Math I

Spring 2017

Name: _____

Teacher: Mrs. Dwiggins

Unit 1(1): SOLVING EQUATIONS & INEQUALITIES	Homework
1/25/17 Wednesday Procedures and Information Translating Expressions Combining Like terms Simplifying Expressions	
1/26 Thursday Writing and Solving Multi-Step Equations	
1/27 Friday Solving Equations that contain fractions or decimals Applications	
1/30 Monday Solving Equations for a Specific Variable (Literal Equations) Review	
1/31 Tuesday Test on Unit 1	

CCM1 - Quarter 1 - Week 1

	Problem 1	Problem 2	Gridded Response
Monday	John earns $15 an hour mowing lawns. Write and solve an equation to find out how many hours he must work to earn $315.	During one possession of a football game, the Panthers gained 15 yards, lost 2 yards, lost 20 yards, gained 3 yards and lost 14 yards. At the end of the possession, how many yards had they gained or lost?	**Problem 2**
Tuesday	How much sand is needed to fill a hole that is ten meters deep, eight meters wide, and twelve meters long?	Mrs. Kidd took her two children to a waterpark for summer fun. An adult ticket cost $32 and the total price of admission for Mrs. Kidd's family was $84. How much was a child's ticket?	**Problem 1**
Wednesday	The temperature at noon on a winter's day was 14°F. At midnight the temperature had dropped 23°F. What was the temperature at midnight?	An industrial oil drum is pictured below. How many cubic feet of oil can the drum hold when it is completely full? Round your answer to the nearest whole number if necessary. 4.9 feet 7.8 feet	**Problem 1**

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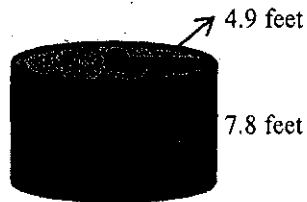
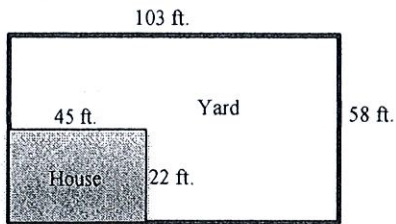|			
Thursday	Simplify the expression below. $5(-x + 12) - 3(x - 10)$	Simplify the expression below when x = -4 and y = 5. $x^2 + (xy)^2$	**Problem 2**
Friday	Nancy needs to cover her yard with grass. The diagram of her backyard is shown below. How many square feet of grass does Nancy need? 103 ft. 45 ft. Yard 58 ft. House 22 ft.	Yvette needs to cover her yard with grass. The diagram of her backyard is shown below. How many square feet of grass does Yvette need? Round your answer to the nearest tenth if necessary. 10 ft. 24 ft.	**Problem 2**
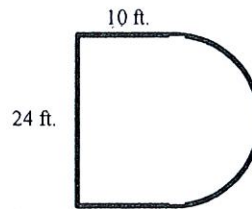
Writing and Simplifying Expressions

Key Vocabulary

Algebraic Expression:

Coefficient:

Constant:

Distributive Property:

Equivalent Expression:

Integers:

Like Terms:

Order of Operations:

Simplify:

Substitute:

Term:

Variable:

Writing Expressions

What are some key words that represent the following operations?

Addition	Subtraction	Tips to remember
Multiplication	**Division**	

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Why Did the Cow Keep Jumping Over the Barrel?

Translate each phrase below into an algebraic expression and find your answer in the corresponding answer column. Write the letter of that exercise in the box that contains the number of the answer.

(E) 3 times a number   (18) $x + 3$

(O) 3 more than a number   (15) $3x - 8$

(S) 3 decreased by a number   (19) $x - 3$

(R) 3 less than a number   (12) $3x + 8$

(A) one third of a number   (3) $3x$

(I) 8 more than 3 times a number   (25) $3 - x$

(N) 8 less than 3 times a number   (5) $\dfrac{x}{3}$

(A) 7 less than 4 times a number   (1) $7 - 4x$

(S) 7 decreased by 4 times a number   (16) $2x - 9$

(G) 9 less than twice a number   (14) $7x + 4$

(N) 9 decreased by twice a number   (9) $4x - 7$

(O) 9 less than half a number   (8) $7x + 4x$

(I) 7 times a number, increased by 4   (24) $9 - 2x$

(R) 7 times a number, increased by 4 times the number   (27) $\dfrac{x}{2} - 9$

(S) 5 times a number, increased by 8   (22) $8(x + 5)$

(A) 5 times the sum of a number and 8   (4) $8(2x + 5)$

(H) 5 more than 8 times a number   (2) $8x + 5$

(O) 8 times the sum of a number and 5   (13) $2(5x + 8)$

(C) twice the sum of 5 times a number and 8   (6) $5x + 8$

(T) 2 more than five eighths of a number   (20) $5(x + 8)$

(W) 8 times the sum of twice a number and 5   (11) $\dfrac{5}{8}x + 2$

(T) 9 meters higher than altitude x   (7) $x + 15$

(F) 15 meters per second slower than speed x   (28) $x + 9$

(P) 15°C hotter than temperature x   (26) $4x - 9$

(O) 9 meters shorter than twice length x   (23) $2x - 9$

(C) 9 years older than twice age x   (10) $2x + 9$

(H) $9 cheaper than 4 times price x   (17) $x - 15$

(M) 9 centimeters less than three fourths of length x   (21) $\dfrac{3}{4}x - 9$

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
																								S			

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OBJECTIVE 1–j: To translate English phrases into algebraic expressions.

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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Name _____

Combining Like Terms/Evaluating Expressions

Date _____ Period _____

1.	$-18x + 9 - 23x$	2.	$15x^2 + 2x - 12 - 23x^2 - 15x$
3.	$-5 + 8p + 24 - 17p$	4.	$4(2e + 7) - 25e$ $8e + 28 - 25e$ $\boxed{-17e + 28}$
5.	$7(z^2 + 2) - 14z^2 - 14$	6.	$-3(2r + 5) - 12r + (-12)$

Evaluate each expression if a = 8, b = -4, and c = -2.

7. $a + b + c$	8. $4b + a$	9. $cb - a$
10. $\frac{a}{b} - c$	11. $c(3 + b)$ $-2(3 + {}^-4)$ $-2(-1)$ $\boxed{2}$	12. c^2
13. $\frac{2a}{4} - b$	14. $3(b - a) - c$	15. $b^2 - c^2$

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What Do Large Circus Animals Wear To Keep Their Legs Warm?

Simplify the expression. Cross out the letter next to each correct answer. When you finish, the answer to the title question will remain.

1-12

R	$30x + 10$
S	$-2x - 15$
O	$4x - 15$
R	$40x - 11$
T	$16x - 8$
L	$64x - 3$
U	$4x - 8$
M	$20x - 65$
D	$26x + 15$
U	$40x + 10$
N	$6x - 8$
Q	$-36x + 8$
H	$16x - 3$
T	$64x + 15$
A	$-2x - 41$
E	$-22x + 66$
G	

1. $5(4x - 13)$

2. $-4(9x - 2)$

3. $7x - 3(5 + x)$

4. $2x - 6(4x - 11)$

5. $5 + 8(8x - 1)$

6. $-9 + 2(-x - 16)$

7. $3(12x + 5) - 10x$

8. $-5(1 - 6x) + 15$
$-5 + 30x + 15$
$\boxed{30x + 10}$

9. $\frac{1}{3}(9x - 24) + x$

10. $7 - \frac{3}{4}(-8x + 20)$ (next page)

11. $4x + 4(9x - 2) - 3$

12. $10x - 3(7 - 2x) + 18$

13-24

T	$-56a$
I	$-9a + 7$
S	$-23a + 72$
P	$a - 6$
U	$-2a - 6$
R	53
G	a
E	$36a + 87$
L	$-9a + 72$
T	$-34a - 25$
O	$40a - 4$
G	$36a - 50$
I	$13a - 48$
E	$-2a - 50$
B	$-a + 7$
L	$2a + 87$

13. $11 + 6(-5a - 6) - 4a$

14. $15 - 2(4 + 7a) + 5a$

15. $-3a + 8 - 8(7 - 2a)$

16. $-1 + 99a + 9(6 - 11a)$

17. $4a - 4(15a - 2) - 8$

18. $-7(-2 - 5a) + 5a - 18$

19. $3(4a + 9) - 10(a - 6)$
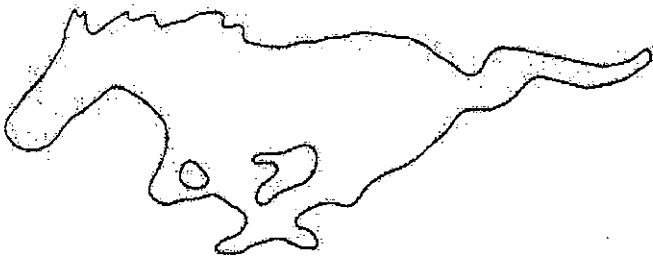
20. $6(-3a + 12) + 8a - 13a$

21. $-2(9 + 2a) - 8(4 - 5a)$

22. $9 - 4(-a + 9) + 3(7 - 2a)$

23. $6 - \frac{1}{5}(20a - 5) + 3a$

24. $-7a + \frac{2}{3}(12a + 15) - 10$

Rational Numbers and Expressions:
Simplifying Expressions Using the Distributive Property

2.10

5

(10) $7 - \frac{3}{4}(-8x + 20)$

$7 + \frac{24}{4}x - \frac{60}{4}$

$7 + 6x - 15$

$\boxed{6x - 8}$

Guided Notes - Multi-Step Equations as Word Problems

Write each sentence as an algebraic equation.

1. Juan's salary plus $125 is $600.   _____$s + 125 = 600$_____

2. Six times as many visitors is 120 visitors.   _____

3. Twenty-seven is seven fewer students than last year.   _____

4. Two and one-half times the amount of interest is $2500.   _____

5. The number of cats decreased by 17 is 19.   _____

6. Four times the number of feet is 12 feet.   _____

7. The price decreased by $4 is $29.   _____

8. After dividing the money 5 ways, each person got $67.   _____

9. Three more than 8 times as many trees is 75 trees.   _____

10. Twice as many points as Bob would be 18 points.   _____

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:

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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. Twelve notebooks cost $15.48 in all. What is the price of one notebook?
   a. Variable: Equation:
   b. Solve:

6. Skylar bought seven books at $12.95 each. How much did Skylar spend?
   a. Variable: Equation:
   b. Solve:

7. Eugene has five payments left to make on his computer. If each payment is $157.90, how much does he still owe?
   a. Variable: Equation:
   b. Solve:

8. 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: Equation:
   b. Solve:

9. 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: Equation:
   b. Solve:

How Much Did Captain Hook Have to Pay for His Earrings?

For each problem, label a variable (let x = the unknown), then write and solve an equation. Find your equation in the column at the right. Write the letter of the equation in the box at the bottom that contains the problem solution.

1 Ben and Jerry together scored 50 points in the big game. If Ben scored 16 points, how many points did Jerry score?

2 Marble Middle School paid $500 for 16 graphing calculators. What was the cost for each calculator?

3 On first down, a football team lost 16 yd. After two downs, the team had an overall gain of 5 yd. How many yards were gained on second down?

4 One sixth of the candies in a bag of M&M's are orange. If there are 15 orange candies, how many M&M's are in the bag?

5 A scuba diver dove 16 ft to an elevation of −50 ft. What was her elevation before the dive?

6 The number of elephants at the circus was two fifths of the number of horses. If there were 16 elephants, how many horses were there?

7 A chest was resting on the ocean floor 500 ft below the surface. It was lifted to the deck of a ship 16 ft above the surface. How far was the chest lifted?

8 If you divide the age of Grampa Gump by 16, you get the age of Junior Gump. If Junior is 5 years old, how old is Grampa?

9 At Maxx Middle School, there are 30 times as many students as teachers. If there are 450 students, how many teachers are there?

10 Kodak cut a pizza into eight equal slices and ate three of them. If his meal had 450 calories, how many calories were in the entire pizza?

equations

R $30x = 450$

S $x - \frac{1}{6} = 15$

E $x + 16 = 50$

U $\frac{2}{5}x = 16$

C $-16 + x = 5$

G $\frac{30}{x} = 450$

B $\frac{3}{8}x = 450$

A $16x = 500$

K $\frac{x}{16} = 5$

A $x - 16 = -50$

O $x \div \frac{2}{5} = 16$

N $\frac{1}{6}x = 15$

L $8x - 3x = 450$

A $-500 + x = 16$

25 yd	$31.25	486 ft	1200 cal	40	21 yd	80	32	516 ft	90	960 cal	34 E	−34 ft	15	$34.75

* 1. | $x =$ Jerry's points

Eq: $16 + x = 50$

solve $16 + x = 50 \rightarrow$ Eq.: E
          $-16 \qquad -16$

          $x = 34 \rightarrow$ solution: 34

Jerry scored 34 points.

11

Property	Addition	Multiplication
Commutative How to remember:	$a + b = b + a$	$a \, b = b \, a$
Example		
Associative How to remember:	$a + (b+c) =$ $(a+b) + c$	$a \, (bc) = (ab)c$
Example		
Identity How to remember:	$a + 0 = a$	$a \, (1) = a$
Example		
Inverse How to remember:	$a + {}^-a = 0$	$a \cdot \frac{1}{a} = 1$ and $\frac{a}{b} \cdot \frac{b}{a} = 1$
Example	$7 + {}^-7 = 0$	$6 \cdot \frac{1}{6} = 1$ and $\frac{3}{7} \cdot \frac{7}{3} = \frac{21}{21} = 1$
Substitution		
Example		
Zero Product		
Example		
Distributive		
Example		
Multiplication by Zero property		

11a

Properties of Equality

Property	Definition	Example
Reflexive	$a = a$	
Symmetric		
Transitive	If $a = b$ and $b = c$, then $a = c$.	If $4 = 3 + 1$ and $3 + 1 = 5 - 1$, then $4 = 5 - 1$.

Name the property illustrated:

1. $x + y = y + x$ _____

2. $5 \cdot (m \cdot n) = (5 \cdot m) \cdot n$ _____

3. $x + 0 = x$ _____

4. $15(a + 4) = 15 \cdot a + 15 \cdot 4$ _____

5. $(2a + 3b) + 4c = 2a + (3b + 4c)$ _____

6. $m \cdot 0 = 0$ _____

7. $x + y = x + y$ _____Reflexive_____

8. $9 \cdot (8 \cdot 3) = 9 \cdot (3 \cdot 8)$ _____

9. $\dfrac{7}{8} \cdot \dfrac{8}{7} = 1$ _____

10. If $x + 5 = 9$, then $9 = x + 5$ _____Symmetric_____

11. $8 \cdot 1 = 8$ _____

12. If $4 + 5 = 10 - 1$ and $10 - 1 = 6 + 3$, then $4 + 5 = 6 + 3$ _____

13. $5 + (-5) = 0$ _____

11b

Algebraic Proofs

Justify each step by a property.

(1)

$$3(10 - 5 \cdot 2) + 21 \div 7$$

$= 3(10-10) + 21 \div 7$ _____

$= 3(0) + 21 \div 7$ _____

$= 0 + 21 \div 7$ _____

$= 0 + 3$ _____

$= 3$ _____

(2)

$$4(a + b) + 2(a + 2b)$$

$= 4a + 4b + 2a + 4b$ _____

$= 4a + 2a + 4b + 4b$ _____

$= a(4 + 2) + b(4 + 4)$ _____

$= a(6) + b(8)$ _____

$= 6a + 8b$ _____

11 c

Notes: Solving Multi-Step Equations

An equation states that each side of the equal sign is equivalent.

Ex: $3 = 3$ $\qquad\qquad 2.5 = \frac{5}{2}$ $\qquad\qquad 6 + 2 = 8$

It is important to always keep each side equivalent.

|	
$3 = 3$ $3 + 5 = 3 + 5$	If you add 5 to one side, you must add 5 to the other side. This is the **addition property of equality**.
$3 = 3$ $3 - 5 = 3 - 5$	If you subtract 5 from one side, you must subtract 5 from the other side. This is the **subtraction property of equality**.
$3 = 3$ $3 \cdot 5 = 3 \cdot 5$	If you multiply by 5 on one side, you must multiply by 5 on the other side. This is the **multiplication property of equality**.
$3 = 3$ $\dfrac{3}{5} = \dfrac{3}{5}$	If you divide by 5 on one side, you must divide by 5 on the other side. This is the **division property of equality**.

12

To solve an equation for an unknown variable, we use inverse operations. Inverse operations are operations that "undo" one another.

- **Addition** and **Subtraction** are inverse operations.
- **Multiplication** and **Division** are inverse operations.
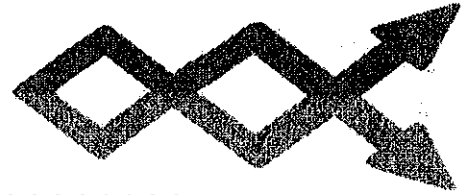
FOREVER ALONE

Solving Equations

Your goal is *to isolate the variable*. This means you want to get the variable alone on one side of the equation.

Examples of One-Step Equations

Solve each equation.   State the property used.

1) $x + 15 = 18$	2) $-7 + w = -2$	3) $N - 6 = -9$
Property:	Property:	Property:
4) $2y = -10$	5) $\frac{2}{5}a = \frac{8}{15}$	6) $\frac{3}{10} = \frac{c}{5}$
Property:	Property:	Property:

13

Your turn:

a) $m - 10 = 2$

b) $-9 = b - 5$

c) $\frac{2}{3}y = \frac{1}{4}$

Property:

Property:

Property:

14

Solving Two-Step Equations

1. Use the Addition or Subtraction Property of Equality to get the term with a variable alone on one side of the equation.
2. Use the Multiplication or Division Property of Equality to write an equivalent equation in which the variable has a coefficient of 1.

Examples: Solve each equation and state each property used.

1) $10 = \frac{m}{4} + 2$

_____

2) $-b + 6 = -11$

_____

You try:

a) $7 = 2y - 3$

_____

b) $-x + 7 = 12$

_____

c) $\frac{x}{9} - 15 = 12$

_____

....

d) $6 - \frac{y}{3} = -2$

_____

Solving Multi-Step Equations

1. Use the Distributive Property to eliminate parentheses
2. Clear the equation of fractions by multiplying by the common denominator (optional step)
3. Combine like terms
4. "Undo" addition or subtraction
5. "Undo" multiplication or division

Examples: Solve each equation.

1. $2x + x + 12 = 78$

2. $2 - 2(x - 4) = 10$

You try:

3. $-2x + 5 + 5x = 14$

4. $15 = 9 - 3(x - 1)$

16

What Do You Get When You . . .

1 Cross a fast dog with a bumblebee?

$$\overline{-16}\ \overline{-12}\ \overline{30}\ \overline{315}\ \overline{2}\ \overline{36}\ \overline{-15}\ \overline{15}\ \overline{-42}\ \overline{-18}\ \overline{-40}\ \overline{44}\ \overline{56}\ \overline{-42}\ \overline{-5}\ \overline{-5}$$

2 Cross an airplane with a magician?

$$\overline{-16}\ \overline{98}\ \overline{-2}\ \overline{7}\ \overline{36}\ \overline{-27}\ \overline{-18}\ \overline{30}\ \overline{295}\ \overline{8}\ \overline{15}\ \overline{315}\ \overline{168}\ \overline{2}\ \overline{315}\ \overline{2}\ \overline{315}$$

Solve each equation or problem and find your solution in the code. Each time the solution appears, write the letter of the exercise above it.

S. $2 + 9n = 74$

E. $-18y + 7 = -29$

H. $11 - 4d = 71$

C. $-8 + \frac{x}{7} = 16$

I. $-\frac{1}{3}p + 1 = 10$

U. $15 - \frac{w}{6} = 22$

G. $\frac{2}{5}y + 8 = 20$

A. $-12 + 5k = -92$

D. $-\frac{3}{8}x - 11 = 4$

F. $-28 = 13q - 2$

O. $30 = 10 + \frac{4}{3}m$

L. $-48 = -6y - 6$

B. $8 - \frac{5}{7}x = -32$

Z. $65 + 13t = 0$

N. $100 = 1 - \frac{11}{2}n$

Y. Mr. Mustard said: "Eight less than three times my age is 100." How old is Mr. Mustard?

R. You are a salesperson for Acme Toys. Every day you earn $30 plus two ninths of your sales. What dollar amount of sales do you need today to earn $100?

Equations and Problems:
Solving Two-Step Equations

3.8

/7

Solving Equations with Variables on Both sides

1. Clean up both sides of the equation individually (combine like terms and simplify).
2. Move all variables to one side of the equation.
3. Move everything else to the other side of the equation.
4. Solve for the variable!

Examples: Solve each equation.

1. $n + 4n - 5 = 2n + 12 - 2n$

2. $38 - y = -3(4y + 2)$

You try:

3. $2(c - 6) = 9c + 2$

4. $3(2x + 1) - x = 8 - 4x + 6$

State each property used to justify each step.

5. $4(x - 1) = 5x + 3 - 2x$

$4x - 4 = 5x + 3 - 2x$ _____

$4x - 4 = 3x + 3$ _____
$-3x \qquad -3x$

$x - 4 = 3$ _____
$\quad +4 \quad +4$

$x = 7$ _____

6. Justify each step.

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

$8 - 3x + 12 = 2x$ _____

$20 - 3x = 12x$ _____
$\quad +3x \quad +3x$

$20 = 15x$ _____
$\ 15 \quad 15$

$\dfrac{4}{3} = x$ _____

18

Name _____ Date _____ Core _____

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

The mistake is in step _____

The correct answer is x = _____

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

The mistake is in step _____

The correct answer is x = _____

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 = _____

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?

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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) $-(1 - 4g) + 10 - g = 2(g + 3)$

$$-1 + 4g + 10 - g = 2g + 6$$
$$3g + 9 = 2g + 6$$
$$-2g \quad\quad -2g$$
$$g + 9 = 6$$
$$-9 \quad -9$$
$$\boxed{g = -3}$$

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)

$$-3(x + 7) = 8 - (2x + 4)$$
(step 1) $-3x + 7 = 8 - 2x - 4$
(step 2) $-3x + 7 = 4 - 2x$
(step 3) $-x + 7 = 4$
(step 4) $-x = -3$
(step 5) $x = 3$

The mistake is in step _____

The correct answer is x = _____

8)

$$5(x - 3) = 2(x + 9) - 8$$
(step 1) $5x - 15 = 2x + 18 - 8$
(step 2) $5x - 15 = 2x + 10$
(step 3) $3x - 15 = 10$
(step 4) $3x = 5$
(step 5) $x = \frac{5}{3}$

The mistake is in step _____

The correct answer is x = _____

9)

$$4(2x - 1) + 3x = 51$$
(step 1) $8x - 4 + 3x = 51$
(step 2) $\underline{-3x \quad\quad -3x}$
$5x - 4 = 51$
(step 3) $\underline{+4 \quad +4}$
$5x = 55$
(step 4) $x = 11$

The mistake is in step _____

The correct answer is x = _____

10. Mowgli solved the equation $2(m + 3) - 4 = 4$ and got 2 as his solution. Without solving the equation, decide if Mowgli is correct or incorrect? Explain how you know.

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What Is the Advantage of Buying a Magnetic Bulletin Board?
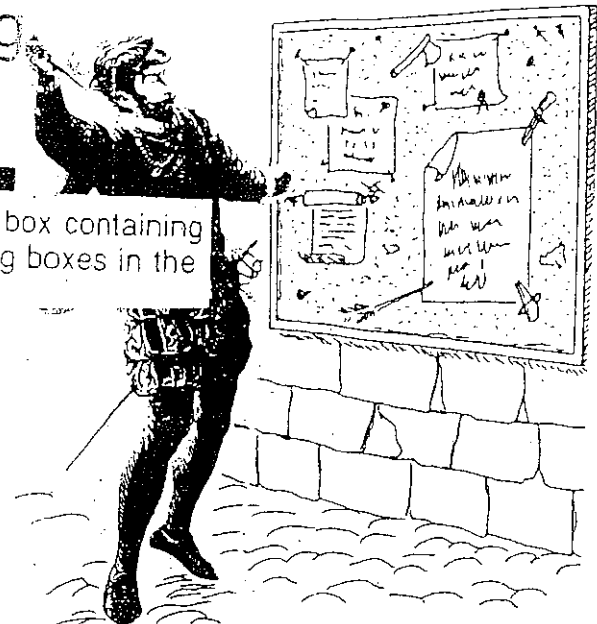
Solve each equation and find your solution below. Cross out the box containing that solution. When you finish, write the letters from the remaining boxes in the spaces at the bottom of the page.

1) $3(5x - 4) = 8x + 2$

:) $9(n + 3) = 7n - 3$

) $2(10 - 6x) = x - 8x$

$5a + 4(3a - 8) = 4 + 13a$

*(5) $2y + 18 = 12 - 6(y + 7)$

$2y + 18 = 12 - 6y - 42$

$2y + 18 = -6y - 30$

$+6y \qquad +6y$

$8y + 18 = -30$

$\quad -18 \quad -18$

$8y = -48$

$\dfrac{8y}{8} = \dfrac{-48}{8} \rightarrow \boxed{y = -6}$

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

(7) $8(m - 5) = 2(3m - 8)$

8) $-4(3 - 6d) = 9(2d - 2)$

9) $7(10 - 3w) = 5(15 - 4w)$

10) $6t + 3(5t - 4) = 12(2t - 5)$

✱ 11) $2(9x - 1) = 99 - 7(3 - 4x)$

$$18x - 2 = 99 - 21 + 28x$$
$$18x - 2 = 28x + 78$$
$$\underline{-28x \qquad\quad -28x}$$
$$-10x - 2 = 78$$
$$\qquad\; \underline{+2 \qquad +2}$$
$$-10x = 80$$
$$\frac{-10x}{-10} = \frac{80}{-10}$$

12) $6(5k - 8) - 20 = 11(2k - 3) + 3k$

13) $-x - (13 + 4x) = -3(5 - 9x) + 2$

QU	IT	HA	I	NG	SA	IS	ST	IC	AC	AN	D	OC	KS	FR	OM	S	CO	EE	RK
4	-2	-5	-11	12	7	2	13	0	-18	-1	-6	16	25	50	-3	-8	-15	11	9

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Multi-step Equations – Special Cases

So far we have looked at equations where there is exactly one solution. It is possible to have no solutions or infinite solutions to an equation.

- **No solution** would mean that there is no answer to the equation. It is impossible for the equation to be true no matter what value we assign to the variable.

  Example: 2x + 3 = 2x + 7

  $$\underline{\quad -2x \qquad -2x \quad}$$
  $$3 = 7$$

  That can't be right! We know that three doesn't equal seven. It is a false statement to say 3 = 7, so we say that there can be **NO SOLUTION!**

  You try: 9x + 3x – 10 = 3(3x + x)

- **Infinite solutions** would mean that any value for the variable would make the equation true.

  Example: 2x + 3 = 2x + 3

  $$\underline{\quad -2x \qquad -2x \quad}$$
  $$3 = 3$$

  When does three equal three? All the time! This means it doesn't matter what value we substitute for x, the equation will always be true. Try two numbers to verify this is true. The answer would be **ALL SOLUTIONS!**

  You try: -3 – 8x + 17 = -2(4x – 7)

- **When the solution is ZERO:** Zero can be an answer! Don't get it confused with no solution!

  Example: 2x + 3 = 3   You try: a + 5 = -5a + 5

  $$\underline{\qquad -3 \quad -3 \quad}$$
  $$2x = 0, \quad x = 0$$

Can you...

1. Create an equation with an answer of all solutions?

2. Create an equation with an answer of no solution?

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Practice – Multi-step Equations – Special Cases

1. $a + 5 = -5a + 5$

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

3. $p - 4 = -9 + p$

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

5. $4m - 4 = 4m$

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

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

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

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

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

11. Create an equation that has no solutions.

12. Create an equation with an answer of all solutions.

13. Pick two problems from above and plug-in your answer to check that they were solved correctly. **You can do this with any problem to check your work!**

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<u>Algebraic Proportions:</u> *Two fractions that are equal*

Steps:

1. Cross multiply
2. Distribute
3. Combine like terms
4. Add or subtract to isolate the variable
5. Multiply or divide to isolate the variable

[cloud note: $\dfrac{2}{3} \cdot \dfrac{5}{7} = \dfrac{10}{21}$ This is multiplying across.]
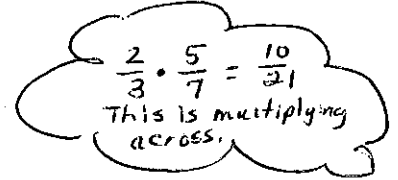
Example 1: $\dfrac{x+4}{5} = \dfrac{x-2}{7}$

$$7(x + 4) = 5(x - 2)$$ Solve like other equations.

Example 2: $\dfrac{12x-32}{4x} = 5$ Rewrite as $\dfrac{12x-32}{4x} = \dfrac{5}{1}$ and Solve.

Try on your own and check with a partner.

1. $\dfrac{2x-2}{3x+6} = \dfrac{2}{5}$

2. $\dfrac{5}{r-9} = \dfrac{8}{r+5}$

3. $0.07x + 9.95 = 12.47 - .05x$

4. $4x + 2.5 = -28.4 - 2.2x$

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BOOKS NEVER WRITTEN

Yours Forever by

$\dfrac{}{\frac{84}{5}}$ $\dfrac{}{\frac{20}{3}}$ $\dfrac{}{-\frac{3}{2}}$ $\dfrac{}{-\frac{3}{2}}$ $\dfrac{}{\frac{20}{3}}$ $\dfrac{}{\frac{32}{3}}$ $\dfrac{}{-12}$ $\dfrac{}{\frac{11}{4}}$ $\dfrac{}{\frac{12}{7}}$ $\dfrac{}{\frac{84}{5}}$ $\dfrac{}{\frac{20}{3}}$ $\dfrac{}{15}$ $\dfrac{}{\frac{32}{3}}$

The Incompetent Bullfighter by

$\dfrac{}{\frac{5}{8}}$ $\dfrac{}{\frac{33}{16}}$ $\dfrac{}{-\frac{43}{4}}$ $\dfrac{}{\frac{11}{4}}$ $\dfrac{}{\frac{33}{16}}$ $\dfrac{}{-12}$ $\dfrac{}{\frac{38}{7}}$ $\dfrac{}{-\frac{3}{2}}$ $\dfrac{}{21}$ $\dfrac{}{\frac{11}{4}}$ $\dfrac{}{\frac{11}{4}}$ $\dfrac{}{\frac{8}{9}}$

ABOVE ARE THE TITLES OF TWO "BOOKS NEVER WRITTEN." TO DECODE THE NAMES OF THEIR AUTHORS, FOLLOW THESE DIRECTIONS:

Solve each equation below and find the solution in the code. Each time the solution appears, write the letter of that exercise above it.

Ⓤ $\dfrac{x}{6} = \dfrac{7}{2}$

Ⓔ $\dfrac{a}{8} = \dfrac{4}{3}$

Ⓨ $\dfrac{2}{9} = \dfrac{t}{4}$

Ⓞ $\dfrac{8}{11} = \dfrac{3}{2y}$

Ⓖ $\dfrac{1}{6x} = \dfrac{4}{15}$

Ⓘ $\dfrac{k+5}{7} = \dfrac{5}{3}$

Ⓑ $\dfrac{x-4}{2} = \dfrac{x+1}{9}$

✳ Ⓝ $\dfrac{7}{d+5} = \dfrac{10}{d+2}$

Ⓐ $\dfrac{x}{4} = \dfrac{2x+3}{15}$

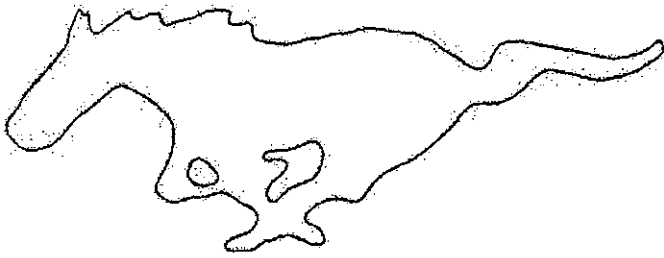Ⓜ $\dfrac{21}{y-8} = 3$

Ⓡ $\dfrac{17-4x}{12} = 5$

Ⓣ $\dfrac{11u}{6} = u+14$

Ⓓ $\dfrac{2n+3}{4} = \dfrac{5n-1}{6}$

Ⓛ $\dfrac{15}{8x-3} = \dfrac{1}{2+2x}$

OBJECTIVE 3–c: To solve proportions.

✳ worked out on
next page   26

(N) $\dfrac{7}{d+5} = \dfrac{10}{d+2}$

$10(d+5) = 7(d+2)$

$10d + 50 = 7d + 14$

$-7d -7d$

$3d + 50 = 14$

$-50 -50$

$3d = -36$

$\dfrac{3d}{3} = \dfrac{-36}{3}$

$\boxed{d = -12}$

Multi-Step Equations with Fractions/Decimals and Algebraic Proportions

Equations with Fractions/Decimals:

Steps:

1.   Clear parentheses by using the distributive property.

2.   If there are fractions or decimals, clear them by multiplying by the lowest common denominator (lowest decimal place value for decimal numbers).

3.   Combine like terms on each side of the equal sign.

4.   Add or subtract to isolate the variable

5.   Multiply or Divide to isolate the variable

Example 1: $\frac{2}{7}x + \frac{4}{7}x = -\frac{30}{7}$ **Multiply by 7 to clear the fraction.** $2x + 4x = -30$.

Solve like other equations.

Example 2:   28 – 2.2y = 11.6y + 262.6   **Multiply by 10 (since lowest decimal is tenths place).**

280 – 22y = 116y + 2626

Solve.

Try on your own and check with a partner.

1. $-\frac{17}{24} = -\frac{4}{3}x - \frac{7}{4} + \frac{1}{2}x$ *Mult. by :*

2. 13.7b – 6.5 = -2.3b + 8.3

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

4. 27.67x – 8 = 22.56x + 40   *Mult. by :*

Algebra I

Name_____

Multi-Step Equations - Fractions - WS#1

Date_____ Period_____

Solve each equation.

1) $-\dfrac{5}{3}r - 2r = -\dfrac{11}{9}$

2) $-2r + \dfrac{1}{3} - \dfrac{5}{2}r = -\dfrac{25}{6}$

3) $\dfrac{3}{4}x + \dfrac{3}{2}x = \dfrac{9}{4}$

4) $\dfrac{8}{3}r - \dfrac{9}{4}r = -\dfrac{5}{12}$

5) $r - \dfrac{10}{3} + \dfrac{1}{2} = -\dfrac{11}{6}$

6) $-\dfrac{5}{2}a + \dfrac{4}{3} + \dfrac{2}{3} = \dfrac{13}{4}$

7) $\dfrac{8}{3}x + \dfrac{3}{2} + \dfrac{2}{3} = -\dfrac{23}{6}$

8) $\dfrac{10}{3}n - \dfrac{5}{2}n = \dfrac{5}{3}$

9) $-\dfrac{5}{3}n + \dfrac{4}{3} + \dfrac{3}{4} = \dfrac{19}{4}$

10) $x + \dfrac{6}{5} + 2\dfrac{1}{5} = \dfrac{9}{10}$

11) $\dfrac{12}{5}x - 2x = \dfrac{3}{10}$

12) $-\dfrac{7}{2}x - \dfrac{5}{2} + 2x = -\dfrac{17}{5}$

13) $\dfrac{3}{2}n + \dfrac{9}{4} - 1 = -1$

14) $\dfrac{5}{4}m + 1 + 4 = \dfrac{15}{2}$

15) $r + \dfrac{1}{3} - \dfrac{8}{5} = \dfrac{22}{5}$

16) $\dfrac{9}{5}b + \dfrac{3}{2}b = -\dfrac{33}{10}$

17) $-\dfrac{5}{2}n + \dfrac{5}{4}n = -\dfrac{1}{2}$

18) $-\dfrac{7}{4}p + 1 + \dfrac{2}{5} = \dfrac{7}{2}$

19) $\dfrac{3}{2}n - \dfrac{15}{4}n = \dfrac{21}{4}$

20) $p - \dfrac{8}{5} - \dfrac{2}{3}p = -\dfrac{7}{5}$

21) $-\dfrac{1}{4}n - n = -\dfrac{5}{6}$

22) $-\dfrac{5}{4}a + \dfrac{1}{3} + \dfrac{4}{3} = \dfrac{25}{6}$

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23) $-\dfrac{10}{3}a + \dfrac{5}{3}a = \dfrac{35}{6}$

24) $\dfrac{7}{4}x + \dfrac{5}{3}x = 0$

25) $\dfrac{3}{2}x + \dfrac{4}{3}x = -\dfrac{85}{9}$

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Solving Word Problems with Equations

Consecutive and Non-Consecutive Integers

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

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

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

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

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

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

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

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

9) The sum of three numbers is 61. The second number is 5 times the first, while the third is 2 less than the first. Find the numbers.

10) The sum of three numbers is 84. The second number is twice the first, and the third is 4 more than the second. Find the numbers.

11) The sum of two numbers is 35. Three times the larger number is the same as 4 times the smaller number. Find the numbers. *(HINT: Let   x = larger number   35 − x = smaller number)*

Perimeter

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

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

14) 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.

15) 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.

16) 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.

17) 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.

18) The length of a rectangular field is 18 m longer than the width. The field is enclosed with fencing and divided into two parts with a fence parallel to the shorter sides. If 216 m of fencing are required, what are the dimensions of the outside rectangle?

Age and Points

19) 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?

20) 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?

21) 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?

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Math I: Practice Rearranging Formulas

Name: _____ Date: _35_

Directions: Solve for the variable in **BOLD** type. Clearly show your steps.

1) $a = b\boldsymbol{C}$

2) $d = \boldsymbol{E} + f$

3) $g = \dfrac{H}{i}$

4) $m = n - \boldsymbol{P}$

5) $s = \dfrac{t}{U}$

6) $y = m\boldsymbol{X} + c$

7) $p = q\boldsymbol{r} - s$

8) $a = d + b\boldsymbol{C}$

9) $a = \dfrac{B}{c} + d$

10) $e = \dfrac{F}{g} + h$

11) $j = \dfrac{k}{N} + m$

12) $V = k\boldsymbol{v}^3$

13) $A = \dfrac{Bh}{2}$

14) $A = \pi r^2$

15) $C = \pi d$

16) $A = 2\pi r^2 + 2\pi r h$

17) $V = \dfrac{4\pi r^3}{3}$

18) $a\boldsymbol{B} + a\boldsymbol{C} = D$

35

Name_____   Date_____

<u>Practice: Literal Equations</u>

Solve the following equations for the variable listed.

1. -3x + b = 6x; for x   1._____

2. y = mx + b; for m   2._____

3. $\frac{5x+y}{a} = 2$; for a   3._____

4. P = IRT; for T   4._____

5. 12x – 4y = 20; for y   5._____

6. $A = \frac{bh}{2}$; for h   6._____

7. $s = \frac{u+v}{t}$; for v   7._____

8. $x^2 + y^2 = z^2$; for x   8._____

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Unit 1 - Review

Solve each equation below. Show all work in the boxes provided.

1. $\frac{2}{3} + \frac{3K}{4} = \frac{7}{12}$	2. $18x - 5 = 3(6x - 2)$
3. $9 + 5a = 2a + 9$	4. $-8x + 14 = -2(4x - 7)$
5. $2 = -\frac{3x - (-4)}{8}$	6. $2 = -\frac{3x - (-4)}{8}$
7. $\frac{a-2}{a+5} = \frac{3}{8}$	8. $3y + 2 = 9x - 4$

Solve each equation for x.

9. $\frac{a}{x} = \frac{b}{c}$	10. $2xy + z = 5x$

Define the variable (if needed) and write an expression.

11. 4 more than twice a number

12. 12 times the quantity of x minus 8

13. The quotient of the sum of y and 3 and 5.

Define a variable, write an <u>equation or inequality</u> and find the solution.

14. There are 4 more boys than girls in Spanish class. The class has 38 members. How many boys and girls are there separately?

15. Find three consecutive odd integers whose sum is 45.

16. Ten less than two times a number is the same as the number increased by 6.

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