# Study Guide

Graph Systems of Inequalities
03/22/2012

**Graph Systems of 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 |
| $\geq$ | is greater than or equal to | Solid |
| $\leq$ | is less than or equal to | Solid |

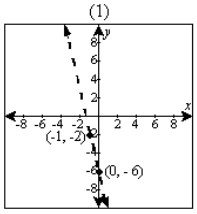
A dashed line tells the reader that the values on the line ARE NOT included in the inequality. A solid line tells the reader that the values on the line ARE included in the inequality.

**Example 1:**

Graph the inequality.

$y > -4x - 6$

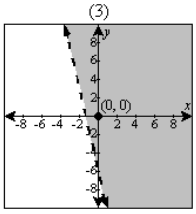
(1)



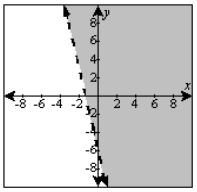

(2)

$y > -4x - 6$
$0 > -4(0) - 6$
$0 > -6$
This is TRUE!

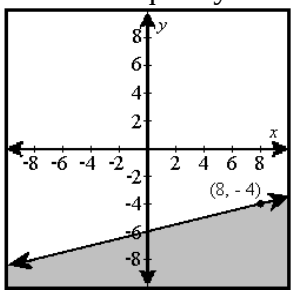
(3)



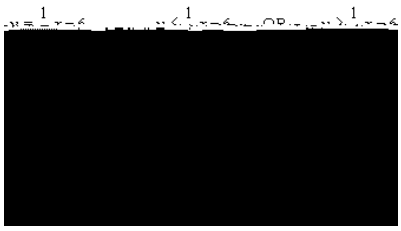

Step 1



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




(1) (2)



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 (<, >, $\leq$, or $\geq$). The line on the graph is solid, so the $\leq$ or $\geq$ 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 $y \leq (?)x - 6$ is true when (0, - 8) is used as the test point, it is the correct inequality.

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

**Systems of Inequalities:**

When graphing a system of inequalities, the process is very similar. A system of inequalities is two or more inequalities. The main difference is that the final solution is **the area where the shaded regions overlap**.

**Example 3:**
Choose the system of inequalities represented by the following graph.

inequality by a - 4. In the second inequality, both sides need to be divided by 6.
Step 3: Simplify each term in the inequality. Remember, since the first inequality was divided by a negative number, the direction of the inequality sign must be changed. In the second inequality, the sign remains the same since the division was by a positive number.

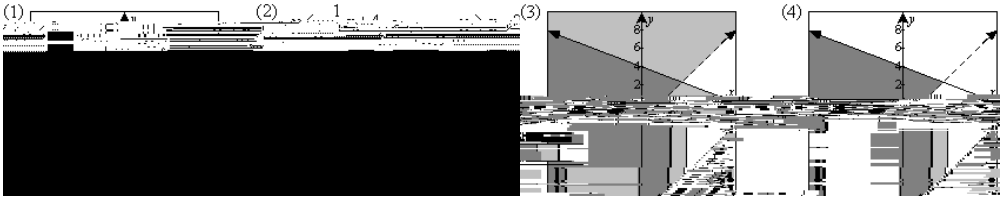
$y < 2x - 6$

**nswer:** $\frac{5}{6} - \frac{1}{6}x \le y$

**Example 5:**
Graph the solution to the following system of inequalities.

$y \le -\frac{1}{3}x + 4$

$y > x - 2$




Step 1: Graph the lines that are represented by the inequalities. The *y*-intercept of the top line is 4 and the slope is -1/3. The *y*-intercept of the second line is -2 and the slope is 1. Use the chart on page 1 to determine whether the lines should be dashed or solid. The line with t13(n th)-o1 0e second lid. T[ B3C 1B/F1 12