Algebra 1: 7.2 Guided Notes **Name** _____ **Period** _____
Systems of Linear Inequalities

Learning Goal:
Write and graph systems of linear inequalities.

Notes

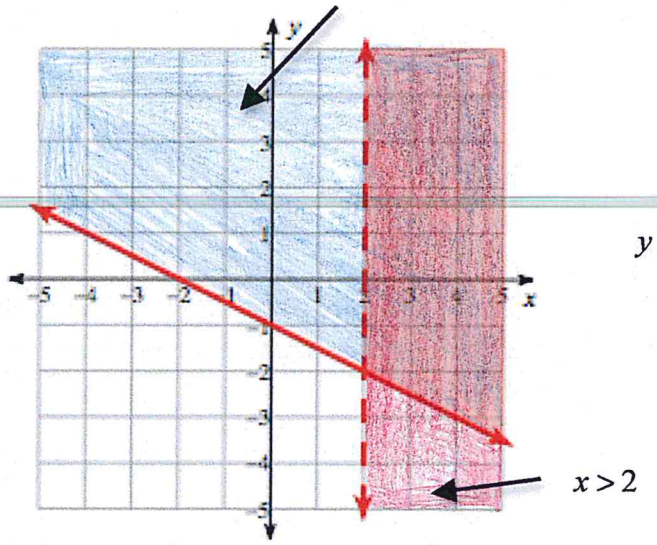
Two or more linear inequalities together form a system of linear inequalities.

A solution for a system of linear inequalities makes each inequality in the system true.

The solutions for a system of inequalities are ALL the ordered pairs in the OVERLAPPING shaded region.

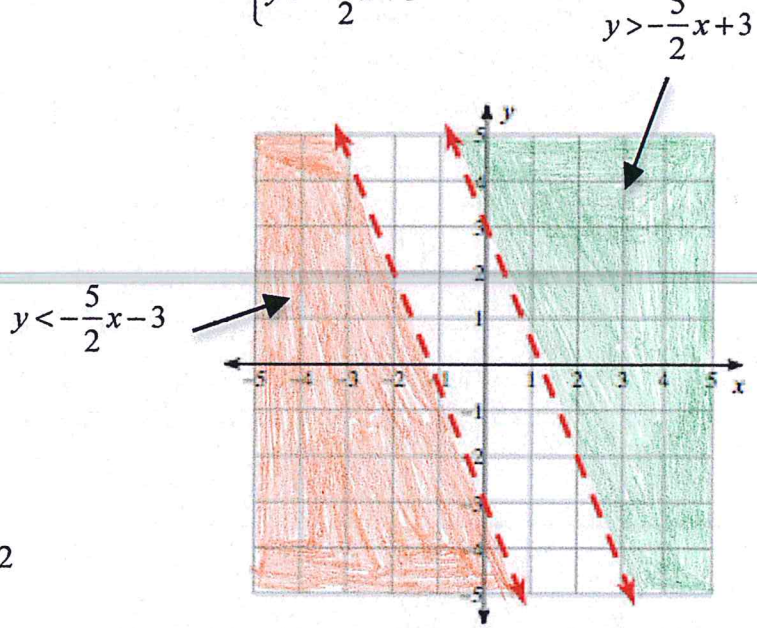
If the shaded regions do NOT overlap, then there is NO solution.

$$\begin{cases} x > 2 \\ y \geq -\frac{1}{2}x - 1 \end{cases}$$



The solutions are all the ordered pairs in the overlapping shaded region and on the solid line.

$$\begin{cases} y < -\frac{5}{2}x - 3 \\ y > -\frac{5}{2}x + 3 \end{cases}$$



There is no solution since the shaded regions do not overlap.

Helpful Tip

Use one colored pencil to graph the first inequality and another color to graph the second inequality. The points in the region where the two colors overlap are the solutions. Algebraically, these points must satisfy both inequalities.

Graphing a System of Linear Inequalities

Steps:

- Write each inequality in slope-intercept form ($y = mx + b$).
- Graph each inequality on the same coordinate plane using the slope & y-intercept.
- Dashed line if < or >. Solid line if ≤ or ≥.
- Shade above if > or ≥. Shade below if < or ≤.
- Solutions are the ordered pairs (x, y) where the shaded regions OVERLAP.
- If the shaded regions, do NOT overlap, there is NO solution.

Graph the system of linear inequalities.

$$\begin{cases} y < 2x - 3 \\ 2x + y > 2 \end{cases}$$

$2x + y > 2 \rightarrow y > -2x + 2$ (slope-intercept form)

$y < 2x - 3$

$m = \frac{2}{1}, b = -3$

Dashed line

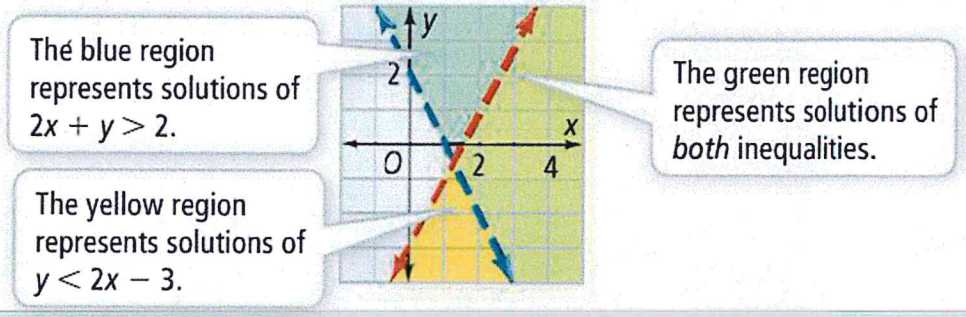
Shade below

$y > -2x + 2$

$m = \frac{-2}{1}, b = 2$

Dashed line

Shade above



The solutions are all the ordered pairs in the green area where the shaded regions overlap.

- Choose an ordered pair (x, y) where the shaded regions overlap.
- Plug the x- and y-values into both inequalities and simplify.
- Make sure the x- and y-values result in TRUE statements for BOTH inequalities.

Check your work algebraically using a test point!

Answers will vary.
Choose a point in the overlapping shaded regions. The point (4, 1) is in the region graphed by BOTH inequalities. That means $x = 4$ and $y = 1$.

$y < 2x - 3$

$1 < 2(4) - 3$

$1 < 8 - 3$

$1 < 5$ true

(4, 1) is a solution.

$2x + y > 2$

$2(4) + 1 > 2$

$8 + 1 > 2$

$9 > 2$ true

(4, 1) is a solution.

The point (4, 1) satisfies both inequalities.