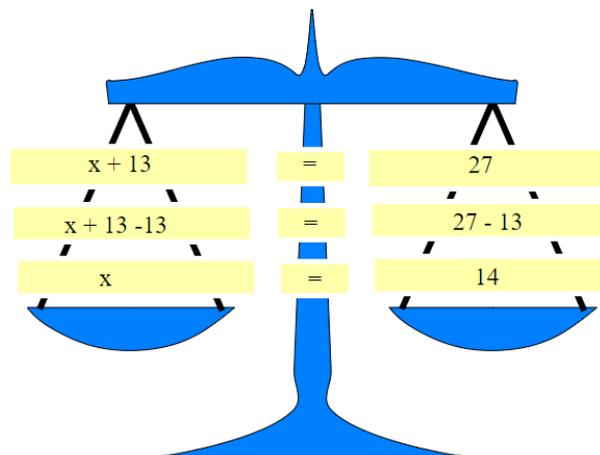


# Solving Equations

## Unit One



Name: \_\_\_\_\_ Period: \_\_\_\_\_

## Lesson #1 Solving One and Two Step Equations

An \_\_\_\_\_ is a mathematical sentence that contains a \_\_\_\_\_.

One step equations are easily solved mentally, by using \_\_\_\_\_.

When we use inverses we are also using mathematical properties:

The \_\_\_\_\_ is used when we add a number to both sides of an equation.

The \_\_\_\_\_ is used when we subtract a number from both sides of an equation.

The \_\_\_\_\_ is used when we multiply each side of the equation by the reciprocal of a number to isolate the variable.

### Examples:

1.  $5x = 30$

2.  $\frac{a}{15} = 4$

3.  $a + 8 = 13$

4.  $\frac{72}{d} = 8$

5.  $18 - z = 12$

6.  $\frac{3}{4}x = 24$

### Try on your own:

7.  $12 - d = 9$

8.  $3x = 18$

9.  $4 = \frac{t}{9}$

10.  $\frac{56}{d} = 14$

11.  $z + 15 = 1$

12.  $\frac{2}{3}x = 16$

**Examples:**

13.  $5x - 2 = 13$

14.  $4 = \frac{1}{6}n + 11$

15.  $-16 = 6a - 4$

16.  $1 + \frac{2}{3}b = -13$

**Try on your own:**

17.  $4 - 8x = 20$

18.  $-2 = \frac{1}{4}n - 10$

19.  $3x - 28 = -7$

20.  $9 + \frac{2}{5}b = 27$

## HW #1 Solving One and Two Step Equations

Show work to solve each of the following.

1.  $\frac{2}{3}x = 28$

2.  $\frac{3}{4}x = 36$

3.  $\frac{3}{2}x = 15$

4.  $\frac{5}{6}x = 55$

5.  $15 - 2x = -9$

6.  $38 = 20 - 6x$

7.  $\frac{1}{3}x - 18 = -9$

8.  $56 - \frac{1}{2}x = 40$

## Lesson #2 Translating Verbal Expressions

In order to translate a verbal expression, you must be familiar with the vocabulary words that represent each operation.

**Words that represent each operation:**

**Addition**

**Subtraction**

**Multiplication**

**Division**

**Translate and solve each of the following:**

1. A number increased by 8 is 23.
2. Twenty - five is ten less than a number.
3. The quotient of 56 and a number is 7.
4. 15 dollars per hour for a total of 60 dollars.

5. Half the number of students is 12.

6. 5 times the number of weeks in school is 200.

7. The product of a number and -3 decreased by 12 is 18.

8. If 17 is decreased by twice a number, the result is 5.

9. One – ninth of a number increased by 5 is 8.

10. Six less than three halves of a number is -30.

11. She paid three – quarters of the price of a new laptop and used a \$10 off coupon for a total \$398. What was the original price?

12. He ordered 4 new tires for his truck and paid \$96 for installation for a total of \$384. How much did each tire cost?

## HW #2 Variables and Equations

Translate and Solve each of the following problems.

1. When 12 is added to the product of a number and -8 the result is 68.
2. Half a number decreased by 54 is equal to -18.
3. Twenty – six more than the triple of a number is eleven.
4. Eighteen less than three quarters of a number is 0.
5. At the end of the summer a pool company sold all their pools for three – fifths of their original price and offered installation for \$250. One costumers total cost was \$1,330. What was the original price of the pool she purchased?





### HW #3 Using Equations to Solve a Problem

Write a two step equation that models each scenario below and use it to solve the problem.

1. The Keesler's took out a 0% interest loan to purchase a new camper. They put \$2,400 down and have to pay \$160 a month until they pay off a total of \$12,000. How many months do they have to pay for camper? How many years?
2. Emily was given \$750 for high school graduation. She opened a savings account and plans to add \$125 per week. How many weeks will it take her to save \$3,000?
3. Lindsay just bought a new MP3 player and purchased a Music Download program online. The program has a start up fee of \$40 and charges \$0.50 per song downloaded. If Lindsay spends \$100, how many songs did she download?

## Lesson #4 Using the Distributive Property to Solve Equations

### Steps:

1. Distribute the number outside of the parenthesis to each number inside the parenthesis, \_\_\_\_\_.
2. Use \_\_\_\_\_ to combine the \_\_\_\_\_ and the answer.
3. Use inverse operations to combine the \_\_\_\_\_ and the answer.
4. \_\_\_\_\_ your work!

### Examples:

1.  $2(x - 1) = 12$

2.  $-3(n - 5) = 36$

3.  $60 = 4(2x + 3)$

4.  $42 = 3(4n + 2)$

5.  $-5(2x + 1) = -45$

6.  $-6(-3x - 2) = 48$

7.  $\frac{1}{3}(18x - 45) = -75$

8.  $147 = -\frac{3}{4}(20x - 36)$

**Use the distributive property to solve each word problem below:**

9. Twice the sum of a number and 15 is equivalent to -24. Find the number.

10. Half the difference of a number and 18 is equivalent to -25. Find the number.

## HW #4: Using the Distributive Property to Solve Equations

**Solve.**

1.  $64 = -4(2x - 6)$

2.  $\frac{1}{2}(16x - 58) = -77$

**Write an equation using the Distributive Property, then solve.**

3. Three times the sum of a number and 24 is equivalent to 12. Find the number.

4. One third the difference of a number and 33 is equivalent to -15.

## Lesson #5 Using the Distributive Property to Solve Word Problems

1. A quarter of the sum of a number and 40 is equivalent to 17. Find the number.
2. Three quarters of the difference of a number and 28 is equivalent to 15. Find the number.
3. A one - day pass to an amusement park costs \$40 plus an additional fee for parking per person. If fifteen people attend the park the total cost is \$675, find the price per person for parking.
4. A volleyball uniform costs \$15 for the shirt, \$10 for the pants and  $x$  dollars for the socks. If a coach has 12 players and spends a total amount of \$396 before taxes, find how much each pair of socks cost.

5. A class of 24 students is going on a class trip to the zoo. Each student had to pay \$12 for admission and  $x$  dollars for the bus ride. The total cost of the trip was \$480. How much did each student pay for the bus?
  
  
  
  
  
  
  
  
  
  
6. Mrs. Keesler bought 125 pencils and protractors for her students. Each pencil cost \$0.05. If her total bill was \$130, find the price of each protractor.
  
  
  
  
  
  
  
  
  
  
7. Eight Friends went to the amusement park. They each bought a ticket for \$30 each and a locker for  $x$  dollars. If they spent a total of \$280, how much did each locker cost?
  
  
  
  
  
  
  
  
  
  
8. The principal awarded the 12 students of the month with a free breakfast. Each student received a bagel and a juice box. If each bagel cost \$0.75, and the principal spent a total of \$15.60, how much did each juice box cost?

## Lesson #6 Solving Equations by Combining Like Terms

### Procedure:

1. \_\_\_\_\_ if necessary.
2. Combine all \_\_\_\_\_ and \_\_\_\_\_.
3. Use inverse operations to combine the \_\_\_\_\_ and the answer.
4. Use inverse operations to combine the \_\_\_\_\_ and the answer.

### Examples:

1.  $2x + 6 - 5x - 10 = 11$

2.  $12x - 10 - 5x + 8 = 54$

3.  $-\frac{5}{2}x + 18 + \frac{3}{4}x - 26 = 55$

4.  $3x + 5(x - 2) = 14$

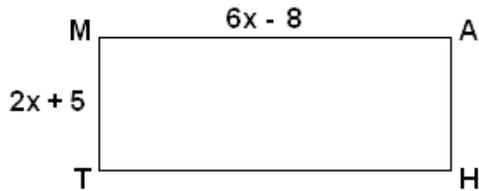
5.  $5x - 4(2x + 3) = -30$

6.  $\frac{4}{5}x + 12 - \frac{7}{15}(x + 60) = 30$

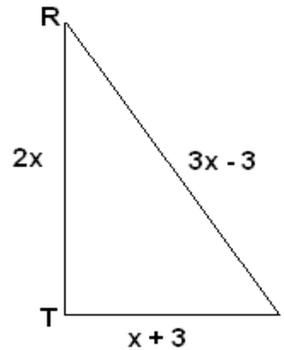
Perimeter is the distance \_\_\_\_\_ a shape. To find the perimeter \_\_\_\_\_ all the sides.

**Given the perimeter find the lengths of each side in the shapes below.**

7. Perimeter is 74 cm.



8. Perimeter is 36 ft.



## HW #6 Solving Equations by Combining Like Terms

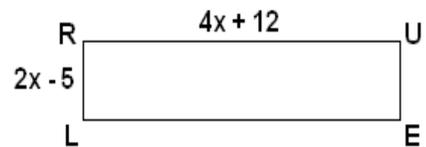
Solve.

1.  $6x + 8 - 10x + 4 = 32$

2.  $-5x + 3 + 8x - 9 = -18$

3.  $-\frac{3}{2}x + 15 + \frac{7}{4}x - 27 = 6$

4. The perimeter of the rectangle below is 62 inches. Determine the value of  $x$  and the length of each side.











4. Amanda has 350 dollars less than twice the amount of money Paul has. The sum of their accounts is \$2,650, find how much money they each have saved.
5. The Junior and Senior classes fundraised for a local charity. The seniors fundraised \$360 less than twice the Juniors. The difference between the amount each raised is \$500. How much did each raise?
6. Jenna and Michael are both fundraising for a local charity. Michael raised seventy-five dollars less than three times the amount of money Jenna raised. Together they were able to donate \$645. How much money did they each raise?





6. Find two consecutive even integers that have a sum of  $-34$ .
  
  
  
  
  
  
  
  
  
  
7. Find two consecutive integers that have a sum of  $-25$ .
  
  
  
  
  
  
  
  
  
  
8. Find three consecutive even integers that have an average of  $80$ .
  
  
  
  
  
  
  
  
  
  
9. Find four consecutive odd integers that have an average of  $96$ .
  
  
  
  
  
  
  
  
  
  
10. Four siblings have consecutive odd ages. If the sum of their ages is  $24$ . Find each of their ages.

## Lesson #10 Variables on Both Sides of the Equations

### Procedure:

1. Use \_\_\_\_\_ to combine like terms on \_\_\_\_\_ of the equal sign.
2. Use inverse operations to \_\_\_\_\_.

### Examples:

1.  $6x - 12 = 2x$

2.  $8x = 4x + 8$

3.  $-\frac{1}{2}x - 18 = \frac{1}{4}x$

4.  $9x - 3 = 7x + 5$

$$5. -2x - 8 = 10 - 5x$$

$$6. \frac{3}{4}x + 16 = 2 - \frac{1}{8}x$$

$$7. 7x + 16 = 3x$$

$$8. 3x - 12 = 9x$$

$$9. 3x + 4.5 = 7.2 - 6x$$

$$10. 16 - \frac{3}{4}x = 20 - \frac{1}{2}x$$

## HW #10 Solving Equations with Variables on Each Side

Solve for the variable in each equation below.

1.  $14n = 18 + 12n$

2.  $27x - 6 = 14x + 7$

3.  $\frac{3}{4}y - 6 = \frac{1}{4}y + 10$

## Lesson #11 Variables on Both Sides Continued

Solve for the variable in each equation below.

1.  $27 - 5x = 4x$

2.  $6x - 48 = 10x$

3.  $\frac{1}{3}x + 5 = \frac{2}{3}x$

4.  $\frac{1}{2}x - 6 = \frac{5}{8}x$

5.  $7x - 18 = 4x + 54$

6.  $-3x + 52 = 5x - 4$

$$7. 85 - 9x = 17 - 26x$$

$$8. -\frac{3}{4}x + 16 = -\frac{1}{2}x + 20$$

$$9. -\frac{9}{10}x - 14 = \frac{2}{5}x + 12$$

$$10. \frac{1}{2}(6x - 18) = 5x + 21$$

## HW #11 Variables on Both Sides Continued

Solve for the variable in each equation below.

1.  $3x - 28 = 7x$

2.  $\frac{2}{3}x + 12 = \frac{3}{2}x - 18$

3.  $\frac{7}{4}x - 26 = \frac{3}{2}\left(\frac{1}{4}x + 12\right)$



4. \$4.40 less than the cost of six baseballs is equal to the cost of three baseballs increased by \$4.60. Find the cost of each baseball.
5. Emily's Great Aunt Grace is six times her age. If you subtract twenty – eight from Aunt Grace's age and add eleven to three times Emily's age their ages are the same. Find their ages.
6. Julia's saving account is one and a half times greater than Jacob's account. If you add \$485 to Jacob's account and subtract \$115 from Julia's their balances are the same. How much money is in each of their accounts?



## Lesson #13: Classification of Solutions

There are three classifications of solutions to equations:

**one solution, no solution, or infinitely many solutions.**

Equations with \_\_\_\_\_ will, after being simplified, have coefficients of  $x$  that are the same on both sides of the equal sign and constants that are different.

Examples: \_\_\_\_\_

Equations with \_\_\_\_\_ will, after being simplified, have coefficients of  $x$  and constants that are the same on both sides of the equal sign.

Examples: \_\_\_\_\_

**Solve each of the following equations for  $x$  and classify as having only one, none or infinitely many solutions.**

1.  $7x - 3 = 5x + 5$

2.  $7x - 3 = 7x + 5$

3.  $7x - 3 = -3 + 7x$

4.  $-8x + 15 = 15 - 8x$

5.  $-8x + 15 = 8x - 15$

6.  $15 - 8x = 8x - 15$

Determine what kind of solution(s) you expect the following linear equations to have. Transform the equation into a simpler form if necessary.

7.  $11x - 2x + 15 = 8 + 7 + 9x$

8.  $3(x - 14) + 1 = -4x + 5$

9.  $-3x + 32 - 7x = -2(5x + 10)$

10.  $\frac{1}{2}(8x + 26) = 13 + 4x$

11.  $5 - \frac{3}{2}x = 9 - \frac{1}{4}(6x + 16)$

12.  $\frac{3}{4}x - 9 = 12 + \frac{2}{3}\left(\frac{9}{8}x - 3\right)$

13.  $\frac{1}{3}(15x - 12) = \frac{5}{2}(10 - 2x)$

14.  $\frac{7}{8}x + 10 - \frac{1}{4}x = 5\left(\frac{1}{8}x + 2\right)$

### HW #13: Classification of Solutions

Explain what kind of solution(s) you expect the following linear equations to have and why. Transform the equation into a simpler form if necessary.

1.  $18x + \frac{1}{2} = 6(3x + 25)$

2.  $8 - 9x = 15x + 7 + 3x$

3.  $5(9 + x) = 5x + 45$

4.  $\frac{5}{6}x - 8 = 18 + \frac{4}{3}\left(\frac{1}{2}x - 6\right)$

5.  $\frac{2}{9}(27x - 72) = -4\left(24 - \frac{1}{18}x\right)$

6.  $\frac{3}{2}x + 15 - \frac{1}{2}x = 2\left(\frac{1}{2}x + 5\right)$

## Lesson #14 Classifications of Solutions

Simplify the equations below to determine if they have one solution, no solution, or infinite solutions. Solve the ones with you one solution completely.

1.  $12x - 8 = 3(4x + 2)$

2.  $\frac{1}{2}(16x + 6) = 3 + 8x$

3.  $\frac{1}{4}(24x - 8) = 8x + 1$

4.  $20 - 2(5x + 4) = 12 - 10x$

5.  $-3(5x - 9) + 4 = 5x - 11 + 3x$

6.  $-18\left(\frac{1}{3}x - 2\right) = -6x + 36$

7.  $3x + 19 - 7x = 9 - 4x$

8.  $15 + \frac{2}{3}(6x - 15) = 4x$

## Lesson #15 Equation Review

1. Amelia was given \$150 in gifts for her 14<sup>th</sup> birthday. She plans to open a savings account and add \$40 per week. How long will it take her to save \$430?
2. Mrs. Heart is pet sitting. She charges \$35 per day for dogs and cats. One day she had three cats and earned \$175. How many dogs did she pet sit that day?
3. Four consecutive even integers have a sum of 84. What are the four integers?
4. Three fifths of a number decreased by one is equivalent to the same number increased by seven. Find the number.

5. Without solving completely, identify which of the following equations has a unique solution, no solution, or infinitely many solutions.

a.  $\frac{1}{3}(18x - 24) = 6x - 8$

b.  $-x + 3 = 8x + 4 - 7x$

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

6. The perimeter of a rectangle is 82 inches. Its length is seven less than half its width. Find the dimensions of the rectangle.

7. Solve:  $\frac{2}{3}(15x - 24) - 6x = 9x - 1$

8.  $\frac{2}{3}(5x - 45) = 30 - \frac{5}{4}(x - 4)$