Geometry Lomac 2015-2016	Date 11/2 due 11/3	Modeling with Systems of Inequalities 4.4L
		Day 1

Name _____ **Per**_____

LO: I can write systems of inequalities to represent situations and solve the systems to answer questions about the situation.

emath 5.7

☐ **DO NOW**   On the back of this packet

☐ **(1)**   **Systems and the graphing calculator**

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**?

(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.

(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.

(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.

(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.

(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.

Hours at Bakery, *y*

Hours Mowing, *x*
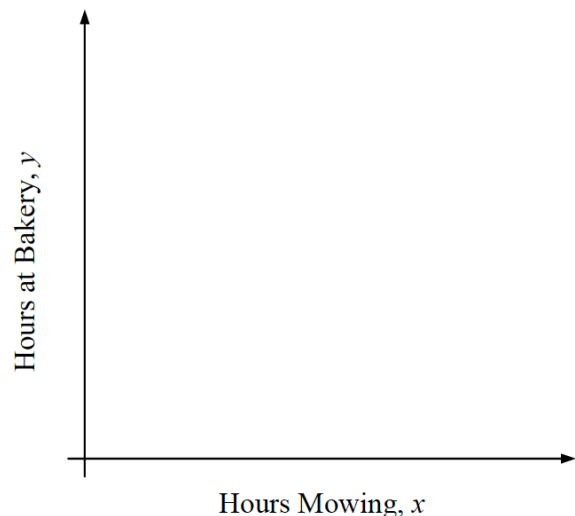
☐ (2)   **Systems and situations**

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.

(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.

☐ (3) **Systems and Situations**

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.

Adult Tickets, y

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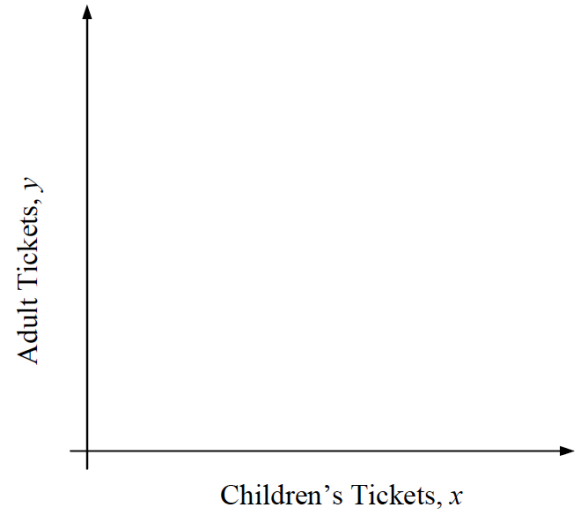
(c) If the students want to sell exactly 500 tickets and make exactly $2000, how many of each ticket should they sell? Why is this answer not realistic?

☐ (4)   **Systems and Situations**
APPLICATIONS

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) What is the maximum amount of money that Jody can make in a week given the system in (a)? Explain your reasoning.

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

(d) Find the coordinates of point A by solving a system of equations by Elimination.
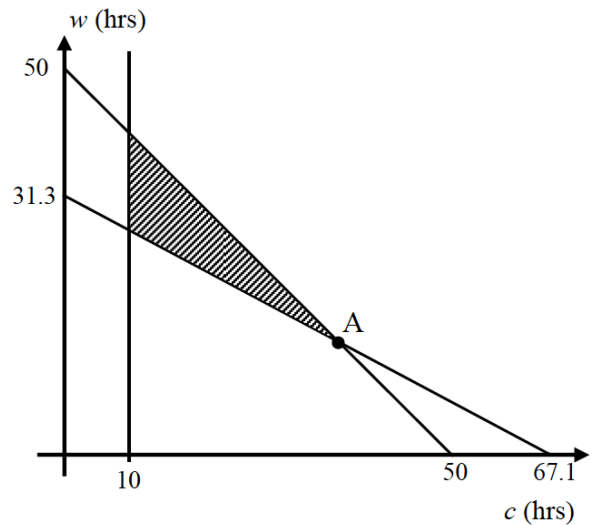
☐ (5) **Exit Ticket**

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☐ (6) **Homework**

(1) For each of the following, create a system of inequalities that models the scenarios presented. You do not need to solve the systems.

(a) Two pumps at a local water facility can only run individually. They will run for at least 18 hours in a day but obviously no more than 24 hours in a day. Pump 1 can move 120 gallons per hour while Pump 2 can move 200 gallons per hour. In total the two pumps must move at least 3,000 gallons of water per day. If x represents the number of hours that Pump 1 runs and y represents the number of hours that Pump 2 runs, write a system of inequalities that models all conditions.

(b) Dave is buying popcorn and sodas for his son and his three friends that he brings to the movies (four kids total). He needs to buy at least one of the two items for each of the four. Popcorn costs $2.50 per bag and sodas cost $4.00 each. Dave can spend at most $20. If s represents the number of sodas he buys and p represents the number of bags of popcorn, then write a system that models this scenario.

☐ (6)   **Homework**
cont.
(3)

Next weekend Marnie wants to attend either carnival A or carnival B. Carnival A charges $6 for admission and an additional $1.50 per ride. Carnival B charges $2.50 for admission and an additional $2 per ride.

a) In function notation, write $A(x)$ to represent the total cost of attending carnival A and going on x rides. In function notation, write $B(x)$ to represent the total cost of attending carnival B and going on x rides.

b) Determine the number of rides Marnie can go on such that the total cost of attending each carnival is the same. [Use of the set of axes below is optional.]

c) Marnie wants to go on five rides. Determine which carnival would have the lower total cost. Justify your answer.
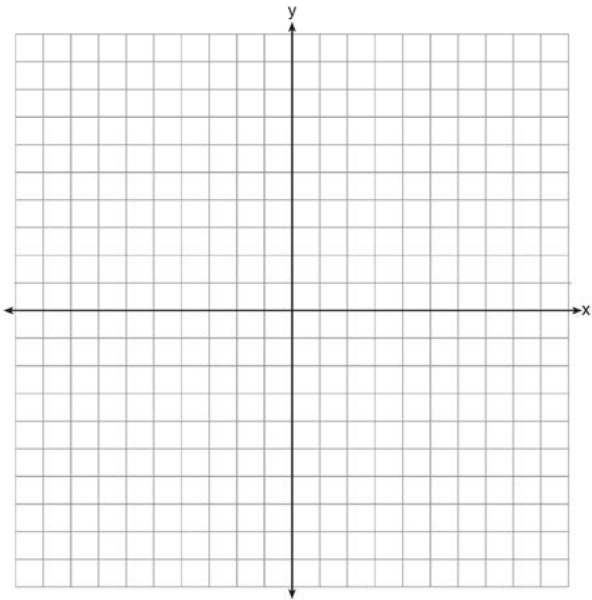
Exit Ticket   **Name**_____ **Date** _____ **Per**_____   **4.4L**

(1) The LO (Learning Outcomes) are written below your name on the front of this packet. Demonstrate your achievement of these outcomes by doing the following:

Do the problem below:

Edith babysits for x hours a week after school at a job that pays $4 an hour. She has accepted a job that pays $8 an hour as a library assistant working y hours a week. She will work both jobs. She is able to work no more than 15 hours a week, due to school commitments. Edith wants to earn at least $80 a week, working a combination of both jobs. Write a system of inequalities that can be used to represent the situation. Graph these inequalities on the set of axes below.
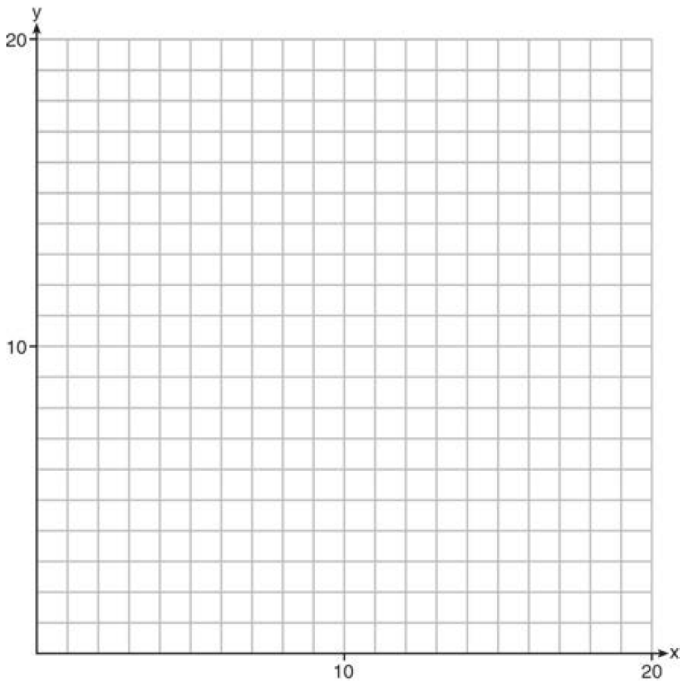
Determine and state one combination of hours that will allow Edith to earn *at least* $80 per week while working *no more than* 15 hours.

DO NOW   **Name**_____ **Date** _____ **Per**_____   **4.4L**

(1) Solving progress: Solve one of the two problems below.

(a) $-\dfrac{1}{2}(6x - 4) + 5(x + 2) = 0$ (b) $-100y + 30 = 120y + 90$

(2) Translation to algebra progress. Write an algebraic statement to represent this situation. Be sure to write a "Let" statement to define any variables.

Tom performed a total of 100 hours of community service. He served at three charities – Salvation Army, Red Cross and Rescue Mission. The number of hours he served at the Red Cross was 19 hours more than at the Salvation Army. The number of hours he served at the Rescue Mission was 8 hours more than what he served at the Red Cross. Find the number of hours he volunteered at each charity.