KY.HS.A.20 Solve systems of linear equations in two variables.
a. Understand a system of two equations in two variables has the same solution as a new system formed by replacing one of the original equations with an equivalent equation.
b. Solve systems of linear equations with graphs, substitution and elimination, focusing on pairs of linear equations in two variables. (MP.3, MP.6)

Solving Systems of Equations

1. Here is a system of equations: $\begin{cases} 3x - y = 17 \\ x + 4y = 10 \end{cases}$

   a. Solve the system by graphing the equations (by hand or using technology).

   b. Explain how you could tell, without graphing, that there is only one solution to the system.

2. Consider this system of linear equations: $\begin{cases} y = \frac{4}{5}x - 3 \\ y = \frac{4}{5}x + 1 \end{cases}$

   a. Without graphing, determine how many solutions you would expect this system of equations to have. Explain your reasoning.

   b. Try solving the system of equations algebraically and describe the result that you get. Does it match your prediction?

3. How many solutions does this system of equations have? Explain how you know.

$$\begin{cases} 9x - 3y = -6 \\ 5y = 15x + 10 \end{cases}$$

4. Select **all** systems of equations that have no solutions.

A. $\begin{cases} y = 5 - 3x \\ y = -3x + 4 \end{cases}$

B. $\begin{cases} y = 4x - 1 \\ 4y = 16x - 4 \end{cases}$

C. $\begin{cases} 5x - 2y = 3 \\ 10x - 4y = 6 \end{cases}$

D. $\begin{cases} 3x + 7y = 42 \\ 6x + 14y = 50 \end{cases}$

E. $\begin{cases} y = 5 + 2x \\ y = 5x + 2 \end{cases}$

5. Consider this system of equations, which has one solution: $\begin{cases} 2x + 2y = 180 \\ 0.1x + 7y = 78 \end{cases}$

Here are some equivalent systems. Each one is a step in solving the original system.

Step 1:

$\begin{cases} 7x + 7y = 630 \\ 0.1x + 7y = 78 \end{cases}$

Step 2:

$\begin{cases} 6.9x = 552 \\ 0.1x + 7y = 78 \end{cases}$

Step 3:

$\begin{cases} x = 80 \\ 0.1x + 7y = 78 \end{cases}$

a. Look at the original system and the system in Step 1.

i. What was done to the original system to get the system in Step 1?

ii. Explain why the system in Step 1 shares a solution with the original system.

b. Look at the system in Step 1 and the system in Step 2.

i. What was done to the system in Step 1 to get the system in Step 2?

ii. Explain why the system in Step 2 shares a solution with that in Step 1.