Lesson 88

Graphing and Solving Linear Inequalities

A linear inequality can be rearranged just like a linear equation. The only difference is that multiplying or dividing both sides of the inequality by a negative number changes the direction of the inequality sign. To solve a linear inequality, convert it to slope-intercept form.

Example 1 Solving Linear Inequalities

a. Solve the linear inequality $3x + 2y > 1$ for y.

SOLUTION

Rearrange the linear inequality as if it were a linear equation.

$3x + 2y > 1$	Given
$3x + 2y - 3x > 1 - 3x$	Sub. Property of Inequality
$2y > 1 - 3x$	Simplify.
$\frac{2y}{2} > \frac{1}{2} - \frac{3x}{2}$	Div. Property of Inequality
$y > -\frac{3}{2}x + \frac{1}{2}$	Simplify.

Example 1 Solving Linear Inequalities

b. Solve the linear inequality $2x - 5y < 6$ for y.

SOLUTION

$2x - 5y < 6$	Given
$2x - 5y - 2x < 6 - 2x$	Sub. Property of Inequality
$-5y < 6 - 2x$	Simplify.
$\frac{-5y}{-5} > \frac{6}{-5} - \frac{2x}{-5}$	Div. Property of Inequality
$y > \frac{2}{5}x - \frac{6}{5}$	Simplify.

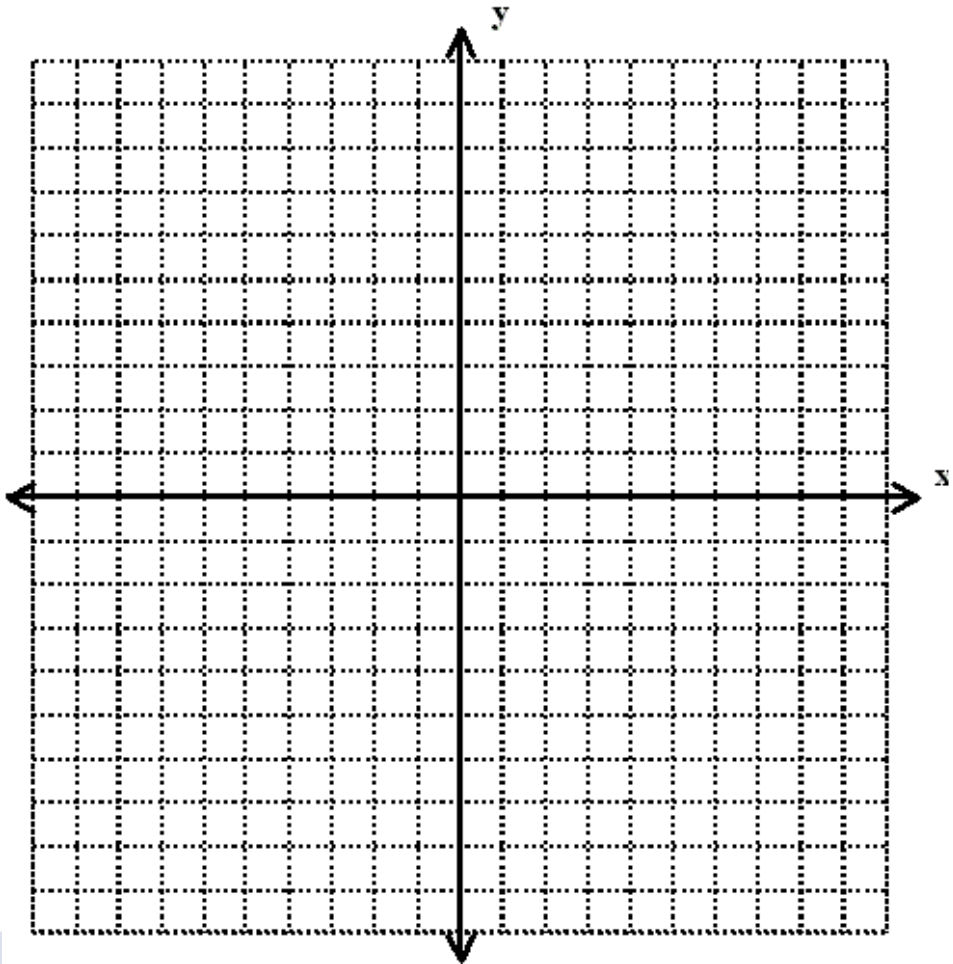
The graph of an inequality includes points that are not on the graph of the linear equation. A region of the coordinate grid bounded by the graph of the linear equation is shaded to show the points that satisfy the inequality. For inequalities where the *y*–values are greater than the *y*–values on the line, shade the region above the line. For *y*–values less than the *y*–values on the line, shade the region below the line.

When an inequality uses ≥ and ≤, the graph includes the line itself, so a solid line is drawn.

For inequalities that use > and <, the graph does not include points on the line, so a dashed line is drawn to show that ordered pairs lying on the line are not part of the solution to the inequality.

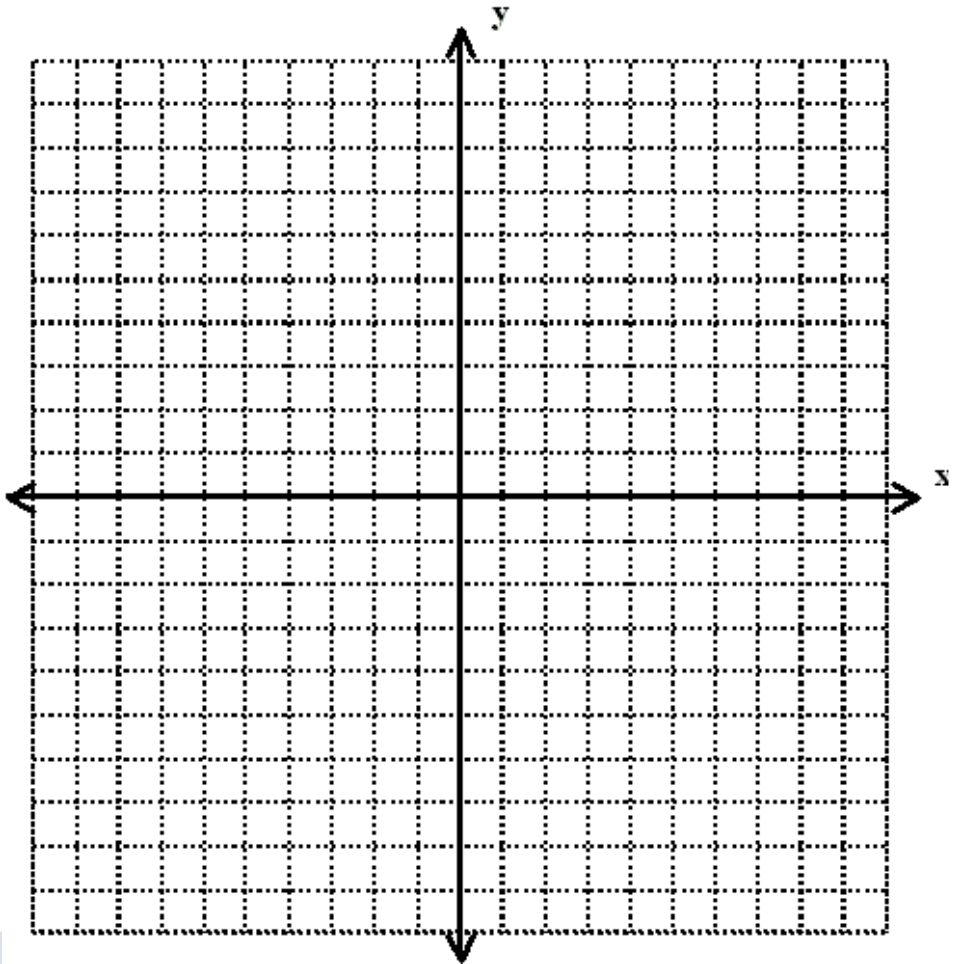
Example 2 Graphing an Inequality

a. Graph the inequality $y < \frac{1}{2}x + 3$



Example 2 Graphing an Inequality

b. Graph the inequality $y \geq 2x - 1$.



Example 3 Application: Sports

Lily and Amit are playing a game. At the end of the game, the sum of their scores will always be at least 21. Let x represent Lily's score and y represent Amit's score. Draw a graph showing the set of possible scores. Is it possible that the game is over when Lily has 13 points and Amit has 8?

SOLUTION

The sum of their scores must be at least 21, so $x + y \geq 21$.

Solve the inequality for y.

$x + y \geq 21$	Given
$x + y - x \geq 21 - x$	Subtraction Property of Inequality
$y \geq -x + 21$	Simplify.

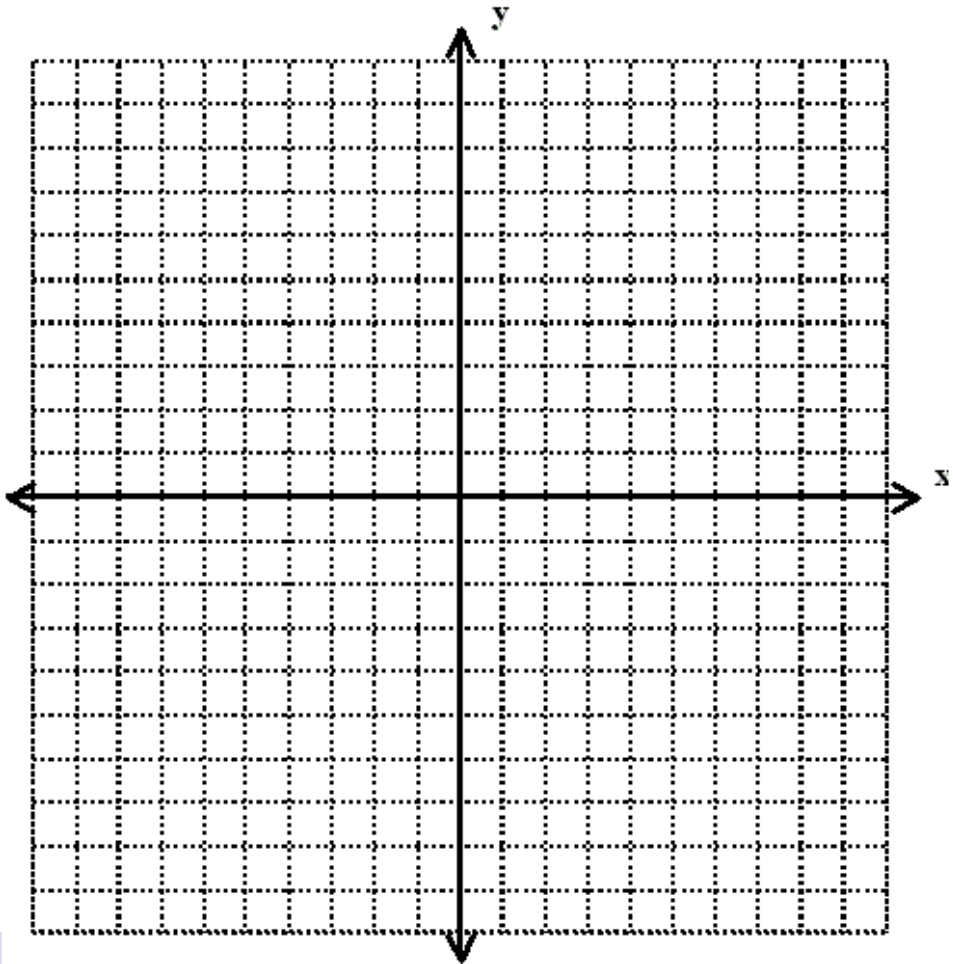
Graph the line $y = -x + 21$ using a solid line.

Since y is greater than $-x + 21$, shade the area above the line.

The point (13, 8) lies on the line. Since the line is included in the set of possible solutions for this inequality, it is possible for the game to be over when Lily has 13 points and Amit has 8.

Example 3 Application: Sports

$y \geq -x + 21$

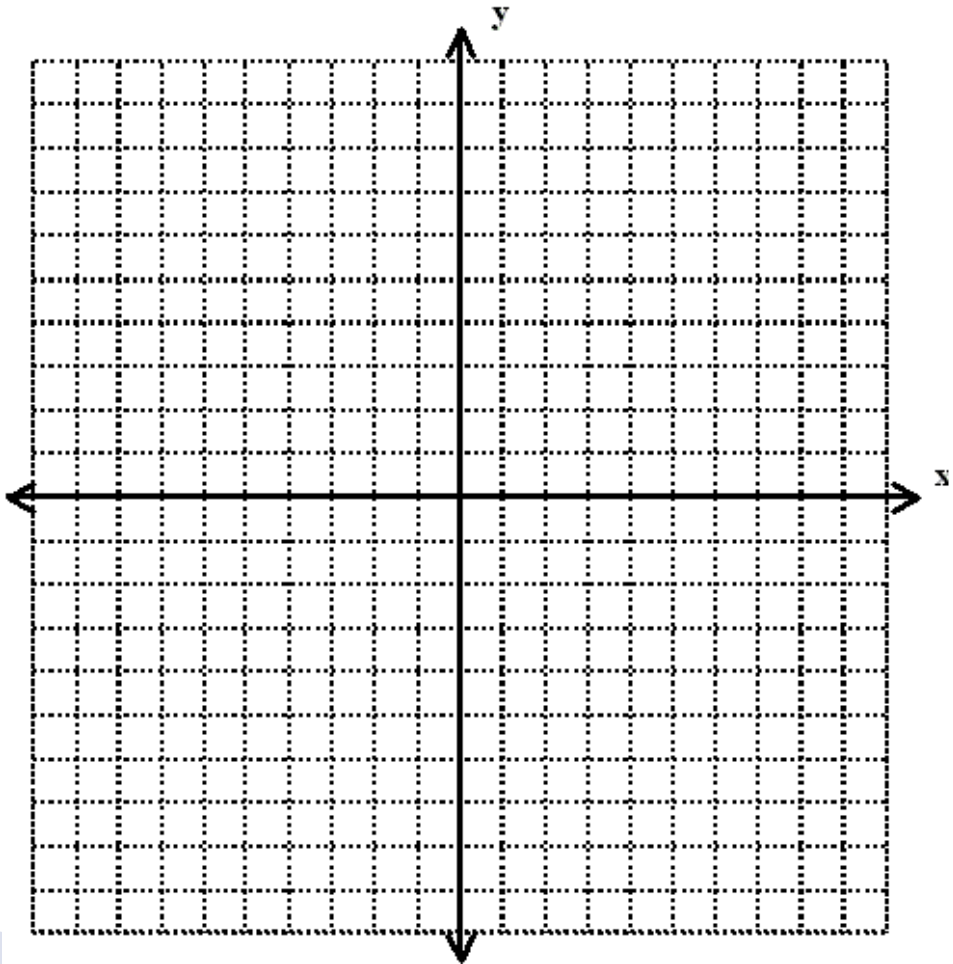


You Try!!!!

a.Solve the linear inequality $-2x - 4y < -8$ for y.

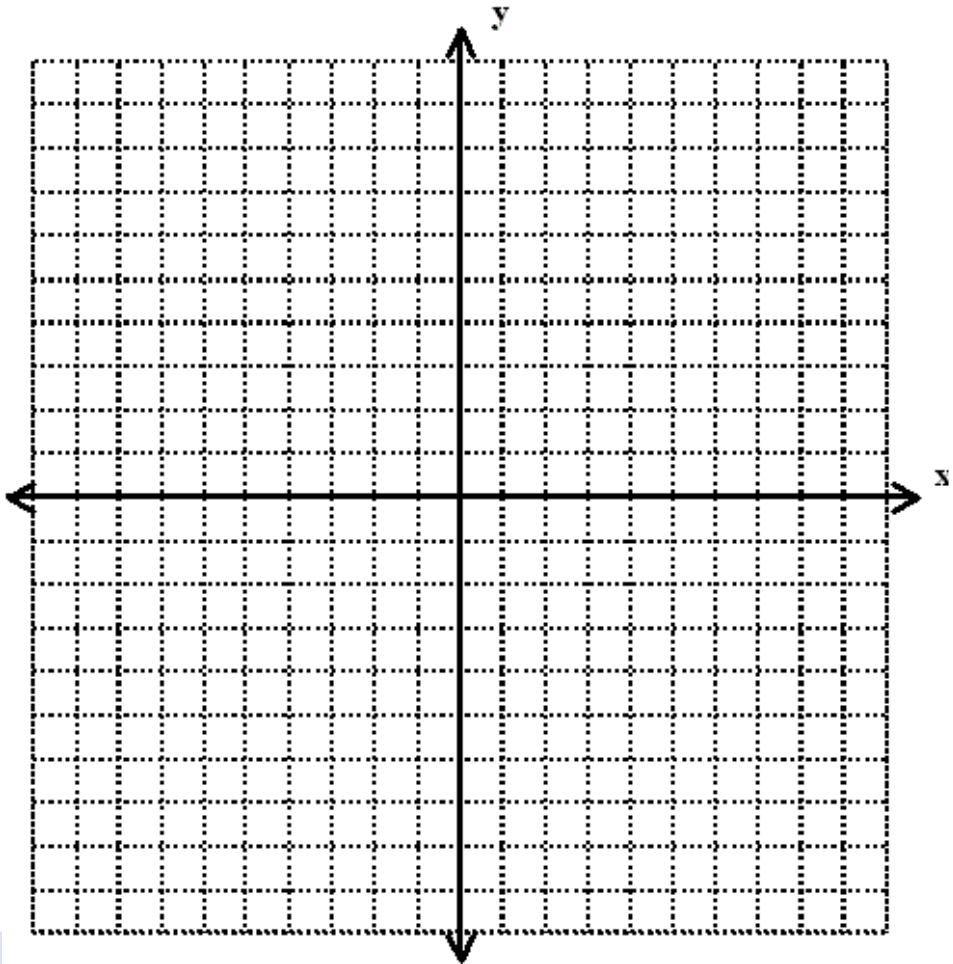
You Try!!!!

b.Graph $y \geq 2x - 6$.



You Try!!!!

c.Graph $2y - 3 > 5 - x$.



Assignment

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Lesson Practice (Ask Mr. Heintz)

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Practice 1-30 (Do the starred ones first)