

5.2 & 5.3 – Day 1 – Solving Systems of Linear Equations by Substitution and Elimination - Notes

**Essential Question:** How can you use substitution to solve a system of linear equations?

Main Ideas/ Questions	Notes/Examples		
What You Will Learn	<ul style="list-style-type: none"> <li>Solve systems of linear equations by substitution and by elimination</li> <li>Use systems of linear equations to solve real-life problems.</li> </ul>		
Methods to Solve Systems	Method #1 Graphing	Method #2 Substitution	Method #3 Elimination

**Solving Systems Using Substitution**

**Steps for solving systems using substitution:**

- Step 1:** Isolate a variable for the 1<sup>st</sup> equation
- Step 2:** Substitute and solve into the 2<sup>nd</sup> equation
- Step 3:** Substitute and solve to find the other variable

1. Equation #1:  $y = -2x - 9$   
 Equation #2:  $6x - 5y = -19$

The solution is  $(-4, -1)$ .

What will you be substituting?  
 $y$   
 will be replaced with  
 $-2x - 9$

Substitute and Solve

$$6x - 5(-2x - 9) = -19$$

$$6x + 10x + 45 = -19$$

$$\boxed{16x} + 45 = -19$$

$$-45 \qquad -45$$

$$6x = -64 \frac{4}{6}$$

$$x = -4$$

Substitute/Find the Other Variable:

$$y = -2(-4) - 9$$

$$y = 8 - 9$$

$$y = -1$$

2. Equation #1:  $x = 6y - 7$   
 Equation #2:  $4x + y = -3$

The solution is  $(-1, 1)$ .

What will you be substituting?  
 $x$   
 will be replaced with  
 $6y - 7$

Substitute and Solve

$$4(6y - 7) + y = -3$$

$$24y - 28 + y = -3$$

$$\boxed{25y} - 28 = -3$$

$$+28 \qquad +28$$

$$25y = 25 \frac{25}{25}$$

$$y = 1$$

Substitute/Find the Other Variable:

$$x = 6(1) - 7$$

$$x = 6 - 7$$

$$x = -1$$

<b>Eliminate</b>	What does it mean to "eliminate" something? to cancel it out. "Get rid of it"
<b>Opposite Coefficients</b>	Find the missing numbers that make the equation true. 1. $3 + \underline{-3} = 0$ 2. $-2 + \underline{2} = 0$ 3. $-5x + \underline{5x} = 0$ 4. $y + \underline{-y} = 0$ 5. $2x + \underline{-2x} = 0$ 6. $-7y + \underline{7y} = 0$ 7. When combining like terms (adding/subtracting), what must the terms look like to equal "0"? same term, opposite signs

**Solving Systems Using Elimination**

**Steps for solving systems using elimination:**

- Step 1:** "Line up" like terms. (Standard Form works best.  $Ax + By = C$ )
- Step 2:** Multiply, if necessary, one or both equations to get opposite coefficients for like terms.
- Step 3:** Add or Subtract the equations together.
- Step 4:** Substitute and solve to find the other variable

**Practice:** Solve the following systems using elimination.

1.  $x + 3y = 17$   
 $-x + 2y = 8$

Solution:  $(2, 5)$

Add the equations and solve:

$$\begin{array}{r} x + 3y = 17 \\ -x + 2y = 8 \\ \hline 5y = 25 \\ \frac{5y}{5} = \frac{25}{5} \\ y = 5 \end{array}$$

Substitute/Find the other variable

$$\begin{array}{r} x + 3(5) = 17 \\ x + 15 = 17 \\ \quad -15 \quad -15 \\ \hline x = 2 \end{array}$$

2.  $2x + 3y = 10$   
 $-2x - y = -2$

Solution:  $(-7, 4)$

3.  $-x + y = 3$   
 $-3x - y = 1$

Solution:  $(-1, 2)$

Add Equations & solve $\begin{array}{r} 2x + 3y = 10 \\ -2x - y = -2 \\ \hline 2y = 8 \\ \frac{2y}{2} = \frac{8}{2} \\ y = 4 \end{array}$	Substitute/Find other variable $\begin{array}{r} 2x + 3(4) = 10 \\ 2x + 12 = 10 \\ \quad -12 \quad -12 \\ \hline 2x = -2 \\ \frac{2x}{2} = \frac{-2}{2} \\ x = -1 \end{array}$	Add Equations & solve $\begin{array}{r} -x + y = 3 \\ -3x - y = 1 \\ \hline -4x = 4 \\ \frac{-4x}{-4} = \frac{4}{-4} \\ x = -1 \end{array}$	Substitute/Find other variable $\begin{array}{r} -(-1) + y = 3 \\ 1 + y = 3 \\ \quad -1 \quad -1 \\ \hline y = 2 \end{array}$
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**5.2 & 5.3 Solving a System of Equations using Substitution and Elimination – DAY 1**

Solve the system of linear equations. Check your solution.

1.  $y = 10 - 2x$   
 $x = y - 4$

Solution:

2.  $4y + 1 = x$   
 $x = 5y$

Solution:

3.  $y = 11 + 4x$   
 $3x + 2y = 0$

Solution:

4.  $5y = 10$   
 $x - 3y = 4$

Solution:

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

6.  $2x - 3y = 9$   
 $5x + 3y = 12$

7.  $2x - 5y = -7$   
 $-2x + 3y = 1$

8. Describe and correct the error in solving the system of linear equations.

~~$y = 2x + 5$~~   
 $2x + y = 5$

The lines have different slopes.  
So, the system has one solution.

9. You and your friend are buying throw blankets with your names embroidered on them. The cost of the throw blanket is  $x$  dollars and the cost of each embroidered letter is  $y$  dollars. Your name has 6 letters and the total cost is \$29. Your friend's name has 3 letters and the total cost is \$24.50.

a. Fill in the blanks for the following system that represents the situation.

$$6y + \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

$$\underline{\hspace{2cm}} + x = \underline{\hspace{2cm}}$$

b. Find the cost of the throw blanket and the cost of each embroidered letter.

Cost of throw blanket:
Cost of each embroidered letter:

10. A wedding planner purchased both small and large lanterns for a wedding reception. The planner purchased a total of 40 lanterns for a purchase price of \$1180. The situation can be represented by the following system.

Lantern	Small, $x$	Large, $y$
Price	\$25	\$40

$$x + y = 40$$

Using substitution, find how many of each size lantern was ordered.

$$25x + 40y = 1180$$