Fluency

Hwk: Due 12/17/15

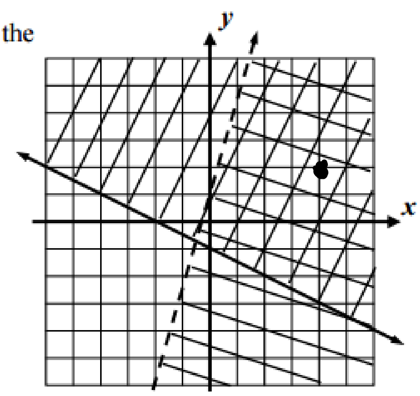
1. Which of the following points is a solution to the system of inequalities shown below?

(1) (2, 5)
(2) (1, 3)
(3) (1, −2)
(4) (2, 3)

$y > x + 1$
$y \le -2x + 7$

2. A system of inequalities is shown graphed below. Which of the following points lies in the solution set of this system?

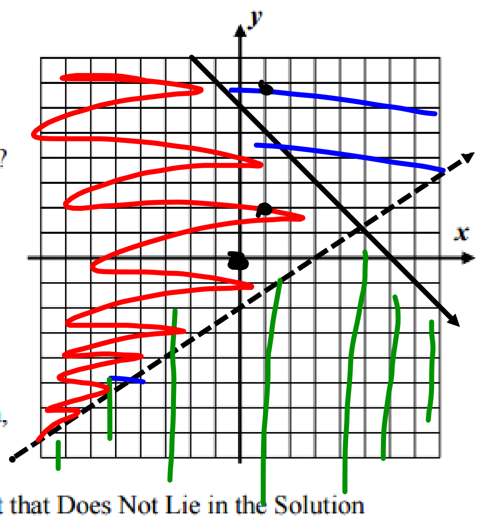
(1) $(-1, 2)$
(2) $(1, 5)$
(3) $(2, -4)$
(4) $(4, 2)$



3. Consider the system of inequalities shown below.

$y > \frac{2}{3}x - 2$ $\quad 0 > -2$ ✓

$y \leq -x + 6$ $\quad 0 \leq 0 + 6$ $\quad 0 \leq 6$ ✓



Y (a) Is the origin, $(0, 0)$, part of the solution set of the system? Determine without first graphing.

(b) Graph the solution to the system of inequalities. Then, state one point that lies in the set and one that doesn't.

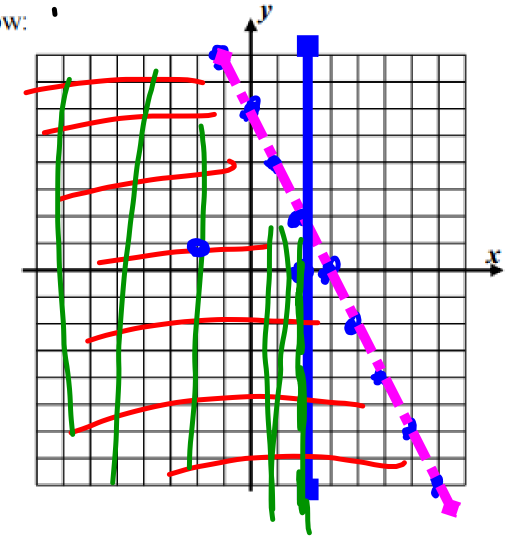
One Point That Lies in the Solution: (1,2)

One Point that Does Not Lie in the Solution (1,7)

4. Sketch the solution to the system of inequalities shown below:

$y + 2x < 6$ $y < -2x + 6$

$x \leq 2$



State a point that lies in the solution set:

(-2, 1)

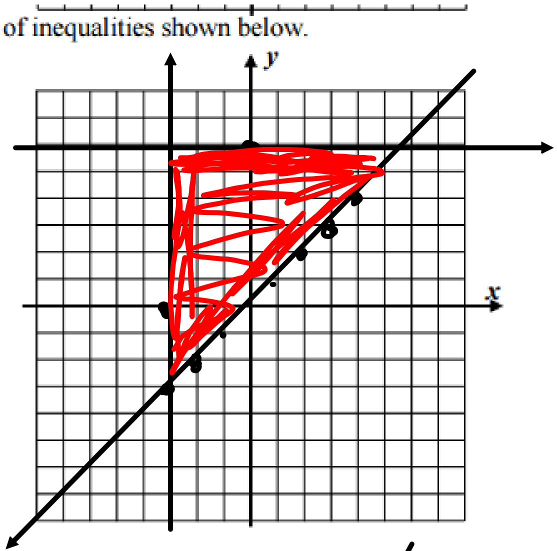
5. Find the area of the triangular region defined by the system of inequalities shown below.

$y \geq x$
$x \geq -3$
$y \leq 6$

$b=9, h=9$

$A_{\Delta} = \frac{1}{2}bh$

$\frac{1}{2}9^2 = \frac{81}{2} = 40.5$



REASONING

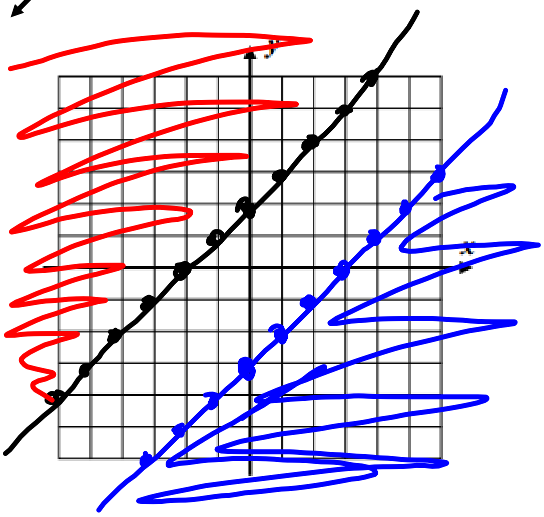
6. Consider the system of inequalities shown below:

$y \geq x+2$

$y \leq x-3$

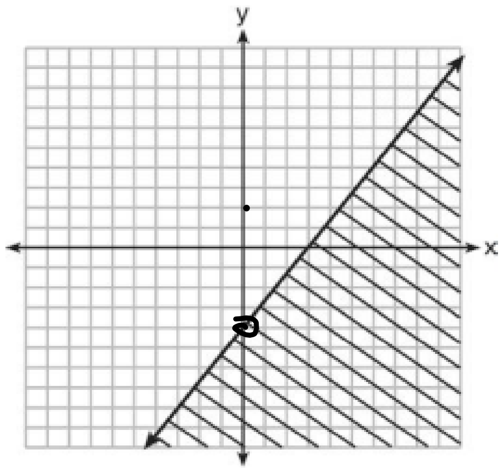
(a) Graph the system solution to the system on the grid.

(b) Why can you **not** state a point in the solution set?



Bell Ringer:

Which inequality is shown in the graph below?



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

2) $y \ge \frac{4}{3}x + 3$

3) $y \le \frac{4}{3}x - 4$

4) $y \ge \frac{4}{3}x - 4$

MODELING WITH SYSTEMS OF INEQUALITIES
COMMON CORE ALGEBRA I

There are many situations that arise in business and engineering that necessitate systems of linear inequalities. The **region** in the ***xy*-plane** that **solves the systems** often represents all of the **viable solutions** to the system, so being able to visualize this region can be extremely helpful. As always, with modeling, it is important to really read the problems and understand the physical quantities involved.

***Exercise* #1:** John mows yards for his father's landscaping business for \$10 per hour and also works at a bakery for \$15 per hour. He can work at most 52 hours per week during the summer. He needs to make at least \$600 per week to cover his living expenses.

(a) If John works 14 hours mowing and 30 hours at the bakery, does this satisfy all of the problem's **constraints**?

$14\cdot 10 + 15\cdot 30 \quad 590 \not\geq 600$

$140 + 450 = 590$

(b) If x represents the hours John spends mowing and y represents the hours he spends at the bakery, write a system of inequalities that describes this scenario.

$x + y \leq 52$

$10x + 15y \geq 600$

(c) If John must work a minimum of 10 hours for his father, will he be able to make enough money to cover his living expenses? Show the work that leads to your answer.

$y \leq 52 - 10$ Y

$y \leq 42$

$10(10) + 15(42) \geq 600$

$730 \geq 600$

(d) Graph the system of inequalities with the help of your calculator (if needed) on the axes below. Use the space below to think about how to graph these lines.

$$\boxed{\begin{array}{l} y \leq -x + 52 \\ y \geq -\frac{2}{3}x + 40 \end{array}}$$

$$\frac{15y \geq -10x + 600}{15}$$

$$\left(\frac{-2}{3}\right)x + 40 \neq -2/3x + 40$$

$$\frac{-2}{3x}$$

(e) John's father needs him to work a lot at the landscaping business. Show the point on the graph that corresponds to the greatest number of hours that he can work while still covering his expenses.

$10(36)+15(16) \geq 600$

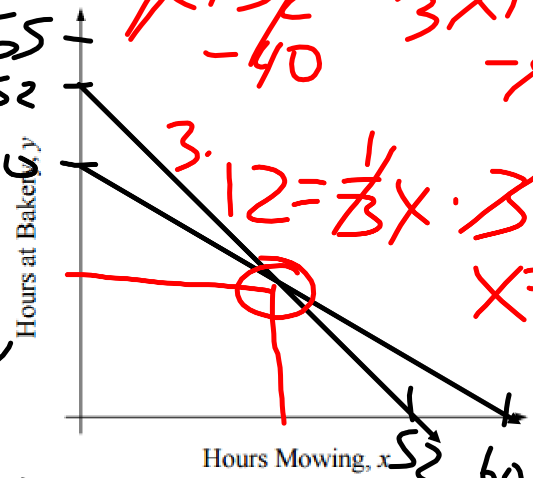
(f) Algebraically, find the greatest number of hours that John can work for his father and still cover his expenses. Explain how you found your answer or show your algebra below.

$10(37)+15(15) \geq 600$

$370+225=590 \geq 600$

$52-36$

16



$-x+52=-\frac{2}{3}x+40$

$12=\frac{1}{3}x$

$x=36$

(36,16)

$y=-x+52$ $y=-\frac{2}{3}x+40$

$0=-x+52$ $0=-\frac{2}{3}x+40$

$x=52$ $x=-40\cdot-\frac{3}{2}$

60

***Exercise* #2:** For each of the following, write a system of inequalities that models the problem. You do not need to solve the system.

(a) Frank is putting together a bouquet of roses and daisies. He wants at least one rose and at least two more daisies than roses. Roses cost \$4 each and daisies cost \$2 each. Frank must spend \$40 or less on this bouquet. If r represents the number of roses he buys and d represent the number of daisies, write the system.

$r \geq 1$

$d \geq r+2$

$4r+2d \leq 40$

(b) A diet food company is attempting to create a non-carb brownie composed entirely of fat and protein. The brownie must weigh at least 10 grams but have no more than 100 calories. Fat has 9 calories per gram and protein has 4 calories per gram. If x represent the weight, in grams, of protein and y represents the weight, in grams, of fat, write the system.

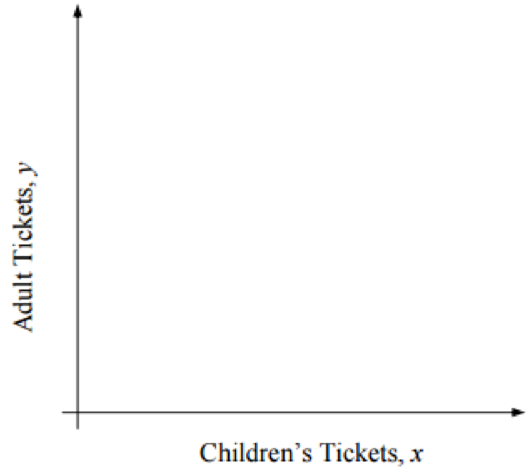
$x+y \geq 10$

$4x+9y \leq 100$

***Exercise* #3:** The drama club at a local high school is trying to raise money by putting on a play. They have only 500 seats in the auditorium that they are using and are selling tickets for these seats at \$5 per child's ticket and \$10 per adult ticket. They must sell at least \$2000 worth of tickets to cover their expenses.

(a) If x represents the number of children's tickets sold and y represents the number of adult tickets sold, write a system of inequalities that models this situation.

(b) Using technology, sketch the region in the coordinate plane that represents solutions to this system of inequalities.



(c) If the students want to sell exactly 500 tickets and make exactly \$2000, how many of each ticket should they sell? Why is this answer not realistic?