5)\cdot 7$  gives the same result as the product \_\_\_\_\_.

Both products are equal to \_\_\_\_\_



The Commutative Property and Associative Property essentially give us permission to rewrite addition and multiplication problems in different orders than what are normally given.

**Exercise #3:** Give an example that shows that subtraction is not commutative.

Even though subtraction is not commutative, we should remember a very important fact about subtraction: **it can always be made into the addition of opposites.**

**Exercise #4:** Change the following expression involving addition and subtraction into one only involving addition and then use the commutative and associative properties to quickly determine the value of this **expression**. Through this, please review some properties of negative numbers.

$$7 - 3 + 8 - 2 - 6 + 1 - (-3)$$

We should be able to now extend the commutative and associative properties for numbers we know to numbers we don't know (variables). One of the very nice ways to illustrate the usefulness of these properties is in combining two or more **expressions**.

**Exercise #5:** Please recall the following quickly:

(a)  $5x + 2x =$

(b)  $7x + -3x =$

(c)  $-8x + -2x$

**Exercise #6:** In the following exercise we show how two linear expressions are combined using various properties. List what the properties are:

$$(3x + 7) + (2x + 8) = 3x + 7 + 2x + 8 \underline{\hspace{10em}}$$

$$3x + 7 + 2x + 8 = 3x + 2x + 7 + 8 \underline{\hspace{10em}}$$

$$3x + 2x + 7 + 8 = (3x + 2x) + (7 + 8) \underline{\hspace{10em}}$$

$$= 5x + 15$$

**Exercise #7:** Combine the expressions below. Replace subtraction by addition of opposites, if needed.

(a)  $4x + 6 + -2x - 9$

(b)  $-6x + 9 + 10x + 3$

(c)  $4y - 10 - 7y - 3$



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**THE COMMUTATIVE AND ASSOCIATIVE PROPERTIES**  
**COMMON CORE ALGEBRA I HOMEWORK**

**FLUENCY**

1. Combine the expressions below. Replace subtraction by addition of opposites, if needed.

(a)  $7x + 3 + 6x + 11$

(b)  $12x + 10 + 3 + 8x$

(c)  $10y + 12 - 7y - 8 - 3y$

(d)  $8x - 6 - 7x + 10$

(e)  $-6x + 9 + 4x - 9$

(f)  $-4x + 5 - 12 - 7x + 4 + 2x$

(g)  $12x - 15 - 3 + 2x - 15x$

(h)  $-7x + 4 - 11 - 7x + 7 + 2x + 12x$

(i)  $-2x + 18 + 4x - 12 - 6$

2. Use the associative property to rewrite the following. You do NOT need to simplify these.

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

(b)  $5 \times (3 \times 7) =$

(c)  $3x - (2x + 9x)$

3. Use the commutative property to rewrite the following. You do NOT need to simplify these.

(a)  $6 + 8 + 7$

(b)  $12x + 8x - 3x$

(c)  $-3y - 6y + 10y$



## APPLICATIONS

4. Sophia and Emily are twin sisters and best friends. They're saving up for concert tickets and agreed to pay for the tickets together when they have enough money. They both created equations to see how fast they were making money and came up with the following expressions:

$$\text{Sophia: } 35w + 55 - 10w$$

where  $w$  is the number of weeks they have been saving

$$\text{Emily: } 28w + 75 - 5w + 12$$

- (a) Combine their expressions to see how much they are making together.
- (b) Using the expressions see if they will have above \$350 in four weeks. If not how much will they be short?
- (c) If their friend Becky also wants to join and is making money according to the expression  $50w + 25$ , create a new expression for the total and see if they will have above \$525 for the three of them after four weeks.

## REASONING

5. List which of the associative and commutative properties are being used in each step.

$$(9x - 3) + (10 - 5x) = 9x - 3 + 10 - 5x$$

\_\_\_\_\_

$$9x - 3 + 10 - 5x = 9x - 5x - 3 + 10$$

\_\_\_\_\_

$$9x - 5x - 3 + 10 = (9x - 5x) + (-3 + 10)$$

\_\_\_\_\_

$$= 4x + 7$$

