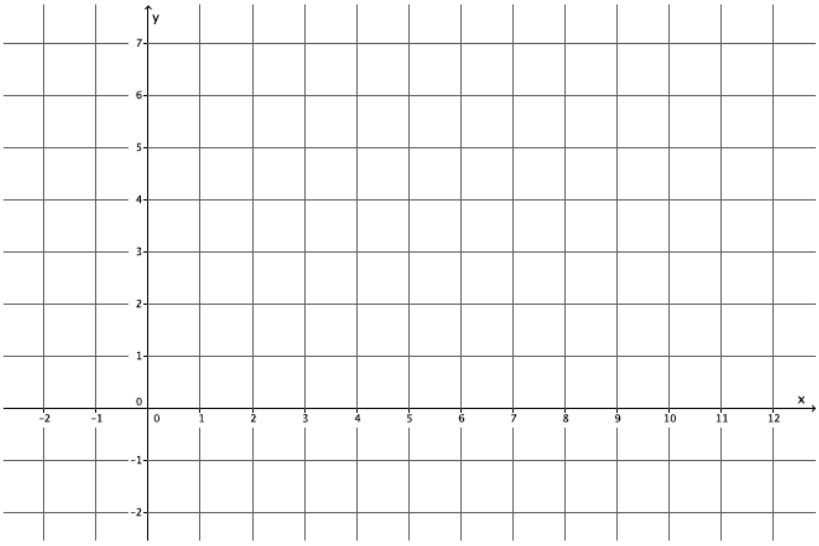
Lesson 25: Geometric Interpretation of the Solutions of a Linear System

Classwork

Exercises

1. Graph the linear system on a coordinate plane: $\begin{cases} 2y + x = 12 \\ y = \frac{5}{6}x - 2 \end{cases}$.



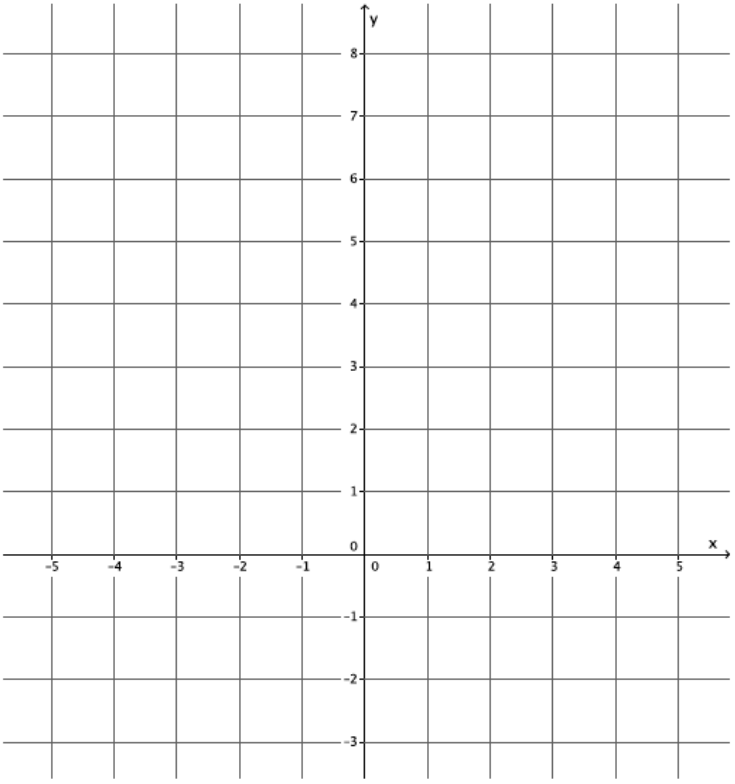
a. Name the ordered pair where the graphs of the two linear equations intersect.

b. Verify that the ordered pair named in (a) is a solution to $2y + x = 12$.

c. Verify that the ordered pair named in (a) is a solution to $y = \frac{5}{6}x - 2$.

d. Could the point $(4, 4)$ be a solution to the system of linear equations? That is, would $(4, 4)$ make both equations true? Why or why not?

2. Graph the linear system on a coordinate plane: $\begin{cases} x + y = -2 \\ y = 4x + 3 \end{cases}$.



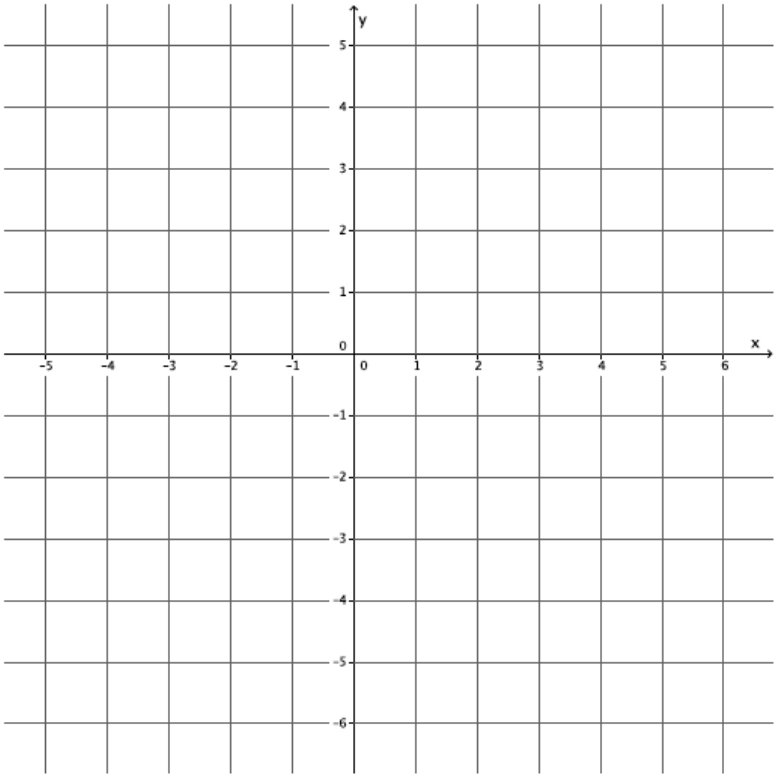
a. Name the ordered pair where the graphs of the two linear equations intersect.

b. Verify that the ordered pair named in (a) is a solution to $x + y = -2$.

c. Verify that the ordered pair named in (a) is a solution to $y = 4x + 3$.

d. Could the point $(-4, 2)$ be a solution to the system of linear equations? That is, would $(-4, 2)$ make both equations true? Why or why not?

3. Graph the linear system on a coordinate plane: $\begin{cases} 3x + y = -3 \\ -2x + y = 2 \end{cases}$.



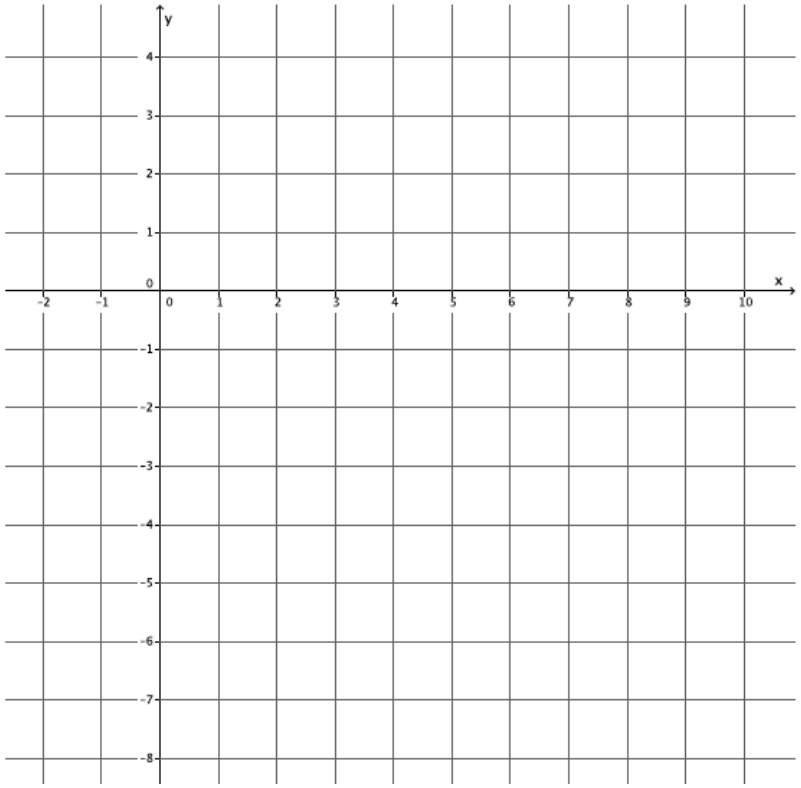
a. Name the ordered pair where the graphs of the two linear equations intersect.

b. Verify that the ordered pair named in (a) is a solution to $3x + y = -3$.

c. Verify that the ordered pair named in (a) is a solution to $-2x + y = 2$.

d. Could the point $(1, 4)$ be a solution to the system of linear equations? That is, would $(1, 4)$ make both equations true? Why or why not?

4. Graph the linear system on a coordinate plane: $\begin{cases} 2x - 3y = 18 \\ 2x + y = 2 \end{cases}$.



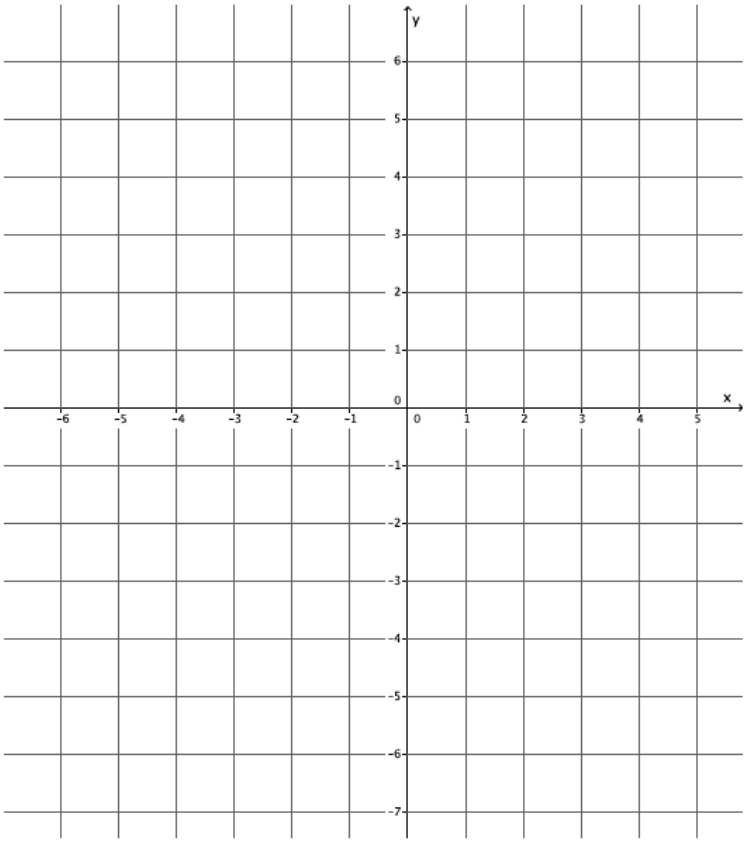
a. Name the ordered pair where the graphs of the two linear equations intersect.

b. Verify that the ordered pair named in (a) is a solution to $2x - 3y = 18$.

c. Verify that the ordered pair named in (a) is a solution to $2x + y = 2$.

d. Could the point $(3, -1)$ be a solution to the system of linear equations? That is, would $(3, -1)$ make both equations true? Why or why not?

5. Graph the linear system on a coordinate plane: $\begin{cases} y - x = 3 \\ y = -4x - 2 \end{cases}$.



a. Name the ordered pair where the graphs of the two linear equations intersect.

b. Verify that the ordered pair named in (a) is a solution to $y - x = 3$.

c. Verify that the ordered pair named in (a) is a solution to $y = -4x - 2$.

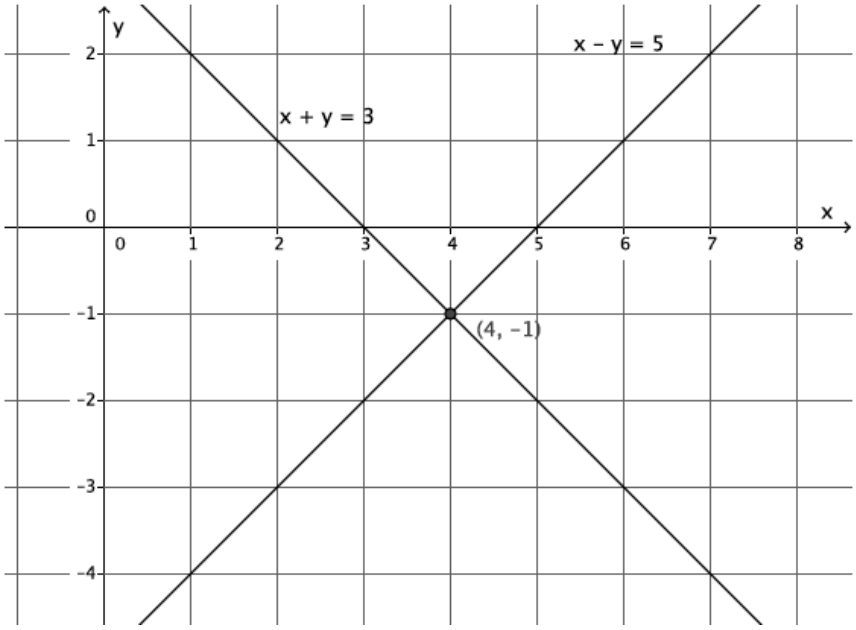
d. Could the point $(-2, 6)$ be a solution to the system of linear equations? That is, would $(-2, 6)$ make both equations true? Why or why not?

6. Write two different systems of equations with $(1, -2)$ as the solution.

Lesson Summary

When a system of linear equations is graphed, the point of intersection of the lines of the graph represents the solution to the system. Two distinct lines intersect at most at one point. The coordinates of that point (x, y) represent values that make both equations of the system true.

Example: The system $\begin{cases} x + y = 3 \\ x - y = 5 \end{cases}$ graphs as shown below.



The graphs of the lines intersect at $(4, -1)$. That means the equations in the system are true when $x = 4$ and $y = -1$:

$$\begin{aligned} x + y &= 3 \\ 4 + (-1) &= 3 \\ 3 &= 3 \end{aligned}$$

$$\begin{aligned} x - y &= 5 \\ 4 - (-1) &= 5 \\ 5 &= 5 \end{aligned}$$

Problem Set

1. Graph the linear system on a coordinate plane: $\begin{cases} y = \frac{1}{3}x + 1 \\ y = -3x + 11 \end{cases}$.
   a. Name the ordered pair where the graphs of the two linear equations intersect.
   b. Verify that the ordered pair named in (a) is a solution to $y = \frac{1}{3}x + 1$.
   c. Verify that the ordered pair named in (a) is a solution to $y = -3x + 11$.

2. Graph the linear system on a coordinate plane: $\begin{cases} y = \frac{1}{2}x + 4 \\ x + 4y = 4 \end{cases}$.
   a. Name the ordered pair where the graphs of the two linear equations intersect.
   b. Verify that the ordered pair named in (a) is a solution to $y = \frac{1}{2}x + 4$.
   c. Verify that the ordered pair named in (a) is a solution to $x + 4y = 4$.

3. Graph the linear system on a coordinate plane: $\begin{cases} y = 2 \\ x + 2y = 10 \end{cases}$.
   a. Name the ordered pair where the graphs of the two linear equations intersect.
   b. Verify that the ordered pair named in (a) is a solution to $y = 2$.
   c. Verify that the ordered pair named in (a) is a solution to $x + 2y = 10$.

4. Graph the linear system on a coordinate plane: $\begin{cases} -2x + 3y = 18 \\ 2x + 3y = 6 \end{cases}$.
   a. Name the ordered pair where the graphs of the two linear equations intersect.
   b. Verify that the ordered pair named in (a) is a solution to $-2x + 3y = 18$.
   c. Verify that the ordered pair named in (a) is a solution to $2x + 3y = 6$.

5. Graph the linear system on a coordinate plane: $\begin{cases} x + 2y = 2 \\ y = \frac{2}{3}x - 6 \end{cases}$.
   a. Name the ordered pair where the graphs of the two linear equations intersect.
   b. Verify that the ordered pair named in (a) is a solution to $x + 2y = 2$.
   c. Verify that the ordered pair named in (a) is a solution to $y = \frac{2}{3}x - 6$.

6. Without graphing, name the ordered pair where the graphs of the two linear equations intersect.

$$\begin{cases} x = 2 \\ y = -3 \end{cases}$$