

## 3.4 Substitution Method

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

Write your questions  
and thoughts here!**Notes****Writing Equations****Example 1:**

Monica built a porch that contained 2 different colors of bricks to create a nice pattern. She purchased the red bricks at \$2 each and the gray bricks for \$3 each. How many red bricks did Monica purchase if she spent \$160 on 60 bricks?

\_\_\_\_\_ = # of red bricks

\_\_\_\_\_ = # of gray bricks

Equation 1: \_\_\_\_\_

Equation 2: \_\_\_\_\_

**Example 2:**

A boat traveled 144 miles downstream and back. The trip downstream took 4 hours. The trip back took 8 hours. What is the speed of the boat in still water?

\_\_\_\_\_ = speed of the boat

\_\_\_\_\_ = speed of the river's current

Equation 1: \_\_\_\_\_

Equation 2: \_\_\_\_\_

**Recall:**

Three types of solutions to a system of equations:

- 1.
- 2.
- 3.

**Solve by Substitution**

1.

2.

3.

**ONE SOLUTION****Example 3:**

$$4x - 3y = -11$$

$$x + 6y = 4$$

**Example 4:**

$$2a + b = -8$$

$$4a - b = -4$$

**Example 5:**

$$7x + 4y = 16$$

$$7x + y = 4$$

Write your questions and thoughts here!



NO SOLUTION	INFINITE SOLUTIONS
<p><b>Example 6:</b>  <math>6x - 2y = 3</math>  <math>-3x + y = 4</math></p>	<p><b>Example 7:</b>  <math>3x + 6y = -15</math>  <math>x + 2y = -5</math></p>

Now summarize what you learned!

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### 3.4 Substitution Method – Solving Systems of Equations

**Practice**

Algebra 1

**Create a system of equations for each problem, but don't solve. Identify each variable's meaning.**

1. Maria and Carlos are selling wrapping paper for a school fundraiser. Customers can buy rolls of plain wrapping paper and rolls of shiny wrapping paper. Maria sold 9 rolls of plain wrapping paper and 6 rolls of shiny wrapping paper for a total of \$204. Carlos sold 1 roll of plain wrapping paper and 8 rolls of shiny wrapping paper for a total of \$140.

\_\_\_\_\_ = \_\_\_\_\_  
 (variable) (what the variable represents)

\_\_\_\_\_ = \_\_\_\_\_  
 (variable) (what the variable represents)

Equation 1: \_\_\_\_\_

Equation 2: \_\_\_\_\_

2. A plane traveled 900 miles to Cleveland and back. (900 miles each way for a total of 1800 miles.) The trip there was with the wind and it took 9 hours. The trip back was into the wind and took 18 hours.

\_\_\_\_\_ = \_\_\_\_\_  
 (variable) (what the variable represents)

\_\_\_\_\_ = \_\_\_\_\_  
 (variable) (what the variable represents)

Equation 1: \_\_\_\_\_

Equation 2: \_\_\_\_\_

3. The Spanish Club purchased 34 tacos for \$40 to sell for a fundraiser. They purchased chicken tacos for \$1 each and beef tacos for \$1.50 each.

\_\_\_\_\_ = \_\_\_\_\_  
 (variable) (what the variable represents)

\_\_\_\_\_ = \_\_\_\_\_  
 (variable) (what the variable represents)

Equation 1: \_\_\_\_\_

Equation 2: \_\_\_\_\_

4. A total of \$1150 was invested, part of it at 12% and part at 11%. The total interest earned was \$133.75.

\_\_\_\_\_ = \_\_\_\_\_  
 (variable) (what the variable represents)

\_\_\_\_\_ = \_\_\_\_\_  
 (variable) (what the variable represents)

Equation 1: \_\_\_\_\_

Equation 2: \_\_\_\_\_

**Solve each system of equations using substitution.**

5.  $2x + 8y = -16$   
 $y = x - 12$

6.  $a = 4b + 19$   
 $-b + 4a = 16$

7.  $3x - y = 2$   
 $6x + 3y = 14$

8.  $4l + w = -2$   
 $4l + 4w = -8$

9.  $c - 3d = 1$   
 $-3c + 9d = 0$

10.  $4m + 4n = -12$   
 $m + 2n = -2$

11.  $3x + 6y = -15$   
 $x + 2y = -5$

12.  $2h - a = 1$   
 $8h + 4a = 6$

13.  $C - 4r = -3$   
 $2C - 8r = -6$

14.  $-w + 3z = -4$   
 $w + 3z = -8$

15.  $4x - 3y = 0$   
 $4x + y = 0$

16.  $a - 4b = 3$   
 $4a - 3b = -1$

17.  $-2\alpha + 2\beta = -4$   
 $2\alpha + \beta = 1$

These are Greek letters Alpha and Beta.

18.  $y - 2x = 4$   
 $4x - 2y = 0$

### 3.4 Substitution Method – Solving Systems of Equations

**Wrap up**

**Practice check:** The next two questions are just like the practice, but we provide no answers. If you can't do these problems, then you're definitely not ready for a Mastery Check!

19. The perimeter of a rectangular parking lot is 190 meters. The width is one-fourth the length. Write a system of equations for this scenario, **but do not solve**.

20. Solve  $x - 4y = -4$   
 $-3x + 12y = -4$

21. Remember Mr. Bean riding his motor scooter and lawn mower? Assume Hill-Billie Bean is on his lawnmower at his farmhouse. 1 kilometer away is Biker Bean riding his motor scooter towards Hill-Billie Bean to play chicken. Assume the lawnmower is traveling at 5 km/hour, and the scooter is traveling at 15 km/h.

- a. You are going to use the formula  $d = rt$ . For this situation, the two variables are  $d$  and  $t$ . Define the following variables and include units.

$d$  represents \_\_\_\_\_ measured in \_\_\_\_\_.  
(units)

$t$  represents \_\_\_\_\_ measured in \_\_\_\_\_.  
(units)

**EXAMPLE of using  $d = rt$ .** Micah is running away from his house at 11 km/hour. If he starts 2 km from his house, then the distance from his house can be represented by  $d = 11t + 2$ . Now answer parts b and c.

- b. Create an equation that represents the distance Hill-Billie Bean has traveled from his farmhouse. Use the example above to help.

- c. Create an equation that represents the distance Biker Bean is from the farmhouse. *Hint: this equation contains +1 because he starts 1 km away from the farm house. Also, the distance from the farmhouse is DECREASING, so this will change your rate.*

- d. Solve these two equations by using the substitution method. Check with your teacher to see if your equations are correct before you start solving them.

- e. Using your answer from part d, how long does it take until they run into each other?

- f. Using your answer from part d, how far will the lawnmower travel?