

EDCI 5964: Lesson Plan for Observation #2

**Name:** Emily Staskin

**Date:** 11/8/19

**Grade/Class:** Algebra I

**SOL: A.5** The student will b) represent the solution of linear inequalities in two variables graphically;

**Learning Target:** I can represent the solution of linear inequalities in two variables graphically.

**Key Vocabulary:** linear inequality, solution, boundary/bounds

**Materials:** Do Now Worksheet, INB, foldable, scissors, highlighters, glue sticks, large graph poster paper, colored markers, colored pencils, rulers

### SIOP Features

Preparation: <input type="checkbox"/> Adaptation of content <input type="checkbox"/> Links to background X Links to past learning X Strategies incorporated	Scaffolding: X Modeling X Guided Practice X Independent Practice X Comprehensible Input	Group Options: X Whole class <input type="checkbox"/> Small groups <input type="checkbox"/> Partners X Independent
Integration of Process: X Reading X Writing X Speaking X Listening	Application: <input type="checkbox"/> Hands-on X Meaningful X Linked to objectives X Promotes engagement	Assessment: X Individual X Group X Written X Oral

**Total Time: 1hr 35min**

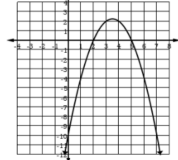
**Do Now (15 min):**

Four question spiral review. Students will work quietly and independently as teacher/co-teacher/student teacher monitor, stamp, and guide students to note pages. The Do Now will be collected before whole group discussion over any common errors.

This is how students start every single class. They are used to this routine and know to start up their computer and begin their Do Now when they enter the room. Every single class at William Fleming starts with a Do Now, not just the math classes.

**DO NOW**

1. The graph of  $h(x)$  is shown.



Which set contains only the zeros of the function  $h$ ?

- A.  $\{-10, 2, 5\}$     B.  $\{0, 2, 5\}$   
 C.  $\{-2, -5\}$     D.  $\{2, 5\}$

3. Which is the equation for the line that passes through  $(-5, 0)$  and has a slope of  $-2$ ?

- A.  $y = -2x - 10$     B.  $y = 3x + 15$   
 C.  $y = -2x$     D.  $y = 2x - 10$

2. Directions: Type your answer in the box.

Evaluate the expression when  $x = -3$  and  $y = 27$

$$\frac{-x^2 + 2\sqrt[3]{y}}{-1}$$

4. What is the slope of a line that passes through  $(-2, -3)$  and the origin?

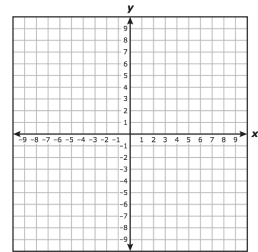
- A. 0    B.  $\frac{2}{3}$   
 C.  $\frac{3}{2}$     D.  $-\frac{3}{2}$

**Engagement/Exploration (15min):**

The teacher will begin by having students think about the equation  $x + y = 5$ . The following visual will be displayed on the board:

1. What values of  $x$  and  $y$  make this equation true?
2. Write student solutions below the equation.
3. Can we put these solutions in our graph? How?
4. Once you graph the points, connect them with a line. What do we know about all the points on this line?
5. What is this equation? If so, what do we know about all the solutions to this equation?

$x + y = 5$

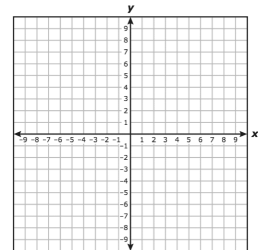


The goal is for students to make the connection that the equation is really just a relationship between two values. All the points on the graph of the line are solutions.

Then, the teacher will have students think about the linear inequality  $x + y > 5$ . The following visual will be displayed on the board:

1. What values of  $x$  and  $y$  make this equation true? Are they the same values as before? Why or why not?
2. Write student solutions below the equation.
3. Can we put these solutions in our graph? How?
4. What about the line  $y = -x + 5$ ? Are these solutions? Once they determine no, make it a dashed line.
5. How can we represent all possible solutions on the graph?
6. What about  $y > -x + 5$ ? Is this the same? If so, what do we know about all the solutions to this inequality?

$x + y > 5$



The goal is for students to make connections between the linear equation and the linear inequality. In the linear inequality, the ordered pairs are still x and y values that make the inequality true. Through this discussion, students will begin to see how linear inequalities are graphed.

**Explanation (20min):**

Interactive Notebooks: Graphing Linear Inequalities Foldable. Using student observations from the exploration, the teacher will guide students through filling out their foldable.

One aspect of graphing linear inequalities that students often have a hard time with is determining which side of the boundary line to shade, especially with a steep slope. The teacher will encourage students to draw either an up or down arrow from the boundary line, based on the inequality, to help them determine how the graph should be shaded.

**to graph a linear inequality...**

- Use the slope and y-intercept to graph two points on the boundary line.
- Use a solid or dashed line depending on the inequality.
 

$< \text{ or } >$	$\leq \text{ or } \geq$
← dashed →	solid →
- Shade above or below the line depending on the inequality.
 

$> \text{ or } \geq$	$< \text{ or } \leq$
above	below

**#1:** Graph  $y \geq \frac{2}{5}x - 3$  y-int (0, -3)

Type of Line	Shading
<input checked="" type="radio"/> Solid	<input checked="" type="radio"/> Above
<input type="radio"/> Dashed	<input type="radio"/> Below

solutions in shade →

solutions on the line →

**#3:** Graph  $y \leq -\frac{1}{2}x + 2$  y-int (0, 2)

Type of Line	Shading
<input type="radio"/> Solid	<input checked="" type="radio"/> Above
<input type="radio"/> Dashed	<input checked="" type="radio"/> Below

solutions on the line →

solutions in shade →

**#2:** Graph  $y > -2x - 5$  y-int (0, -5)

Type of Line	Shading
<input type="radio"/> Solid	<input checked="" type="radio"/> Above
<input checked="" type="radio"/> Dashed	<input type="radio"/> Below

solutions in shade →

NO solutions on dashed lines

dashed!

**#4:** Graph  $y < 3x + 1$  y-int (0, 1)

Type of Line	Shading
<input type="radio"/> Solid	<input checked="" type="radio"/> Above
<input checked="" type="radio"/> Dashed	<input type="radio"/> Below

solutions in shade →

NO solutions on dashed line

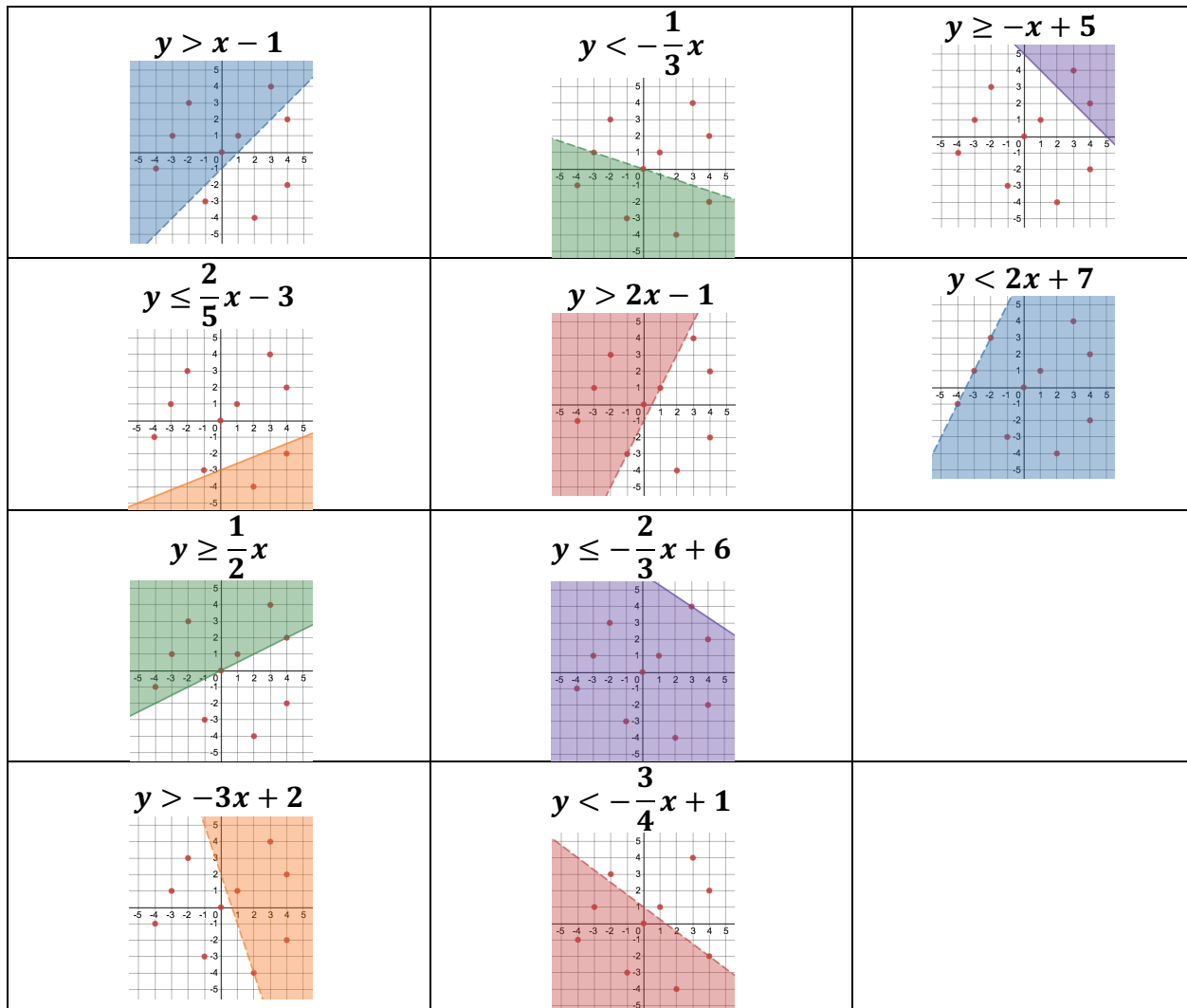
**Extension (25min):**

(15min) Students will work in groups of 2-3 for this activity. First, each group will be assigned a linear inequality. They will be asked to graph this inequality on large graph paper that can be displayed in the classroom.

Students will be encouraged to graph their linear inequality in pencil first, then check with a teacher before graphing it in markers. They will also be encouraged to use Desmos to check their graph.

One student can plot the y-intercept, another can count the slope, and if there is a third group member, they can check the graph in Desmos.

The following inequalities will be assigned:



(10min) Once each group has completed their graph, each pair will be assigned an ordered pair and a marker color. They must walk around the room, to each group's graph, and graph their ordered pair to determine whether or not it is a solution or not. Each group will have a different color marker so that their point is the same color on all of the graphs.

The following ordered pairs will be assigned: Indicates the ordered pair is on the boundary line.

(1, 1)		(0, 0)		(-2, 3)		(4, -2)	
Solution	Not a Solution	Solution	Not a Solution	Solution	Not a Solution	Solution	Not a Solution
$y > x - 1$	$y < -\frac{1}{3}x$	$y > x - 1$	$y < -\frac{1}{3}x$	$y > x - 1$	$y < -\frac{1}{3}x$	$y < -\frac{1}{3}x$	$y > x - 1$
$y < 2x + 7$	$y \geq -x + 5$	$y > 2x - 1$	$y \geq -x + 5$	$y > 2x - 1$	$y \geq -x + 5$	$y \leq \frac{2}{5}x - 3$	$y \geq -x + 5$
$y \geq \frac{1}{2}x$	$y \leq \frac{2}{5}x - 3$	$y < 2x + 7$	$y \leq \frac{2}{5}x - 3$	$y \geq \frac{1}{2}x$	$y \leq \frac{2}{5}x - 3$	$y < 2x + 7$	$y > 2x - 1$
$y \leq -\frac{2}{3}x + 6$	$y > 2x - 1$	$y \geq \frac{1}{2}x$	$y > -3x + 2$	$y \leq -\frac{2}{3}x + 6$	$y < 2x + 7$	$y < 2x + 7$	$y > 2x - 1$
$y > -3x + 2$	$y < -\frac{3}{4}x + 1$	$y \leq -\frac{2}{3}x + 6$			$y > -3x + 2$	$y \leq -\frac{2}{3}x + 6$	$y \geq \frac{1}{2}x$
		$y < -\frac{3}{4}x + 1$			$y < -\frac{3}{4}x + 1$	$y > -3x + 2$	$y < -\frac{3}{4}x + 1$

(3, 4)		(-1, -3)		(-3, 1)		(4, 2)	
Solution	Not a Solution	Solution	Not a Solution	Solution	Not a Solution	Solution	Not a Solution
$y > x - 1$	$y < -\frac{1}{3}x$	$y < -\frac{1}{3}x$	$y > x - 1$	$y > x - 1$	$y < -\frac{1}{3}x$	$y \geq -x + 5$	$y > x - 1$
$y \geq -x + 5$	$y \leq \frac{2}{5}x - 3$	$y < 2x + 7$	$y \geq -x + 5$	$y > 2x - 1$	$y \geq -x + 5$	$y < 2x + 7$	$y < -\frac{1}{3}x$
$y < 2x + 7$	$y > 2x - 1$	$y \leq -\frac{2}{3}x + 6$	$y \leq \frac{2}{5}x - 3$	$y > 2x - 1$	$y \geq -x + 5$	$y < 2x + 7$	$y < -\frac{1}{3}x$
$y \geq \frac{1}{2}x$	$y < -\frac{3}{4}x + 1$	$y \leq -\frac{2}{3}x + 6$	$y \leq \frac{2}{5}x - 3$	$y \geq \frac{1}{2}x$	$y \leq \frac{2}{5}x - 3$	$y \geq \frac{1}{2}x$	$y \leq \frac{2}{5}x - 3$
$y \leq -\frac{2}{3}x + 6$		$y < -\frac{3}{4}x + 1$	$y > 2x - 1$	$y \leq -\frac{2}{3}x + 6$	$y < 2x + 7$	$y \leq -\frac{2}{3}x + 6$	$y > 2x - 1$
$y > -3x + 2$			$y \geq \frac{1}{2}x$	$y < -\frac{3}{4}x + 1$	$y > -3x + 2$	$y > -3x + 2$	$y < -\frac{3}{4}x + 1$
			$y > -3x + 2$				

(2, -4)		(-4, -1)	
Solution	Not a Solution	Solution	Not a Solution
$y < -\frac{1}{3}x$	$y > x - 1$	$y > x - 1$	$y \geq -x + 5$
$y \leq \frac{2}{5}x - 3$	$y \geq -x + 5$	$y < -\frac{1}{3}x$	$y \leq \frac{2}{5}x - 3$
$y < 2x + 7$	$y > 2x - 1$	$y > 2x - 1$	$y < 2x + 7$
$y \leq -\frac{2}{3}x + 6$	$y \geq \frac{1}{2}x$	$y \geq \frac{1}{2}x$	$y > -3x + 2$
$y < -\frac{3}{4}x + 1$	$y > -3x + 2$	$y \leq -\frac{2}{3}x + 6$	

If there is a group who finishes early, they will be given another group's point to go around and check.

Students will record their work with their ordered pair in the following sheet so that they can receive a classwork grade for participating:

Circle <b>Solution</b> or <b>Not a Solution</b> for each linear inequality.				
Write your assigned ordered pair here:  _____				
$y > x - 1$ <b>Solution</b> <b>Not a Solution</b>	$y < -\frac{1}{3}x$ <b>Solution</b> <b>Not a Solution</b>	$y \geq -x + 5$ <b>Solution</b> <b>Not a Solution</b>	$y \leq \frac{2}{5}x - 3$ <b>Solution</b> <b>Not a Solution</b>	$y > 2x - 1$ <b>Solution</b> <b>Not a Solution</b>
$y < 2x + 7$ <b>Solution</b> <b>Not a Solution</b>	$y \geq \frac{1}{2}x$ <b>Solution</b> <b>Not a Solution</b>	$y \leq -\frac{2}{3}x + 6$ <b>Solution</b> <b>Not a Solution</b>	$y > -3x + 2$ <b>Solution</b> <b>Not a Solution</b>	$y < -\frac{3}{4}x + 1$ <b>Solution</b> <b>Not a Solution</b>

Since there are a lot of components of this activity, groups will be assigned. My cooperating teacher and myself worked together to choose groups of students who would work well together, help one another, and hopefully stay on task. I then assigned them an inequality and an ordered pair based on the difficulty level I thought the students should receive.

A1/B1 Groups:

Group	Students	Inequality	Ordered Pair
1	[Redacted]	$y > x - 1$	(1, 1)
2	[Redacted]	$y < -\frac{1}{3}x$	(-2, 3)
3	[Redacted]	$y \geq -x + 5$	(4, -2)
4	[Redacted]	$y \leq \frac{2}{5}x - 3$	(3, 4)
5	[Redacted]	$y > 2x - 1$	(-3, 1)
6	[Redacted]	$y < 2x + 7$	(0, 0)
7	[Redacted]	$y \geq \frac{1}{2}x$	(-1, -3)
8	[Redacted]	$y \leq -\frac{2}{3}x + 6$	(-3, 1)
9	[Redacted]	$y > -3x + 2$	(4, 2)
10	[Redacted]	$y < -\frac{3}{4}x + 1$	(2, -4)

A3/B3 Groups:

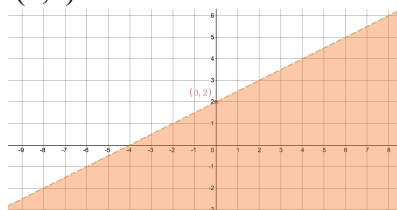
Group	Students	Inequality	Ordered Pair
1	Alexis, Algha	$y > x - 1$	(1, 1)
2	Aurysian, Carter	$y < -\frac{1}{3}x$	(-2, 3)
3	Adina, Deven, Destina	$y \geq -x + 5$	(4, -2)
4	Ashly, Brian, Nathalia	$y \leq \frac{2}{5}x - 3$	(3, 4)
5	Caris, Karissa	$y > 2x - 1$	(-1, -3)
6	Adina, Nathalia, Brian	$y < 2x + 7$	(-3, 1)
7	Aurysian, Aurysian, Leah	$y \geq \frac{1}{2}x$	(4, 2)
8	Jamison, Karissa	$y \leq -\frac{2}{3}x + 6$	(0, 0)
9	Caris, Karissa	$y > -3x + 2$	(2, -4)
10	Adina, Nathalia, Brian	$y < -\frac{3}{4}x + 1$	(-4, -1)

### Evaluation (20min):

Based on how much time is left, the teacher will determine which activity we have enough time for. There is an independent practice worksheet and a maze. The maze will not take as long and can be used as an exit pass instead of the independent practice if needed.

If there is not enough time for either of these activities, then the students will complete a Post-It Prove-It to show what they have learned. The teacher will display one question on the board. Each student will have a post-it note. They will write their name on the back of the post-it note and their answer on the front. When they have a solution and have recorded it on the post-it note, the student will place the note on the bulletin board in the classroom and can view other students' solutions.

The following will be the Post-It Prove-It question: Look at the following linear inequality and graphed ordered pair. Is the point (0,2) a solution to this linear inequality? Why or why not?





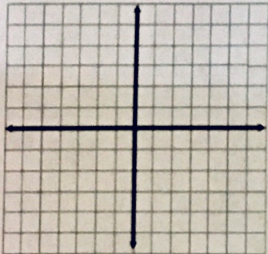
Independent Practice:

Name: \_\_\_\_\_ Date: \_\_\_\_\_

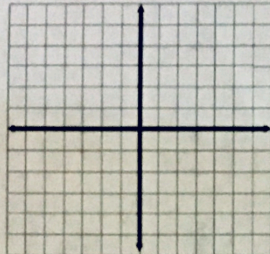
**Independent Practice**

Directions: Graph the following inequalities.

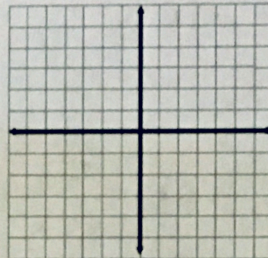
1.  $x + 3y \leq -9$



2.  $5x - y \geq 5$



3.  $x + 3y \geq 3$



4. Directions: Shade the box to choose the inequalities you want to select. You must select all correct inequalities.

Identify the inequalities that have a solution of (3, -6).

$y < 2x + 1$

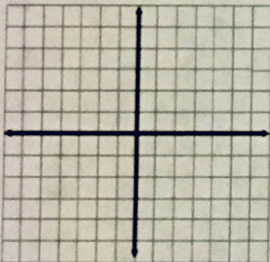
$y < -5x + 7$

$y > 2x + 1$

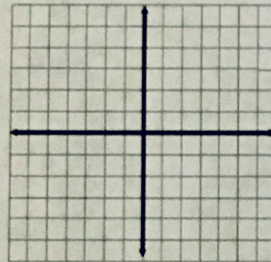
$y > -5x + 7$

Directions: Graph the following inequalities.

5.  $y \geq 5$

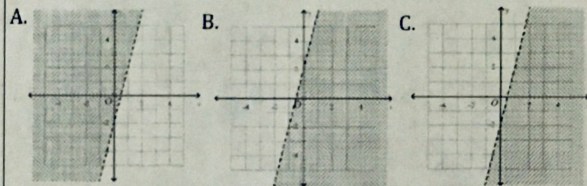


6.  $x \leq -2$



7. Which of the following correctly represents the solution set to the inequality shown below?

$y < 4x - 2$

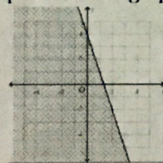


8. Which inequality correctly represents the graph below?

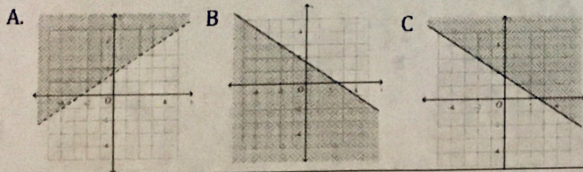
A.  $y \geq -3x + 4$

B.  $y \leq -3x + 4$

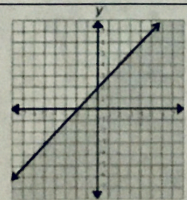
C.  $y \leq 3x + 4$



9. Which of the following correctly represents the solution set to the inequality shown below?  $4x + 6y \geq 10$



10. Which inequality best represents the line shown on the grid?



A.  $y \leq x + 2$

C.  $y < x + 2$

B.  $y \leq -x + 2$

D.  $y \geq x + 2$

11. Directions: Shade the box to choose the points you want to select. You must select all correct ordered pairs.

Select the points that are NOT part of the solution set to the inequality shown.

$2y - x < -1$

(-4, 1)

(4, 1)

(0, -3)

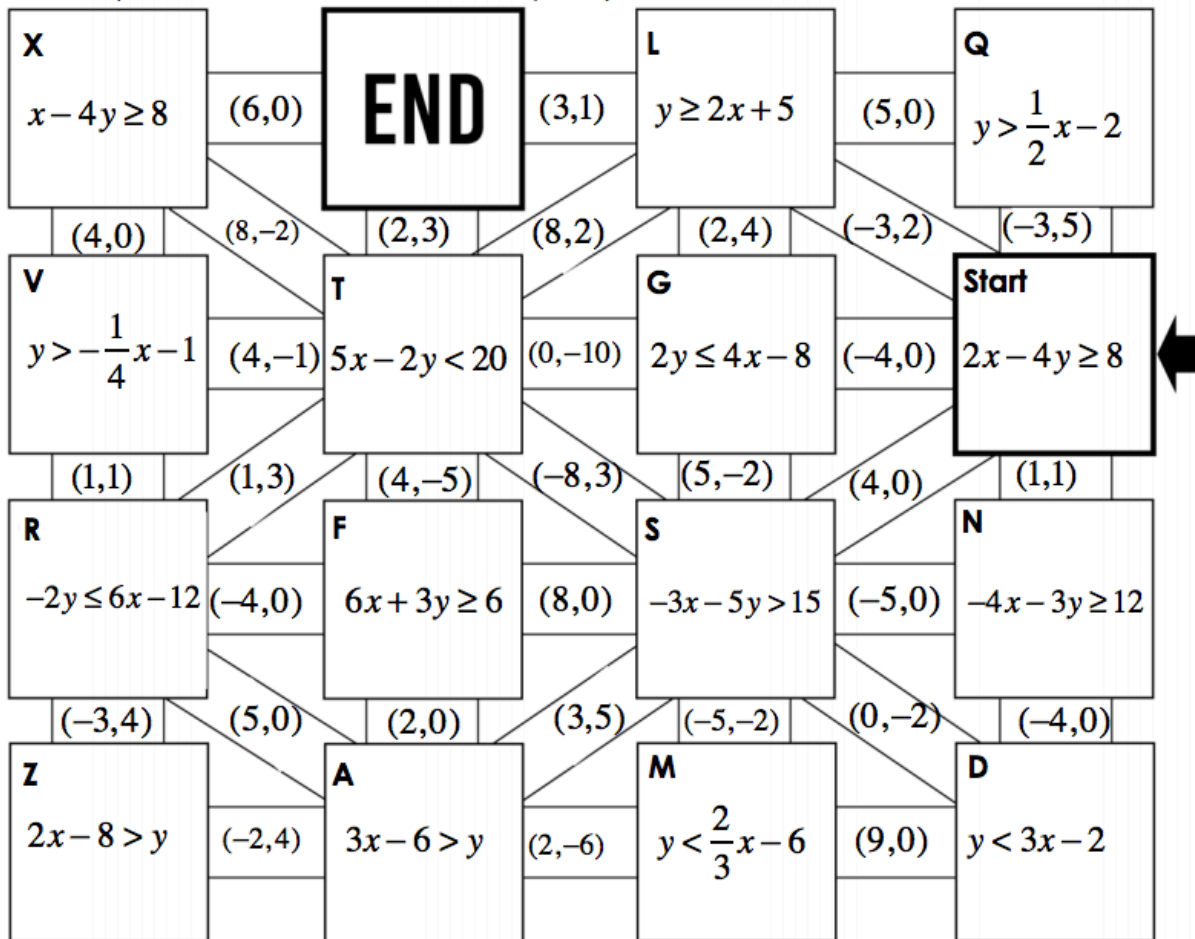
(-1, -1)



Maze:

# Challenge # 1

Which point is a solution to the inequality?



**Crack the Code: Using the letters from the boxes you passed through, create a 5 letter word.**

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## Reflection on Lesson:

This lesson was created for my midterm evaluation. My goal for this observation was to include multiple representations in a lesson and to have students move around during class to keep them engaged. I think that the gallery walk went extremely well. The students had not done an activity like this before and it took longer than expected to get them started, but they did a great job. I circulated the room providing extra support to certain groups and it was exciting to hear the mathematical conversations going on around me.

One change I made to the lesson was to add a summarizing component after the gallery walk. I pulled the class back together and had them discuss how they determined whether or not their points were solutions for each linear inequality. I wrote their ideas up on the board so that all the students could see what they had learned. I did not have time for this in the first class, but in the second class I felt that this helped them to connect all of the lesson together and really understand what their goal was for the day.

In both classes, I did not have time for either the independent practice or the maze activity. The following class period was focused on solving practical problems by graphing linear inequalities. I knew students would get more independent practice on this day, so I was not concerned. Instead, in both classes I moved straight into the Post-It Prove-It question. Again, students had not done this activity before, so it took a long time to explain what they needed to do. I had to reiterate the directions numerous times before the students understood what was expected of them. I think that they liked this activity, but next time I need to make sure that all of the students are writing *why* they had a particular answer, not just yes or no. This would have given me another way to assess which students understood the concepts and which needed extra review.

Overall, I was pleased with the level of engagement of the class. I think it would have been beneficial to have a more hands-on engagement activity so that the first part of the class was not all sitting. I think this would have kept students more interested at the beginning of the lesson and I would not have had to work as hard while setting up the gallery walk to get all the students to buy into the activity.