Systems of Linear Inequalities

Algebra Worksheet · Grade 8–10

Name: _____ Date: _____

Learning Objectives

- Graph a single linear inequality using solid or dashed lines and correct shading
- Solve a linear inequality for y before graphing
- Find the solution region of a system of two or more linear inequalities

Problems

1. Determine whether the line should be solid or dashed, and whether to shade above or below for the inequality below:

$$y < 3x + 1$$

2. Determine whether the line should be solid or dashed, and whether to shade above or below for the inequality below:

$$y \geq -2x + 4$$

3. Identify the slope and y-intercept, then describe how to graph the boundary line for the inequality below:

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

4. Solve the inequality for y, then state the slope and y-intercept:

$$2x + y > 5$$

5. Solve the inequality for y, then identify the line type and shading direction:

$$3x + 3y \leq 9$$

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6. Solve the inequality for y and describe how to graph it:

$$2x + 3y > 12$$

7. Describe the solution region for the system of inequalities below. State whether the shaded regions overlap, and what the overlap represents:

$$y < 2x - 3 \quad \text{and} \quad y > x - 1$$

8. Graph the system of inequalities below and identify the type of boundary line for each inequality:

$$y \geq -x + 2 \quad \text{and} \quad y < 3x - 1$$

9. Solve each inequality for y, then describe the complete solution region for the system below:

$$2x + y \leq 6 \quad \text{and} \quad x - y < 2$$

10. Solve each inequality for y, graph the system, and determine whether the point (1, 1) is in the solution region:

$$3x + 2y \geq 4 \quad \text{and} \quad x - y > -1$$

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Systems of Linear Inequalities — Answer Key

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Answer Key

1. Answer: Dashed line, shade below

- The symbol is < (strictly less than), so use a dashed line.
- Less than means shade below the line.

2. Answer: Solid line, shade above

- The symbol is >= (greater than or equal to), so use a solid line.
- Greater than or equal to means shade above the line.

3. Answer: Slope = 1/2, y-intercept = -3, solid line, shade below

- Slope m = 1/2, y-intercept b = -3.
- Plot (0, -3), then move 1 unit up and 2 units right to find the next point.
- Draw a solid line (≤ includes equal to) and shade below.

4. Answer: y > -2x + 5; slope = -2, y-intercept = 5

- Subtract 2x from both sides: y > -2x + 5.
- Slope m = -2, y-intercept b = 5.

5. Answer: y ≤ -x + 3; solid line, shade below

- Subtract 3x from both sides: 3y ≤ -3x + 9.
- Divide all terms by 3: y ≤ -x + 3.
- Use a solid line (≤) and shade below.

6. Answer: y > -2/3 x + 4; dashed line, shade above

- Subtract 2x from both sides: 3y > -2x + 12.
- Divide all terms by 3: y > -\frac{2}{3}x + 4.
- Use a dashed line (strict >) and shade above.
- Plot y-intercept at (0, 4), then move 2 units down and 3 units right.

7. Answer: The overlap (intersection) of the two shaded regions is the solution set

- Graph y = 2x - 3 as a dashed line; shade below it.
- Graph y = x - 1 as a dashed line; shade above it.
- The solution region is where both shaded areas overlap.

8. Answer: First: solid line, shade above. Second: dashed line, shade below. Solution is the intersection.

- For y ≥ -x + 2: plot y-intercept at (0,2), slope -1; draw solid line and shade above.
- For y < 3x - 1: plot y-intercept at (0,-1), slope 3; draw dashed line and shade below.
- The solution set is the region where both shaded areas overlap.

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9. Answer: $y \leq -2x + 6$ (solid, below) and $y > x - 2$ (dashed, above); solution is the intersection

- First inequality: subtract $2x \rightarrow y \leq -2x + 6$; solid line, shade below.
- Second inequality: subtract x, multiply by -1 (flip sign) $\rightarrow y > x - 2$; dashed line, shade above.
- Graph both and identify the overlapping region as the solution.

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10. Answer: (1, 1) is NOT in the solution region

- First: $2y \geq -3x + 4 \rightarrow y \geq -\frac{3}{2}x + 2$; solid line, shade above.
- Test (1,1): $1 \geq -3/2 + 2 = 0.5$ ✓ (satisfies first inequality).
- Second: $-y > -x - 1 \rightarrow y < x + 1$; dashed line, shade below.
- Test (1,1): $1 < 1 + 1 = 2$ ✓ (satisfies second inequality).
- Wait — re-check: second inequality $x - y > -1 \rightarrow 1 - 1 = 0 > -1$ ✓.
- Both satisfied, so (1,1) IS in the solution region. Answer: Yes, (1,1) is in the solution region.

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