Study Guide

Graph Inequalities
03/21/2012

Graph Inequalities
An inequality is a number sentence that uses *is greater than* or *is less than* symbols. For example, $6n < 4$ and $y \geq 2x - 3$ are inequalities.

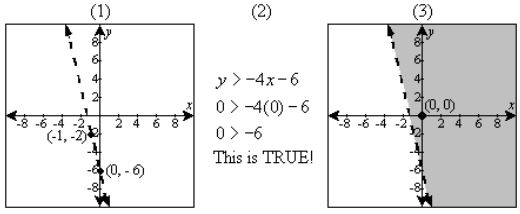
When graphing an inequality, the student should mentally replace the inequality symbol with an equal sign in order to graph the inequality as an equation. Then use the table below to decide the type of line that should be used when drawing the graph.

Symbol:	Definition:	Type of Line:
>	is greater than	Dashed
<	is less than	Dashed
≥	is greater than or equal to	Solid
≤	is less than or equal to	Solid

A dashed line tells the reader that the values on the line ARE NOT included in the inequality. A solid line tells the reader that the values on the line ARE included in the inequality.

Example 1:
Graph the inequality.

$y > -4x - 6$

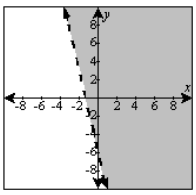


Step 1: Graph the line that is represented by the inequality. (Remember to mentally replace the > with =.) This equation is given in $y = mx + b$ form (slope-intercept form), where m is the slope and b is the y-intercept. Plot the y-intercept, (0, - 6), then use the slope, - 4, to move up 4 units and to the left 1 unit. The *is greater than* symbol (>) is used, refer to the chart above to see that this symbol requires a dashed line. Connect the two points using a dashed line.
Step 2: Choose a test point to determine which side of the line should be shaded. The most common test point to use is (0, 0), but it does not matter what point is used. Substitute the test point into the inequality and simplify.

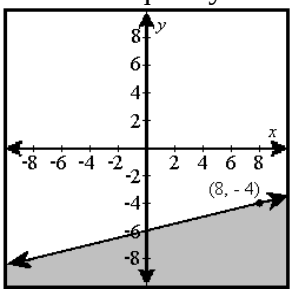
- **If the test point makes the inequality true, shade the side of the line that includes the test point.**
- **If the test point makes the inequality false, shade the side of the line that does not include the test point.**

In this case, the test point makes the inequality true.
Step 3: Since the test point makes the inequality true, shade the side of the dotted line that includes the point (0, 0).

Answer:



Example 2:
Determine the correct inequality for the graph below.



(1) $y = \frac{1}{4}x - 6$

(2) $y \le \frac{1}{4}x - 6$ OR $y \ge \frac{1}{4}x - 6$

(3)

$y \le \frac{1}{4}x - 6$	OR	$y \ge \frac{1}{4}x - 6$
$-8 \le \frac{1}{4}(0) - 6$		$-8 \ge \frac{1}{4}(0) - 6$
$-8 \le -6$		$-8 \ge -6$
TRUE		FALSE

Step 1: Determine the equation of the line. In this case, the *y*-intercept is at (0, - 6) and the slope appears to be *up 1*, *over 4* (or ?), as can be seen by points at (8, - 4) and (4, - 5). Therefore, the equation of the boundary line is $y = (?)x - 6$.

Step 2: Use the table on page 1 to determine which type of inequality symbol to use (<, >, $\le$, or $\ge$). The line on the graph is solid, so the $\le$ or $\ge$ symbol must be used.

Step 3: Choose a test point from the shaded side of the line and substitute it into each inequality to determine which of the two inequalities is correct. A good test point to use is (0, - 8), since (0, - 8) is included in the shaded area of the graph. Since $y = (?)x - 6$ is true when (0, - 8) is used as the test point, it is the correct inequality.

Answer: $y \le \frac{1}{4}x - 6$

To reinforce this skill, create of set of index cards with inequalities written on them and another set with the graphs of the equations drawn and shaded. Shuffle the cards and lay them face-down on a table in columns and rows. Have the student turn two cards over at a time and try to match the inequality to the correct graph. If the two cards do not match, the next player can try to make a match. If the cards match, the player keeps the two cards and gets a chance to make another match. The player with the most matches at the end of the game wins.