Algebra 1R
Chapter 6 & 7 – Day 5

Section 7.2 – Systems of Linear Inequalities

Whitewater Rafting

Chase is an experienced whitewater rafter who guides groups of adults and children out on the water for amazing adventures. The super-raft he uses can hold 800 pounds of weight. Any weight greater than 800 pounds will cause the raft to sink, hit more rocks, and maneuver more slowly.

1. Chase estimates the weight of each adult as approximately 200 pounds and the weight of each child under age sixteen as approximately 100 pounds. Chase charges adults $75 and children under age sixteen $50 to ride down the river with him. His goal is to earn at least $150 each rafting trip.

Write an inequality to represent the most weight Chase can carry in terms of rafters. Define your variables.

let x = adults
y = children

$200x + 100y \leq 800$

Write an inequality to represent the least amount of money Chase wants to collect for each rafting trip.

$75(x-1) + 50y \geq 150$

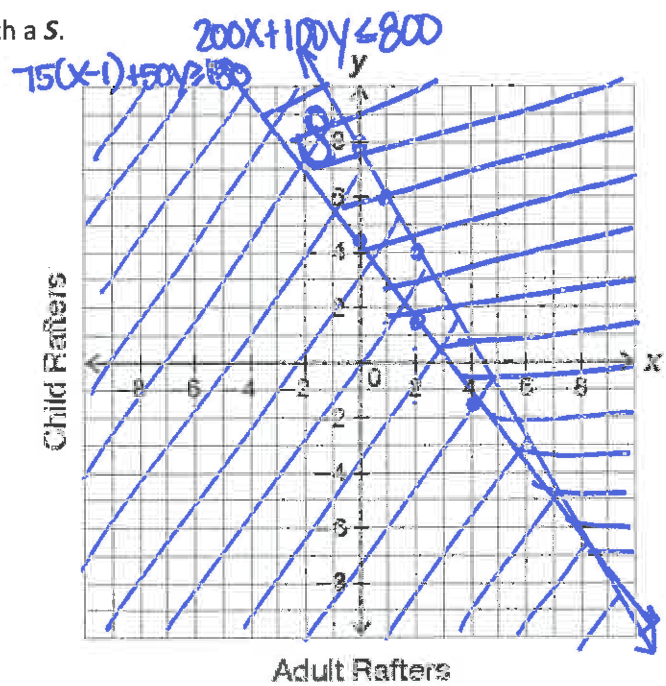
Write a system of inequalities to represent the maximum weight of the raft and the minimum amount of money Chase wants to earn per trip.

$200x + 100y \leq 800$
$75(x-1) + 50y \geq 150$

Graph the system of inequalities, label your solution with a ***S***.

$$200x + 100y \leq 800$$
$$-200x \qquad -200x$$
$$\frac{100y}{100} \leq \frac{-200x}{100} + \frac{800}{100}$$
$$y \leq -2x + 8 \qquad m = \frac{-2}{1} \qquad b = 8$$

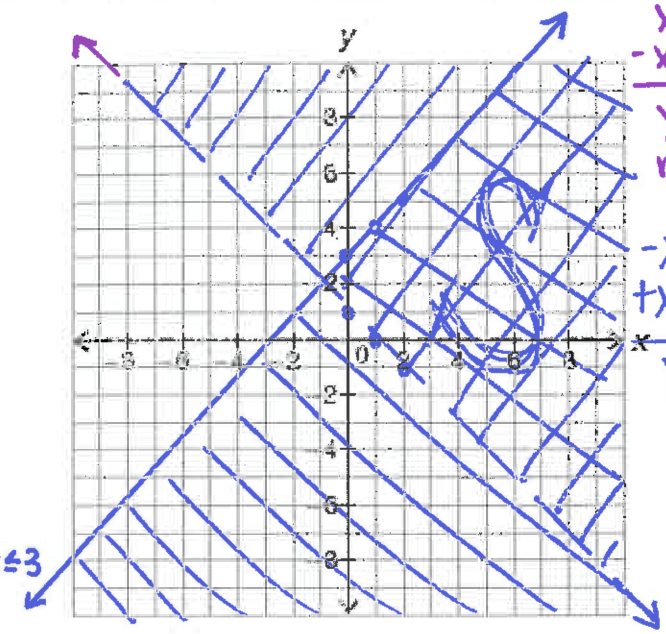
$$75(x-1) + 50y \geq 150$$
$$75x - 75 + 50y \geq 150$$
$$+75 \qquad +75$$
$$75x + 50y \geq 225$$
$$-75x \qquad -75x$$
$$50y \geq -75x + 225 \qquad m = \frac{-3}{2}$$
$$y \geq -\frac{3}{2}x + 4.5 \qquad b = +4.5$$



Analyze the solution set of the system of linear inequalities shown.

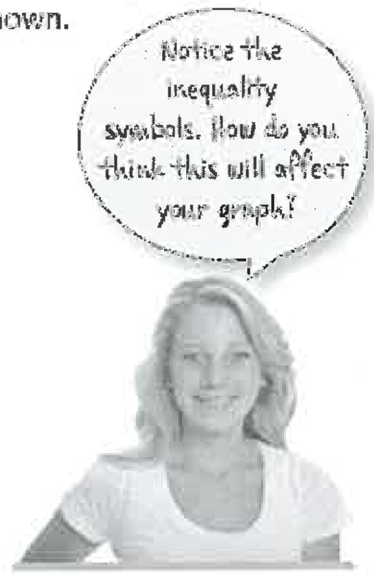
$$\begin{cases} x + y > 1 \\ -x + y \le 3 \end{cases}$$

a. Graph the system of linear inequalities.



$x + y > 1$
$-x \quad\quad -x$
$y > -x + 1$
$m = -\frac{1}{1}$ $b = 1$

$-x + y \le 3$
$+x \quad\quad +x$
$y \le x + 3$
$m = \frac{1}{1}$
$b = 3$



b. Choose a point in each shaded region of the graph. Determine whether each point is a solution of the system. Then describe how the shaded region represents the solution.

Point	$x + y > 1$	$-x + y \le 3$	Description of location
$(-8, 2)$	$-8 + 2 > 1$ $-6 > 1$ ✗	$-(-8) + 2 \le 3$ $10 \le 3$ ✗	The point is not a solution to either inequality and it is located in the region that is not shaded by either inequality.
(2,8)	2+8>1 10>1 ✓	-2+8≤3 6≤3 ✗	The point is in one solution but not the other
(8,2)	8+2>1 10>1 ✓	-8+2≤3 -6≤3 ✓	The point is a solution for both
(-2,-8)	-2+-8>1 -10>1 ✗	2-8≤3 -6≤3 ✓	The point is a solution for 1 but not the other

c. Alan makes the statement shown.

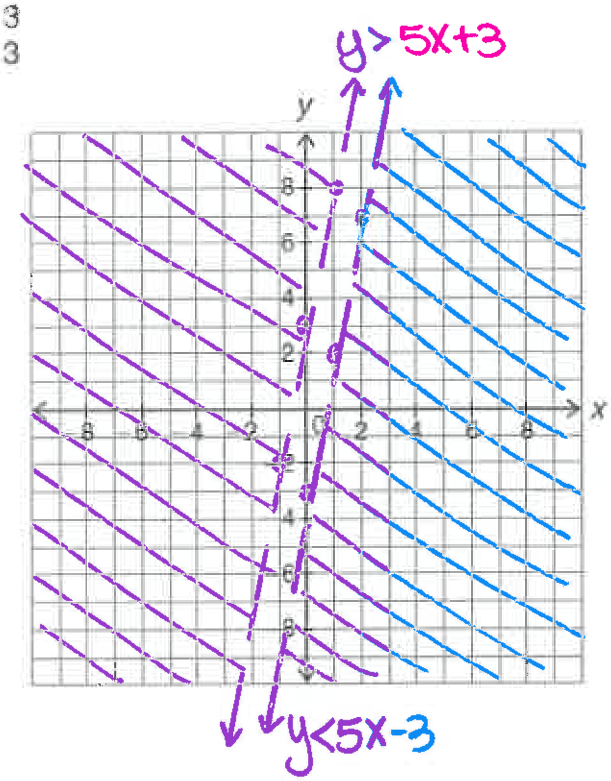
> **Alan**
>
> The intersection point is always an algebraic solution to a system of inequalities because that is where the two lines meet.

Explain why Alan's statement is incorrect. Use the intersection point of this system to explain your reasoning.

(-1,2) Alan is incorrect since the intersection point only works for one inequality and not both. Therefore it is not a solution.

Solve each system of linear inequalities by graphing the solution set. Then identify two points that are solutions of the system.

a. $\begin{cases} y > 5x + 3 \\ y < 5x - 3 \end{cases}$



$y > 5x+3$

$m = \frac{5}{1}$

$b = 3$

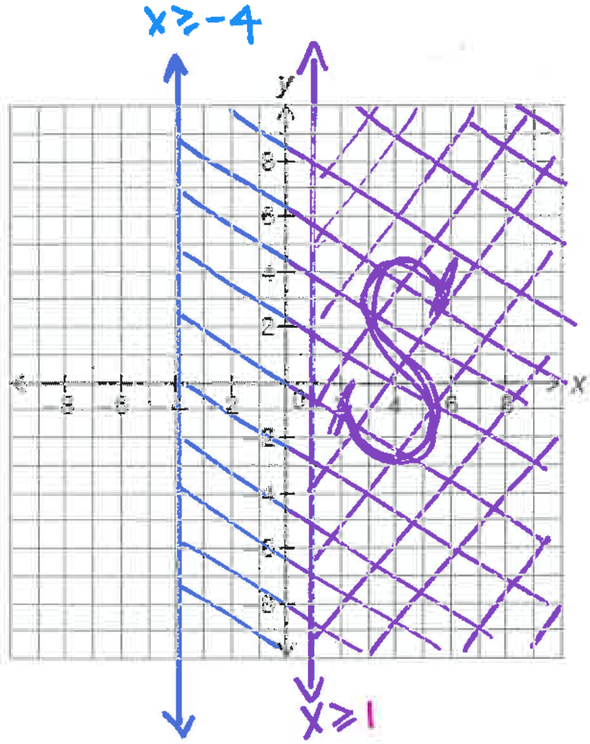
$y < 5x-3$

$m = \frac{5}{1}$

$b = -3$

No intersection = No solution

b. $\begin{cases} x \geq -4 \\ x \geq 1 \end{cases}$



$x \geq -4$

$x \geq 1$

2 possible points are (4,4) & (6,-3)

You can use a graphing calculator to graph a system of linear inequalities.

Step 1: Press Y= and enter the two inequalities as Y_1 and Y_2.

Step 2: While still in the Y= window, access the inequality function by moving your cursor to the left until the \ flashes. Press **ENTER** to select the appropriate inequality symbol (◣ or ◥).

Step 3: Press **WINDOW** and set the bounds.

Step 4: Press **GRAPH**.

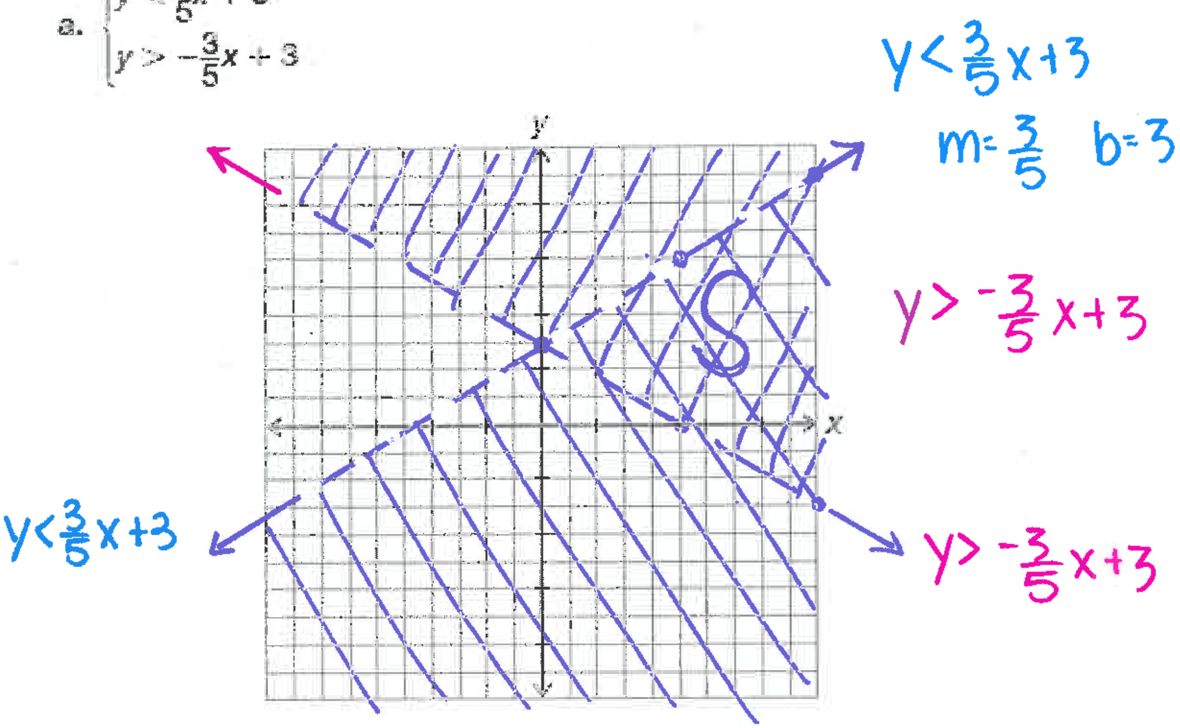
Remember to solve for the y-value before entering the inequalities.

When choosing the inequality symbol, think about the half-plane you must shade.

Set the WINDOW for this problem using the bounds [0, 50] x [0, 50].

Solve each system of linear inequalities using your graphing calculator. Graph each system then identify two points that are solutions to the system on the grid shown.

a. $\begin{cases} y < \frac{3}{5}x + 3 \\ y > -\frac{3}{5}x + 3 \end{cases}$



2 possible solutions
(6,4) & (8,0)