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: 
  \[ \begin{align*}
  2x - 3y &= 4 \\
  2x + 8y &= 11
  \end{align*} \]
  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: 
  \[ \begin{align*}
  6x + 3y &= -6 \\
  2y - 4x &= 12
  \end{align*} \]

7.2: Solve Systems of Equations by Substitution:

- Be able to solve a system of equations by substitution
  Ex: \[\begin{align*}
  y &= x - 2 \\
  x &= 17 - 4y
  \end{align*}\]
  \[\begin{align*}
  x &= 17 - 4(x - 2) \\
  x &= 17 - 4x + 8 \\
  + 4x &+ 4x \\
  5x &= 25 \\
  5 &= 5 \\
  x &= 5
  \end{align*}\]
  \[\begin{align*}
  y &= x - 2 \\
  y &= 5 - 2 \\
  y &= 3 \\
  (5, 3)
  \end{align*}\]

Ex: \[\begin{align*}
  5x + 2y &= 9 \\
  x + y &= -3
  \end{align*}\]
  \[\begin{align*}
  -x &= -x \\
  y &= -3 - x
  \end{align*}\]
  \[\begin{align*}
  5x + 2(-3 - x) &= 9 \\
  5x + -6 - 2x &= 9 \\
  3 x - 6 &= 9 \\
  + 6 &+ 6 \\
  3x &= 15 \\
  x &= 5
  \end{align*}\]
  \[\begin{align*}
  y &= -3 - x \\
  y &= -3 - 5 \\
  y &= -8 \\
  (5, -8)
  \end{align*}\]
Ex: \[ y = x - 4 \]
\[ y = 18 + 2x \]

\[
x - 4 = 18 + 2x
\]
\[
-x \quad -x
\]
\[
-4 = 18 + x
\]
\[
-18 \quad -18
\]
\[
-22 = x
\]

\[ y = x - 4 \]
\[ y = -22 - 4 \]
\[ y = -26 \quad (-22, -26) \]

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**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

\[ 2.5x + 2y = 336 \]
\[ x = 2y \]

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

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

\[ x = 2y \]
\[ x = 2(48) \]
\[ x = 96 \]

96 bags of popcorn, 48 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
  
  **Ex:** \(4x - 3y = 5\)  
  **Ex:** \(6x - 4y = 14\)  
  \[\begin{array}{c}
  + \quad -2x + 3y = -7 \\
  \hline
  2x = -2 \\
  2x = -2
  \end{array}\]
  
  \[\begin{array}{c}
  \hline
  3x = 13 \\
  3x = 13
  \end{array}\]
  
  \[\begin{array}{c}
  \hline
  x = \frac{13}{3} \text{ or } 4 \frac{1}{3} \\
  x = \frac{13}{3} \text{ or } 4 \frac{1}{3}
  \end{array}\]
  
  After plugging \(x\) into either equation, you would get the value for \(y\).
  
  \[y = -3\]
  
  \((-1, -3)\)
  
  **Ex:** \(3x + 4y = -6\)
  
  \(2y = 3x + 6\)
  
  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.
  
  \[\begin{array}{c}
  3x + 4y = -6 \\
  + \quad -3x + 2y = 6 \\
  \hline
  6y = 0 \\
  6y = 0
  \end{array}\]
  
  \[\begin{array}{c}
  \hline
  y = 0 \\
  y = 0
  \end{array}\]
  
  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.
  
  \[\begin{array}{c}
  2x + 2y = 4 \\
  - 2x + 7y = 9
  \end{array}\]
  
  \[\begin{array}{c}
  8x - 6y = 16 \\
  - 15x - 6y = -33
  \end{array}\]
  
  Subtract the equations from each other
  
  \[\begin{array}{c}
  -5y = -5 \\
  -5
  \end{array}\]
  
  \[\begin{array}{c}
  \hline
  -7x = 49 \\
  -7
  \end{array}\]
  
  \[\begin{array}{c}
  \hline
  y = 1 \\
  y = 1
  \end{array}\]
  
  \[\begin{array}{c}
  \hline
  x = -7 \\
  x = -7
  \end{array}\]
  
  Plug the value of the variable into any equation to find the other value.
  
  \[x = 1\]
  
  \((-7, -12)\)