Notes - Writing and Simplifying Expressions

Key Vocabulary – Use the word bank below to fill in the appropriate vocabulary word.

Word Bank:

- Algebraic Expression
- Coefficient
- Constant

- Distributive Property
- Equivalent Expression

- Integers
- Like Terms
- Order of Operations

- Simplify
- Substitute
- Term
- Variable

1. _____
To replace a letter with a number or algebraic expression

2. _____
"parts" in an expression that are added or subtracted (ex. $4x^2 + 3$ -> $4x^2$ and 3 are terms)

3. _____
A value that does not change (ex. 4)

4. _____
a letter that represents an unknown number

5. _____
A mathematical phrase that can include numbers, variables, and operation symbols (ex. $3y + 7$)

6. _____
For every real number a, b, and c: $a(b + c) = ab + ac$ and $a(b-c) = ab - ac$ (ex. $4(x + 3) = 4x + 12$)

7. _____
Expressions that have the same value for all variables

8. _____
A number that is multiplied by a variable (ex. **5**x)

9. _____
Have identical variables; that is, they have the same variable to the same exponent. Constants are like terms as well. (ex. $6x^2$ and $99x^2$ are like terms)

10. _____
Parenthesis, Exponents, Multiplying and Dividing (left to right), Adding and Subtracting (left to right) **PEMDAS!**

11. _____
To write an expression in simplest form (combine all like terms)

12. _____
Positive and negative whole numbers (ex. 22, -3)

Writing Expressions

Place the key words with the appropriate operation.

Addition	Subtraction
Multiplication	**Division**

Key Words	
Increased by	Quotient
Divided by	Plus
Product	Multiplied by
Twice	More than
Difference	Times
Less Than*	Sum
Minus	

Name: _____   Date: _____

Writing Expressions

Write the following expressions in algebraic form.

1. 9 more than c

2. b minus 4

3. the quotient of z and 9

4. the total of n and 40

5. the sum of 8 and m

6. x divided by 5

7. the difference of h and 7

8. 23 less than p

9. the product of g and 2

10. 77 plus twice v

11. two times r increased by 12

12. 3 times j decreased by 12

Simplifying Expressions

Identify the coefficient and constant(s) in expressions listed below:

1. $8x + 9 - 3x$
Coefficient(s):

Constant(s):

2. $17 - 2a + 5a - 1$
Coefficient(s):

Constant(s):

Steps to Simplifying an Expression:

1. **Distribute to get rid of any parenthesis**
2. **Combine like terms**
3. **Put terms with variables in abc order and constants at the end.**

Simplify the following expressions:

1. $3(4x - 5)$

2. $-4(x - 2)$

3. $7(b - 10)$

4. $2(b-3) + 4(2b + 2)$

5. $5(-3y + 5)$

6. $-(7y - 4)$

7. $-5(-8g - 3) - (5g + 3)$

8. $4(2a + b) - 3(3a - 4b)$

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Writing and Simplifying Algebraic Expressions

Write each phrase as an algebraic expression.

1. $18 less than the sale price   _____

2. the quotient of *n* and 12   _____

3. 8 less than 25 multiplied by a number *q*   _____

4. 3 more than the difference of 20 and a number *m*   _____

5. 5 less than the quotient of a number *z* and 16   _____

6. 8 times the product of 28 and a number *g*   _____

7. 10 plus a number *s* times 5   _____

8. 10 less than the quantity *j* multiplied by 44   _____

9. $6y + (-13y)$	10. $-12z + (-9z)$	11. $-8x + 9x - 13x$
12. $15x + 2x - 12x - 13x^2 - 15$	13. $2p^4 + 3p + 12 - 18p^4 - p - 7$	14. $12m + (-9) - 45m$
15. $-8 + 8k + 14 - 19k$	16. $5(3e + 5) - 25e$	17. $-12n - 18n + 9(4n + 3)$
18. $8(z^2 + 3) - 19z^2 + 14$	19. $-6(3m + 2) - 6m + (-13)$	

Solving Equations

Review:

1) $6x - 4 = -16$

2) $4x + 17 = 8x + 1$

Tips and Tricks:

- Show all work and every step!

- Remember you are trying to ISOLATE the VARIABLE!

- ALWAYS check your answer!

Special Cases for Equations:

1. _____

2. _____

3. _____

4. _____

Distributive Property

     defined as: _____

Examples:

1) $112 = 7x + 7(-4x - 17)$

2) $7x - 6(5x + 3) = -156$

No Solution

defined as: _____

Examples:

1) $2x + 3 = 2x + 7$

2) $4m - 4 = 4m$

All Solutions or Infinite Solutions

defined as: _____

Examples:

1) $2x + 3 = 2x + 3$

2) $-3 - 8x + 17 = -2(4x - 7)$

Clearing Fractions and Decimals

defined as: _____

Examples:

1) $\frac{5}{6} = -x - \frac{4}{3} - 1$

2) $13.7b - 6.5 = -2.3b + 8.3$

Algebraic Proportions

defined as: _____

Examples:

1) $\frac{x+4}{5} = \frac{x-2}{7}$

2) $\frac{5}{r-9} = \frac{8}{r+5}$

Solving Equations Homework

1. $\frac{1}{3}p - p = 4$

2. $\frac{3n-2}{5} = \frac{7}{10}$

□

(3) $-108 = 3x + 3(3x - 16)$

(4) $-6x + 2(2x + 13) = 48$

5. $13.7b - 6.5 = -2.3b + 8.3$

6. $\frac{3}{2}y - y = 4 + \frac{1}{2}y$

□

7. $11 + 3x - 7 = 6x + 5 - 3x$

8. $6x + 5 - 2x = 4 + 4x + 1$

9. $13 - (2x + 2) = 2(x + 2) + 3x$

10. $7x - 4y + 12z + 4 = 5 - 3y + 7x - y + 12z$

Solving Equations Practice

1. a + 5 = -5a + 5

2. 6 = 1 – 2n + 5

3. p - 4 = -9 + p

4. 12 = -4(-6x – 3)

5. $\dfrac{m+3}{5} - \dfrac{m-3}{4} = 1$

6. $28 - 2.2y = 11.6y + 262.6$

7. $\dfrac{2x-3}{2} + \dfrac{x+2}{4} = \dfrac{1}{2}$

8. $\dfrac{2}{3}a - \dfrac{1}{2} + a + \dfrac{1}{3} = a + 1$

(5) $88 = 4x + 4(3x - 10)$

(6) $^-126 = ^-2x - 2(4x + 13$

(7) $^-6x + 4(3x - 13) = ^-82$

(8) $5x - 7(x - 18) = 146$

(9) $^-180 = 5x + 5(2x - 3)$

(10) $7x - 4(4x - 14) = ^-43$

Name _____ Date _____ Core _____

Solving Multistep Equations with the Distributive Property

Directions: Identify the solution for each equation.

1) $x + 9(x - 2) = -5 + 5x - 3$ 2) $3(r + 2) - 5 = 4(r + 2)$ 3) $-(1 - 4g) + 10 - g = 2(g + 3)$

4) $-2(x + 9) = -(6 - 5x) + 2x$ 5) $7(x + 4) - 2x = 10 + (4x - 2)$ 6) $8 - (3 + 5x) = 7(2 + 5x)$

Directions: Each problem has been incorrectly solved for the variable x. Identify which step the mistake was made and complete the problem to correctly solve for x. Solve the equations correctly below.

7)
$(step1)$ $-3(x + 7) = 8 - (2x + 4)$
$(step2)$ $-3x + 7 = 8 - 2x - 4$
$(step3)$ $-3x + 7 = 4 - 2x$
$(step4)$ $x + 7 = 4$
$(step5)$ $x = -3$

8)
$(step1)$ $5(x - 3) = 2(x + 9) - 8$
$(step2)$ $5x - 15 = 2x + 18 - 8$
$(step3)$ $5x - 15 = 2x + 10$
$(step4)$ $3x - 15 = 10$
$(step5)$ $3x = 5$
$(step6)$ $x = \dfrac{5}{3} \text{ or } 1\dfrac{2}{3}$

9)
$(step1)$ $-3(6x + 1) - 9 = -4(3x - 2)$
$(step2)$ $-24x - 3 - 9 = -12x + 8$
$(step3)$ $-24x - 12 = -12x + 8$
$(step4)$ $-36x = 20$
$(step5)$ $x = 20/-36 = -5/9$
$(step6)$ $x = -5/9$

The mistake is in step _____

The mistake is in step _____

The mistake is in step _____

The correct answer is x = _____

The correct answer is x = _____

The correct answer is x = _____

Explain the steps used to solve the equation below. Be specific!

10) $-(-x + 5) - 8x = -29 - 5x$

Name_____

Multi-Step Equations

Date_____ Period____

Solve each equation.

1) $-20 = -4x - 6x$

2) $6 = 1 - 2n + 5$

3) $8x - 2 = -9 + 7x$

4) $a + 5 = -5a + 5$

5) $4m - 4 = 4m$

6) $p - 1 = 5p + 3p - 8$

7) $5p - 14 = 8p + 4$

8) $p - 4 = -9 + p$

9) $-8 = -(x + 4)$

10) $12 = -4(-6x - 3)$

11) $14 = -(p - 8)$

12) $-(7 - 4x) = 9$

13) $-18 - 6k = 6(1 + 3k)$

14) $5n + 34 = -2(1 - 7n)$

15) $2(4x - 3) - 8 = 4 + 2x$

16) $3n - 5 = -8(6 + 5n)$

17) $-(1 + 7x) - 6(-7 - x) = 36$

18) $-3(4x + 3) + 4(6x + 1) = 43$

19) $24a - 22 = -4(1 - 6a)$

20) $-5(1 - 5x) + 5(-8x - 2) = -4x - 8x$

Solving Multistep Equations

Directions: Identify the solution for each equation. Show your work on a separate sheet of paper.

1) $x + 6 = 14 + 5x$

2) $6r - 1 = 11 + 6r$

3) $-10 - 14v = -14v$

4) $-2x + 9 = -6 - 2x + 15$

5) $7x - 3 + 2x = 9 - 3x$

6) $-3 + 5x + 6 = 7x - 4 + 5x$

Directions: Each problem has been incorrectly solved for the variable x. Identify which step the mistake was made and complete the problem to correctly solve for x. Use a separate sheet of paper for your work.

7)
$(step1) \quad -3x + 7 = 8 - 2x + 4$
$(step2) \quad -3x + 7 = 4 - 2x$
$(step3) \quad -5x + 7 = 4$
$(step4) \quad -5x = -3$
$(step5) \quad x = \dfrac{3}{5}$

8)
$(step1) \quad 5x - 3 = 9x + 9 - 4x - 12$
$(step2) \quad 5x - 3 = 5x + 9 - 12$
$(step3) \quad 5x = 5x + 9 - 12 + 3$
$(step4) \quad 0x = 0$
$(step5) \quad x = 0$

9)
$(step1) \quad -6x + 3x - 14 = 12x + 16$
$(step2) \quad 9x - 14 = 12x + 16$
$(step3) \quad -14 = 3x + 16$
$(step4) \quad -30 = 3x$
$(step5) \quad -10 = x$
$(step6) \quad x = -10$

The mistake is in step _____

The correct answer is x = _____

The mistake is in step _____

The correct answer is x = _____

The mistake is in step _____

The correct answer is x = _____

Directions: Using a separate sheet of paper set up an equation to help you solve each word problem below. Check your work by substituting your answer back into your equation.

10) Four more than twice Jason's age is the same as his age ten years from now. How old is Jason now?

11) Seven increased by the product of three and a value x is the same as the product of 3 and a value x decreased by seven.

12) The sum of two consecutive even numbers is the same as three times the smallest number. What are the two numbers?

Writing and Solving Equations

Define the variable, write the equation, and solve.

1. Yesterday Josh sold some boxes of greeting cards. Today he sold seven boxes. If he sold 25 boxes in all, how many did he sell yesterday?
   a. Variable: Equation:
   b. Solve:

2. After Hoshi spent $27.98 for a sweater, she had $18.76 left. How much money did she have to begin with?

   a. Variable: Equation:
   b. Solve:

3. After Simon donated four books to the school library, he had 28 books left. How many books did Simon have to start with?
   a. Variable: Equation:
   b. Solve:

4. One day Reeva baked several dozen muffins. The next day she made 8 dozen more muffins. If she made 20 dozen muffins in all, how many dozen did she make the first day?
   a. Variable: Equation:
   b. Solve:

5. Daniel Davis Dillard is proud of the lawn care business he runs after school. He charges a flat rate of $10 plus $5 per quarter acre of lawn. After mowing Mr. Stafford's lawn 5 times, he made a total of $125. Write and solve an equation to determine how many acres of lawn Mr. Stafford has.

6. Sean has a stomach ache! He ate some cupcakes at breakfast, three times that number of cupcakes at lunch and 6 cupcakes at dinner. If he ate 18 cupcakes total, write and solve an equation to determine how many cupcakes he ate at lunch.

7. Find two consecutive even integers such that the sum of the larger and twice the smaller is 62.

8. Find three consecutive even integers such that the sum of the smallest and the largest is 36.

9. Find three consecutive odd integers such that the sum of the smallest and 4 times the largest is 61.

10. Find three consecutive integers such that the sum of twice the smallest and 3 times the largest is 126.

11. An 84-meter length cable is cut so that one piece is 18 meters longer than the other. Find the length of each piece.

12. The length of a rectangle is 2 cm less than 7 times the width. The perimeter is 60 cm. Find the width and length.

13. The first side of a triangle is 7 cm shorter than twice the second side. The third side is 4 cm longer than the first side. The perimeter is 80 cm. Find the length of each side.

14. The length of a rectangle is 6 cm longer than the width. If the length is increased by 9 cm and the width by 5 cm, the perimeter will be 160cm. Find the dimensions of the original rectangle.

15. Matthew is 3 times as old as Jenny. In 7 years, he will be twice as old as she will be then. How old is each now?

16. Melissa is 24 years younger than Joyce. In 2 years, Joyce will be 3 times as old as Melissa will be then. How old are they now?

Solving Equations Homework

1) In the Championship game, Julius scored 5 points less than Kareem, and Wilt scored 1 point more than twice as many as Kareem. If Wilt scored 20 points more than Julius, how many points were scored by each player?

2) The first side of a triangle is 8 m shorter than the second side. The third side is 4 times as long as the first side. The perimeter is 26 m. Find the length of each side.

3) A triangular sail has a perimeter of 25 m. Side a is 2 m shorter than twice side b, and side c is 3 m longer than side b. Find the length of each side.

4) Find four consecutive odd integers who sum is 56.

5) The larger of two numbers is 1 less than 3 times the smaller. Their sum is 63. Find the numbers.

6) The sum of two numbers is 172. The first is 8 less than 5 times the second. Find the first number.

7) Find two numbers whose sum is 92, if the first is 4 more than 7 times the second.

8) I ordered four new CDs by mail. Each costs the same amount and there was an additional $5.00 shipping/handling charge that brought the total to $33.00. Write and solve an equation to find the cost of one CD.

9) Trevor is a salesperson who is paid a salary of $500 plus 2% commission. Write and solve an equation to determine how much Trevor must sell to earn $2,000 this month.

10) Hugo received $100 for his birthday. He then saved $20 per week until he had a total of $460 to buy a printer. Write an equation to show how many weeks it took him to save the money.
   a. Variable:
   b. Solve: Equation:

11) A health club charges a $50 initial fee plus $2 for each visit. Mary has spent a total of $144 at the health club this year. Use an equation to find how many visits she has made.
   a. Variable:
   b. Solve: Equation:

Name:_____   Date:_____

Math I: Unit 2 Part I Study Guide – Equations and Word Problems

Solve each equation.

1. $3x + 5x = 34 - 10$ 2. $3(x + 5) - 2x = 51 - 25$ 3. $7n + 5 - 3 - n = 8$

4. $\dfrac{9z + 4}{5} - 8 = 5.4$ 5. $4a + 3 - \dfrac{1}{2}a = 10$ 6. $12m - 3 = 4 - 2m$

7. $9y + 3 - 2y = 12 - 6y + 4$ 8. $2(t + 4) - 3 = \dfrac{1}{2}(10 + 4t)$ 9. $6 + 4(2 - t) = 3t$

10. $9 + 4z = 4z - 3$ 11. $2(y - 3) = 1.2 - y$ 12. $6 = 3 + 4(b - 2)$

13. $3(x - 4) = 3x - 12$ 14. $-8(4 + 9t) = 7(-2 - 4t)$ 15. $\dfrac{2}{3}x + \dfrac{1}{6}x = 25$

Simplify the Expression

16. $4(2e + 7) - 25e$ 17. $-3d + 18d + (-7d)$ 18. $-6(3m + 2) - 6m + (-13)$

Express as a radical

19. $5^{\frac{1}{4}}$ 20. $2m^{\frac{1}{3}}$ 21. $x^{\frac{2}{3}}$

Express with a rational exponent

22. $\sqrt[3]{x}$ 23. $\sqrt{36}$ 24. $\sqrt[4]{y^6}$

Write an expression for each phrase.

25. the sum of 5 and three times a number   26. 30 minus a number
27. the quotient of 7 and a number   28. the product of a number and 12
29. 12 more than the product of 3 and x   30. n plus eight squared
31. four less than twice x   32. the quotient of eight and the quantity n minus four

Define the variable, write an equation, and solve each of the following.

33. Sam challenged: "Tell me my number. When I subtracted 3 from it and then multiply the result by 2, I get the same result as when I divide my number by 2 and then add 18 to the quotient."
34. The sum of two numbers is 46. Five times the smaller number is 6 more than twice the larger. Find the numbers.
35. The perimeter of a rectangle is 84 inches. The length is 9 less than twice the width. Find the length and width.
36. One cell phone plan cost $39.95 per month. The first 500 minutes of usage are free. Each minute thereafter cost $.35. For a bill of $66.20, how many minutes over 500 minutes was the cell phone in use?
37. In 1999, 189 physical therapists ran the New York City Marathon. This was 1048 fewer than the number of engineers who ran. How many engineers ran the marathon?
38. One telephone company charges $16.95 per month and $.10 per minute for local calls. Another company charges $22.95 per month and $.05 per minute for local calls. For what number of minutes of local calls per month is the cost of the plans the same?
39. A library receives a large cash donation and uses the funds to double the number of books it owns. Then a book collector gives the library 3056 books. After this, the library has 54,618books. How many books did the library have before the cash donation and the gift of books?
40. The Lackey family rented a moving truck for $49.95 plus $.30 per mile. Before returning the truck, they filled the tank with gasoline, which cost $18.32. The total cost was $95.87. Find the number of miles the truck was driven.

Multi-Step Equations Explanation

Directions: Pick four problems from the Equations Word Problems II sheet to solve below. Imagine that you are teaching a Math 7+ student how to solve multi-step equations. You should use appropriate math vocabulary, but also make sure your directions are easy to understand. For each step, you need to write at least 2 sentences. One sentence should describe what you have done and the other should explain why. Your work needs to be neat and easy to read.

Problem #1: Solve the Equation:	Directions to my 7+ student to explain each step:
Step 1:	Step 1:
Step 2:	Step 2:
Step 3:	Step 3:
Step 4:	Step 4:
Step 5:	Step 5:

Problem #1: Solve the Equation:	Directions to my 7th grade student to explain each step:
Step 1:	Step 1:
Step 2:	Step 2:
Step 3:	Step 3:
Step 4:	Step 4:
Step 5:	Step 5: