Coordinating Seminar : Technology Project

Geogebra Lesson: Grades 9-10

<u>**Find the Solutions Systems of Linear Equations and Systems of Linear Inequalities**</u>

Warm up/Review
1. Put this equation into slope interval form
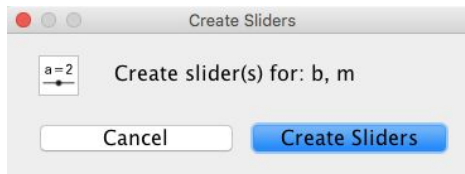 $$2x + 2y = -10$$

$y = mx + b$

slope intercept

2. Match these inequality signs with their meaning.

$\leq$	$\geq$	$=$	$<$	$>$

Equal to	Less than	Greater than equal to	Less than or equal to	Greater than

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Solutions to Systems of Linear Equations

1) Insert the general formula for the equation of a line in the input line. $y = mx + b$
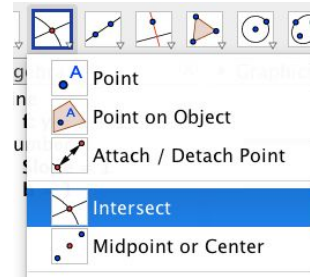2) Click on create sliders when prompt appears

3) Organize the sliders:
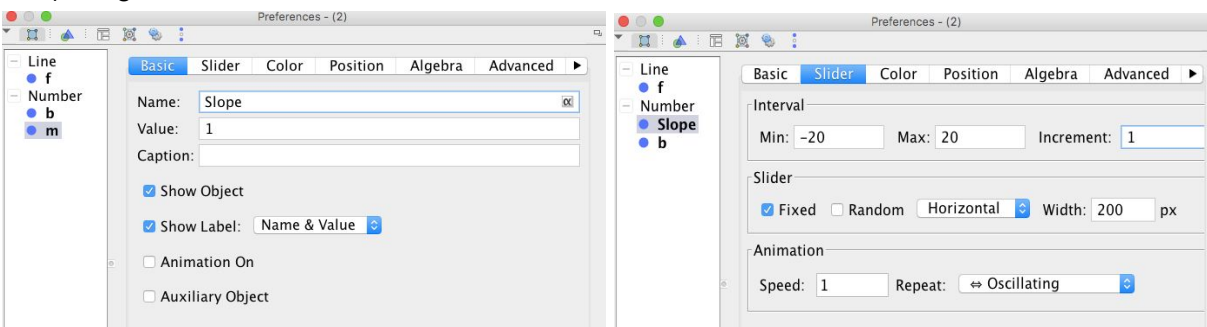
   a) Right click on the line and click on Object Properties. Click on m and b, change intervals to -20 to 20, and the increment to 1.
   b) Label the m value: Slope

4) Insert this additional equation into the input line. $y = 2x + 1$

5) Create a point on the intersection of the two lines.

6) The solution to a system of linear equations is based upon the intersections of two lines. Move the sliders on the equation in order to see the number of possible solutions.
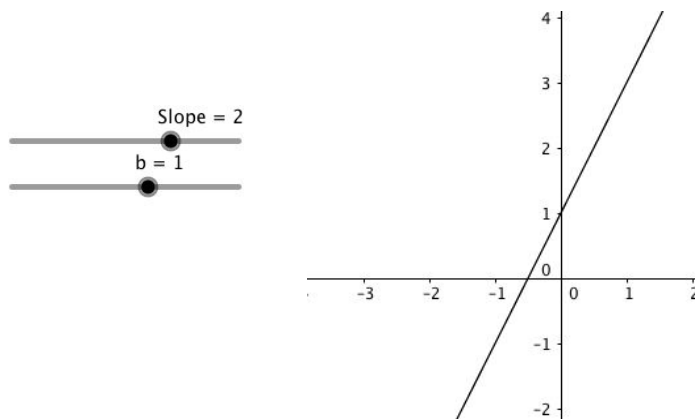
Try each situation and describe what happens to the point of intersection.
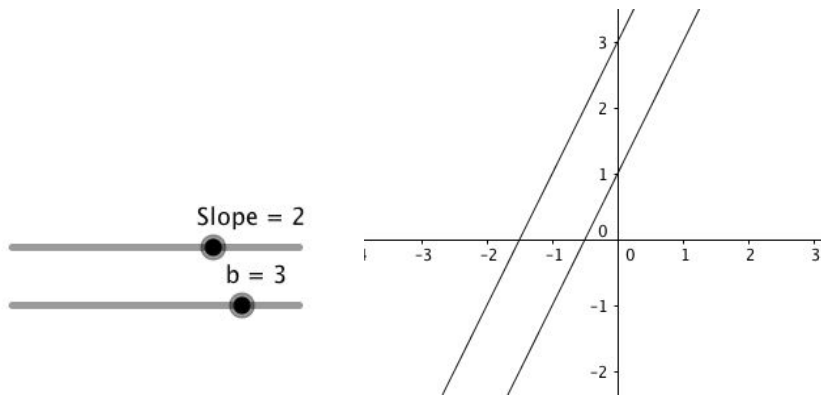
What solutions do you see?

Different slopes :_____

Slope = 1

b = 1
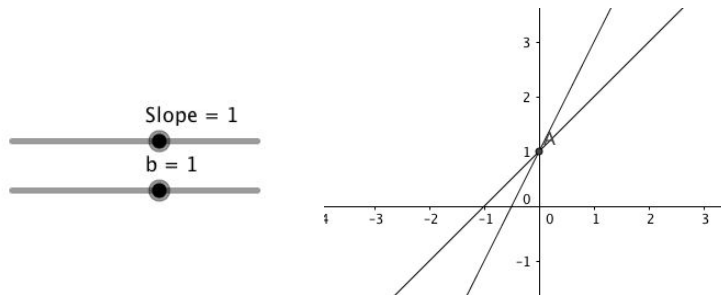
Same slope (Adjust slope slider): _____

Slope = 2

b = 1

Different y-Intercept, Same Slope(Adjust y-intercept slider):_____

Slope = 2

b = 3

Using geogebra we are able to see that systems of linear equations can ultimately have three types of solutions. One, infinitely many, and no solution.

How many solutions exist for each of the following systems of linear equations.

1) $y = 2x - 1$ 2) $2x + 3y = 6$ 3) $y = 3x + 1$
   $y = x + 1$ $4x + 6y =- 12$ $2y = 6x + 2$

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Open New Geogebra Window.

## Solutions to Systems of Linear Inequalities

1) Insert the first linear inequality $y \geq 3x - 5$ in the input line. Insert the second linear inequality $x - 5y < 15$ in the input line.
(Use the α key in the input line to show the inequalities.)

2) We want to adjust the characteristics of the inequalities so that they can be seen.

    a) Right click on the line and click on Object Properties.

    b) Label each line Inequality 1 and Inequality 2 using the **Basic** tab.
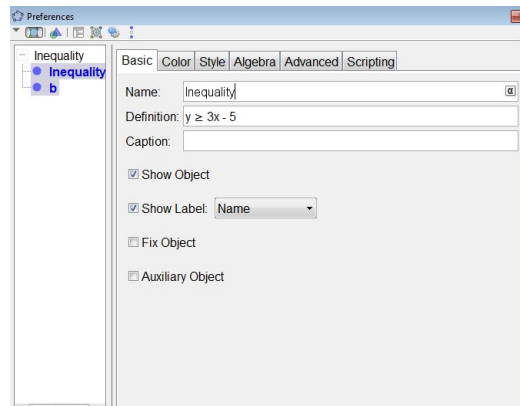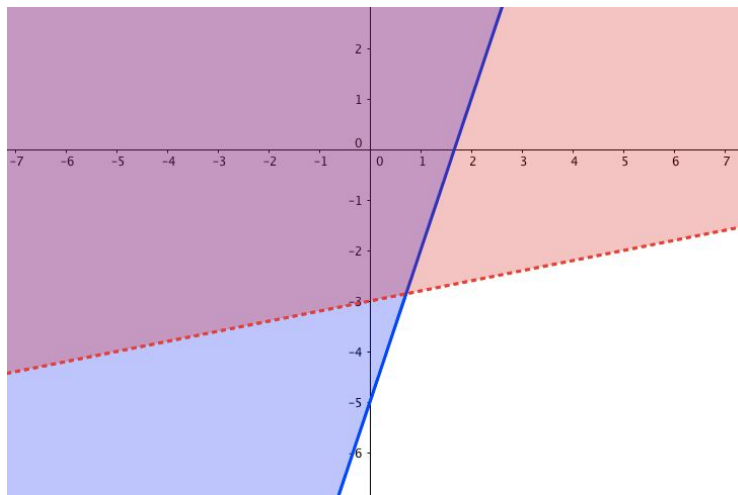

    c) Fix the color and opaqueness of the inequalities (Make sure that one is lighter than the other and different colored.) using the **Color** tab.
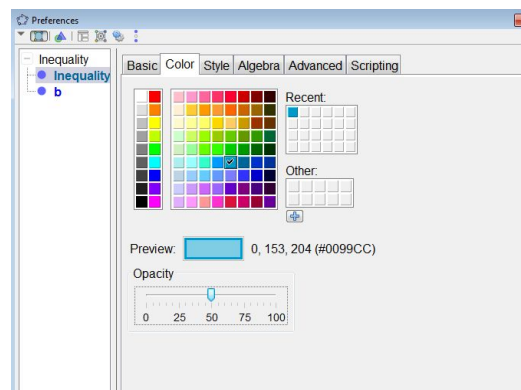
d) Fix the line thickness of the inequalities using the **Style** tab. (Make sure that it is six or above.)
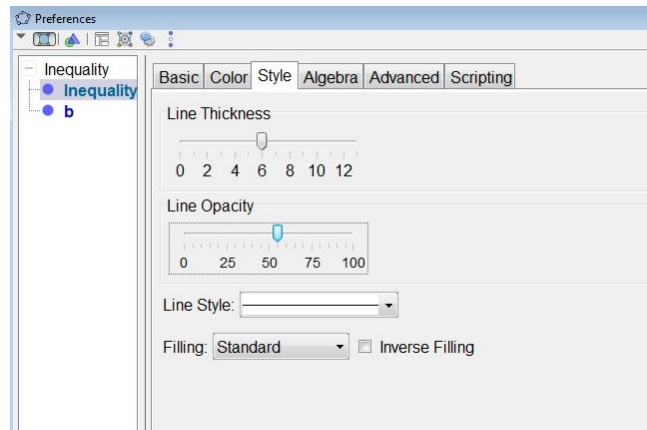

This is what you should have at this point ! ↓

3) **Dashed Line or Solid Line**: Using the given inequalities identify the type of line used to graph each type of inequality.
   a) What type of lines are used for *Less than* and *Greater than* when graphing a linear inequality ? _____
   b) What type of lines are used for *Less than or equal to* and *Greater than or equal to* when graphing a linear inequality? _____

4) The shaded region with both colors is the _____.

5) State if the following points are in the solution set for this system of linear inequalities.
   a) (0,0)
   b) (-1,-1)
   c) (3,0)
   d) (1,-3)
   e) (-3,-6)
   f) (6,-4)
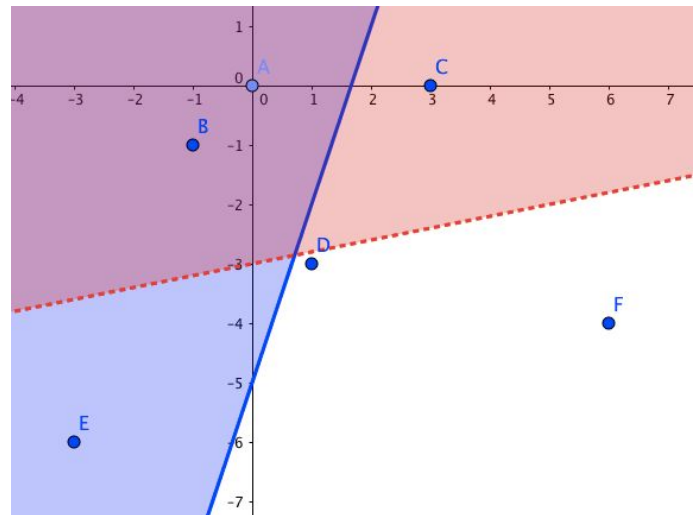
Example:
1) *a)* $15x + 5y \geq 5$ *and b)* $2x + 2y > 4$

2) State what lines are used for each inequality.

   a) _____

   b) _____

3) Identify three points in the solution set and two points not in the solution set for this system of inequalities.

   In the solution set   Not in the solution set

   a) _____   d) _____
   b) _____   e) _____
   c) _____

Extension Activity:
1) Meghan is selling bracelets and earrings to make money for a trip. The bracelets cost $2 and the earrings cost $3. She needs to make at least $500. Create a graphic representation for the solution set of this problem.
2) Develop a real-world application problem based on systems of linear inequalities and how the knowing the solution would help in the specific situation.