Graphing Linear Inequalities   NAME _____ "_____" TXTBK#____

To graph linear inequalities in the coordinate plane, use the same strategies used to graph linear equations.

We need to consider these things when graphing a linear inequality.

- THE BOUNDARY LINE – The boundary line is set of points we graph to divide the coordinate plane into three parts. We graph the boundary line with the same strategies we've been using for graphing any line.
  - Is the BOUNDARY LINE BROKEN OR SOLID?
    - When the points on the line are included as part of the solution set and make the linear sentence true, then we use a SOLID LINE to indicate inclusion. ($=, \leq, \geq$)
    - When the points on the line result in a false statement when substituted, then we use a BROKEN LINE to indicate that they are excluded from the solution set. ($\neq, <, >$)
- THE HALF PLANES – The boundary line divides the plane into two HALF PLANES. One half plane contains every pair of coordinates that are solutions and make the sentence true. The other half plane contains only points that have coordinates that result in a false statement when substituted into the equation.

Go to DESMOS.COM to $\boxed{START\ GRAPHING}$. Type in each linear inequality, one at a time (clearing out the input window after each). Copy what you see on the screen and answer the questions below each graph. Watch for patterns and things that make you go "hmm…" After the exploration, write what you noticed and what you think you now know about graphing linear inequalities.
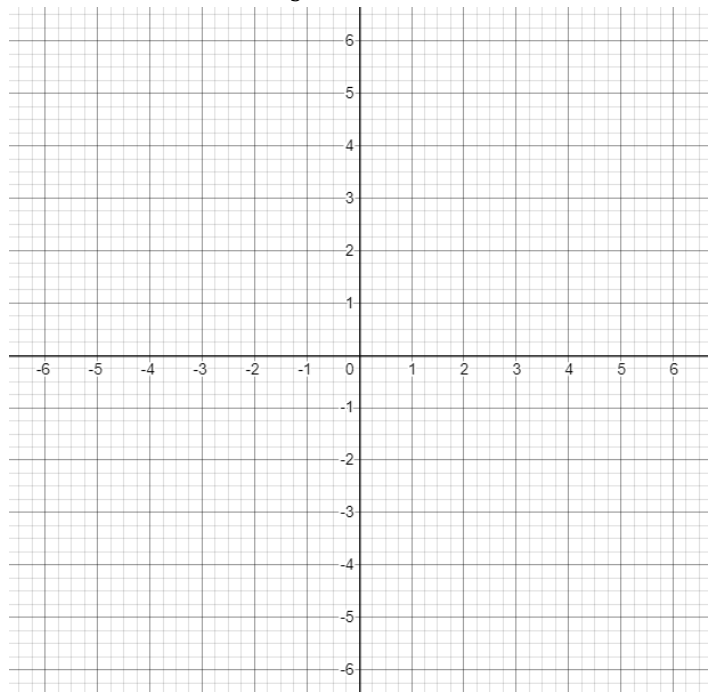
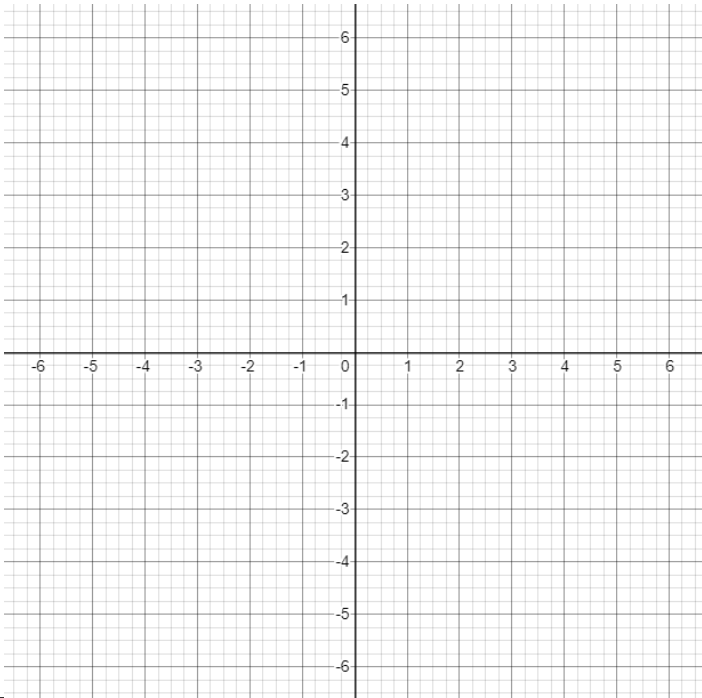EXAMPLE 1 $y > 2x - 3$
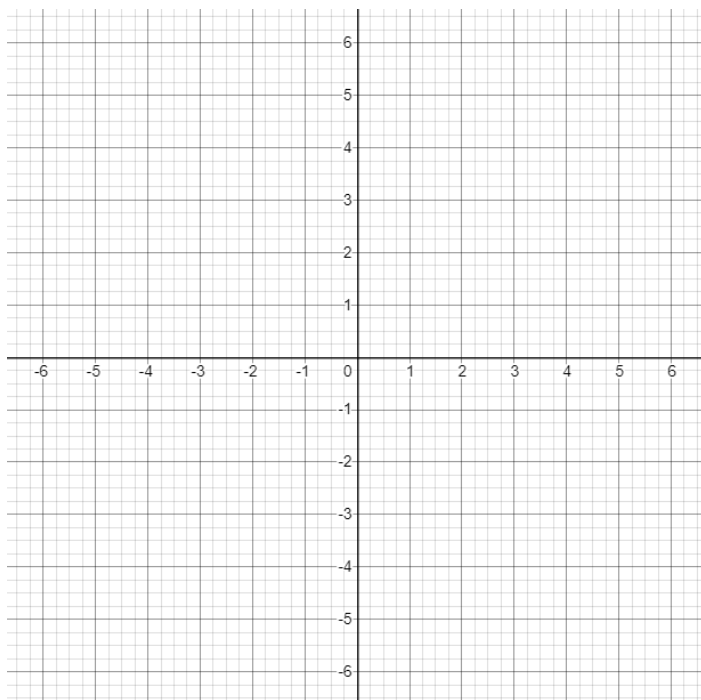
EXAMPLE 2 $y < \frac{2}{5}x - 3$

Is the boundary line solid or broken?

Is (0, 0) in the shaded half plane?

When you substitute $x = 0\ and\ y = 0$ into the equation, do you get a true statement or a false statement?

Is the shaded half plane "below" or "above" the boundary line?

Is the boundary line solid or broken?

Is (0, 0) in the shaded half plane?

When you substitute $x = 0\ and\ y = 0$ into the equation, do you get a true statement or a false statement?

Is the shaded half plane "below" or "above" the boundary line?
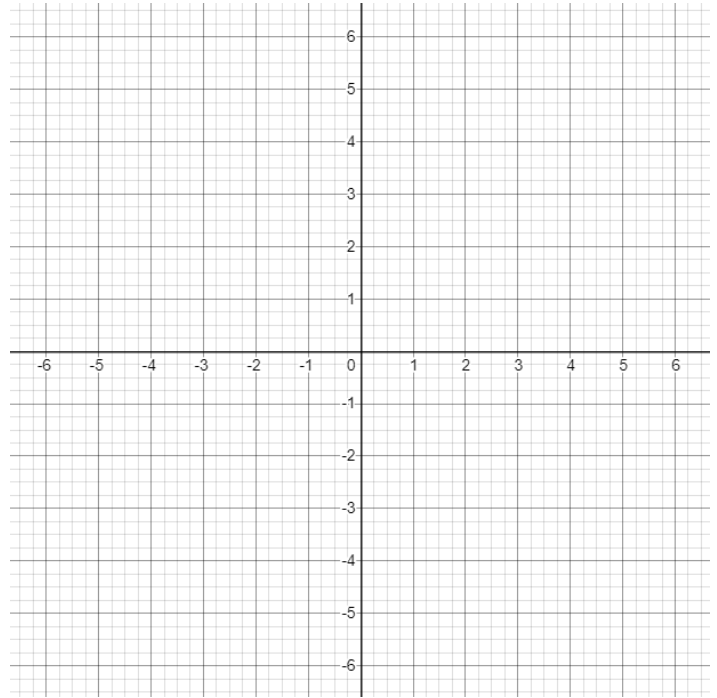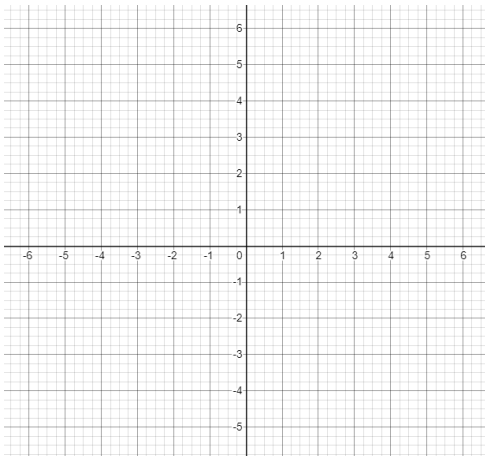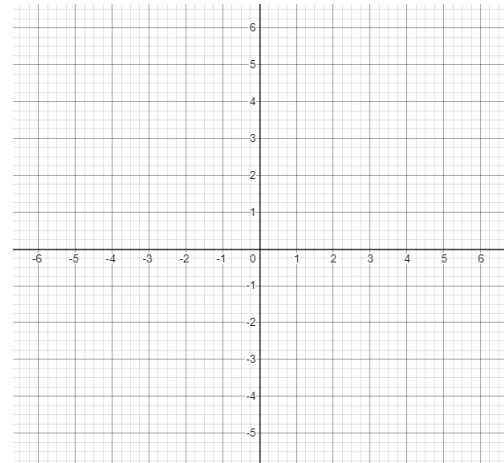
EXAMPLE 3 $y \leq -x - 3$

EXAMPLE 4 $y \geq \frac{4}{3}x - 3$

Is the boundary line solid or broken?

Is (0, 0) in the shaded half plane?

When you substitute $x = 0 \text{ and } y = 0$ into the equation, do you get a true statement or a false statement?

Is the shaded half plane "below" or "above" the boundary line?

Is the boundary line solid or broken?

Is (0, 0) in the shaded half plane?

When you substitute $x = 0 \text{ and } y = 0$ into the equation, do you get a true statement or a false statement?

Is the shaded half plane "below" or "above" the boundary line?

EXAMPLE 5 $y > -3$

EXAMPLE 6 $x \leq -3$

Is the boundary line solid or broken?

Is (0, 0) in the shaded half plane?

When you substitute $x = 0 \text{ and } y = 0$ into the equation, do you get a true statement or a false statement?

Is the shaded half plane "below" or "above" the boundary line?

Is the boundary line solid or broken?

Is (0, 0) in the shaded half plane?

When you substitute $x = 0 \text{ and } y = 0$ into the equation, do you get a true statement or a false statement?

Is the shaded half plane "below" or "above" the boundary line?

When is the boundary line solid? broken?

How could choosing a test point like (0, 0) help you in determining the solution set for a linear inequality?
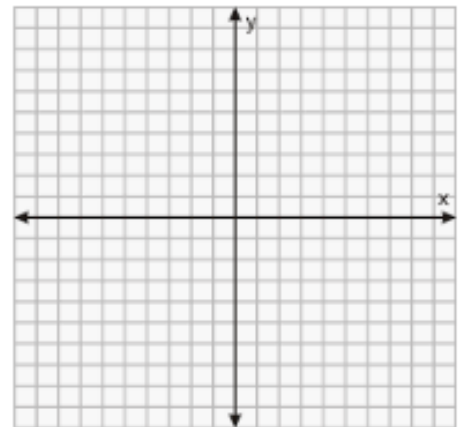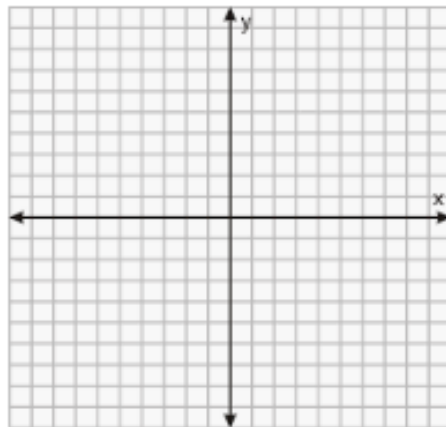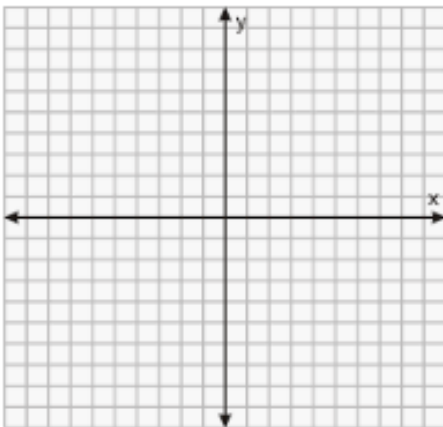
Describe a scenario when a linear inequality would be a better representation than a linear equation.

PRACTICE – Graph each of the following.

1. $y > x + 2$

2. $2x - y \leq -1$

3. $y < x$

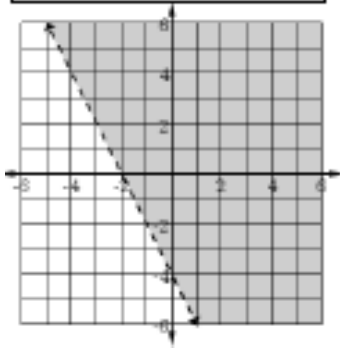Complete the matching activity on the worksheet. You will need to create a color key for each column.

Write the inequality of the graph shown. Find your answer and color it according to your color chart. Not all answers will be used.

$y > x$	$y > -x$	$y < 4x + 2$	$y \geq -x$
$y < 3$	$y \leq 4x + 2$ $\quad$ $y \leq x + 3$		$y > \frac{2}{3}x + 1$
$y < 3x$	$y \geq \frac{1}{4}x + 2$ $\quad$ $y < -2x - 4$		$y > \frac{1}{2}x + 1$
$y > -2x - 4$ $\quad$ $y > 4x + 2$		$y \geq \frac{2}{3}x + 1$ $\quad$ $y \geq \frac{1}{2}x + 1$	

The unused answers are □

Answers in this box are □
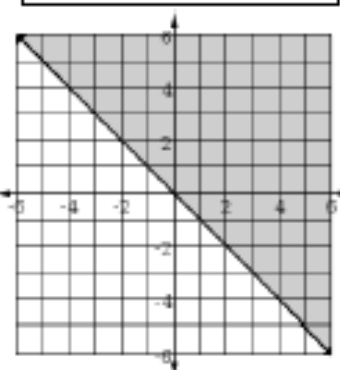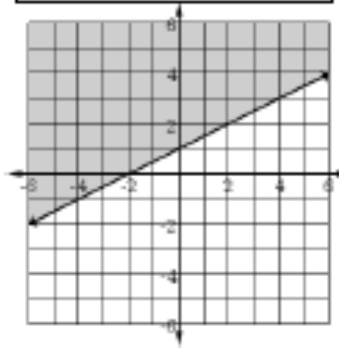
1.

2.
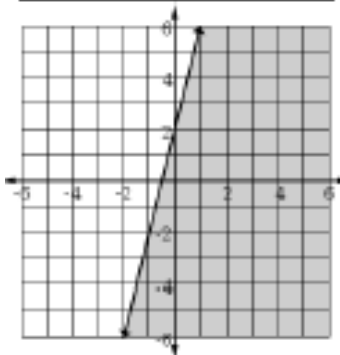
3.
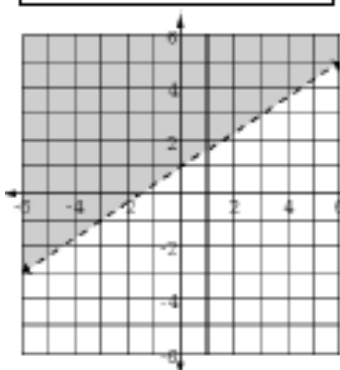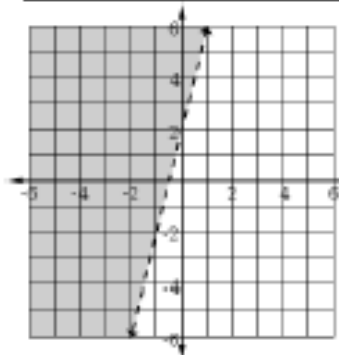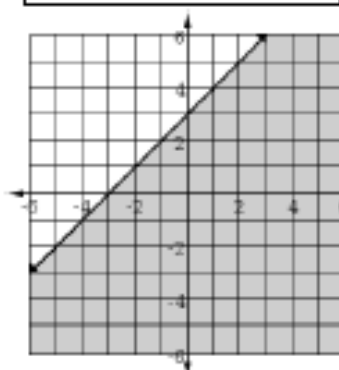

Answers in this box are □
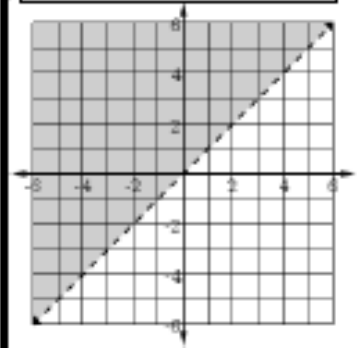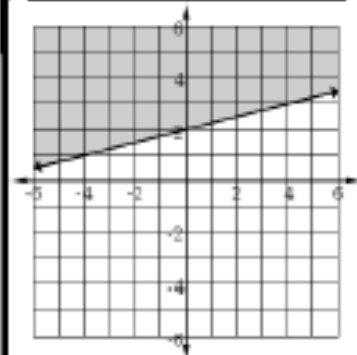
4.
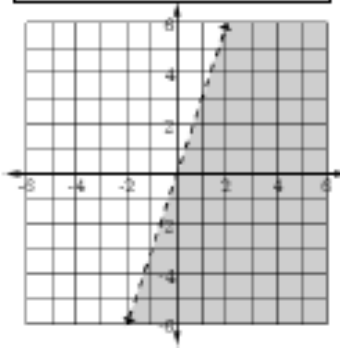
5.
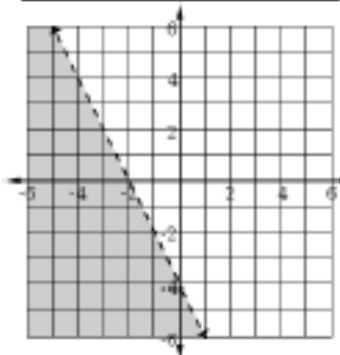
6.

Answers in this box are □

7.

8.

9.

Answers in this box are □

10.

11.

12.