

~~PA~~ Tuesday

Linear Programming Project

QUIZ GRADE:

Accuracy	<u>75 points (total)</u> 10
- Graph	35 points
- Constraints	25 points
- Objective Function	15 points
- Solution with units	15 points
Work Shown when needed	5 points
Neatness	5 points

You must make a neat graph (Include the original word problem, constraints, and objective function). You must show all work where needed!

Choose ONE of the following problems.

**Problems**

1. Patriot Pontoons must make at least 5,000 yachts and 12,000 catamarans each year. They can make at most 30,000 jet skis in a year. The company has two factories: one in Charleston and one in Boston; each factory stays open for a maximum of 240 days per year. The Charleston factory makes 20 yachts, 40 catamarans, and 60 jet skis each day. The Boston factory makes 10 yachts, 30 catamarans, and 50 jet skis each day. The cost to run the Charleston factory each day is \$960,000; the cost to run the Boston factory each day is \$750,000. How many days should each factory run in order to meet the boat productions, yet do so at minimum cost?
2. The Algebra 2 quiz consists of multiple choice problems and open-ended problems. Multiple Choice problems are worth 6 points each and open-ended problems are worth 10 points each. You can answer a multiple choice problem in 2 minutes and an open-ended problem in 4 minutes. You have forty minutes to take the quiz and may choose no more than 12 problems to answer. Assuming you answer all the problems attempted correctly, how many of each type should you answer to get the highest score? What is the highest score you can get?
3. Adidas makes shoes and shirts in South Carolina and North Carolina. South Carolina makes a minimum of 1000 shoes and shirts. North Carolina makes a minimum of 800 shoes and shirts. South Carolina can make 10 shoes and 5 shirts per hour, and North Carolina can make 5 shoes and 15 shirts per hour. It costs \$30 per hour to produce a shoe and \$35 an hour to produce a shirt. How many hours should be spent on each item in order to minimize cost? What is the minimum cost?
4. Patriot Pedals makes two types of bikes: one is aluminum, which costs \$300, and one is carbon, which costs \$600. Each bike has the same frame and tires, but the assembly and paint time for the aluminum bike is 1 hour and for the carbon bike it takes 3 hours. There are 300 frames and 360 hours of labor available to make bikes in one given day. How many bicycles of each model should be produced for maximum revenue? What is the maximum revenue?
5. The Annual North Charleston Dirt Bike Competition is coming up, and participants are looking for bikes! Of course, everyone knows that AJ makes the best bikes in town. AJ has 18 wheels, 15 seats, and 14 exhaust pipes in his shop. He can use these parts to assemble the bikes, but cannot order any more. AJ makes two different types of bikes: The Rider and The Rover.  
The Rider has 2 wheels, 1 seat, and 2 exhaust pipes.  
The Rover has 3 wheels, 3 seats and 1 exhaust pipes.  
AJ can sell Riders for \$15 and Rovers for \$30. How many of each type of should AJ assemble if he wants to maximize his profit?

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6. The Fort Dorchester Beta Club has 200 sweatshirts and 100 pairs of sweatpants available to sell. During Spirit Week, they decide to offer two package deals to students.  
Package A has one sweatshirt and one pair of sweatpants for \$30.  
Package B has three sweatshirts and one pair of sweatpants for \$50.  
The Beta Club wants to sell at least 20 of Package A and at least 10 of Package B.  
How many of each type of package must they sell in order to maximize their revenue?
7. A hospital dietician wishes to prepare corn-squash vegetable dish that will provide at least three grams of protein and cost no more than \$0.35 per serving. An ounce of cream corn provides  $\frac{1}{2}$  gram of protein and costs \$0.04. An ounce of squash supplies  $\frac{1}{4}$  gram of protein and costs \$0.03. For taste, there must be at least two ounces of corn and at least as much squash as corn. It is important to keep the total number of ounces in a serving as small as possible. Find the combination of corn and squash that will minimize the amount of ingredients used per serving.
8. Erin is buying wings and hot dogs for a party. Hotdogs cost \$4 per package of 5 hot dogs and a package of 10 wings costs \$7. She has at most \$56 to spend on meat. Erin knows that she will buy at least five packages of hot dogs and at least two packages of wings. If Erin wants to maximize the number of items she has at the party, how many of each package should she buy?
9. At the Fort Dorchester Football Games the concessions sell hamburgers and hot dogs. To stay in business, it must sell at least 10 hamburgers, but cannot cook more than 40. It must also sell at least 30 hot dogs, but cannot cook more than 70. The snack bar cannot cook more than 90 total items. The profit on a hamburger is \$2 and the profit on a hot dog is \$1. How many of each item should it sell to maximize profit?
10. In order to ensure optimal health (and thus accurate test results), a lab technician needs to feed the rabbits a daily diet containing a minimum of 24 grams (g) of fat, 36 g of carbohydrates, and 4 g of protein. But the rabbits should be fed no more than five ounces of food a day. Rather than order rabbit food that is custom blended, it is cheaper to order Food X and Food Y, and blend them for an optimal mix. Food X contains 8 g of fat, 12 g of carbohydrates, and 2 g of protein per ounce, and costs \$0.20 per ounce. Food Y contains 12 g of fat, 12 g of carbohydrates, and 1 g of protein per ounce, at a cost of \$0.30 per ounce. What is the optimal blend of Food X and Food Y?
11. Spot builds dog houses. He needs 10 wooden boards and 15 nails to build a small dog house; and, he uses 18 boards and 45 nails for a large dog house. Spot makes a \$40 profit on every small dog house and \$52 profit on every large dog house. If he has 60 wooden boards and 135 nails, how many of each type of dog house should he make to maximize profit?
12. A travel agent is organizing a trip for a local ski club. She can make arrangements for a maximum of 10 people, and there must be at least 4 men and 3 women in the group. Her profit is \$12.25 for each woman and \$15.40 for each man. How many men and how many women will give her the maximum profit? What is the maximum profit?
13. A carpentry shop makes dinner tables and coffee tables. Each week the shop must complete at least 9 dinner tables and 13 coffee tables to be shipped to furniture stores. The shop can produce at most 30 dinner tables and coffee tables combined each week. If the shop sells dinner tables for \$120 and coffee tables for \$150, how many of each item should be produced for a maximum weekly income? What is the maximum weekly income?