

### NC Math 3: Linear Programming Word Problems

1. Jeanne makes banana bread and raisin bread to sell at a carnival. A loaf of banana bread requires 2 cups of flour and 2 eggs. A loaf of raisin bread takes 3 cups of flour and 1 egg. Jeanne has 12 cups of flour and 8 eggs on hand. She makes \$2 profit per loaf of banana bread and \$2 per loaf of raisin bread. To maximize profits, how many loaves of each type should she bake?
2. Miss Evans makes two types of wood clocks to sell at local stores. It takes her two hours to assemble a pine clock, which requires 1 oz of varnish. It takes two hours to assemble an oak clock, which takes 4 oz of varnish. Miss Evans has 16 oz of varnish in stock, and she can work 20 hours. If she makes \$3 profit on each pine clock and \$4 profit on each oak clock, how many of each type should she make to maximize her profits?
3. The Southern Bagel Factory makes two types of bagels, plain and blueberry. The oven can cook up to 200 bagels per hour. Blueberry bagels each require 2 ounces of dry ingredients and plain bagels each require 1 ounce of dry ingredients. The staff can prepare at most 300 ounces of dry ingredients. The profit on plain bagels is \$0.25 and the profit on blueberry bagels is \$0.36. How many of each type of bagel should be made per hour to maximize profit? What is the maximum hourly profit?
4. The area of parking lot is 600 square meters. A car requires 6 square meters. A bus requires 30 square meters. The attendant can handle only 60 vehicles. If a car is charged \$2.50 and a bus \$7.50, how many of each should be accepted to maximize income?
5. The cost to run Machine 1 for an hour is \$2. During that hour, Machine 1 produces 240 bolts and 100 nuts. The cost to run Machine 2 for an hour is \$2.40. During that hour, Machine 2 produces 160 bolts and 160 nuts. With a combined running time of no more that 30 hours, how long should each machine run to produce an order of at least 2080 bolts and 1520 nuts at the minimum operating cost?
6. A company makes whole-wheat crackers and sesame crackers. The crackers are sold by the box. Each box of wheat crackers contains 5 packets and each box of sesame crackers contains 3 packets. The company cannot produce more than 150 packets of crackers per minute, but at least 15 boxes of whole-wheat crackers and at least 20 boxes of sesame crackers must be produced per minute. If the profit per box of whole-wheat crackers is 10 cents and the profit per box of sesame crackers is 5 cents, how many boxes of each type should be produced per minute in order to maximize profits? What is the maximum profit?
7. A biologist wishes to feed laboratory rabbits a mixture of two types of foods. Type I contains 8g of fat, 12 g of carbohydrates, and 2 g of protein per ounce, whereas type II contains 12g of fat, 12 g of carbohydrates, and 1 g of protein per ounce. Type I costs \$.20 per ounce and type II costs \$.30 per ounce. The rabbits each receive a daily minimum of 24g of fat, 36g of carbohydrates, and 4 g of protein per ounce, but get no more than 5 oz of food per day. How many ounces of each food type should be fed to each rabbit daily to satisfy the dietary requirements at minimum costs?
8. *Denim Duds* makes jackets and jeans. Each garment must be cut from a pattern and sewn. There are 40 worker-hours per day available for cutting and 52 workers-hours available for sewing. Jackets require 1 hour for cutting and 4 hours for sewing. Jeans take 2 hours to cut and 2 hours to sew. *Demin Duds* makes \$14 on each jacket they sell and an \$8 profit on each pair of jeans. How many of each garment should be made by the company to make the most profit

9. Mrs. Smith grows peaches and apples. At least 500 peaches and 700 apples must be picked daily to meet minimum demands from the buyers. The workers can pick no more than 1200 apples and 1400 peaches daily. The combined number of peaches and apples that the packaging department can handle is 2300 per day. If Mrs. Smith sells her apples at \$0.25 each and peaches at \$0.20 each, how many of each should be picked daily for maximum income?
10. Suppose you make and sell skin lotion. A quart of regular skin lotion used 2 cups oil and 1 cup cocoa butter. A quart of extra-rich skin lotion contains 1 cup oil and 2 cups cocoa butter. You will make a profit of \$10 per quart on regular lotion and a profit of \$8 per quart on extra-rich lotion. You have 24 cup oil and 18 cup cocoa butter. How many quarts of each lotion should you make to maximize your profit? What is the maximum profit?
11. You are going to make and sell bread. A loaf of Irish soda bread is made with 2 cups flour and  $\frac{1}{4}$  cup sugar. Kugelhopf cake is made with 4 cups of flour and 1 cup sugar. You will make a profit of \$1.50 on each loaf of Irish on soda bread and a profit of \$4 on each Kugelhopf. You have 16 cups of flour and 3 cups of sugar. How many of each kind of bread should you make to maximize the profit? What is the maximum profit?
12. Trees in urban areas help keep air fresh by absorbing carbon dioxide. A city has \$2100 to spend on planting spruce and maple trees. The land available for planting is 45,000 square feet. The cost of planting a spruce tree is \$30 and requires 600 square feet to plant. The cost of planting a maple tree is \$40 and requires 900 square feet to plant. Spruce trees absorb 650 pounds of carbon dioxide per year and a maple tree absorbs 300 pounds of carbon dioxide per year. How many of each tree should the city plant to maximize carbon dioxide absorption? What is the maximum amount of carbon dioxide that can be absorbed per year?
13. Every day Jane Fonda needs a dietary supplement of 4 mg of vitamin A, 11mg of vitamin B, and 100 mg of vitamin C. Either of two brands of vitamin pills can be used: Brand X at \$.06 a pill or Brand Y at \$.08 a pill. Brand X contains 3 mg of vitamin A; 3 mg of vitamin B, and 25 mg of vitamin C. Brand Y contains 1 mg of vitamin A, 4 mg of vitamin B, and 50 mg of vitamin C. How many pills of each brand should she take each day in order to satisfy the minimum daily need most economically?
14. During the summer break, Allie works as many as 35 hours per week. On Saturdays she spends between two and six hours teaching adults to sail. On weekdays she can work between 10 and 40 hours teaching sailing at a children's camp. Teaching adults pays \$10 per hour while teaching children pays \$6.25 per hour. How can Allie earn the most money each week?
15. A potter is making cups and plates. It takes her 6 minutes to make a cup and 3 minutes to make a plate. Each cup uses 0.75 lb of clay and each plate uses 1 lb of clay. She has 20 hours available for making the cups and plates and has 250 lbs of clay on hand. She makes a profit of \$2 on each cup and \$1.50 on each plate. How many cups and how many plates should she make to maximize her profit?