Solving Systems of Linear Equations by Graphing

Algebra Worksheet · Grade 8–10

Name: ________________________________ Date: ___________________

Learning Objectives

- Graph linear equations using slope-intercept form (y = mx + b)
- Identify the point of intersection of two lines on a coordinate plane
- Determine the solution of a system of linear equations using the graphing method

Problems

1. Identify the slope and y-intercept of the equation below.

$$y = 2x + 3$$

2. Identify the slope and y-intercept of the equation below.

$$y = -\frac{1}{2}x + 4$$

3. Describe how you would graph the equation below using slope-intercept form. State the starting point and the direction of movement.

$$y = \frac{1}{3}x - 2$$

4. Describe how you would graph the equation below using slope-intercept form. State the starting point and the direction of movement.

$$y = -4x + 1$$

5. Graph the system of equations below and find the point of intersection. The point of intersection is the solution.

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$$\begin{cases} y = x + 1 \\ y = -x + 3 \end{cases}$$

6. Graph the system of equations below and find the point of intersection.

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

7. Graph the system of equations below and determine the solution.

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

8. First rewrite each equation in slope-intercept form, then graph the system and find the solution.

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

9. Rewrite each equation in slope-intercept form, then graph the system and find the solution. If the lines are parallel, write 'no solution'.

$$\begin{cases} 3x - y = 5 \\ 6x - 2y = 8 \end{cases}$$

10. Rewrite each equation in slope-intercept form, graph the system, and determine the solution. If the lines are the same (coincident), write 'infinitely many solutions'.

$$\begin{cases} 4x - 2y = 6 \\ -2x + y = -3 \end{cases}$$

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Solving Systems of Linear Equations by Graphing — Answer Key

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Answer Key

1. Answer: slope = 2, y-intercept = 3
- The equation is in slope-intercept form $y = mx + b$.
- $m = 2$, so the slope is 2.
- $b = 3$, so the y-intercept is 3.

2. Answer: slope = -1/2, y-intercept = 4
- The equation is in slope-intercept form $y = mx + b$.
- $m = -1/2$, so the slope is negative one-half.
- $b = 4$, so the y-intercept is 4.

3. Answer: Start at (0, -2); move 1 unit up and 3 units right
- The y-intercept is -2, so plot the first point at (0, -2).
- The slope is 1/3, meaning rise = 1 and run = 3.
- From (0, -2), move 1 unit up and 3 units to the right to reach (3, -1).
- Connect the two points to draw the line.

4. Answer: Start at (0, 1); move 4 units down and 1 unit right
- The y-intercept is 1, so plot the first point at (0, 1).
- The slope is -4, meaning rise = -4 and run = 1.
- From (0, 1), move 4 units down and 1 unit to the right to reach (1, -3).
- Connect the two points to draw the line.

5. Answer: (1, 2)
- Graph $y = x + 1$: y-intercept at (0, 1), slope = 1, so also plot (1, 2).
- Graph $y = -x + 3$: y-intercept at (0, 3), slope = -1, so also plot (1, 2).
- Both lines pass through (1, 2), so the point of intersection is (1, 2).
- The solution of the system is (1, 2).

6. Answer: (2, 3)
- Graph $y = 2x - 1$: y-intercept at (0, -1), slope = 2, so also plot (1, 1).
- Graph $y = -x + 5$: y-intercept at (0, 5), slope = -1, so also plot (1, 4).
- Set $2x - 1 = -x + 5$ to verify: $3x = 6$, $x = 2$, $y = 3$.
- The point of intersection and solution is (2, 3).

7. Answer: (-2, 3)
- Graph $y = -1/2\, x + 2$: y-intercept at (0, 2), slope = -1/2, so also plot (2, 1).
- Graph $y = -3x - 3$: y-intercept at (0, -3), slope = -3, so also plot (1, -6).

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- Set -1/2 x + 2 = -3x - 3: 2.5x = -5, x = -2, y = 3.
- The solution is (-2, 3).

8. Answer: (2, 0)

- Rewrite equation 1: y = -2x + 4 (slope = -2, y-intercept = 4).
- Rewrite equation 2: y = x - 2 (slope = 1, y-intercept = -2).
- Graph both lines on the same coordinate plane.
- Set -2x + 4 = x - 2: 3x = 6, x = 2, y = 0. Solution is (2, 0).

9. Answer: No solution (lines are parallel)

- Rewrite equation 1: y = 3x - 5 (slope = 3, y-intercept = -5).
- Rewrite equation 2: 2y = 6x - 8, so y = 3x - 4 (slope = 3, y-intercept = -4).
- Both lines have the same slope (3) but different y-intercepts, so they are parallel.
- Parallel lines never intersect, therefore the system has no solution.

10. Answer: Infinitely many solutions (same line)

- Rewrite equation 1: -2y = -4x + 6, so y = 2x - 3.
- Rewrite equation 2: y = 2x - 3.
- Both equations simplify to the exact same line y = 2x - 3.
- Since the lines are identical (coincident), there are infinitely many solutions.