Math 6 Study Guide Chapter 2 & 4

2.1 Using variables to write expressions

Learning Objective: write numerical expressions with variables to represent relations expressed verbally.

Vocabulary:
Variable – a letter that can hold a place value (a holding spot) for a number whose quantity can change. Ex. x, y
Coefficient – the number that appears before the variable. It tells you how many there of the variable (it multiplies the variable). Ex. 3a: 3 times a.
Algebraic expression – a mathematical phrase that contains at least one variable and one operation. Ex. 10 * n or 10n, 12 – x.

A variable can be used to represent some unknown when you translate a verbal phrase into an algebraic one. How? Read the verbal expression and rewrite what they are asking for using an algebraic expression.

Verbal Phrase	Algebraic Expression
ten less than a number b	b - 10
the sum of 8 and a number c	8 + c
the quotient of a number h divided by 2	h ÷ 2
twice the sum of a number p and 8	2•(p+8)

2.2 Properties of Operations

Learning Objective: tell which addends and factors are missing and state the property used.

Commutative Property of addition: You can add numbers in any order and the sum will be the same. Ex. 11 + 4 + 8 = 8 + 4 + 11	Associative Property of addition: You can group numbers differently and the sum will be the same. Ex. (11 + 4) + 8 = 11 + (4 + 8)
Commutative Property of multiplication: You can multiply numbers in any order and the product will be the same. Ex. 12 * 4 * 2 = 2 * 4 * 12	Associative Property of multiplication: You can group numbers differently and the product will be the same. Ex. (12 * 4) * 2 = 12 * (4 * 2)

THESE PROPERTIES DO NOT HOLD TRUE FOR SUBTRACTION OR DIVISION!

Identity Properties You can add zero to a number or multiply it by 1 and not change the value of that number. Ex. 13 + 0 = 13 Ex. 32 * 1 = 32	Multiplication property of zero If you multiply a number by zero, the product will always be zero. Ex. 41 * 0 + 41

2.3 Order of Operations

Learning Objective: use the correct order of operations to evaluate expressions

Use the acronym **PEMDAS** to help you remember the order in which to perform operations in calculations.

P – compute inside parentheses
E – evaluate terms with exponents
MD – multiply and divide from left to right
AS – add and subtract from left to right

Examples:

$36 \div 6 + 6 =$

- Divide 36 by 6
- Add 6 so the answer is 12

$36 \div (6 + 6)$

- Find sum inside parentheses: 12
- Divide 36 by 12 and find quotient is 3

$36 + (1 + 3)^2 \div 8 =$

- Find sum inside parentheses: 4
- Square sum of parentheses:
- $4^2 = 4 \times 4 = 16$
- Divide that product by 8: 2
- Add 36 and 2 so the answer is 38

$48 \div (4 + 8) + 2^2$

- Find sum inside parentheses – 12
- Evaluate exponent $2^2 = 4$
- Divide 48 by 12 = 4
- Add 4 + 4 = 8

2-4 The Distributive Property

Learning Objective: use the distributive property to evaluate expressions.

Distributive Property – multiplying a sum (or difference) by a number gives the same results as multiplying each number in the sum (or difference) by the number and adding (or subtracting) the products.

$a(b + c) = a(b) + a(c)$ OR $a(b - c) = a(b) - a(c)$

$4(20 + 6) = 4(20) + 4(6)$ $\quad 20(23 - 10) = 20(23) - 20(10)$

"Break up" the number in the parentheses so mental math is easier. Examples:

- $4(96) = 4(100 - 4) = 4(100) - 4(4)$
- $6(37) = 3(30 + 7) = 3(30) + 3(7)$

Sometimes just completing the operation in the parentheses is enough to use mental math. Example:

- $2(21 - 11) = 2(10)$

2.6 Evaluating Expressions

Learning Objective: evaluate algebraic expressions using substitution.

When you are given an algebraic expression and asked to evaluate it or solve it, you need to replace the variable with a value.

Follow these steps to evaluate an expression:

1) Substitute or replace the variable with the value given in the problem
2) Perform the operation or operations
3) If there is more than one operation, use the order of operations (PEMDAS)

Examples: Evaluate each expression for the value given

• Given $35 \div t$ for $t = 5$ 1) Substitute t with 5 2) $35 \div 5$ 3) Solve the expression = 7	• Given $2(w) + 4$ for $w = 4$ 1) Substitute w with 4 2) $2(4) + 4$ 3) Solve the expression = 12
• Given $56 - x^2$ for $x = 5$ 1) Substitute x with 5 2) 56 - 25 3) Solve the expression = 31	• Given $44 - 24 \div 12x$ for $x = 12$ 1) Substitute x with 12 2) $44 - 24 \div 12(12)$ 3) Solve the expression using PEMDAS = 20

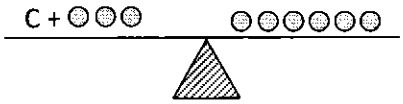
Remember multiplication can be written as a(b), a • b, or a*b

4.2 Solving Addition and Subtraction Equations

Learning Objective: use inverse operations (addition and subtraction) to isolate the variable and solve one-step equations.

Vocabulary:
Inverse operations – operations that "undo" each other. Addition and subtraction are inverse operations.

Think of an equation as a balance beam with the equal sign being the center (the fulcrum) of the balance beam. Whatever you do to one side of the equation, you need to do to the other so the left side is in balance with the right side.



If we remove 3 counters from the left side we need to remove 3 counters from the right side.

Follow the steps to solve one step equations, remember to **SHOW YOUR WORK** and to **CHECK**:

1) Isolate the variable by using the operation that "undoes" the operation in the equation
2) Perform that operation on both sides of the equal sign
3) Solve for the variable
4) CHECK your work by substituting the variable with the solution

Examples:

$x + 23 = 59$ $x + 23 - 23 = 59 - 23$ $x = 36$	$y - 42 = 62$ $y - 42 + 42 = 62 + 42$ $y = 104$

4.4 Solving Multiplication and Division Equations

Learning Objective: use inverse operations (multiplication and division) to isolate the variable and solve one-step equations.

Vocabulary:
Inverse operations – operations that "undo" each other. Multiplication and division are inverse operations.

* Think of an equation as a balance beam with the equal sign being the center (the fulcrum) of the balance beam. Whatever you do to one side of the equation, you need to do to the other so the left side is in balance with the right side.

Follow the steps to solve one step equations, remember to **SHOW YOUR WORK** and to **CHECK**:

1) Isolate the variable by using the operation that "undoes" the operation in the equation
2) Perform that operation on both sides of the equal sign
3) Solve for the variable
4) CHECK your work by substituting the variable with the solution

Examples:

$33m = 99$ $33m \div 33 = 99 \div 33$ $m = 3$ CHECK: $33(3) = 99$ $99 = 99$ ☑	$t \div 6 = 42$ $t \div 6 \times 6 = 42 \times 6$ $t = 252$ CHECK: $252 \div 6 = 42$ $42 = 42$ ☑

Review for Units 2 and 4 Test

Translate the following algebraic expressions into verbal expressions.

1) $5x - 6$ _____

2) $3 * (7 + y)$ _____

Translate the following verbal expressions into algebraic expressions.

3) 6 more than *b* _____

4) the product of 12 and *m* _____

5) Ms. Pungello baked 3 more than twice the amount of cookies that Mrs. Ciesielski baked. If Mrs. Ciesielski baked *c* cookies, what expression would represent the number of cookies Ms. Pungello baked?

_____

6) Write an example of each property:

Commutative Property of Addition _____

Commutative Property of Multiplication _____

Associative Property of Addition _____

Associative Property of Multiplication _____

Identity Property of Addition _____

Identity Property of Multiplication _____

Multiplication Property of Zero _____

7) Fill in the blank: 7(63) = 7(60) + 7(____)

8) Ms. Grabowski is buying 3 bags of grapes. Each bag of grapes costs $4.25. Which of the following is **NOT** equivalent to the total cost?
   A. 3 x ($4 + $0.25)
   B. $4.25 + $4.25 + $4.25
   C. 3 x $4 + 3 x $0.25
   D. 3 x $4 + $0.25

Evaluate the following expressions.

9) 17 + (23 +4) + 6 = _____

10) $(6-2)^2 + 10$ = _____

Evaluate the following expressions for the given value of the variable.

11) 12 + 3w if w = 6 _____

12) 21 – x ÷ 3 if x= 3 _____

Show the <u>inverse</u> <u>operation</u> on both sides to solve the following equations. You must show your work!

13) $a + 9 = 15$

14) $p - 25 = 64$

15) $4m = 56$

16) $\frac{x}{7} = 49$