

Name _____

Unit 6: Properties & Algebraic Expressions

Tentative Quiz Date: _____

Tentative Test Date: _____

Day	In Class	Homework
1	Introduction to Expressions Matching Activity	Intro to Expressions Wkst
2	Grouping Symbols and Less Than	Writing Expressions Wkst
3	Properties of Math Identifying Properties Wkst	Working with Properties Wkst
4	Evaluating Expressions	Evaluating Expressions Wkst
5	Combining Like Terms Practice Combining Like Terms	Simplifying Expressions #1 Wkst
6	Equivalent Expressions Identifying Equivalent Expressions	Generate Equivalent Expressions
7	Quiz	
8	Distributive Property using Area Model	Distributive Property w/ Area Models Wkst
9	Factoring Expressions Using GCF Factoring a Common Factor using Area	Distributive Property and Factoring Wkst
10	Expressions in the Real World	Writing and Evaluating Expressions Review
11	Sports Complex Project	Finish Project
12	Unit 6 Review	Study Guide
13	Study Guide	Study
14	UNIT 6 TEST	NO HW

*****Please note this is a tentative guide for the unit. Lessons and homework assignments are subject to change based on student understanding and performance.*****

Order of Operations:

P
 E
 M D (left to right)
 A S (left to right)

PEMDAS Practice:

1) $\frac{5+(12-3)}{2}$

2) $15 + 2^3$

3) $8 - 3 \times 2 + 7$

4) $36 \div (1 + 2)^2$

An _____ has numbers, symbols, and operators grouped together that show the value of something.

Ex:

We can use variables and expressions to solve problems.

A _____ is a letter or symbol that _____.

Ex: $8n \rightarrow n$ is a _____ that represents a number that we don't know

****When a number is written beside a variable, like $8n$, it means to MULTIPLY them****

A _____ expression contains one or more numbers and operations.

Ex:

An _____ expression contains at least one _____.

Ex:

A number on its own is called a _____. In the example $7n + 4$, the constant is _____.

Circle the constant in the following expressions:

1) $10 - 2y$

2) $4x + 3y + 9$

3) $4n + 2$

A _____ is a number used to multiply a variable. In the example $8n$, the variable is _____ and the coefficient is _____.

An _____ is a symbol that represents an operation.

Ex:

A _____ is either a single number or variable, or numbers and variables multiplied together.

Ex: $4x - 7$ $4x$ is a term -7 is a term

Expression	Variable(s)	Constant	Coefficient(s)	Terms	Operators
$4x - 7$					
$2y + 3x - 1$					
$15n + 9$					
$10 - y + 10x$					

Words for Operations

ADD	SUBTRACT
MULTIPLY	DIVIDE

Write as a numerical expression:

- 1) The product of ten and seven _____
- 2) The difference of nine and two _____
- 3) The total of eight and one _____

To represent an unknown number, we could use a _____.

Write an algebraic expression to represent each written expression:

- 1) The sum of ten and a number _____
- 2) The quotient of a number and twelve _____
- 3) Eleven decreased by five times a number _____

Class work: Expressions

Directions: Match the written expressions in the column A with the algebraic expressions in column B.

COLUMN A

COLUMN B

The sum of a number and ten

The product of ten and a number increased by eight

The quotient of a number and eight

Eight less than twice a number

Ten divided by a number

Ten decreased by three times a number

The product of eight and a number

Eight increased by a number

A number decreased by ten

Ten more than twice a number

$$x - 10$$

$$x + 10$$

$$8x$$

$$10 \div x$$

$$10 - 3x$$

$$10 + 2x$$

$$10x + 8$$

$$8 + x$$

$$2x - 8$$

$$\frac{x}{8}$$

1) Write an algebraic expression for each written expression.

a) a number divided by seven plus ten

b) twice a number plus one-half

c) the difference between three and x

d) the product of three and number, minus eight

2) Think back to your class. Describe things that are similar and different between a numerical expression and algebraic expression.

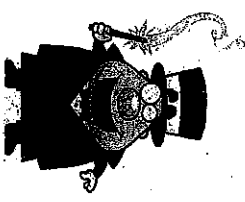
3) Hey it's me, Marvin. I have been showing you a couple new ways to write multiplication. The newest way is when a number is written next to a variable. A student forgot to write all the multiplication in these algebraic expressions the new way. Help the student by rewriting the multiplication using the new way.

a) $2 \times n$

b) $3 \cdot p$

c) $10 \cdot x - 3$

d) $\frac{t \times 3}{5}$



4) Write a written expression for each algebraic expression.

a) $x + 5$

b) $x \div 10 + 6$

c) $3x - 9$

5) Trina wrote a written expression for the algebraic expression $n + 10$.

Trina is right!!!
~~Trina wrote $n + 10$ for a number and ten.~~

Using Trina's expression above as an example, use the word *size* to describe the following algebraic expression.

a) $x + 5$

b) $h + 4$

c) $10 + t$

d) Use the word *difference* to describe the expression, $x - 5$

6) You can write algebraic expression to represent real world problem. Write an algebraic expression for each.

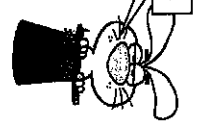
a) three pounds heavier than Adlai's weight

b) three dollars more than the cost of a ticket

c) half as many pieces of candy

d) two inches shorter than Kathryn's height

e) six centimeters shorter than the length of the pencil



Warm Up:

Grouping Symbols:

When a written expression has the words _____, _____, or quantity of, we use grouping symbols, or _____, when we write it as an algebraic expression. These phrases signify that we need to perform that operation FIRST in order of operations.

Practice:

- 1.
- 2.

The phrase _____ tells us that the number needs to be **SUBTRACTED FROM**. Ex: Five less than a number times four $\rightarrow 4n - 5$

More Practice:

1. Seven less than the difference of 9 and a number _____
2. Eight less than the product of a number and fifteen _____
3. The sum of a number and four less than ten _____
4. $3(5-n)$ _____
5. $(18+n) \div 3$ _____
6. Eleven less than the sum of a number and four _____
7. A number less than twelve _____

Written to Algebraic:

1. seven less than two times a number _____
2. the difference of a number and 9 divided by 4 _____
3. the sum of a number and 6, times 3 _____
4. nine more than the product of 2 and a number _____

Algebraic to Written (use the phrase "less than" when possible)

1. $2n + 8$ _____
2. $2(n+3) - 5$ _____
3. $n - 10$ _____
4. $10 - n$ _____

Name _____

Date _____

MA_EquationsExpressions_Lesson04_Homework

1. Write two written expressions for each algebraic expression.

a) $4x + 9$

b) $2(x+5)$

c) $x - 6$

2. Write an algebraic expression for the given written expression.

a) a number less than fifteen

b) three times the difference of a number and seven

c.) ten times the sum of a number and eleven

3. (Review) Indicate with math symbols what operations are being described by the given word(s).
Use +, -, •, ÷ symbols.

1. sum _____

2. product _____

3. decreased by _____

4. quotient _____

5. increased by _____

6. difference _____

7. more than _____

8. less than _____

9. twice something _____

4. The written expression "the sum of a number and two, divided by nine" can be written two ways.
Write two algebraic expressions for this written expression. Hint: One is using a fraction bar.

5. Match the written expressions with the correct algebraic expression.

A) Four times the difference of a number and two

B) The sum of a number and three times five

C) Two less than the product of four and a number

D) The product of five and number increased by three

Algebraic Expression

$$5(p + 3)$$

$$5p + 3$$

$$4p - 2$$

$$4(p - 2)$$

Testing

Properties of math Notes

Property	Example	Additional Notes
Commutative Property of _____		
Commutative Property of _____		
Identity Property of _____		
Identity Property of _____		
Associative Property of _____		
Associative Property of _____		
Zero Property of _____		
Distributive Property		The distributive property helps to multiply a single term and two or more terms inside parentheses.

Practice

- a) $10(a+7) =$ _____
- b) $x(3+10) =$ _____
- c) $2(x+10) =$ _____
- d) $7(x+3) =$ _____
- e) $a(10+9) =$ _____
- f) $3x(x+10) =$ _____

• Additive Inverse: Any number plus its opposite equals zero.
 ex: $2 + -2 = 0$

• Multiplicative Inverse: Any number multiplied by its reciprocal equals 1.
 ex: $2 \times \frac{1}{2} = 1$



Instructions: Determine which property of multiplication is shown (Identity, Associative, Distributive or Commutative).

Answers

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

12. _____

13. _____

14. _____

15. _____

16. _____

17. _____

18. _____

19. _____

20. _____

1) $2 \times (8 \times 3) = (2 \times 8) \times 3$

2) $5 \times 1 = 5$

3) $3 \times 5 = 5 \times 3$

4) $7 \times (2 + 9) = (7 \times 2) + (7 \times 9)$

5) $9 \times (3 \times 4) = (9 \times 3) \times 4$

6) $6 \times 3 = 3 \times 6$

7) $9 \times 1 = 9$

8) $2 \times (5 + 3) = (2 \times 5) + (2 \times 3)$

9) $6 \times (3 \times 4) = (6 \times 3) \times 4$

10) $8 \times 3 = 3 \times 8$

11) $3 \times (7 + 6) = (3 \times 7) + (3 \times 6)$

12) $4 \times 2 = 2 \times 4$

13) $5 \times 1 = 5$

14) $4 \times (3 \times 8) = (4 \times 3) \times 8$

15) $6 \times 4 = 4 \times 6$

16) $8 \times (3 \times 7) = (8 \times 3) \times 7$

17) $7 \times (6 \times 9) = (7 \times 6) \times 9$

18) $3 \times (9 + 5) = (3 \times 9) + (3 \times 5)$

19) $7 \times 3 = 3 \times 7$

20) $6 \times 2 = 2 \times 6$

Teacher : _____ Date : _____

Working with the Properties of Mathematics

- 1) Which is an example of Associative Property of Addition ?
 A. $2 + 0 = 2$
 B. $8 + 6 = 6 + 8$
 C. $3 + (-3) = 0$
 D. $(6 + 7) + 5 = 6 + (7 + 5)$
- 2) Which equation shows the Identity Property of Multiplication ?
 A. $a(b + c) = ab + ac$
 B. $(a + b) + 3 = a + (3 + b)$
 C. $a \times 1$
 D. $a + a + a = 3 \times a$
- 3) Which property of addition is used in the following ? $(5 + 9) + 2 = 5 + (9 + 2)$
 A. Distributive Property
 B. Commutative Property
 C. Associative Property
 D. Identity Property
- 4) Which property is used in the following expression ? $(3 \times 2) \times 4 = 2 \times (4 \times 3)$
 A. Distributive Property of Multiplication
 B. Commutative Property of Addition
 C. Associative Property of Addition
 D. Associative Property of Multiplication
- 5) Which property is used in the following ? $6 \times (3 + 7) = 6 \times 3 + 6 \times 7$
 A. None of the above
 B. Associative Property
 C. Commutative Property
 D. Distributive Property
- 6) Which of the following does not show the Commutative Property ?
 A. $xy - 7 = xy$
 B. $yx = xy$
 C. $3 + y = y + 3$
 D. $x + y = y + x$
- 7) The value of any nonzero number will be changed by _____
 A. adding zero
 B. multiplying by one
 C. dividing by one
 D. multiplying by zero
- 8) Which of the following does not show the Commutative Property of Addition ?
 A. $3x + 4y = 4y + 3x$
 B. $a + b = b + a$
 C. $ab = ba$
 D. $7 + x = x + 7$
- 9) Which equation shows the Commutative Property of Multiplication ?
 A. $2 \times 6 - 7 \times 6 = (2 - 7) \times 9$
 B. $8 \times 4 = 4 \times 8$
 C. $9 \times 3 = 9 + 9 + 9$
 D. $3 \times 1 = 3$
- Which property would you use to simplify the following expression ? $8(y + 9)$
 A. Distributive Property
 B. Associative Property
 C. Multiplication Property of Zero
 D. Commutative Property

Homework

Teacher : _____ Date : _____

Working with the Properties of Mathematics

- 11) Simplify this expression : $5(y + z)$
 A. $5y + z$
 B. $5z + y$
 C. $5yz$
 D. $5y + 5z$
- 12) Which property is used in the following expression ? $7(6 + 5) = 42 + 35$
 A. Associative Property of Addition
 B. Distributive Property
 C. Associative Property of Multiplication
 D. Commutative Property of Addition
- 13) Which operation will not change the value of any nonzero number ?
 A. Adding One
 B. Multiplying by One
 C. Dividing by Zero
 D. Multiplying by Zero
- 14) Which Property of Multiplication is shown ? $(2 + 4) \times 8 = 2 \times 8 + 4 \times 8$
 A. Identity Property
 B. Associative Property
 C. Distributive Property
 D. Commutative Property
- 15) Which is an example of Identity Property of Addition ?
 A. $2 + 9 = 9 + 2$
 B. $4 + 0 = 4$
 C. $5 \times 1 = 5$
 D. $(9 + 3) + 6 = 9 + (3 + 6)$
- 16) Which of the following is an example of Commutative Property of Addition ?
 A. $3 + 9 = 2 + 3$
 B. $4 \times 1 = 4$
 C. $8 + 6 = 6 + 8$
 D. $(6 + 7) + 5 = 6 + (7 + 5)$
- 17) Which Property of Addition does $4 + 0 = 4$ illustrate ?
 A. Identity Property
 B. Zero Property
 C. Distributive Property
 D. Commutative Property
- 18) Which equation shows the Zero Property of Multiplication ?
 A. $3 \times 2 = 2 \times 3$
 B. $5 \times 0 = 0$
 C. $7 + 7 + 7 = 3 \times 7$
 D. $8 \times 1 = 8$
- 19) Which property is used in the following expression ? $(a \times b) \times c = a \times (b \times c)$
 A. Associative Property of Addition
 B. Associative Property of Multiplication
 C. Commutative Property of Addition
 D. Distributive Property

Homework

Evaluating Expressions Guided Notes

Warm Up:

Review

Write an algebraic expression to match each written expression:

1. seven less than two times a number _____
2. the difference of a number and 9 divided by 4 _____
3. the sum of a number and 6, times 3 _____
4. nine more than the product of 2 and a number _____

To _____ an expression means to _____

In order to evaluate an expression, we use _____

*****Remember to follow order of operations*****

You try:

z	$z \div 5 + 4^2$
20	
45	
60	

1) $5(x + 2)$; $x = 4$

2) $x + y - 1$; $x = 12$ and $y = 4$

3) $2a^2 + a$; $a = 8$

4) xy^2 ; $x = 8$ and $y = 6$

5) $3x + 4y$; $x = 4$ and $y = 5$

6) $2.5 - n$; $n = 1.8$

PRACTICE

Evaluate each expression for the given value(s) of the variable(s).

1. $x - 7$; $x = 23$ _____

2. $3r$; $r = 6$ _____

3. $\frac{8}{t}$; $t = 4$ _____

4. $9 + m$; $m = 1.5$ _____

5. $p - 2$; $p = 19$ _____

6. $3h$; $h = \frac{1}{6}$ _____

7. $2.5 - n$; $n = 1.8$ _____

8. k^2 ; $k = 4$ _____

9. $4(b - 4)$; $b = 5$ _____

10. $38 - \frac{x}{2}$; $x = 12$ _____

11. $\frac{30}{d} - 2$; $d = 6$ _____

12. $x^2 - 34$; $x = 10$ _____

13. $\frac{1}{2}w + 2$; $w = \frac{1}{9}$ _____

14. $5(6.2 + z)$; $z = 3.8$ _____

15. $2a^2 + a$; $a = 8$ _____

16. $7y + 32$; $y = 9$ _____

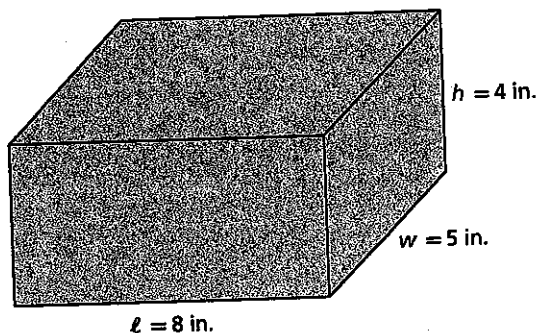
17. xy ; $x = 8$ and $y = 6$ _____

18. $x + y - 1$; $x = 12$ and $y = 4$ _____

19. $3x + 4y$; $x = 4$ and $y = 5$ _____

20. $4x + 1 + 3y$; $x = 6$ and $y = 8$ _____

21. The expression lwh gives the volume of a rectangular prism with length l , width w , and height h . Find the volume of the rectangular prism. _____ in^3



22. The expression $1.8c + 32$ gives the temperature in degrees Fahrenheit for a given temperature in degrees Celsius c . Find the temperature in degrees Fahrenheit that is equivalent to 30°C . _____ $^\circ\text{F}$

23. **Error Analysis** Marjorie evaluated the expression $3x + 2$ for $x = 5$ as shown:

$$3x + 2 = 35 + 2 = 37$$

What was Marjorie's mistake? What is the correct value of $3x + 2$ for $x = 5$?

Notes on Combining Like Terms

Like terms are terms that have the SAME _____ AND _____.

<p>1. To add or subtract, you <i>must have</i> like terms. With like terms, only add or subtract the coefficient.</p>	<p>Notes:</p>
<p>Example: $2z + 4z + 3z = 9z$ Example: $5r - 2r = 3r$</p>	<p>Additional Examples:</p>
<p>2. To multiply or divide, you <i>don't need</i> like terms.</p>	<p>Notes:</p>
<p>Examples: $5(2z) = 10z$ $12(3a) = 36a$</p>	<p>Additional Examples:</p>
<p>3. As always, follow the Order of Operations. Use Math Properties to work your way through Order of Operations.</p>	<p>Notes:</p>
<p>Example:</p> <p>Simplify: $4(x + 2) + 5(x + 3)$</p> <ol style="list-style-type: none">1. Distribute: $4x + 8 + 5x + 15$2. Commutative of Addition: $4x + 5x + 8 + 15$3. Combine Like Terms: $9x + 23$4. Therefore: $4(x + 2) + 5(x + 3) = 9x + 23$ <p>You try:</p> <p>Simplify: $3(x + y) + 7(2x + 3y)$</p>	<p>Additional Examples and Notes:</p>

Practice Combining Like Terms

* Remember - like terms have the same variable and power →

$$1) \boxed{14b} + \boxed{6b} + 8 \quad \underline{20b + 8}$$
$$20b + 8$$

$$2) 9x + 4y + 2x + y \quad \underline{\hspace{2cm}}$$

$$3) 8(x+y) + 5x \quad \underline{\hspace{2cm}}$$

$$4) 23x - 10x + 6y - 4y \quad \underline{\hspace{2cm}}$$

$$5) 20y + 7 + 4y \quad \underline{\hspace{2cm}}$$

$$6) 8n + 12 + 5 \quad \underline{\hspace{2cm}}$$

$$7) 4x + x^2 + 12 - 4 - 2x \quad \underline{\hspace{2cm}}$$

$$8) 8k^2 + 4k + 3k^3 + k^2 - k + 5 \quad \underline{\hspace{2cm}}$$

$$9) 13a - 8a + 8 + 9b - 4b + b^2 \quad \underline{\hspace{2cm}}$$

$$10) 2x(x+5) - 3x \quad \underline{\hspace{2cm}}$$

Name _____

SIMPLIFYING EXPRESSIONS #1

Directions: For each expression below, simplify the expression by combining *like terms*. Any two terms can be added/subtracted as long as they contain the same variable(s) and the same exponents. Terms that have different variables or exponents must be kept separated. Write the simplified expression on the line provided.

Examples: $5x + 2y + 8x = \underline{13x + 2y}$ $5x^2 + 2y + 8x + 2x^2 = \underline{7x^2 + 8x + 2y}$

1) $10x + 3y + 5x =$ _____

2) $2x^2 + 7y + 4x + 6x^2 =$ _____

3) $9y + 3y + 5x =$ _____

4) $2y^2 + 7y + 4y + 6y^2 =$ _____

5) $8x + y - 2x =$ _____

6) $x^2 + 7y - 4y + 9x^2 =$ _____

7) $14x - 3x + 2y - y + 3x =$ _____

8) $5y^2 + 5y + 5y + 5x^2 =$ _____

9) $23x + 3y - 5x =$ _____

10) $18x^2 + 3y + x + 6x^2 =$ _____

Generating Equivalent Expressions

Use properties of operations to determine whether the expressions are equivalent.

1. $2x + 13 + 15x$ and $17x + 13$

2. $5 \times 7n$ and $35n$

3. $10 + 8y - 3y$ and $18 - 3y$

4. $(9w + 0) - 12$ and $9w - 12$

5. $11(p + q)$ and $11p + (7q + 4q)$

6. $6(4b + 3d)$ and $24b + 3d$

7. $14m + 9 - 6m$ and $8m + 9$

8. $(y \times 1) + 2$ and $y + 2$

9. $4 + 5(6r + 1)$ and $9 + 30r$

10. $9x + 0 + 10x$ and $19x + 1$

11. $12c - 3c$ and $3(4c - 1)$

12. $6a \times 4$ and $24a$

MIXED APPLICATIONS

13. Rachel needs to write 3 book reports with b pages and 3 science reports with s pages during the school year. Write an algebraic expression for the total number of pages Rachel will need to write.

14. Rachel's friend Yasir has to write $3(b + s)$ pages for reports. Use properties of operations to determine whether this expression is equivalent to the expression for the number of pages Rachel has to write.

Generate Equivalent Expressions

Use properties of operations and combining like terms to write an expression equivalent to each of these expressions.

1. $7n - 3n$

2. $5x + 7 + 2x$

3. $16 + 13p - 9p$

4. $y^2 + 13y - 8y$

5. $5(2h + 3) + 3h$

6. $12 + 18n + 7 - 14n$

Use the Distributive Property to write equivalent expressions.

7. $2(9 + 5k)$

8. $5(3m + 2)$

9. $6(g + h)$

10. $4j + 8$

11. $21p + 35q$

12. $18x + 9y$

MIXED APPLICATIONS

13. The expression $15n + 12n + 100$ represents the total cost in dollars for skis, boots, and a lesson for n skiers. Simplify the expression $15n + 12n + 100$. Then find the total cost for 8 skiers.

14. Casey has n nickels. Megan has 4 times as many nickels as Casey has. Write an expression for the total number of nickels Casey and Megan have. Then simplify the expression.

The Distributive Property with Area Models

Directions: To show the distributive property (for all numbers a , b , and c , $a(b + c) = ab + ac$), we can use an area model to help us.

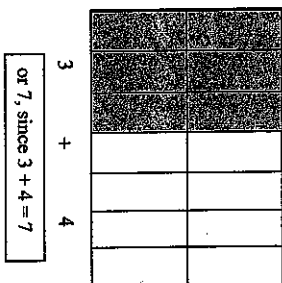
Section 1: Example: $2(3 + 4)$

- A. First, split your big box into the number of sections outside the parentheses (2 sections).
- B. Second, split the other side of the big box up into the number of sections in the parentheses (ex: for 3 and 4, we need to split the box into $3 + 4 = 7$ sections).
- C. Our answer is the total area or total number of little boxes we have, and that shows us that the Distributive Property works

$2(3 + 4) = 2(3) + 2(4)$
 and that $2(7) = 6 + 8$ because we have 14 little

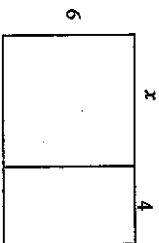
$14 = 14$

boxes when we split our big box up into the appropriate number of little boxes, which is $2(7)$ or $2(3) + 2(4)$.

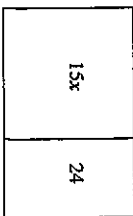


Section 3: Use the distributive property to represent the area model.

1.



4.

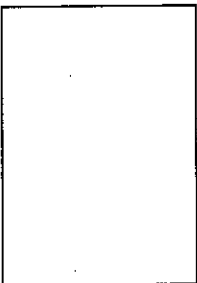


Section 2: Use an area model to show the Distributive Property for the following numbers.

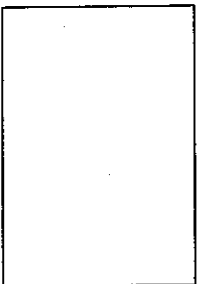
1. $5(2 + 1) =$



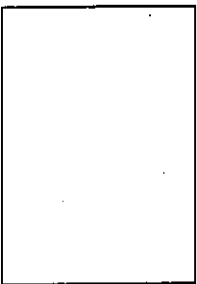
3. $4(5 + 3) =$



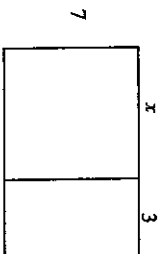
4. $6(2 + 5) =$



2. $3(4 + 7) =$

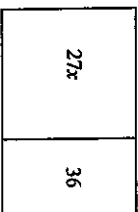


2.

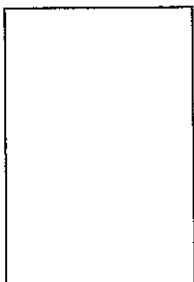


Find the GCF to create an equivalent expression.

3.



5. $3(6 + 2) =$ _____



Factoring a Common Factor Using Area

NAME _____

Fill in the missing information for each: dimensions, area as product, and area as sum

<p>1.</p> <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;">x</td> <td style="width: 50px; text-align: center;">6</td> </tr> <tr> <td style="width: 50px; text-align: center;">2</td> <td style="width: 50px; text-align: center;">2</td> </tr> <tr> <td style="width: 50px; height: 40px; text-align: center;"><input type="text"/></td> <td style="width: 50px; height: 40px; text-align: center;"><input type="text"/></td> </tr> </table> <p>_____</p> <p>_____</p>	x	6	2	2	<input type="text"/>	<input type="text"/>	<p>2.</p> <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;"><input type="text"/></td> <td style="width: 50px; text-align: center;"><input type="text"/></td> </tr> <tr> <td style="width: 50px; text-align: center;">5</td> <td style="width: 50px; text-align: center;">20</td> </tr> <tr> <td style="width: 50px; height: 40px; text-align: center;">$5x$</td> <td style="width: 50px; height: 40px; text-align: center;">20</td> </tr> </table> <p>_____</p> <p>_____</p>	<input type="text"/>	<input type="text"/>	5	20	$5x$	20	<p>3.</p> <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;"><input type="text"/></td> <td style="width: 50px; text-align: center;">8</td> </tr> <tr> <td style="width: 50px; text-align: center;"><input type="text"/></td> <td style="width: 50px; text-align: center;">48</td> </tr> <tr> <td style="width: 50px; height: 40px; text-align: center;">$6x$</td> <td style="width: 50px; height: 40px; text-align: center;">48</td> </tr> </table> <p>_____</p> <p>_____</p>	<input type="text"/>	8	<input type="text"/>	48	$6x$	48	<p>4.</p> <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;">x</td> <td style="width: 50px; text-align: center;"><input type="text"/></td> </tr> <tr> <td style="width: 50px; text-align: center;"><input type="text"/></td> <td style="width: 50px; text-align: center;">30</td> </tr> <tr> <td style="width: 50px; height: 40px; text-align: center;">$10x$</td> <td style="width: 50px; height: 40px; text-align: center;">30</td> </tr> </table> <p>_____</p> <p>_____</p>	x	<input type="text"/>	<input type="text"/>	30	$10x$	30
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Fill in the missing dimensions from the expression given.

<p>5. $5x + 35 = 5(\quad)$</p> <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;"><input type="text"/></td> <td style="width: 50px; text-align: center;"><input type="text"/></td> </tr> <tr> <td style="width: 50px; text-align: center;"><input type="text"/></td> <td style="width: 50px; text-align: center;"><input type="text"/></td> </tr> <tr> <td style="width: 50px; height: 40px; text-align: center;"><input type="text"/></td> <td style="width: 50px; height: 40px; text-align: center;"><input type="text"/></td> </tr> </table>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<p>6. $2x + 12 = 2(\quad)$</p> <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;"><input type="text"/></td> <td style="width: 50px; text-align: center;"><input type="text"/></td> </tr> <tr> <td style="width: 50px; text-align: center;"><input type="text"/></td> <td style="width: 50px; text-align: center;"><input type="text"/></td> </tr> <tr> <td style="width: 50px; height: 40px; text-align: center;"><input type="text"/></td> <td style="width: 50px; height: 40px; text-align: center;"><input type="text"/></td> </tr> </table>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<p>7. $3x + 21 = (\quad)$</p> <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;"><input type="text"/></td> <td style="width: 50px; text-align: center;"><input type="text"/></td> </tr> <tr> <td style="width: 50px; text-align: center;"><input type="text"/></td> <td style="width: 50px; text-align: center;"><input type="text"/></td> </tr> <tr> <td style="width: 50px; height: 40px; text-align: center;"><input type="text"/></td> <td style="width: 50px; height: 40px; text-align: center;"><input type="text"/></td> </tr> </table>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
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<p>8. $7x + 21 = (\quad)$</p> <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;"><input type="text"/></td> <td style="width: 50px; text-align: center;"><input type="text"/></td> </tr> <tr> <td style="width: 50px; text-align: center;"><input type="text"/></td> <td style="width: 50px; text-align: center;"><input type="text"/></td> </tr> <tr> <td style="width: 50px; height: 40px; text-align: center;"><input type="text"/></td> <td style="width: 50px; height: 40px; text-align: center;"><input type="text"/></td> </tr> </table>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<p>9. $3x + 15 = 3(\quad)$</p> <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;"><input type="text"/></td> <td style="width: 50px; text-align: center;"><input type="text"/></td> </tr> <tr> <td style="width: 50px; text-align: center;"><input type="text"/></td> <td style="width: 50px; text-align: center;"><input type="text"/></td> </tr> <tr> <td style="width: 50px; height: 40px; text-align: center;"><input type="text"/></td> <td style="width: 50px; height: 40px; text-align: center;"><input type="text"/></td> </tr> </table>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<p>10. $5x + 45 = (\quad)$</p> <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="width: 50px; text-align: center;"><input type="text"/></td> <td style="width: 50px; text-align: center;"><input type="text"/></td> </tr> <tr> <td style="width: 50px; text-align: center;"><input type="text"/></td> <td style="width: 50px; text-align: center;"><input type="text"/></td> </tr> <tr> <td style="width: 50px; height: 40px; text-align: center;"><input type="text"/></td> <td style="width: 50px; height: 40px; text-align: center;"><input type="text"/></td> </tr> </table>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
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This process of writing a sum or difference as the product of factors is called **factoring**.

Factor these:

- | | |
|-----------------------|-----------------------|
| 11. $4x - 16 =$ _____ | 12. $7x - 35 =$ _____ |
| 13. $9x - 81 =$ _____ | 14. $4x + 18 =$ _____ |

Distributive Property and Factoring Worksheet

Use the distributive property to rewrite the expression.

1. $5(x + 3)$

2. $4(2 + m)$

3. $6(v + 4)$

4. $2(b - 5)$

5. $7(3 - n)$

6. $3(8n - 3m)$

7. $8(3t - 2g)$

8. $(2 + 3q)^4$

9. $(8 - 5n)^3$

10. $(12r + 7m)^2$

Use the GCF to rewrite the expression.

1. $48 + 6m$

2. $20r + 16z$

3. $14n + 12p$

4. $36 - 9z$

5. $24x - 18y$

6. $8x - 6t$

7. $21 + 14y$

8. $26p - 13h$

9. $6 - 9z$

10. $96g + 80f$

Expressions in the Real World

- To calculate the perimeter of a rectangle you add the length (l) and the width (w), then double the sum.
 - Write an expression to represent how to find the perimeter of a rectangle.
 - Use the expression to find the perimeter of a rectangle with a length of 15 and a width of 20.
- You are saving up for a new pair of shoes. Your aunt gives you \$45 to start, and each week following you save \$3.
 - Write an algebraic expression to represent this.
 - How much money would you have after 4 weeks?
 - How much would you have after 10 weeks?
- You earn 15h dollars for n lawns. How much would you make for mowing 8 yards? For mowing 12 yards?
- Use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length $s = 2$.

Writing and Evaluating Expressions Worksheet

Evaluate each expression using the values $m = 7$, $r = 8$, and $t = 2$.

1. $5m - 6$

2. $4m + t$

3. $\frac{r}{t}$

4. mt

5. $5t + 2m$

6. rm

7. $3m - 5t$

8. $\frac{mr}{t}$

Write a word phrase for each algebraic expression.

10. $n + 16$

11. $3 \cdot 2n$

12. $25 \cdot 6 - n$

13. $\frac{n}{24}$

14. $\frac{24}{n}$

15. $n - 15$

Write an algebraic expression for each word phrase.

16. 12 more than m machines

17. six times the daily amount of fiber f in your diet

18. your aunt's age a minus 25

19. the total number of seashells s divided by 10

20. 9 less than k

21. m divided by 6

22. twice x

23. 4 more than twice x

24. For a walk-a-thon a sponsor committed to give you a flat fee of \$5 plus \$2 for every mile m you walk.

a. Write an expression for the total amount you will collect from your sponsor at the end of the walk-a-thon.

b. Then evaluate your expression for 20 miles walked.

25. You and four friends plan a surprise party. Each of you contributes the same amount of money m for food.

a. Write an algebraic expression for the total amount of money contributed for food.

b. Evaluate your expression if each person contributed \$5.25.

26. A cell phone company charges \$40 per month plus a \$35 activation fee.

a. Write an expression for the total cost for m months.

b. Then evaluate your expression for 10 months of service.

Sports Complex Project

The sports complex on Wendover Road in Charlotte, North Carolina is not making enough money this year from concession stand sales to keep the complex open the last two months of this year's sports season.

The committee overseeing the sports complex projects a \$1,000 shortfall in funds to pay for lights, grass cutting, and maintenance. In other words, the complex needs to raise \$1,000 or it will have to shut down.

After much debate, the sports complex committee has decided to hold a carnival to raise the money. The committee needed to decide on one of the following options to raise the money.

- Option 1: \$1.00 admission to the carnival and \$.25 per game ticket. All concessions will cost \$1.00.
- Option 2: No admission to the carnival and \$.50 per game ticket. All concessions will cost \$1.25

Which of these two options is the best to help raise enough money to avoid charging admission to everyone who uses the sports complex?

Facts needed to solve the problem:

- At last year's event, a total of 500 game tickets were sold
- The committee expects between 200-400 people to attend the carnival.
- The committee expects that each person that attends will buy at least one concession.

Which of the two options will raise the most money for the sports complex?

Requirements:

Math to support your answer.

One paragraph about Option 1

One paragraph about Option 2

One paragraph choosing which option you believe is best and justification for your answer.

1. A carpenter needs to determine the total cost of building a new deck. His only expenses will be for the materials (boards and nails). The total cost of the boards he will need is \$200. The nails he will use cost \$0.10 each, and he will use 8 nails for each board. If b represents the number of boards the carpenter will use, which expression represents the total cost of the materials needed to build the deck?

2. Write an expression that represents x less than 5 times y ?

3. Which is the algebraic expression for "two times the sum of a number n and 24"?

- A. $(n + 24)^2$ B. $n + 24 \times 2$ C. $2(n + 24)$ D. $2n + 24$

4. Write an expression that is equivalent to a number, r , subtracted from 10?

5. What are the terms in the expression $3x^2 + 5x - 2$?

6. Which of the following terms describes the 2 in the expression $2x + 5$?

- A. term B. variable C. coefficient D. constant term

7. Which number is the coefficient in $4y + 7 = 15$?

8. The equation below can be used to calculate s , the service charge for cashing n checks.

$$0.10n = s$$

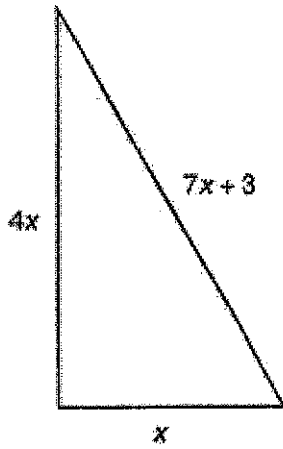
Using the equation provided, what should be the service charge for cashing 23 checks?

9. The workers at a construction site needed to determine a , the amount of concrete needed to pour a foundation at a job site when s , the amount per square foot, is known. They used this equation to help them.

$$a = (20 \cdot 14) \cdot s$$

What is the value of a in the equation when s is equal to 3 cubic feet?

10. In the triangle shown below, the side lengths are given in terms of x .



What is the length of the longest side of the triangle when $x = 8$?

12. The function $A = 6e^2$ gives the surface area A of a cube with edge length e . Using this function, what is the surface area of a cube with an edge length of 5 inches?

13. Which equation is true?

A. $5 \times 9 = (3 + 9) \times (2 + 9)$

B. $5 \times 9 = (5 \times 9) + (5 \times 9)$

C. $5 \times 9 = (3 \times 6) + (2 \times 3)$

D. $5 \times 9 = (5 \times 6) + (5 \times 3)$

14. Which expression is equivalent to $4(2s + 3t + 2)$?

A. $2s + 3t + 8$

B. $6s + 7t + 6$

C. $8s + 3t + 2$

D. $8s + 12t + 8$

18. Which expression is equivalent to $10n + 81 - 4n - 9$?

- A. $6n + 90$
- B. $14n + 72$
- C. $6n + 72$
- D. $14n + 90$

19. Which expression is NOT equivalent to $2m^3 + 4$?

- A. $4 + 2m^3$
- B. $3m^2 + 4$
- C. $2(m^3 + 2)$
- D. $m^3 + m^3 + 3 + 1$

20. Which two expressions are equivalent?

- A. $5x - 5$ and $5(x - 5)$
- B. $5(x - 5)$ and $5x - 25$
- C. $5x - 1$ and $5(x - 5)$
- D. $5x(x - 1)$ and $5x - 5$

21. Which expression is equivalent to $5(n - 9)$?

- A. $5n - 45$
- B. $5n + 45$
- C. $5n - 9$
- D. $5n + 9$

Expressions

Vocab: Constant, Coefficient, Variable, Operator, Term

Combining Like Terms, Written expressions <---> algebraic expressions, Properties of Math, equivalent expressions, substitution, Order of Operations

Complete each sentence using a word from the word bank.

- | | | | |
|-------------------------------------|-----------------------------|----------------------------------|-----------------------------|
| Distributive property | Variable | Coefficient | Associative Property |
| Inverse property of addition | Commutative Property | Inverse property of mult. | |

- A(n) _____ is a symbol or letter that represents an unknown value/number.
- The _____ is true because the order of the numbers does not change the sum or product.
- In the _____ the product of number "n" times a sum is equal to the products of "n" and each addend. $N(4 + 2) = 4n + 2n = 6n$
- $(-x) + x$ is an example of _____
- A(n) _____ is a mathematical sentence with more than one solution.
- _____ states that grouping does not change the sum or product.
- When you multiply a number times its inverse, the product is always _____ because of _____.

Simplify by combining like terms

- | | |
|-------------------------------|----------------------------|
| 1. $10y + 3 - 2y$ | 2. $19m + 23n + m - 3n$ |
| 3. $18 + 2(x-5) + 20x \div 4$ | 4. $n(5n + 2) + n + 10n^2$ |

Evaluate if $x = 2$ and $y = 5$

- | | | |
|---------------|---------------|-------------------|
| 1) $2x^3 + y$ | 2) $(x + 3)y$ | 3) $3(x + 4) - y$ |
|---------------|---------------|-------------------|

Write an algebraic expression for each of the following.

- | | |
|----------------------------------|---|
| 1. Twice a number decreased by 9 | 2. Four less than the sum of a number and 2 |
|----------------------------------|---|

3. The quotient of a number and six, decreased by ten

Write a written expression for each algebraic expression (Hint: If there are parenthesis, you need to say something to indicate that)

1. $(x + 12)^2$
2. $4(x - 2)$
3. $6 + x/4$

Identify the sets of equivalent expressions by circling them. If the expression is not equivalent, explain why.

1. $5(x-1)$ and $5x - 1$
2. xy and yx
3. $4(x + 7) + 2x$ and $6x + 28$
4. $3t(t + 3)$ and $4t + 9t$

Area Models/Factoring Expressions

Always factor out the GCF

1. Area: _____ Length: _____ Width: _____

16x	20
-----	----

2. What would the area of a rectangle be with a length of $2x + 4$ and a width of $3x$?

Common Core Math 6+ Study Guide

Use the algebraic expression below to answer the questions below.

$$5x + 12y - 9x + 8 - 3y + 10x + 6$$

1. Give an example of a coefficient _____
2. How many terms are in the expression? _____
3. List the variables in the expression _____
4. True/False 8 and 6 are constants _____
5. What are the operations in the expression? _____

Translate the following words into algebraic expressions.

6. "The product of 9 and the quantity of x more than 7"
7. "'a decreased by b"
8. "5 more than 35 divided by y"
9. "5 taken away from quadruple a number"

Translate the following algebraic expressions into words. Then evaluate each expression for the value given.

10. $5x^2 + 3 - 3x$ _____
Evaluate when $x=2$ Answer _____

11. $(x + 7)^3$ _____
Evaluate when $x = 11$ Answer _____

12. $\frac{x}{9} - 5$ _____
Evaluate when $x = 63$ Answer _____

13. Taylor wants to purchase a new iPod. An electronics store offers two installment plans for buying the \$250 iPod.

Plan A: A fixed weekly payment of \$10.50

Plan B: A \$120 initial payment, followed by \$5 per week

- a. Write an expression for each of the plans for "t" number of weeks

Plan A _____

Plan B _____

b. After 15 weeks, how much money will she have paid on each plan?

c. Which plan requires the least number of weeks to pay off the iPod?

Matching - Properties

14. _____ $5 + (8 + 6) = (5 + 8) + 6$

15. _____ $0 * 56 = 0$

16. _____ $x + b = b + x$

17. _____ $-w + w = 0$

18. _____ $99 * 1 = 99$

19. _____ $1/45 * 45 = 1$

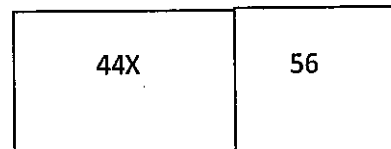
20. _____ $ab = ba$

21. _____ $t + 0 = t$

22. _____ $(pr)s = p(rs)$

- a) associative property of addition
- b) associative property of multiplication
- c) commutative property of addition
- d) commutative property of multiplication
- e) identity property of addition
- f) identity property of multiplication
- g) inverse property of addition
- h) inverse property of multiplication
- i) zero property of multiplication

26. Find the length and width of the combined rectangle



Simplify these expressions.

23. $5(g + 7) + 45g \div 5$

24. $6(4) + h(5 + 8) - 12$

25. $k(k + 3) + 4g * 7 + k^2$

27. Find the area of the combined rectangle

