Chapter 7: Systems of Equations and Inequalities
Study Guide

7.1: Solve Systems of Equations by Graphing:

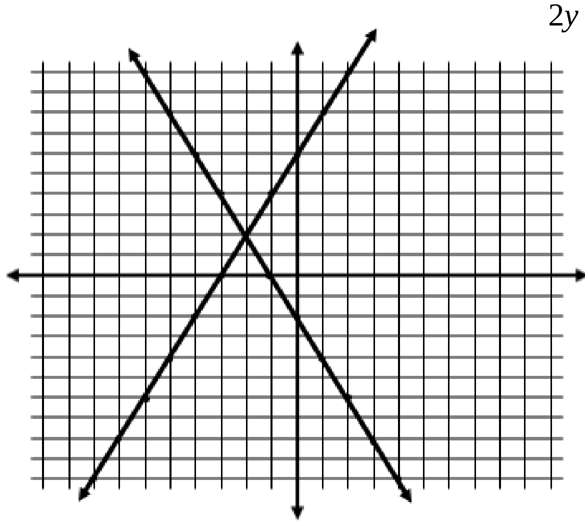
- Be able to identify an ordered pair as a solution to a system

  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: $y = x - 2$
  $x = 17 - 4y$

  $x = 17 - 4(x - 2)$
  $x = 17 - 4x + 8$
  $+ 4x \quad + 4x$
  $\frac{5x}{5} = \frac{25}{5}$
  $x = 5$

  $y = x - 2$
  $y = 5 - 2$
  $y = 3$
  (5, 3)

  Ex: $5x + 2y = 9$
  $x + y = -3$
  $-x \quad -x$
  $y = -3 - x$

  $5x + 2(-3 - x) = 9$
  $5x + -6 - 2x = 9$
  $3x - 6 = 9$
  $+ 6 \quad +6$
  $3x = 15$
  $x = 5$

  $y = -3 - x$
  $y = -3 - 5$
  $y = -8$
  (5, –8)

Ex: $y = x - 4$
$y = 18 + 2x$

$x - 4 = 18 + 2x$
$\underline{-x \qquad\qquad -x}$
$-4 = 18 + x$
$\underline{-18 \;\; -18}$
$-22 = x$

$y = x - 4$
$y = -22 - 4$
$y = -26$ (–22, –26)

- Be able to write an 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.

$2.5(2y) + 2y = 336$
$5y + 2y = 336$
$\frac{7y}{7} = \frac{336}{7}$
$y = 48$

$x = 2y$
$x = 2(48)$
$x = 96$ 96 bags of popcorn, 48 pretzels

<u>7.3 – 7.4: Solve Systems of Equations by Eliminating a Variable</u>:

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

Ex: $4x - 3y = 5$
$\underline{+ \quad -2x + 3y = -7}$
$\frac{2x}{2} = \frac{-2}{2}$
$x = -1$

Ex: $6x - 4y = 14$
$\underline{- \quad 3x - 4y = 1}$
$\frac{3x}{3} = \frac{13}{3}$
$x = \frac{13}{3}$ or $4\frac{1}{3}$

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

$y = -3$ $\qquad\qquad$ $y = 3$

$(-1, -3)$ $\qquad\qquad$ $(\frac{13}{3}, 3)$

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.

$$\begin{array}{r} 3x + 4y = -6 \\ + \ \underline{-3x + 2y = 6} \\ \frac{6y}{6} = \frac{0}{6} \\ y = 0 \end{array}$$

Now add the equations together

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: $x + y = 2$

$2x + 7y = 9$

Multiply the first equation by 2. Now x matches.

$$\begin{array}{r} 2x + 2y = 4 \\ - \ \underline{2x + 7y = 9} \\ \frac{-5y}{-5} = \frac{-5}{-5} \\ y = 1 \end{array}$$

Ex: $4x - 3y = 8$

$5x - 2y = -11$

Multiply the top equation by 2 and multiply the bottom equation by 3. *Y* matches now.

$$\begin{array}{r} 8x - 6y = 16 \\ - \ \underline{15x - 6y = -33} \\ \frac{-7x}{-7} = \frac{49}{-7} \\ x = -7 \end{array}$$

Subtract the equations from each other

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

$x = 1$ $\qquad\qquad$ $y = -12$

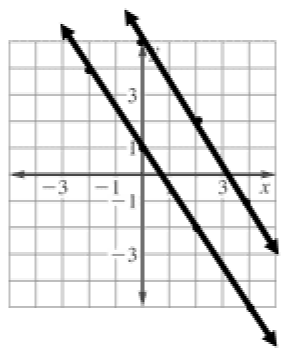
$(1, -1)$ $\qquad\qquad$ $(-7, -12)$

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:

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

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

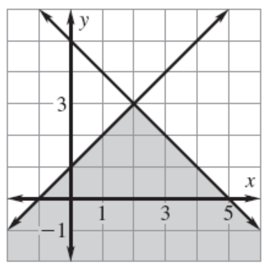
In the first example, since the slopes are the same and *y*-intercepts are different, then you can say that the lines are parallel, meaning they will never intersect so there is no solution.

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.

<u>7.6: Solve Systems of Linear Inequalities</u>:

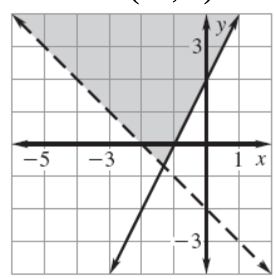
- Be able to identify a solution to a system of linear inequalities

Ex: Is (1, 2) a solution?



Yes, it is in the overlapping shaded region.

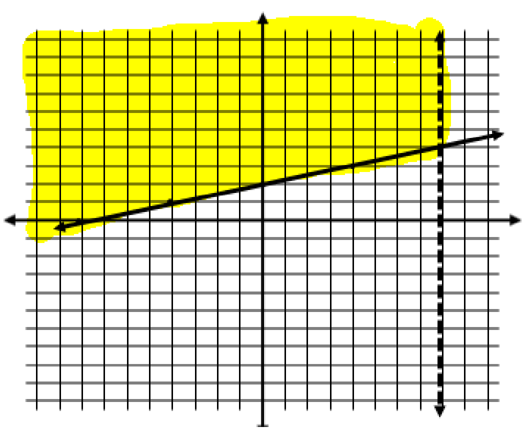
Ex: Is (–2, 0) a solution?



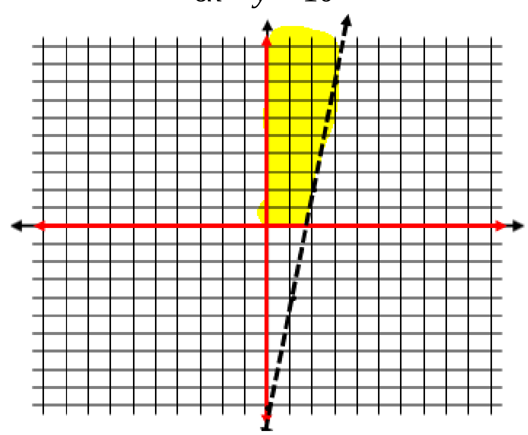
No, its on the dotted line.

- Be able to graph a system of linear inequalities

Ex: $x < 8$
$x - 4y \leq -8$

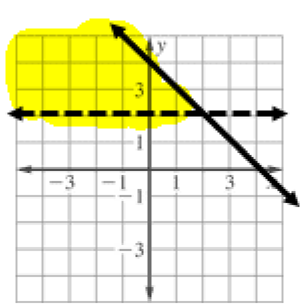


Ex: $x \geq 0$
$y \geq 0$
$6x - y < 10$

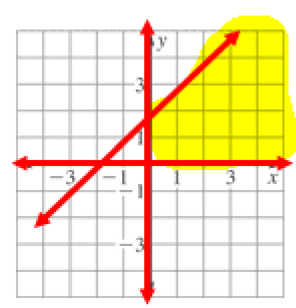


- Be able to write a system of linear inequalities given the graph

Ex:



Ex:



$y > 2$

$y \leq -x + 4$

$y \geq 0$

$x \geq 0$

$y \leq x + 2$