

## "Commute"



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## "Associate"



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## "Distribute"



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## "Identity"



## Take Note

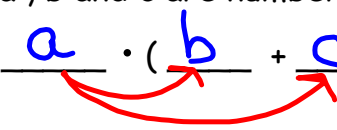
### COMMUTATIVE PROPERTY:

- Summary: If the **order** 2 numbers are added/multiplied is reversed, the answer is the same.
- If a and b are numbers, then  $\underline{a} + \underline{b} = \underline{b} + \underline{a}$
- If a and b are numbers, then  $\underline{a} \cdot \underline{b} = \underline{b} \cdot \underline{a}$

### ASSOCIATIVE PROPERTY:

- Summary: If the **grouping** 3 numbers are added/multiplied is changed, the answer is the same.
- If a, b and c are numbers, then  $\underline{a} + (\underline{b} + \underline{c}) = (\underline{a} + \underline{b}) + \underline{c}$
- If a, b and c are numbers, then  $\underline{a} \cdot (\underline{b} \cdot \underline{c}) = (\underline{a} \cdot \underline{b}) \cdot \underline{c}$

### DISTRIBUTIVE PROPERTY (of multiplication over addition):

- Summary: If a number multiplies each number of a sum instead of adding first, the answer is the same.
- If a, b and c are numbers, then  
$$\underline{a} \cdot (\underline{b} + \underline{c}) = (\underline{a} \cdot \underline{b}) + (\underline{a} \cdot \underline{c})$$


### ZERO PROPERTY OF MULTIPLICATION:

- Summary: If a number is multiplied by zero, the answer is zero.
- If a is a number, then  $\underline{a} \cdot \underline{0} = \underline{0}$

Properties of Real Numbers

Name \_\_\_\_\_

Date \_\_\_\_\_

Name the property:

1)  $13 \cdot 9 = 9 \cdot 13$  \_\_\_\_\_

2)  $4 + (7 + 2) = (4 + 7) + 2$  \_\_\_\_\_

3)  $3 \cdot (2 + 6) = (3 \cdot 2) + (3 \cdot 6)$  \_\_\_\_\_

4)  $-4 \cdot 0 = 0$  \_\_\_\_\_

5)  $m + (1 \cdot 6) = m + (6 \cdot 1)$  \_\_\_\_\_

6)  $5 \cdot (n + 2) = (5 \cdot n) + (5 \cdot 2)$  \_\_\_\_\_

7)  $\frac{3}{4} \cdot 8 + 7 = 7 + \frac{3}{4} \cdot 8$  \_\_\_\_\_

8)  $\frac{3}{4} \cdot (8 + 7) = \frac{3}{4} \cdot 8 + \frac{3}{4} \cdot 7$  \_\_\_\_\_

9)  $c \cdot 0 = 0$  \_\_\_\_\_

10)  $e(f + g) = ef + eg$  \_\_\_\_\_

11)  $(a \cdot 1) \cdot b = a \cdot (1 \cdot b)$  \_\_\_\_\_

12)  $4 + m = m + 4$  \_\_\_\_\_

13)  $0 = 14(0)$  \_\_\_\_\_

14)  $-5 \cdot (a + b) = -5 \cdot a + (-5 \cdot b)$  \_\_\_\_\_

Write True or False.

15)  $-4 + 7 = 4 + -7$  \_\_\_\_\_

16)  $8 + (-2) = -2 + 8$

17)  $(7 + 10) + 3 = 7 + (10 - 3)$

18)  $\frac{1}{3} \cdot 12 = 12 \cdot \frac{1}{3}$  \_\_\_\_\_

Name \_\_\_\_\_

Date \_\_\_\_\_

## Properties

1. Which illustrates the commutative property ?

- (1)  $a + b = a - b$
- (2)  $a - b = -a + b$
- (3)  $ab = ab$
- (4)  $ab = ba$

5. Which illustrates the distributive property ?

- (1)  $\frac{1}{4} + \frac{3}{4}(\frac{1}{2}) = \frac{1}{4} + \frac{1}{2}(\frac{3}{4})$
- (2)  $2.5(a + 6) = 2.5a + 2.5(6)$
- (3)  $(0.3 \times 0.5) \times 10 = 0.3 \times (0.5 \times 10)$
- (4)  $-3(5 + 7) = (-3)(5) + (-3)(7)$

2. Which equation illustrates the associative property?

- (1)  $d + e + f = d + f + e$
- (2)  $d(e + f) = de + df$
- (3)  $d + (e + f) = (d + e) + f$
- (4)  $d + (e + f) = (e + f) + d$

3. Which equation is an illustration of the distributive property ?

- (1)  $x(0 + b) = x(0) + xb$
- (2)  $x + 0 = 0 + x$
- (3)  $x(yz) = (xy)z$
- (4)  $x(y + z) = (y + z)x$

4. Which property is illustrated by the equation  $7 + (3 + y) = 7 + (y + 3)$ ?

- (1) associative property of addition
- (2) associative property of multiplication
- (3) distributive property
- (4) commutative property of addition

## Take Note

Identity: Keep the number the SAME.

The **Additive Identity** element is zero.

Example:  $\underline{0} + \underline{5} = \underline{5}$

The **Multiplicative Identity** element is one.

Example:  $\underline{5} \cdot \underline{1} = \underline{5}$

Name \_\_\_\_\_

Date \_\_\_\_\_

## Properties of Real Numbers

Name the property:

1)  $5 + 8 = 8 + 5$  \_\_\_\_\_

2)  $4 \cdot (7 + 2) = (4 \cdot 7) + (4 \cdot 2)$  \_\_\_\_\_

3)  $(3 \cdot 2) \cdot 6 = 3 \cdot (2 \cdot 6)$  \_\_\_\_\_

4)  $4 + -4 = 0$  \_\_\_\_\_

5)  $m \cdot 1 = m$  \_\_\_\_\_

6)  $5 \cdot (n + 2) = (5 \cdot n) + (5 \cdot 2)$  \_\_\_\_\_

7)  $7 \cdot 3 = 3 \cdot 7$  \_\_\_\_\_

8)  $(2 + 5) + 4 = 2 + (5 + 4)$  \_\_\_\_\_

9)  $a \cdot \frac{1}{a} = 1$  \_\_\_\_\_

10)  $a(b + c) = ab + ac$  \_\_\_\_\_

11)  $(4 \cdot 1) \cdot 8 = 4 \cdot (1 \cdot 8)$  \_\_\_\_\_

12)  $5 + n = n + 5$  \_\_\_\_\_

13)  $a + 0 = a$  \_\_\_\_\_

14)  $\frac{2}{3} \cdot 0 = 0$  \_\_\_\_\_

Write True or False.

15)  $4 + 7 = 7 + 4$  \_\_\_\_\_

16)  $8 - 2 = 2 - 8$  \_\_\_\_\_

17)  $(8 + 5) - 1 = (5 + 8) - 1$  \_\_\_\_\_

18)  $5 \cdot (9 + 3) = (5 \cdot 9) + 3$  \_\_\_\_\_

## Examples

19. A method for simplifying  $5(x + 4) + 2(x + 8)$  is shown below. Complete the steps and identify the two properties used to complete the indicated steps.

$$\begin{aligned} & 5(x + 4) + 2(x + 8) \\ &= 5x + 20 + 2x + \underline{16} \quad (1) \underline{\text{Distributive}} \\ &= 5x + 2x + 20 + \underline{16} \quad (2) \underline{\text{Commutative}} \\ &= 7x + 36 \end{aligned}$$

20. A method for solving  $8(x - 1) - 2(x - 4) = 12$  is shown below. Identify the properties that justify the four indicated steps.

$$\begin{aligned} & 8(x - 1) - 2(x - 4) = 12 \\ & 8x - 8 - 2x + 8 = 12 \quad (1) \underline{\text{Distributive}} \\ & \underline{8x - 2x} - 8 + 8 = 12 \quad (2) \underline{\text{Commutative}} \\ & 6x + \underline{-8 + 8} = 12 \\ & \underline{6x} + 0 = 12 \quad (3) \underline{\text{Additive Inverse}} \\ & \underline{6x} = 12 \quad (4) \underline{\text{Additive Identity}} \\ & x = 2 \end{aligned}$$

21. What property is illustrated by each example?

$$\begin{aligned} \text{a) } & (\underline{\star + \uparrow}) \cdot \heartsuit = (\underline{\uparrow + \star}) \cdot \heartsuit \quad \underline{\text{Commutative}} \\ \text{b) } & (\underline{\star + \uparrow}) + \heartsuit = \star + (\underline{\uparrow + \heartsuit}) \quad \underline{\text{Associative}} \end{aligned}$$

19. A method for simplifying  $5(x + 4) + 2(x + 8)$  is shown below. Complete the steps and identify the two properties used to complete the indicated steps.

$$\begin{aligned}
 &5(x + 4) + 2(x + 8) \\
 &= 5x + 20 + 2x + \underline{\hspace{2cm}} \quad (1) \underline{\hspace{4cm}} \\
 &= 5x + 2x + 20 + \underline{\hspace{2cm}} \quad (2) \underline{\hspace{4cm}} \\
 &= 7x + 36
 \end{aligned}$$

20. A method for solving  $8(x - 1) - 2(x - 4) = 12$  is shown below. Identify the properties that justify the four indicated steps.

$$\begin{aligned}
 &8(x - 1) - 2(x - 4) = 12 \\
 &8x - 8 - 2x + 8 = 12 \quad (1) \underline{\hspace{4cm}} \\
 &8x - 2x - 8 + 8 = 12 \quad (2) \underline{\hspace{4cm}} \\
 &6x + - 8 + 8 = 12 \\
 &6x + 0 = 12 \quad (3) \underline{\hspace{4cm}} \\
 &6x = 12 \quad (4) \underline{\hspace{4cm}} \\
 &x = 2
 \end{aligned}$$

21. What property is illustrated by each example?

$$\begin{aligned}
 \text{a) } &(\star + \uparrow) \cdot \heartsuit = (\uparrow + \star) \cdot \heartsuit \quad \underline{\hspace{4cm}} \\
 \text{b) } &(\star + \uparrow) + \heartsuit = \star + (\uparrow + \heartsuit) \quad \underline{\hspace{4cm}}
 \end{aligned}$$



Name \_\_\_\_\_

Date \_\_\_\_\_

## Properties

1. What is the additive inverse of the expression  $a - b$  ?

- (1)  $a + b$
- (2)  $a - b$
- (3)  $-a + b$
- (4)  $-a - b$

2. Which equation illustrates the associative property?

- (1)  $x + y + z = x + y + z$
- (2)  $x(y + z) = xy + xz$
- (3)  $x + y + z = z + y + x$
- (4)  $(x + y) + z = x + (y + z)$

3. Which equation is an illustration of the additive identity property ?

- (1)  $x \cdot 1 = x$
- (2)  $x + 0 = x$
- (3)  $x - x = 0$
- (4)  $x \cdot \frac{1}{x} = 1$

4. Which property is illustrated by the equation  $6 + (4 + x) = 6 + (x + 4)$ ?

- (1) associative property of addition
- (2) associative property of multiplication
- (3) distributive property
- (4) commutative property of addition

5. Which illustrates the distributive property ?

- (1)  $\frac{1}{3} + \frac{1}{2} = \frac{1}{2} + \frac{1}{3}$
- (2)  $3.4 + 0 = 3.4$
- (3)  $(1.3 \times 0.07) \times 0.63 = 1.3 \times (0.07 \times 0.6)$
- (4)  $-3(5 + 7) = (-3)(5) + (-3)(7)$

6. Which expression must be added to  $3x - 7$  to equal 0?

- (1) 0
- (2)  $3x + 7$
- (3)  $-3x - 7$
- (4)  $-3x + 7$

7. Which equation illustrates the multiplicative identity property?

- (1)  $x + 0 = x$
- (2)  $x - x = 0$
- (3)  $x \cdot \frac{1}{x} = 1$
- (4)  $x \cdot 1 = x$

8. The additive inverse of  $\frac{1}{a}$  is

- (1)  $\frac{1}{a}$
- (2)  $-a$
- (3) 0
- (4)  $a$

9. Which property is represented by the statement  $\frac{1}{2}(6a + 4b) = 3a + 2b$  ?

- (1) commutative
- (2) distributive
- (3) associative
- (4) identity

10. Which equation illustrates the associative property?

- (1)  $a(1) = a$
- (2)  $a + b = b + a$
- (3)  $a(b + c) = (ab) + (ac)$
- (4)  $(a + b) + c = a + (b + c)$

11. If M and A represent integers,  $M + A = A + M$  is an example of which property?

- (1) commutative
- (2) associative
- (3) distributive
- (4) identity

12. The statement  $2 + 0 = 2$  is an example is which property?

- (1) associative
- (2) additive identity
- (3) additive inverse
- (4) distributive

13. The equation  $\star (\Delta + \Pi) \star \Delta + \star \Pi$  is an example of the

- (1) associative property
- (2) commutative property
- (3) distributive property
- (4) additive inverse property

14. Which equation illustrates the distributive property?

- (1)  $5(a + b) = 5a + 5b$
- (2)  $a + b = b + a$
- (3)  $a + (b + c) = (a + b) + c$
- (4)  $a + 0 = a$

15. Which equation illustrates the multiplicative inverse property?

- (1)  $1 \cdot x = x$
- (2)  $x \cdot \frac{1}{x} = 1$
- (3)  $1 \cdot 0 = 0$
- (4)  $-1 \cdot x = -x$

16. Which equation illustrates the additive inverse property?

- (1)  $6 + 2 = 2 + 6$
- (2)  $6(2) = 2(6)$
- (3)  $6 + (-6) = 0$
- (4)  $6 + 0 = 6$

17. The multiplicative inverse of  $\frac{1}{3}$  is

- (1)  $\frac{1}{3}$
- (2)  $-\frac{1}{3}$
- (3) 3
- (4) -3

18. A method for solving

$$5(x - 2) - 2(x - 5) = 9 \text{ is shown.}$$

Identify the property used to obtain the four indicated steps.

$$5(x - 2) - 2(x - 5) = 9$$

(1)  $5x - 10 - 2x + 10 = 9$  \_\_\_\_\_

(2)  $5x - 2x - 10 + 10 = 9$  \_\_\_\_\_

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

(3)  $3x + 0 = 9$  \_\_\_\_\_

(4)  $3x = 9$  \_\_\_\_\_

$$x = 3$$