Name _____ Date _____

Characterization of Parallel Lines

Does each system of linear equations have a solution? Explain your answer.

1. $\begin{cases} y = \frac{5}{4}x - 3 \\ y + 2 = \frac{5}{4}x \end{cases}$

2. $\begin{cases} y = \frac{2}{3}x - 5 \\ 4x - 8y = 11 \end{cases}$

3. $\begin{cases} \frac{1}{3}x + y = 8 \\ x + 3y = 12 \end{cases}$

Answer Problems 1–5 without graphing the equations.

1. Does the system of linear equations shown below have a solution? Explain.

$$\begin{cases} 2x + 5y = 9 \\ -4x - 10y = 4 \end{cases}$$

2. Does the system of linear equations shown below have a solution? Explain.

$$\begin{cases} \frac{3}{4}x - 3 = y \\ 4x - 3y = 5 \end{cases}$$

3. Does the system of linear equations shown below have a solution? Explain.

$$\begin{cases} x + 7y = 8 \\ 7x - y = -2 \end{cases}$$

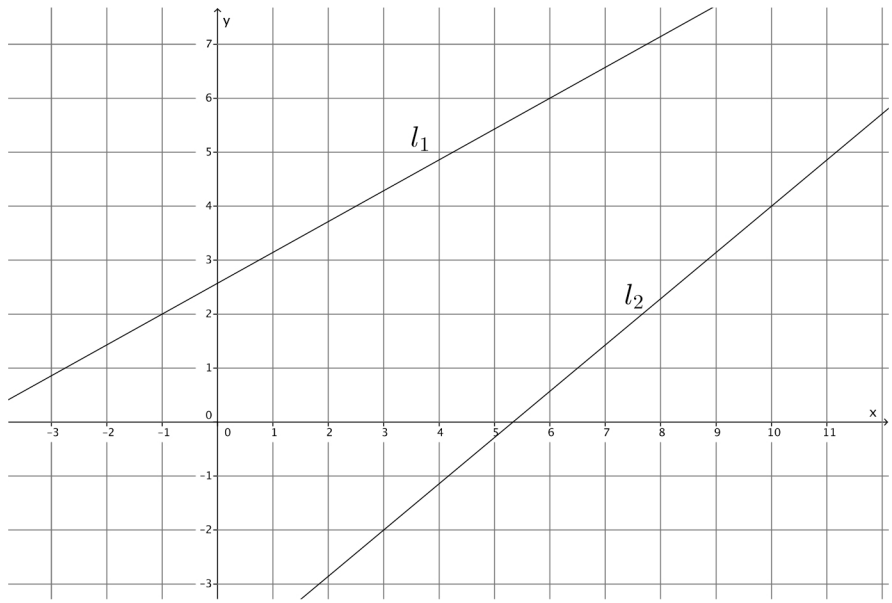
4. Does the system of linear equations shown below have a solution? Explain.

$$\begin{cases} y = 5x + 12 \\ 10x - 2y = 1 \end{cases}$$

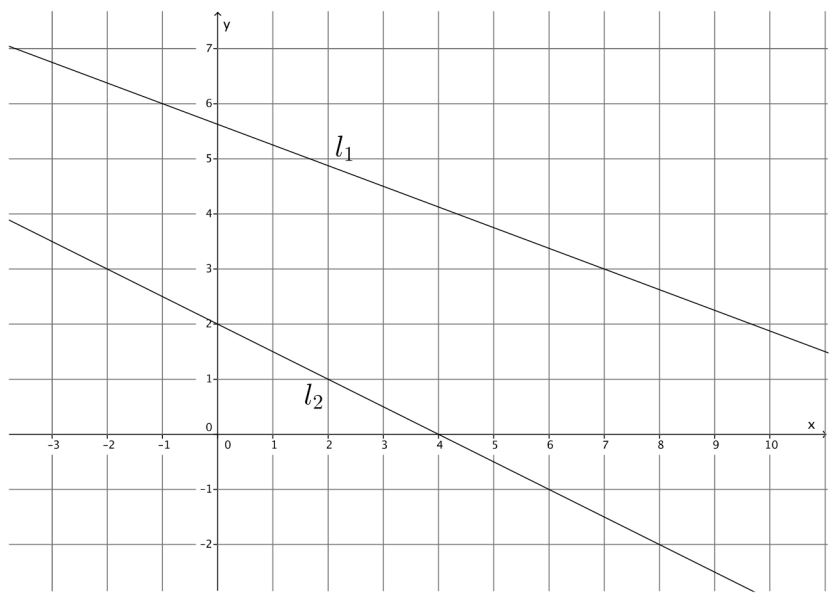
5. Does the system of linear equations shown below have a solution? Explain.

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

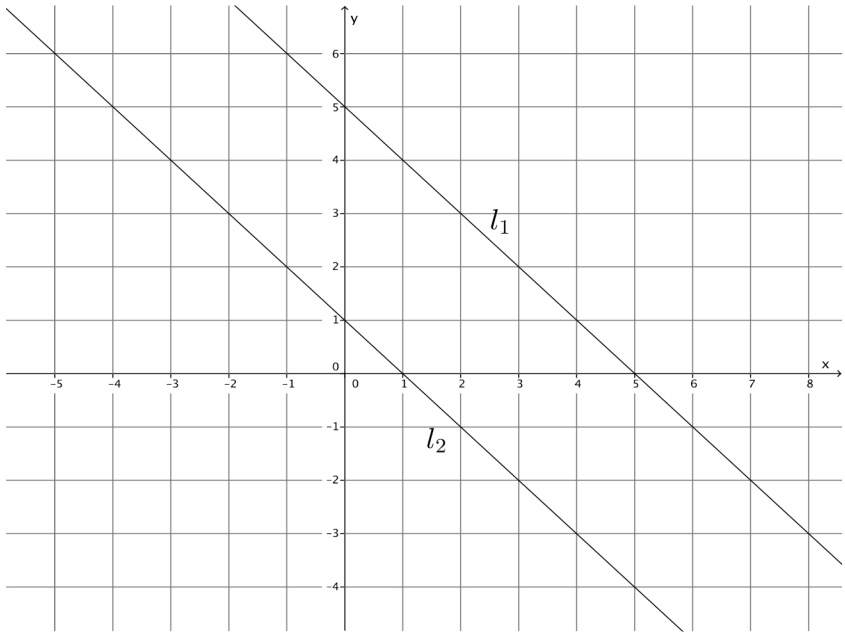
6. Given the graphs of a system of linear equations below, is there a solution to the system that we cannot see on this portion of the coordinate plane? That is, will the lines intersect somewhere on the plane not represented in the picture? Explain.



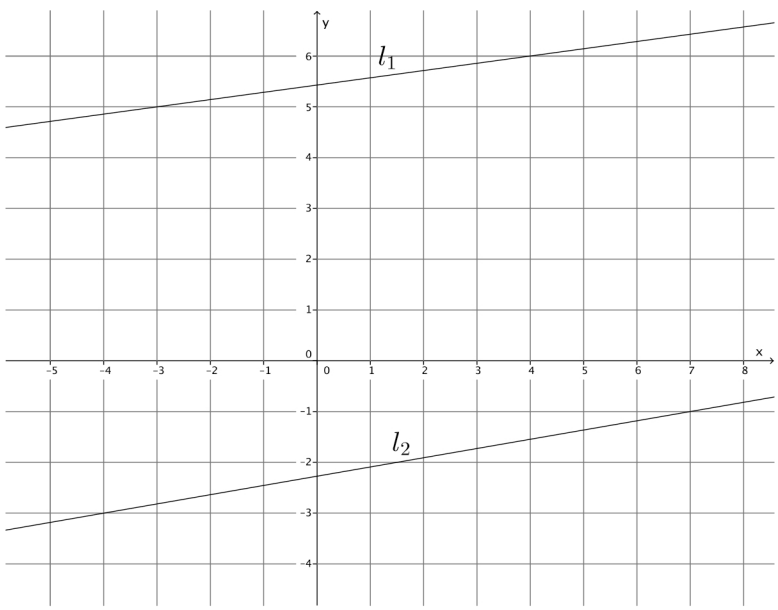
7. Given the graphs of a system of linear equations below, is there a solution to the system that we cannot see on this portion of the coordinate plane? That is, will the lines intersect somewhere on the plane not represented in the picture? Explain.



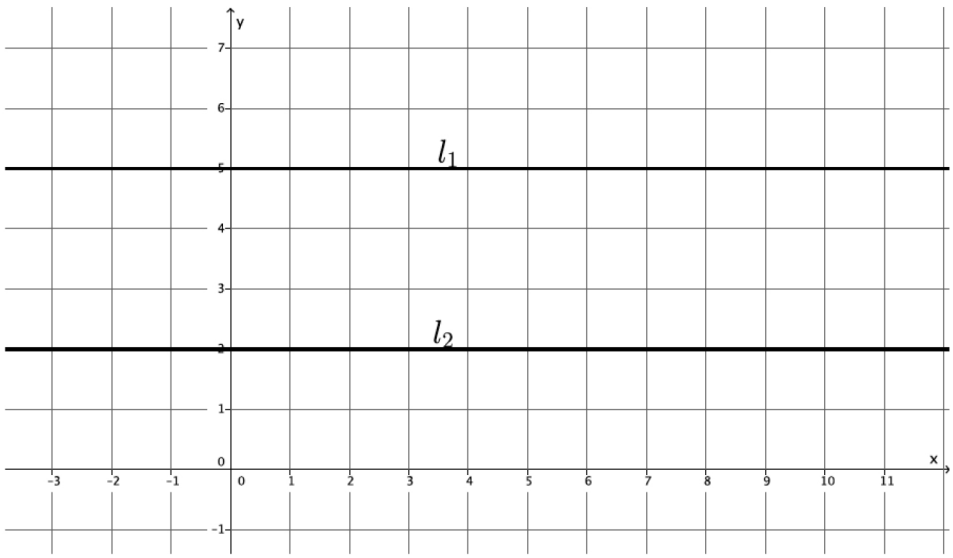
8. Given the graphs of a system of linear equations below, is there a solution to the system that we cannot see on this portion of the coordinate plane? That is, will the lines intersect somewhere on the plane not represented in the picture? Explain.



9. Given the graphs of a system of linear equations below, is there a solution to the system that we cannot see on this portion of the coordinate plane? That is, will the lines intersect somewhere on the plane not represented in the picture? Explain.



10. Given the graphs of a system of linear equations below, is there a solution to the system that we cannot see on this portion of the coordinate plane? That is, will the lines intersect somewhere on the plane not represented in the picture? Explain.



Does each system of linear equations have a solution? Explain your answer.

1. $\begin{cases} y = \frac{5}{4}x - 3 \\ y + 2 = \frac{5}{4}x \end{cases}$

No, this system does not have a solution. The slope of the first equation is $\frac{5}{4}$, and the slope of the second equation is $\frac{5}{4}$. Since the slopes are the same, and they are distinct lines, these equations will graph as parallel lines. Parallel lines never intersect; therefore, this system has no solution.

2. $\begin{cases} y = \frac{2}{3}x - 5 \\ 4x - 8y = 11 \end{cases}$

Yes, this system does have a solution. The slope of the first equation is $\frac{2}{3}$, and the slope of the second equation is $\frac{1}{2}$. Since the slopes are different, these equations will graph as non-parallel lines, which means they will intersect at some point.

3. $\begin{cases} \frac{1}{3}x + y = 8 \\ x + 3y = 12 \end{cases}$

No, this system does not have a solution. The slope of the first equation is $-\frac{1}{3}$, and the slope of the second equation is $-\frac{1}{3}$. Since the slopes are the same, and they are distinct lines, these equations will graph as parallel lines. Parallel lines never intersect; therefore, this system has no solution.

Answer Problems 1–5 without graphing the equations.

1. **Does the system of linear equations shown below have a solution? Explain.**

$$\begin{cases} 2x + 5y = 9 \\ -4x - 10y = 4 \end{cases}$$

No, this system does not have a solution. The slope of the first equation is $-\frac{2}{5}$, and the slope of the second equation is $-\frac{4}{10}$, which is equivalent to $-\frac{2}{5}$. Since the slopes are the same, but the lines are distinct, these equations will graph as parallel lines. Parallel lines never intersect, which means this system has no solution.

2. **Does the system of linear equations shown below have a solution? Explain.**

$$\begin{cases} \frac{3}{4}x - 3 = y \\ 4x - 3y = 5 \end{cases}$$

Yes, this system does have a solution. The slope of the first equation is $\frac{3}{4}$, and the slope of the second equation is $\frac{4}{3}$. Since the slopes are different, these equations will graph as non-parallel lines, which means they will intersect at some point.

3. **Does the system of linear equations shown below have a solution? Explain.**

$$\begin{cases} x + 7y = 8 \\ 7x - y = -2 \end{cases}$$

Yes, this system does have a solution. The slope of the first equation is $-\frac{1}{7}$, and the slope of the second equation is 7. Since the slopes are different, these equations will graph as nonparallel lines, which means they will intersect at some point.

4. **Does the system of linear equations shown below have a solution? Explain.**

$$\begin{cases} y = 5x + 12 \\ 10x - 2y = 1 \end{cases}$$

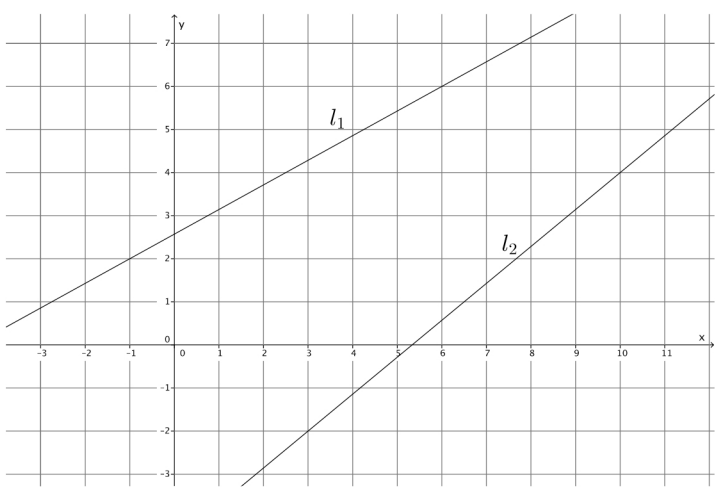
No, this system does not have a solution. The slope of the first equation is 5, and the slope of the second equation is $\frac{10}{2}$, which is equivalent to 5. Since the slopes are the same, but the lines are distinct, these equations will graph as parallel lines. Parallel lines never intersect, which means this system has no solution.

5. **Does the system of linear equations shown below have a solution? Explain.**

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

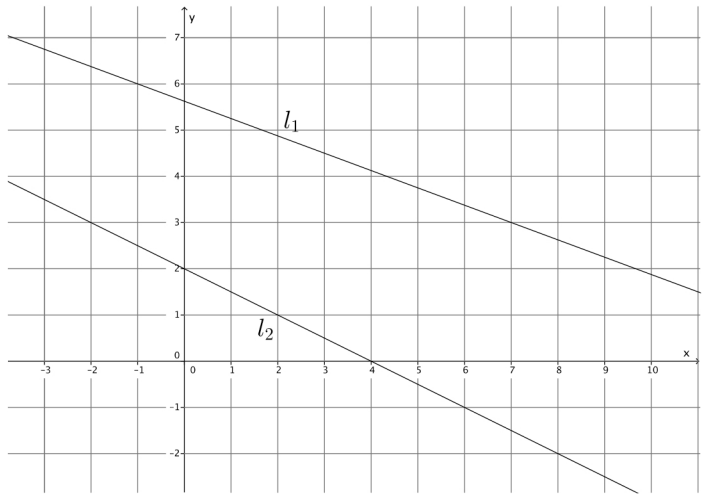
No, this system does not have a solution. The slope of the first equation is $\frac{5}{3}$, and the slope of the second equation is $\frac{5}{3}$. Since the slopes are the same, but the lines are distinct, these equations will graph as parallel lines. Parallel lines never intersect, which means this system has no solution.

6. **Given the graphs of a system of linear equations below, is there a solution to the system that we cannot see on this portion of the coordinate plane? That is, will the lines intersect somewhere on the plane not represented in the picture? Explain.**



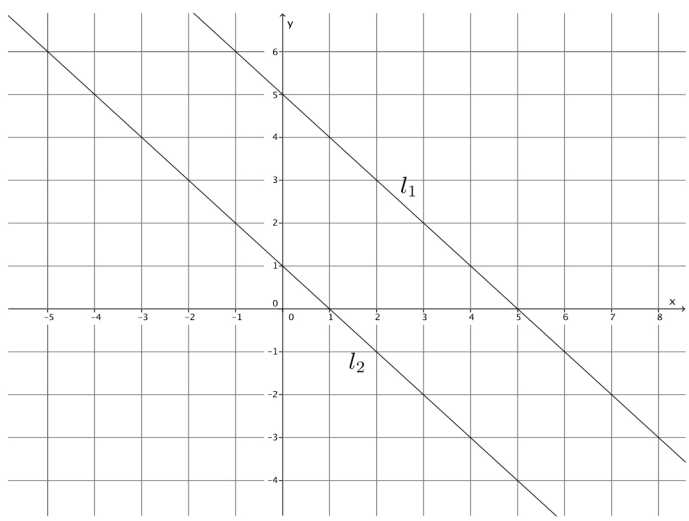
The slope of l_1 is $\frac{4}{7}$, and the slope of l_2 is $\frac{6}{7}$. Since the slopes are different, these lines are nonparallel lines, which means they will intersect at some point. Therefore, the system of linear equations whose graphs are given lines will have a solution.

7. **Given the graphs of a system of linear equations below, is there a solution to the system that we cannot see on this portion of the coordinate plane? That is, will the lines intersect somewhere on the plane not represented in the picture? Explain.**



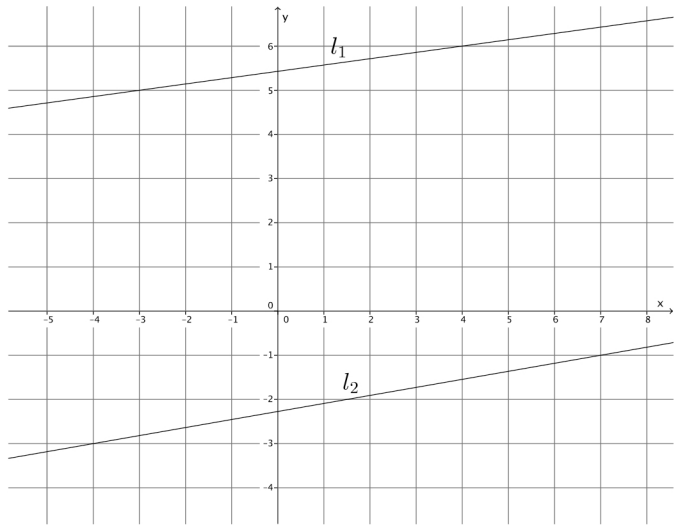
The slope of l_1 is $-\frac{3}{8}$, and the slope of l_2 is $-\frac{1}{2}$. Since the slopes are different, these lines are nonparallel lines, which means they will intersect at some point. Therefore, the system of linear equations whose graphs are given lines will have a solution.

8. **Given the graphs of a system of linear equations below, is there a solution to the system that we cannot see on this portion of the coordinate plane? That is, will the lines intersect somewhere on the plane not represented in the picture? Explain.**



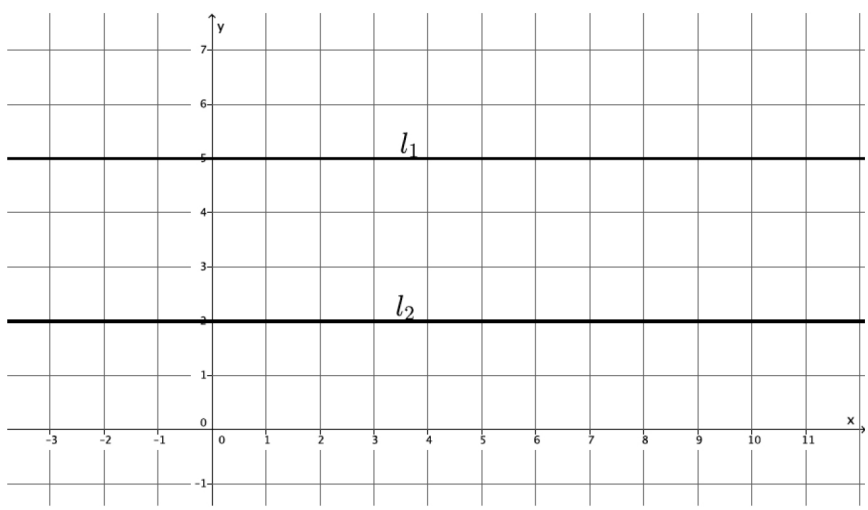
The slope of l_1 is -1, and the slope of l_2 is -1. Since the slopes are the same, and the lines are parallel lines, which means they will not intersect. Therefore, the system of linear equations whose graphs are the given lines will have no solution.

9. **Given the graphs of a system of linear equations below, is there a solution to the system that we cannot see on this portion of the coordinate plane? That is, will the lines intersect somewhere on the plane not represented in the picture? Explain.**



The slope of l_1 is $\frac{1}{7}$, and the slope of l_2 is $\frac{2}{11}$. Since the slopes are different, these lines are non-parallel lines, which means they will intersect at some point. Therefore, the system of linear equations whose graphs are the given lines will have a solution.

10. **Given the graphs of a system of linear equations below, is there a solution to the system that we cannot see on this portion of the coordinate plane? That is, will the lines intersect somewhere on the plane not represented in the picture? Explain.**



Lines l_1 and l_2 are horizontal lines. That means that they are both parallel to the x-axis and, thus, are parallel to one another. Therefore, the system of linear equations whose graphs are the given lines will have no solution.