



Algebra 1 Workbook

Operations

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MATH

IDENTIFYING MULTIPLICATION

■ 1. Give three different examples of how you can write “ a times b ” mathematically.

■ 2. Simplify the following expression.

$$5(2 \cdot 3) \times (1)(a)$$

■ 3. What number would make the expression true?

$$4 \times 3(1)(?? \cdot 1) = 24$$

■ 4. What term would make the expression true?

$$??(3 \cdot x) \times (5)(2) = 60x^2$$

■ 5. Why do we have different ways to write multiplication?

■ 6. If $(3)(x^2) = 10 \times 2$, what does $9x^2$ equal?



THE ASSOCIATIVE PROPERTY

- 1. Give an example of an expression that demonstrates the associative property with multiplication.
- 2. What are the two main operations that the associative property works for?
- 3. Using the associative property, rewrite and simplify $2 \times (3 \times 4)$.
- 4. According to the associative property, what number would make the most sense in the expression?

$$42 + (31 + 17) = (42 + ??) + 17$$

- 5. What does the word “associate” refer to in math?
- 6. Rearrange $(3 + 6) + 2$ using the associative property, then simplify.



■ 7. Give an example of an expression that demonstrates the associative property with addition.

■ 8. What number would make the following expression true?

$$(4 \times 2) \times 9 = ?? \times (2 \times 9)$$

■ 9. Give an example of an expression that does not demonstrate the associative property.



THE COMMUTATIVE PROPERTY

- 1. Using the commutative property, rewrite $6 + 19$ and then simplify.
- 2. Give an example of an expression that demonstrates the commutative property with multiplication.
- 3. According to the commutative property, what number would make the most sense in the expression?

$$11 + (23 + 6) = 11 + (6 + ??)$$

- 4. Using the commutative property, rewrite 3×4 and then simplify.
- 5. Rearrange $(3 + 6) + 2$ using the commutative property and then the associative property.
- 6. Give an example of an expression that demonstrates the commutative property with addition.



- 7. What number would make the following expression true?

$$(4 \times 2) \times 9 = (?? \times 9) \times 4$$

- 8. What are the two main operations that the commutative property works for?



THE TRANSITIVE PROPERTY

- 1. If $AB = CD$ and $CD = EF$ then what is the value of EF ?
- 2. If $x = 2$ and $y = x$, then what does the transitive property tell us?
- 3. According to the transitive property, if $x = 2y$ and $2y = 5z$, then what is the value of x ?
- 4. Give an example that demonstrates the transitive property.
- 5. Use the transitive property to solve for z .

$$x = y$$

$$y = 3 - z$$

$$x = -2z + 7$$

- 6. Transitive comes from the word “transit,” which means, to what?



■ 7. By the transitive property, what expression would make the following statement true?

If $2 + 3 = ??$ and $4 + 1 = 5$, then $2 + 3 = 5$.

■ 8. Use the transitive property to solve for x .

$$y = 2x + 3$$

$$y = z$$

$$z = 5x - 9$$

■ 9. According to the transitive property, what expression would make the most sense in the following statement?

If $x = 2y$ and $2y = ??$, then $x = 5z$.



THE DISTRIBUTIVE PROPERTY

- 1. Use the distributive property to solve for x .

$$5(x - 2) = \frac{1}{2}(6 - 2x)$$

- 2. Use the distributive property to expand the expression.

$$-\frac{2}{5}(10 - 5x)$$

- 3. Give an example that demonstrates the distributive property with subtraction.

- 4. What three main operations are used in the distributive property?

- 5. What does distributing remove from the expression?

- 6. Use the distributive property to solve for x .

$$2(5 - 3x) = x - 4$$



■ 7. What value would make the following expression true?

$$2(x + 3) = ?? + 6$$



THE DISTRIBUTIVE PROPERTY WITH FRACTIONS

- 1. Perform the indicated operation and then simplify.

$$\frac{4y^3z^2}{3x} \times \frac{x^2y}{2z^2}$$

- 2. Use the distributive property to expand the expression.

$$-\frac{x^2z}{y^3} \left(\frac{y^2}{2} - \frac{xz^3}{z^2} \right)$$

- 3. Fill in the blank with the correct words: When we are distributing fractions, we multiply the outside numerator with the _____ of the terms inside the parentheses and the outside denominator with the _____ of the inside terms.

- 4. Use the distributive property to solve for x .

$$-\frac{3xy^2}{z} \left(\frac{2z}{3y^2} - z \right) = 3(3 + xy^2)$$

- 5. Use the distributive property to show that $x = -10$.



$$\frac{2}{3} \left(\frac{x}{2} - 6 \right) = 4 \left(\frac{x}{3} + \frac{3}{2} \right)$$

- 6. Explain why the two sides of the equation aren't equal to one another.

$$\frac{3}{2} \left(\frac{x}{5} - \frac{y}{2} \right) \neq \frac{3x}{10} - \frac{y}{2}$$

- 7. What term would make the following expression true?

$$\frac{2ab}{c^2} \left(\frac{3ac}{b} + a^2c^2 \right) = \frac{6a^2}{c} + ??$$

- 8. What term would make the following expression true?

$$\frac{??}{??} \left(\frac{2x}{z} + y^2 \right) = \frac{2x^3}{3z^2} + \frac{x^2y^2}{3z}$$



THE DISTRIBUTIVE PROPERTY AND BINOMIAL MULTIPLICATION

- 1. Perform the indicated operation and simplify.

$$(x - 1)(x + 4)$$

- 2. How many terms does a binomial have?

- 3. Use the distributive property to expand the expression.

$$4(2 - x)(3 + 2x)$$

- 4. What term would make the following expression true?

$$(2x + 1)(5 - x) = ?? + 10x - x + 5$$

- 5. Use the distributive property to show that $x = 3$.

$$2(x - 1)(x + 1) = 2x^2 + x - 5$$

- 6. Explain why $(x - 2)(x + 1) \neq x^2 - 2$.



- 7. Use the distributive property to expand the expression.

$$\frac{1}{2}(6x + 4)(x - 1)$$

- 8. What term would make the following expression true?

$$(3 + x)(??) = 3x + 3 + x^2 + x$$



GROUPING SYMBOLS WITH PEMDAS AND ORDER OF OPERATIONS

- 1. Write the expression with parentheses.

$$\frac{a}{b + c}$$

- 2. Simplify the expression.

$$2([3 + 1] - 4) - [6 + 3]$$

- 3. Put in grouping symbols that will make the equation true.

$$2x + 1 / 3 + 5x - 2 = \frac{2(x + 1)}{3 + 5x - 10}$$

- 4. Simplify the expression.

$$|2(1 - 4)| - (2 - 5)[(-1)(3 + 2) + 9]$$

- 5. What number would make the expression true?

$$(3 + 1)[2(?? - 5) + 7] - |(4 - 6)| = 4[-2 + 7] - |-2|$$



■ 6. Give three different examples of a grouping symbol.

■ 7. Rewrite the following as a fraction.

$$[2(x + 1) - 3]/[5x - 3(4x)]$$

■ 8. Simplify the following expression.

$$\sqrt{2(5 - 3)} - |3[6 - 7]|$$

■ 9. Using PEMDAS, evaluate each expression separately to show that they are not equal.

$$4 \times (3 - 1) - (4 \div 2 + 2) \text{ and } (4 \times 3 - 1) - 4 \div (2 + 2)$$

■ 10. Use the order of operations to simplify the expression.

$$\left(10 - [(-1)^2 + 1 - 6 \div 6]\right)^{1/2} + 4 \div 2$$

■ 11. What do the letters in PEMDAS stand for?



- 12. What number would make the equation true?

$$2^2 + 4 \cdot [(2 - ??) \div |-4|] = 4 + 4 \cdot [1 \div 4]$$

- 13. Use the order of operations to simplify the expression.

$$3 - [(-2)^2x + (3 - 7)]$$

- 14. Using the order of operations, explain why $9 + 6 \div 3 \neq 5$.

- 15. Put symbols of inclusion that make the equation true.

$$4 - 5 \cdot 3x + (-1)^2 = 4 - 15x - 5$$

- 16. What operations must be performed before multiplication and division?

- 17. Using the order of operations, explain why $\sqrt{(2 + 7)} \neq \sqrt{2} + \sqrt{7}$.

- 18. Simplify this expression.

$$3\{2[4 + 3(7 - 5) - 4]\}$$



- 19. Use the order of operations to simplify the expression.

$$3 + 2(x + 1)$$

- 20. Use order of operations to simplify the expression.

$$\frac{-2 + 3 - 10 \cdot 2 \cdot [(5 - 4) + 2]}{2}$$



UNDERSTOOD 1

■ 1. What is $x + 4x + x + x$?

■ 2. What happens when you multiply something by 1?

■ 3. Simplify the following expression.

$$\frac{1x^1}{1(1^1)} + \frac{1}{1(1x)} - 1^1$$

■ 4. What number would make the expression true?

$$1(2^1) - \frac{1}{1(1)^1} + \frac{??^1}{1 \times 1} = 4$$

■ 5. Simplify the following expression.

$$x(x^2 + 3x^2) - x^3$$

■ 6. Simplify the following expression.



$$\frac{x^1}{4x^3} + \frac{5x^4}{1x}$$

■ 7. Give an example of an expression where it would be useful to write out the understood 1.

■ 8. Simplify the following expression.

$$\frac{x}{1^1} \cdot \frac{x^2 + 1(1)}{5x^2}$$



