Section 5.2
Systems of Linear Equations in Two Variables

Recall that a system of equations is two or more equations considered together. (See Section 5.1.)
In particular, if all of those functions are linear, we call it a _______ __________ of ___________.

Ex. $\begin{cases} 3x - 2y = 5 \\ x + 2y = 7 \end{cases}$

We studied the Substitution Method in Section 5.1. Now we will learn the ____________ Method.

<u>Solving by Elimination</u>:

1. Arrange the equations so that they have the same form – the variables are lined up

2. Multiply one or both equations by constants so that *x* or *y* has the same coefficient (or) different signs

3. Add the equations. One variable is **eliminated.** Solve for the remaining variable.

4. Back-substitute in one of the equations and solve for the other variable

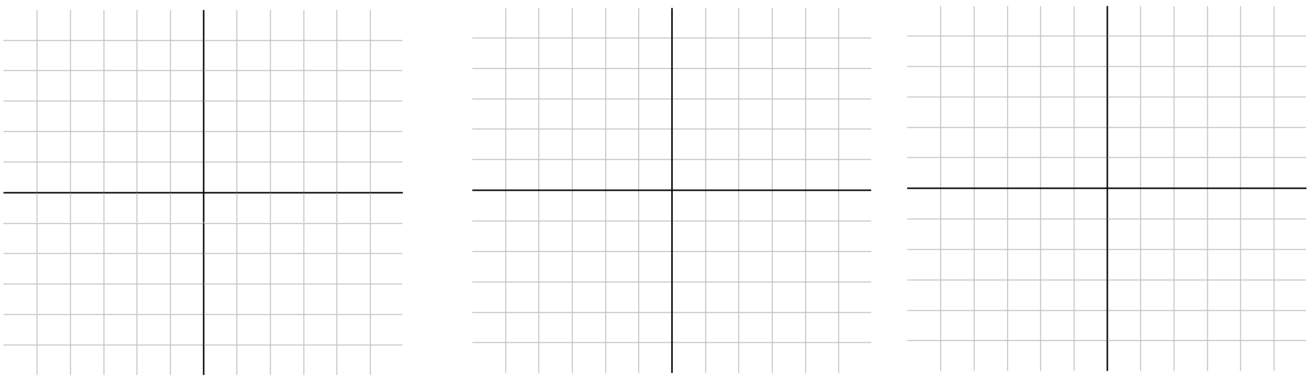
Example 1: Solve the following systems of equations.

a. $\begin{cases} 3x - 2y = 5 \\ x + 2y = 7 \end{cases}$

b. $\begin{cases} 3x + 2y = 10 \\ 2x = -5y + 3 \end{cases}$

Recall that a __________ of a system of equations is an _________ _______ that is a solution of _____ equations.

Ex.



Example 2: Solve $\begin{cases} 3x - 4y = 8 \\ 6x - 8y = 16 \end{cases}$

Let us see the above example again. We notice that the equation (2) divides 2 gives us the equation (1). This is the case of a <u>dependent</u> system of equations. If you notice a system of equations is dependent, there is a simpler method for solving it. Let us try Example 2 again.

Example 2': Solve $\begin{cases} 3x - 4y = 8 \\ 6x - 8y = 16 \end{cases}$

Example 3: Determine which system of equations are dependent.

a. $\begin{cases} 10x - 5y = 8 \\ 30x - 15y = 24 \end{cases}$

b. $\begin{cases} 2x - 5y = 7 \\ 4x + 10y = 14 \end{cases}$

c. $\begin{cases} 5x + 2y = 2 \\ y = -\dfrac{5}{2}x + 1 \end{cases}$

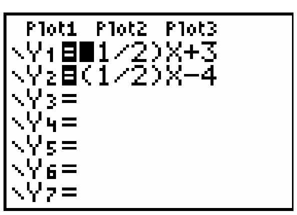
d. $\begin{cases} 2x + 6y = 4 \\ 5x + 15y = 10 \end{cases}$

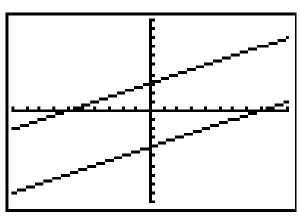
e. $\begin{cases} y - \dfrac{1}{2}x - 3 = 0 \\ x - 2y = 8 \end{cases}$

Let us see Example 3, e. one more time. Notice that the left-hand side of the second equation is obtained as three times the left-hand side of the first equations. But this is not a dependent system of equations, because the constant term cannot be obtained in the same way. This is the case of inconsistent.

Example 4: Solve $\begin{cases} y - \dfrac{1}{2}x - 3 = 0 \\ x - 2y = 8 \end{cases}$

Graphically:





Example 5: Solve:

a. $\begin{cases} 4x - 2y = 9 \\ 2x - y = 3 \end{cases}$

b. $\begin{cases} \frac{3}{5}x - \frac{2}{3}y = 7 \\ \frac{2}{5}x - \frac{5}{6}y = 7 \end{cases}$