Project 2: Systems of Linear Equations/Inequalities
Project 2 - Math 212

Name(s) __________________________________________

Project due date: __________________________

Objectives: Students will
A. Evaluate real-world situations and apply linear models appropriately.
B. Analyze, interpret, and communicate results of linear models in a logical manner from four points of view - visual, formula, numerical, and written.
C. Demonstrate an appreciation and awareness of applications in their daily lives.

Directions:

Systems of Linear Equations

• Select three problems from the twenty-one word problems given (see pages 2 and 3) to demonstrate your knowledge of how to apply systems of linear equations to solve problems. You can not choose more than one problem from each category. As indicated before each set of problems, the categories are as follows: 1) Coin and Money Problems, 2) Ticket Problems and Similar, 3) Bank Account Problems, 4) Mixture Problems, 5) Distance, Rate and Time Problems, and 6) Miscellaneous.
• For each problem chosen you must show 1) the variables defined, 2) the system of equations needed to solve the problem, 3) the solution to the system of equations, and 4) a sentence that answers the question asked.

Systems of Linear Inequalities

• Select one problem from the nine (see page 4) word problems given to demonstrate your knowledge of how to apply systems of linear inequalities to solve problems. You must show 1) the variables defined, 2) the system of linear inequalities needed to solve the problem, 3) a graph of the solution to the system of linear inequalities, and 4) describe, in a sentence, the meaning of two feasible coordinate pair solutions to the system of linear inequalities.

Presentation of Problems

• Divide a poster board into four sections. Retype the problems that you decide to complete. Paste the actual problem on the poster board in the section in which you will show how to work out the problem. Place the name of the category in which the problem belongs at the top of the section. Use pictures to illustrate the problem. Your work should be neat. Typed work is preferred. Projects done in pencil are not acceptable. If you must manually write your steps, you should work out each problem on a separate piece of paper before transferring your answer to the poster board.
• You will present your completed poster board to the class on the date circled above, explaining in detail how you did one of the problems (you choose which one). In detail, means using the chalkboard or overhead and going step-by-step through the problem (you’re the teacher!!)
Systems of Linear Equations Application Problems

Coin and Money Problems
1. Bob has 60 coins consisting of quarters and dimes. The coins combined value is $9.45. Find out how are quarters and how many are dimes.

2. Eric has 130 coins consisting of nickels and quarters. The coins combined value comes to $15.90. Find out how many of each coin Eric has.

3. Alice is counting a cash register at the end of the night. She has $1015 in $5 bills and $10 bills. If she has 138 bills all together, how many of each type does she have?

Ticket Problems and Similar
4. 353 people attend a local play at a private club. Members get tickets for $2.75, while non-members have to pay $6.50. If the total gate for the play came to $1762, how many members and non-members came to the play?

5. Jim runs a food cart and during a busy outdoor festival he sold $7343.75 worth of food. He sells hot dogs for $2.95 and steak sandwiches for $9.95. If he sold a total of 985 items that day, how many of each item did he sell?

Bank Account Problems
7. Jane invests $9885 into two accounts. A savings account earns 6% interest, while a money market account earns 9.5% interest. After one year she made $696.35 interest from both accounts. How much did she invest into each account?

8. Ralph invests $15,600 into two different accounts; a savings account and checking account. The savings account earns 8% interest and the checking earns 9%. After 1 year he has earned $1334.28 interest. How much did Ralph invest into each account?

9. A group invested $20440 into two accounts. A secure bond account earned 2.5% interest and a more risky stock venture account earned 3.4% interest. The group earned $623.05 for the investment in one year. How much did the group invest into each account?

Mixture Problems
10. Lou wants to make a coffee mixture to sell. He is going to mix Sumatra coffee which costs $2.50 per pound with Columbian coffee which costs $3.75 per pound. He wants to make 50 pounds of mix and he wants the cost of the mix to be $3.35 per pound. How many pound of each will he need?

11. Jackie wants to make a mixture of nuts to sell in her store consisting of hazelnuts and cashews. Hazelnuts cost $6.50 per pound and cashews cost $4.50 per pound. If Jackie wants 60 pounds total of mixture and the cost to be $5.10 per pound, how many pounds of each will she need?
12. A chemist wants to make 75 liters of 16% acid solution. He is going to make it by mixing a 10% acid and a 25% acid solution. How many liters of each will he need?

**Distance, Rate and Time Problems**

13. A plane can travel 1,015 miles in 7 hours traveling against the wind. Traveling with the same wind, the plane can travel 820 miles in 4 hours. How fast can the plane travel in still air and how fast is the wind current?

14. A bicycle rider can ride 162 miles on flat ground in 6 hours with a good breeze at her back. It takes her 10 hours to go 90 miles with the same breeze working against her. How fast is bicycle rider going on the bicycle and how fast is the wind speed?

15. It takes Rita, the Girl Scout, 10 hours to paddle a canoe upstream (against the current) a distance of 15 miles. When she turns the canoe around she finds it only takes her 5 hours to paddle the canoe 22.5 miles with the current. How fast is Rita’s boat going in still water and what is the speed of the current of the river?

16. A boat going upstream (against the current) travels 105 miles in 15 hours. It takes the same boat 7.5 hours to make the same trip when it is traveling back downstream (with the current). What is the speed of the boat in still water and what is the speed of the current of the river?

17. Flying from Tokyo to London is approximately 6175 miles. On the way to London from Tokyo (against the wind) the flight took 13 hours. The return flight (with the wind) took 9.88 hours. Find the speed of the plane in still air and the speed of the wind current.

**Miscellaneous**

18. Bob ate 10 carrots and 7 Hershey’s kisses and the total calories were 263. Fred ate 4 carrots and 8 Hershey’s kisses and the total calories were 230. How many calories are in a carrot and a Hershey’s kiss? (The answer is not a scientific truth, only made up numbers!!)

19. During a Techno-Geek-Store sale 6 blank video tapes and 12 blank DVD’s cost $35.10. During the same sale, 8 blank video tapes and 3 blank DVD’s cost $27.95. What was the cost of a blank video tape and the cost of a blank DVD?

20. 40 adults and 26 kids went to see a movie on the opening screening and the revenue for the showing was $486.70. The next showing 20 adults and 31 kids went to see the same movie and the revenue was $332.45. How much was an adult ticket and how much was a kid ticket?

21. On one day Julio’s Sports World sold 9 San Francisco 49ers jerseys and 3 Baltimore Ravens jerseys for a total of $899.40. The next day they sold 12 49er jerseys and only 2 Ravens jerseys for a total of $1139.30. How much is each 49er jersey and how much is each Ravens’ jersey?
Systems of Linear Inequality Application Problems

For the one problem you choose from below, provide the following:

a. Define all variables 
b. Write all inequalities stated in the problem 
c. Graph the system of inequalities, shading the area they have in common. 
d. Identify two feasible coordinate pair solutions and describe, in a complete sentence, what that pair means in terms of the problem.

1. Mike’s Toy Truck Company manufactures two models of toy trucks, standard model and deluxe model. Each standard model requires 2 hours for painting and 3 hours for detail work; each deluxe model requires 3 hours of painting and 4 hours of detail work. Two painters and three detail workers are employed by the company and each works 40 hours per week.

2. Nola’s Nuts has 90 pounds of cashews and 120 pounds of peanuts available. These are to be mixed in 12 ounce packages as follows:
   - Mix Yum: contains 8oz peanuts and 4 oz cashews
   - Mix Tasty: Contains 6oz peanuts and 6 oz cashews

3. You can work a total of no more then 41 hours each week at your two jobs. Housecleaning pays $5 per hour and your sales job pays $8 per hour. You need to earn at least $254 each week to pay your bills.

4. Mary babysits for $4 per hour. She also works as a tutor for $7 per hour. She is only allowed to work 13 hours per week. She wants to make at least $65.

5. A student council is planning a trip. It has a maximum of $600 to spend on transportation. Regular busses seat 40 people and rent for $80/each. Mini-busses seat 20 people and rent for $60 each. A minimum of 240 students is needed to proceed with the trip.

6. Suppose you are hosting a Super Bowl party and want to have wings and hot dogs for your quests. One package of wings costs $7 and hot dogs are $2 per pound. You’ve budgeted to spend less than $40 on wings and hot dogs but want to have at least 4 pounds of hot dogs and at least 2 packages of wings for you quests.

7. Marie want to spend at most $50 for a bouquet of roses and carnations. Roses cost $5 each and carnations costs $2 each. She wants her bouquet to have at least 3 mores roses than carnations.

8. In scheduling two drivers for delivering pizza, James needs to have at least 65 hours scheduled this week. His two drivers, Amal and Todd, are not allowed to get overtime, so each one can work at most 40 hours.
# Grading Rubric for Project 2: Systems of Linear Equations/Inequalities

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<tr>
<th>Systems of Equations Problem #1</th>
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**Demonstrated Knowledge**

- **Shows complete understanding of the questions, mathematical ideas, and processes. Project is neat and well illustrated.** (4)
- Shows substantial understanding of the problem, ideas, and processes. Project is neat and well illustrated. (3)
- Response shows some understanding of the problem. (2)
- Response shows a complete lack of understanding for the problem. (1)
- Did not attempt the problem (0)

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<thead>
<tr>
<th>Systems of Equations Problem #3</th>
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Presentation of one problem: \[ -\frac{4}{4} \] (grading scale as above)

Total = 1\textsuperscript{st} problem + 2\textsuperscript{nd} problem + 3\textsuperscript{rd} problem + 4\textsuperscript{th} problem + presentation = 50

adapted from ‘Show What You Know’ http://fc.dekalb.k12.ga.us