

5.2 & 5.3 – Day 2 – Solving Systems of Linear Equations by Substitution and Elimination - Notes

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

Main Ideas/ Questions	Notes/Examples
<p><b>Methods to Solve Systems of Equations</b></p>	<p><b>Methods to solve systems of equations:</b></p> <ul style="list-style-type: none"> <li>• Solve by graphing</li> <li>• Solve by substitution</li> <li>• Solve by elimination</li> </ul>
<p><b>Special Cases</b></p>	<p>When all the variables cancel completely out... Getting a FALSE statement is NO SOLUTION (a TRUE statement is INFINITE SOLN)</p>
<p><b>Solving Systems Using Substitution or Elimination</b> Solve each system of equations – choose the best method</p>	
<p>1. <math>x = 3 - y</math> <math>5x + 3y = -1</math></p> <p>Solution: <math>(-5, 8)</math></p> $\begin{array}{r} 5(3 - y) + 3y = -1 \\ 15 - 5y + 3y = -1 \\ 15 - 2y = -1 \\ -15 \quad -15 \\ \hline -2y = -16 \\ \frac{-2y}{-2} = \frac{-16}{-2} \\ y = 8 \end{array}$ $\left. \begin{array}{l} x = 3 - 8 \\ x = -5 \end{array} \right\}$	<p>2. <math>x - y = 6</math> <math>x + y = 8</math></p> <p>Solution: <math>(7, 1)</math></p> $\begin{array}{r} x - y = 6 \\ x + y = 8 \\ \hline 2x = 14 \\ \frac{2x}{2} = \frac{14}{2} \\ x = 7 \end{array}$ $\left. \begin{array}{l} 7 - y = 6 \\ -7 - y = -7 \\ \hline -y = -1 \\ \frac{-y}{-1} = \frac{-1}{-1} \\ y = 1 \end{array} \right\}$
<p>3. <math>2x - 3y = 16</math> <math>-2x - 4y = -2</math></p> <p>Solution <math>(5, -2)</math></p> $\begin{array}{r} 2x - 3y = 16 \\ -2x - 4y = -2 \\ \hline -7y = 14 \\ \frac{-7y}{-7} = \frac{14}{-7} \\ y = -2 \end{array}$ $\left. \begin{array}{l} 2x - 3(-2) = 16 \\ 2x + 6 = 16 \\ -6 \quad -6 \\ \hline 2x = 10 \\ \frac{2x}{2} = \frac{10}{2} \\ x = 5 \end{array} \right\}$	<p>4. <math>x = -3y + 5</math> <math>5y - 4x = -3</math></p> <p>Solution: <math>(2, 1)</math></p> $\begin{array}{r} 5y - 4(-3y + 5) = -3 \\ 5y + 12y - 20 = -3 \\ 17y - 20 = -3 \\ 17y = 17 \\ y = 1 \end{array}$ $\left. \begin{array}{l} x = -3(1) + 5 \\ x = -3 + 5 \\ x = 2 \end{array} \right\}$
<p>5. <math>-3x + 3y = 4</math> <math>y = x + 3</math></p> <p>Solution: <b>No Solution</b></p> $\begin{array}{r} -3x + 3(x + 3) = 4 \\ -3x + 3x + 9 = 4 \\ 9 = 4 \\ \text{False} \end{array}$	<p>6. <math>x + 4y = 3</math> <math>-x - 4y = -3</math></p> <p>Solution: <b>Infinitely Many Solutions</b></p> $\begin{array}{r} x + 4y = 3 \\ -x - 4y = -3 \\ \hline 0 = 0 \\ \text{True.} \end{array}$

# Algebra 1

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

## 5.2 & 5.3 – Day 2 – Solving Systems of Linear Equations by Substitution and Elimination - Notes

**Making Adjustments:** Sometimes you need to rearrange or multiply the whole equation by a number in order to make one of the methods work....

7.  $y - 1 = 4x$

$3y = 3x - 6$

$y - 1 = 4x$   
 $+1 \quad +1$   
 $y = (4x + 1)$

$3(4x + 1) = 3x - 6$   
 $12x + 3 = 3x - 6$   
 $-3x \quad -3x$   
 $9x + 3 = -6$   
 $-3 \quad -3$   
 $9x = -9$   
 $x = -1$

Solution:  $(-1, -3)$

8.  $4x + 2y = 2$

$2(-2x + y = 5)$

$4x + 2y = 2$   
 $-4x + 2y = 10$   


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 $4y = 12$   
 $\frac{4y}{4} = \frac{12}{4}$   
 $y = 3$

Solution:  $(-1, 3)$

$4x + 2(3) = 2$   
 $4x + 6 = 2$   
 $-6 \quad -6$   
 $4x = -4$   
 $\frac{4x}{4} = \frac{-4}{4}$   
 $x = -1$

**Application:** 9. An adult ticket,  $x$ , to a museum costs \$3 more than a children's ticket,  $y$ . When 200 adult tickets and 100 children's tickets are sold, the total revenue is \$2100. The situation can be represented by the following system:

$x = 3 + y$

$200x + 100y = 2100$

What is the cost of a children's ticket? \$5

$200(3 + y) + 100y = 2100$   
 $600 + 200y + 100y = 2100$   
 $-600 \quad -600$   
 $300y = 1500$   
 $\frac{300y}{300} = \frac{1500}{300}$   
 $y = 5$

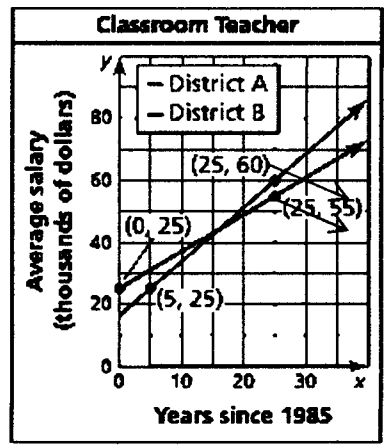
$x = 3 + y$   
 $x = 3 + 5$   
 $x = 8$

Adult = \$8  
 Child = \$5

10. The graph represents the average salaries of classroom teachers in two school districts. Solve the system using the method of your choice.

$\begin{array}{r|l} x & y \\ 5 & 25 \\ 25 & 60 \end{array} \Rightarrow y = 1.75x + 16.25 \quad (16, 44)$

$\begin{array}{r|l} x & y \\ 0 & 25 \\ 25 & 55 \end{array} \Rightarrow y = 1.2x + 25$



a. What year were the average salaries in the two districts equal?

$1985 + 16 = 2001$

b. What was the average salary in both districts in that year? \$44,000

**5.2 & 5.3 Solving a System of Equations using Substitution and Elimination – DAY 2**

In Exercises 1 and 2, tell which equation you would choose to solve for one of the variables. Explain.

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

Equation #2:  $x + 7y = 2$

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

Equation #2:  $3x + 3y = 7$

Solve each system of equations. Check your solution.

3.  $y = 2x - 5$   
 $4x - 2y = 10$

Solution:

4.  $12x - 8y = 10$   
 $-6x + 4y = 5$

Solution:

5.  $x + y = 7$   
 $5x + 2y = 8$

6.  $7x - 6y = 9$   
 $5x + 2y = 19$

7.  $3x + 4y = -1$   
 $-2x - 5y = 10$

Solution:

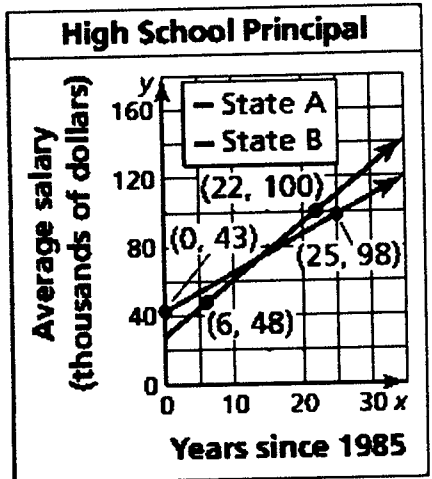
Solution:

Solution:

8. McDonald's sells Big Macs and Double Cheeseburgers. One day, McDonald's sold 15 more Big Macs than Double Cheeseburgers for a total of 35 hamburgers. Would it be reasonable for McDonald's to sell 9 Double Cheeseburgers and 26 Big Macs?

- A Yes, since the total number of burgers sold is 35.
- B No, since the number of Cheeseburgers is not 15 more than then number of Big Macs.

9. The graph represents the average salaries of high school principals in two states.



- a. During what year were the average salaries in the two states equal?
- b. What was the average salary in both states in that year?

10. To raise money for Homecoming, the Student Council sold tickets to a basketball game. There were a total of 240 tickets sold. The number of adult tickets was 2 times the number of student tickets. Based on this information, would it be reasonable for the Student Council to have sold 160 student tickets and 80 adult tickets?

- A Yes, since the total number of tickets sold is 240.
- B No, since the number of adult tickets is not two times the number of student tickets.

Use the tables to determine the solution of the system.

11. \_\_\_\_\_

x	y	y
0	-1	8
1	0	6
2	1	4
3	2	2
4	3	0

12. \_\_\_\_\_

x	y	y
-2	5	2
-1	4	4
0	3	6
1	2	8
2	1	10

13. \_\_\_\_\_

$y = 2x - 5$        $y = -x - 2$

x	y	x	y
-1		-1	
0		0	
1		1	
2		2	
3		3	

14. \_\_\_\_\_

$y = -x - 1$        $y = -3x + 5$

x	y	x	y
1		-1	
2		0	
3		1	
4		2	
5		3	

15. Prove that  $(-2, 1)$  is or is not a solution for the system:  $y = 2x + 5$   
 (Plug in the x and y values into BOTH equations)       $y = x - 2$