

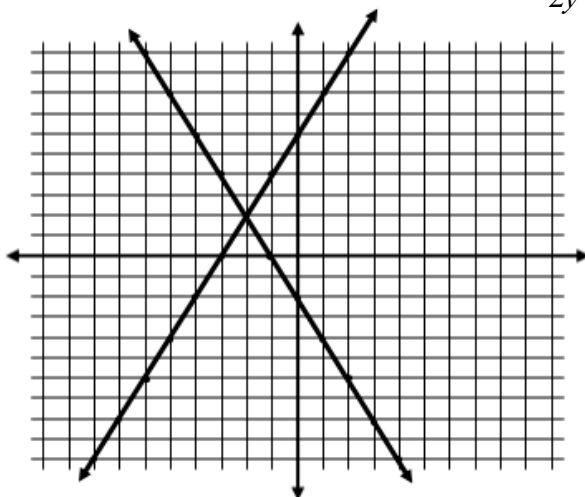
## Chapter 7: Systems of Equations and Inequalities Study Guide

### 7.1: Solve Systems of Equations by Graphing:

- Be able to identify an ordered pair as a solution to a system  
**Ex:** Is (5, 2) a solution to the system:  $2x - 3y = 4$   
 $2x + 8y = 11$

No because if you plug in the ordered pair into **both** equations, it does not work.

- Be able to solve a system of equations by graphing  
**Ex:** Solve the system by graphing:  $6x + 12y = -6$   
 $2y - 4x = 12$



### 7.2: Solve Systems of Equations by Substitution:

- Be able to solve a system of equations by substitution  
**Ex:**  $y = x - 2$   
 $x = 17 - 4y$

$$\begin{aligned}
 x &= 17 - 4(x - 2) \\
 x &= 17 - 4x + 8 \\
 +4x &\quad +4x \\
 \hline
 5x &= 25 \\
 5 &\quad 5 \\
 x &= 5
 \end{aligned}$$

$$\begin{aligned}
 y &= x - 2 \\
 y &= 5 - 2 \\
 y &= 3 \\
 &(5, 3)
 \end{aligned}$$

$$\begin{aligned}
 \text{Ex: } 5x + 2y &= 9 \\
 x + y &= -3 \\
 \hline
 -x &\quad -x \\
 y &= -3 - x
 \end{aligned}$$

$$\begin{aligned}
 5x + 2(-3 - x) &= 9 \\
 5x + -6 - 2x &= 9 \\
 3x - 6 &= 9 \\
 +6 &\quad +6 \\
 \hline
 3x &= 15 \\
 x &= 5
 \end{aligned}$$

$$\begin{aligned}
 y &= -3 - x \\
 y &= -3 - 5 \\
 y &= -8 \\
 &(5, -8)
 \end{aligned}$$

$$\begin{aligned} \text{Ex: } y &= x - 4 \\ y &= 18 + 2x \end{aligned}$$

$$\begin{aligned} x - 4 &= 18 + 2x \\ \underline{-x} \quad \quad \quad \underline{-x} \\ -4 &= 18 + x \\ \underline{-18} \quad \underline{-18} \\ -22 &= x \\ y &= x - 4 \\ y &= -22 - 4 \\ y &= -26 \end{aligned} \qquad (-22, -26)$$

- Be able to write and solve a linear system

**Ex:** During a football game the parents of football players sell pretzels and popcorn to raise money for new uniforms. They charge \$2.50 for a bag of popcorn and \$2 for a pretzel. The parents collect \$336 in sales during the game and sell twice as many bags of popcorn as pretzels. How many bags of popcorn do they sell? How many pretzels?

Let  $x$  = the number bags of popcorn sold                      Let  $y$  = the number of pretzels sold  
 $2.5x + 2y = 336$                       Popcorn is \$2.50 each, pretzels are \$2. They made \$336 total.  
 $x = 2y$                       There was more popcorn ( $x$ ) sold, so  $y$  needs to be multiplied by 2 to make the two amounts equal.

$$\begin{aligned} 2.5(2y) + 2y &= 336 \\ 5y + 2y &= 336 \\ \underline{7y} &= \underline{336} \\ 7 \quad 7 & \\ y &= 48 \end{aligned}$$

$$\begin{aligned} x &= 2y \\ x &= 2(48) \\ x &= 96 \end{aligned} \qquad 96 \text{ bags of popcorn, } 48 \text{ pretzels}$$

### 7.3 – 7.4: Solve Systems of Equations by Eliminating a Variable:

- Be able to add or subtract equations to eliminate a variable in order to solve a system

$$\begin{array}{r} \text{Ex: } 4x - 3y = 5 \\ + \quad -2x + 3y = -7 \\ \hline \quad \quad \underline{2x} = \underline{-2} \\ \quad \quad 2 \quad 2 \\ \quad \quad x = -1 \end{array} \qquad \begin{array}{r} \text{Ex: } 6x - 4y = 14 \\ - \quad 3x - 4y = 1 \\ \hline \quad \quad \underline{3x} = \underline{13} \\ \quad \quad 3 \quad 3 \\ \quad \quad x = \frac{13}{3} \text{ or } 4\frac{1}{3} \end{array}$$

After plugging  $x$  into either equation, you would get the value for  $y$ .

$$y = -3$$

$$(-1, -3)$$

$$y = 3$$

$$\left(\frac{13}{3}, 3\right)$$

**Ex:**  $3x + 4y = -6$

$$\underline{2y = 3x + 6}$$

First you have to rewrite the equations so they are lined up. The first equation stays the same, you will subtract  $3x$  in the second equation.

$$\begin{array}{r} 3x + 4y = -6 \\ + \underline{-3x + 2y = 6} \end{array} \quad \text{Now add the equations together}$$

$$\underline{6y = 0}$$

$$6 \quad 6$$

$$y = 0$$

Plug  $y$  into either equation to get  $x = -2$

$$(-2, 0)$$

- Be able to multiply equations first, then eliminate a variable, in order to solve a system

**Ex:**  $x + y = 2$

$$2x + 7y = 9$$

**Ex:**  $4x - 3y = 8$

$$5x - 2y = -11$$

**Multiply the first equation by 2.**

**Now  $x$  matches.**

$$2x + 2y = 4$$

$$- \underline{2x + 7y = 9}$$

Subtract the equations from each other

$$\underline{-5y = -5}$$

$$-5 \quad -5$$

$$y = 1$$

Plug the value of the variable into any equation to find the other value.

$$x = 1$$

$$(1, 1)$$

**Multiply the top equation by 2 and multiply the**

**bottom equation by 3.  $Y$**

**matches now.**

$$8x - 6y = 16$$

$$- \underline{15x - 6y = -33}$$

$$\underline{-7x = 49}$$

$$-7 \quad -7$$

$$x = -7$$

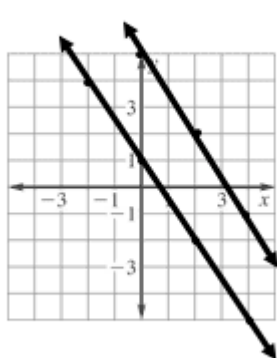
$$y = -12$$

$$(-7, -12)$$

## 7.5: Special Types of Linear Systems:

- Be able to identify when a system of equations has one solution, no solution or an infinite number of solutions by solving using any method.

**Ex:** Solve by graphing:  $3x + 2y = 10$



$$y = -\frac{3}{2}x + 1$$

**No solution, the lines are parallel so they will never intersect.**

**Ex:** Solve by substitution:

$$x - 2y = -4$$

$$y = \frac{1}{2}x + 2$$

**Infinite solutions**

**Ex:** Solve by eliminating:

$$2x - 3y = 6$$

$$2x - 3y = -4$$

**No solution**

- Be able to identify the number of solutions to a system without actually solving it.

**Ex:**  $5x + 3y = 6$

$$-5x - 3y = 3$$

**Ex:**  $y = 2x - 4$

$$-6x + 3y = -12$$

**You must first put both equations in slope-intercept form:**

$$y = -\frac{5}{3}x + 2$$

$$y = -\frac{5}{3}x - 1$$

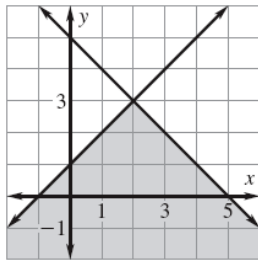
**In the first example, since the slopes are the same and  $y$ -intercepts are different, then you can say that the lines are parallel, meaning they will never intersect so there is no solution.**

In the second example, both the slopes and the y-intercepts are the same, so they are the same line, so there is an infinite number of solutions.

**7.6: Solve Systems of Linear Inequalities:**

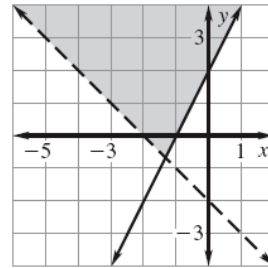
- Be able to identify a solution to a system of linear inequalities

**Ex:** Is (1, 2) a solution?



Yes, it is in the overlapping shaded region.

**Ex:** Is (-2, 0) a solution?

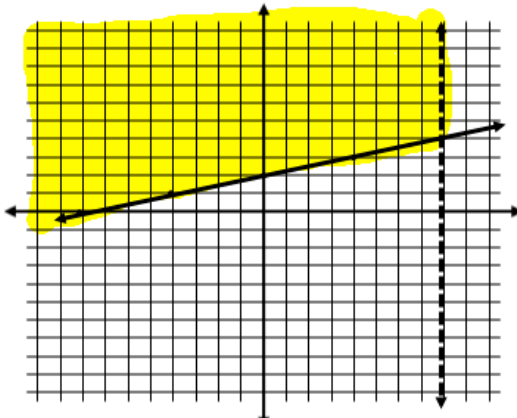


No, its on the dotted line.

- Be able to graph a system of linear inequalities

**Ex:**  $x < 8$

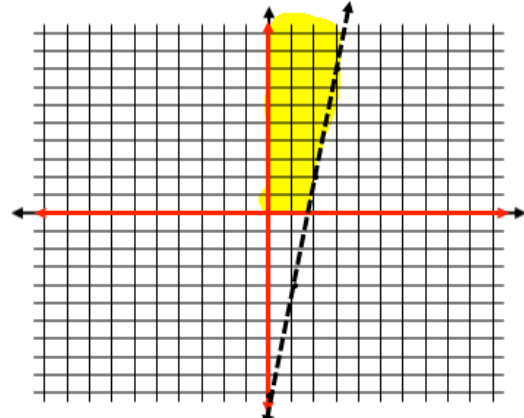
$x - 4y \leq -8$



**Ex:**  $x \geq 0$

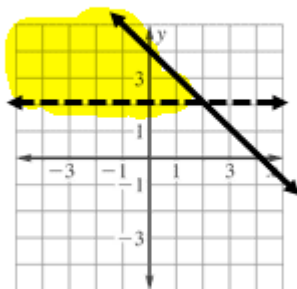
$y \geq 0$

$6x - y < 10$

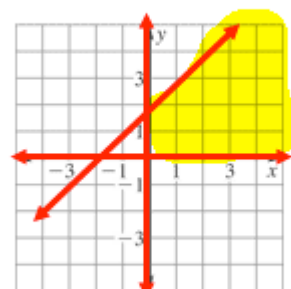


- Be able to write a system of linear inequalities given the graph

**Ex:**



**Ex:**



$$y > 2$$

$$y \leq -x + 4$$

$$y \geq 0$$

$$x \geq 0$$

$$y \leq x + 2$$