Name: _____ Date: _____

MODELING WITH SYSTEMS OF INEQUALITIES

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.

***Do Now*:** 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.

Hours

Cost

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

★ 14 hrs mowing @ \$10 per hour = \$140

★ 30 hrs baking @ \$15 per hour = \$450

(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.

① $x + y \leq 52$

② $10x + 15y \geq 600$

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) 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.

① $x + y \geq 10$

② $4x + 9y \leq 100$

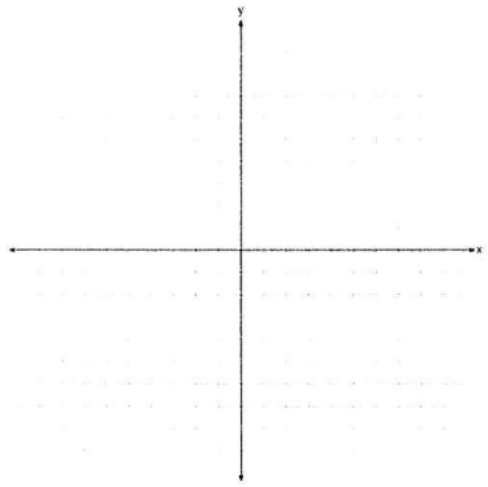
Exercise #3: The drama club at a local high school is trying to raise money by putting on a play. They have only 500 seats in the auditorium that they are using and are selling tickets for these seats at \$5 per child's ticket and \$10 per adult ticket. They must sell at least \$2000 worth of tickets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

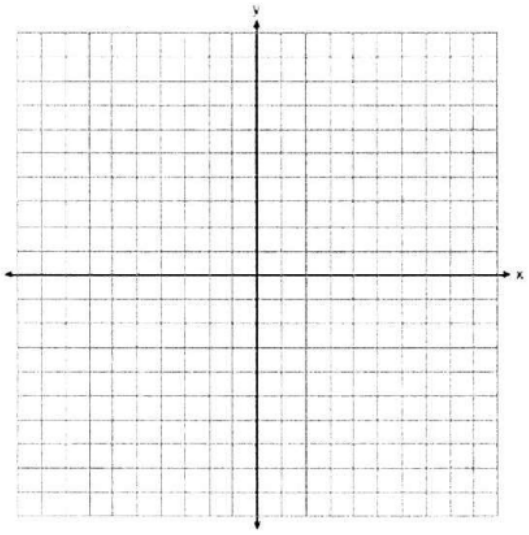
① $x + y \leq 500$

② $5x + 10y \geq 2000$

On the set of axes below, graph the inequality $2x + y > 1$.



Graph the inequality $y + 4 < -2(x - 4)$ on the set of axes below.



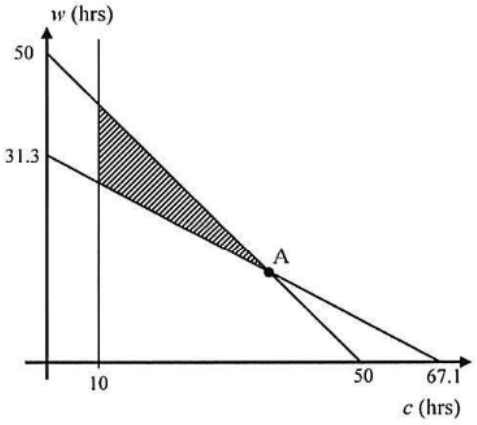
MODELING WITH SYSTEMS OF INEQUALITIES
HOMEWORK

1. Jody is working two jobs, one as a carpenter and one as a website designer. He can work at most 50 hours per week and makes $35 per hour as a carpenters and $75 an hour as a website designer. He wants to make at least $2350 per week but also wants to work at least 10 hours per week as a carpenter. Let c represent the hours he works as a carpenter and let w represent the hours he works as a website designer.

   (a) Write a system of inequalities that models this scenario.

   (b) The graph of the system is shown below with its solutions shown shaded. Three lines are graphed. Label each with its equation.

   (c) Find the coordinates of point A by solving a system of equations by Elimination.



35 Solve the following system of inequalities graphically on the grid below and label the solution S.

$$3x + 4y > 20$$
$$x < 3y - 18$$

Is the point (3,7) in the solution set? Explain your answer.