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Unit 3: Expressions Study Guide

Vocabulary:

1. **Term**__: A number, variable, product, or quotient in an expression. A term is not a sum or difference.
 2. **numerical expression**__: A mathematical statement including numbers and operations.
 3. **algebraic expression**__: A group of numbers, symbols, and variables that express an operation or a series of operations.
 4. **coefficient**__: A numerical factor in a term of an algebraic expression.
 5. **Distributive Property**__: $a \times (b + c) = (a \times b) + (a \times c)$ and $a \times (b - c) = (a \times b) - (a \times c)$, where a, b, and c stand for any real numbers.
 6. **Exponent**__: The number that tells how many equal factors there are.
 7. **Expression**__: A variable or combination of variables, numbers, and symbols that represents a mathematical relationship.
 8. **Variable**__: A quantity that changes or can have different values. A symbol, usually a letter, that can stand for a variable quantity.
 9. **Constant**__: A number with a value that is always the same.
 10. **Order of Operations**__: Rules describing what sequence to use in evaluating expressions. (1) Evaluate within grouping symbols. (2) Do powers or roots. (3) Multiply or divide left to right. (4) Add or subtract left to right.
 11. **Like Terms**__: Terms whose variables (and their exponents such as the 2 in x^2) are the same.
 12. **Substitution**__: The replacement of the letters in an algebraic expression with known values.
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Part A: Exponents

- I have completed Section A and checked my answers on Weebly.
- I can evaluate exponents and can rewrite problems from expanded form to exponential form with confidence.
- I need help with understanding Section A.

Evaluate each expression.

- | | | |
|--------------------|--------------------|--------------------|
| 13. $(-2)^6$ _____ | 14. -1^8 _____ | 15. $(-3)^1$ _____ |
| 16. -8^2 _____ | 17. 12^0 _____ | 18. $(-6)^2$ _____ |
| 19. 0^0 _____ | 20. $(-1)^8$ _____ | 21. 0^5 _____ |

Write in exponential form.

- | | |
|---|--|
| 22. $(-5x)(-5x)(-5x)$ _____ | 23. $-(c \cdot c \cdot c \cdot c)$ _____ |
| 24. $y \cdot w \cdot 2 \cdot y \cdot 6 \cdot w \cdot w$ _____ | 25. $a \cdot (-4) \cdot a \cdot a \cdot 9 \cdot a \cdot a \cdot b$ _____ |

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Part B: Numerical Expressions & Order of Operations

- I have completed Section B and checked my answers on Weebly.
 I can simplify expressions by following the Order of Operations with confidence.
 I need help with understanding Section B.

Simplify each expression. Show work.

26. $-6^2 + 5 \cdot 3^3$

27. $(25 - 5^2) - (9^2 - 4^3)$

28. $5 \cdot 6 + [37 - 18 \div (4 - 7)]$

29. $[9 - (7^2 + 15) \div (-3)]^0$

30. $3(2 + 7 - 8) + 16$

31. $2\{2[2(3) + 1] + 1\} + 1$

Part C: Writing & Evaluating Expressions

- I have completed Section C and checked my answers on Weebly.
 I can write, evaluate, and identify parts of an expression with confidence.
 I need help with understanding Section C.

32. Write an algebraic expression for the following situation:
There are x frogs and 2 lizards. What is the total?

33. There are 16 children on the bus. C of them got off the bus at the first stop. Write an algebraic expression to represent the total number of children left on the bus.

34. Johnny's mother exercises on a stair-step machine. She exercises at the same rate for the entire time. For every minute she exercises, she burns 9 calories. Write an expression to represent the number of calories she burns after x minutes.

35. Write an algebraic expression for the following.

- a) nine less than g
- b) k divided by five
- c) twenty more than twice c
- d) The product of 5 and the sum of y and 2

36. Write the expression in words for the following.

- e) $7z$
- f) $n - 3$
- g) $36 \div m$
- h) $100 \div (6 + w)$
- i) $8k - 14$

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Use the expression below to answer the following.

$$7x^2 - 4xy + 10y - 3$$

37. How many terms are in the expression?

38. Name the terms.

39. Identify the constant.

40. Identify the variable(s).

41. Identify the exponent.

42. Identify the coefficient(s).

Evaluate the expression to find the missing values in the table.

43.

y =	$y^2 + 3$
1	
2	
3	
4	
5	

Evaluate each expression for the given values of the variables. Show substitutions and work.

44. $x^2 - y^2$ if $x = 4$, $y = -5$

45. $\frac{4ab^3}{(3b)^2}$ if $a = 2$, $b = -2$

46. $(5a)^3$, for $a = -1$

47. $-n^6$, for $n = 2$

48. $(e - 7)^3$, for $e = 4$

49. $x^2 + 3x - 7$, for $x = -4$

50. $-(2g)^2$, for $g = 5$

51. $(6 + h^2)^2$, $h = -3$

52. Complete the table. Substitute the value on the left for the variable in the expression at the top of each column. Then evaluate each expression.

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	$t + 2$	$2t - 1$	$2(t - 1)$	$2(2t)$
$t = 1.7$				
$t = 2.04$				

53. In the algebraic expression $7 \div y$, what is the coefficient of y ? Explain

Part D: Simplifying Expressions

- I have completed Section D and checked my answers on Weebly.
 I can simplify expressions by combining like terms and using the distributive property with confidence.
 I need help with understanding Section D.

Use the Distributive Property to simplify the following. **Watch signs and don't forget about M&Ms!!!** 😊

54. $8(x - 4)$ _____
55. $-3(y + 5)$ _____
56. $(m + 3)7$ _____
57. $-(n - 2)$ _____
58. $6(3x + 7)$ _____
59. $-2(5x - 9)$ _____
60. $-5(-4m + 2)$ _____
61. $7(-4n - 1)$ _____

Identify the like terms in the following expressions.

62. $7x + 12x - 7$ _____
63. $21 - 10t + 9 - 2t$ _____
64. $-d + b + 2t - 4$ _____
65. $-3 + x - 4x + 9$ _____
66. $-6k + 10 - 4k$ _____

Simplify each expression.

67. $-10x + 4x$ _____
68. $7x - 9 - 3x^2 + 2x + 4 - 5x^2$ _____
69. $x + 3(x - 4) + 2x$ _____
70. $8x - (3x - 4)$ _____
71. $11 - (3x - 6) + 2(4x + 5) - x$ _____
72. $5x + 3(4 - x)$ _____
73. $12(x + 3) + 4(2x - 5)$ _____
74. $-7(-v + 4)$ _____

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75. Explain why you should perform the distributive property in the expression $4x + 3(2x + 1)$ before simplifying it any other way. Then simplify.

76. Are these two expressions equivalent for each of the following? Explain your answer.

a. $4(x + 8)$ and $4x + 18 + 14$

b. $7(x + 2y)$ and $14x + 14y$

c. $3c - 9d$ and $3(c - 3d)$

77. Use the GCF to write an equivalent expression for each expression.

a. $2y + 4$

b. $10c - 15$

c. $24x - 40y$

78. Prove that the two expressions in the table are equivalent using the given values of x .

Value of x	Value of expression $3(x + 4)$	Value of expression $3x + 12$
0		
1		
2		
3		

Part E: Open-Ended

79. Elena and Jorge have similar problems and find the same answer. Each determines that the solution to their problem is 24.

Elena: $(14 + 42) \div 7 + 4^2$

Jorge: $14 + (42 \div 7) + 4^2$

a. Evaluate each expression to determine if both Elena and Jorge are correct.

b. Why would each find the solution of 24? What mistakes were made, if any?

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80. To improve in basketball, Ivan's coach told him that he needs to take four times as many free throws and four times as many jump shots every day. If f represents the number of free throws and j represents the number of jump shots Ivan shoots daily, write an expression to show how many shots he will need to take in order to improve in basketball.

81. Are the following expressions equivalent? **Explain** how you know.

$$2x + 3 = 5x$$

82. Are the following expressions equivalent? **Explain** how you know.

$$3 + 4y = y + 3y + 3$$

83. A grocery store has advertised a sale on ice cream. Each carton of any flavor of ice cream costs \$3.97.

- If Millie buys 2 cartons of strawberry ice cream and 4 cartons of chocolate ice cream, write an expression that represents the total cost of buying the ice cream.
- Write an equivalent expression for your answer in part (a).
- Explain** how the expressions are equivalent.

84. Trey goes to the movies with his family. Each family member buys a ticket and two boxes of popcorn. If there are five members of his family, let t represent the cost of a ticket and p represent the cost of a box of popcorn. Write **two different** expressions that represent the total amount his family spent. **Explain** how each expression describes the situation in a different way.

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