

SET UP the following linear programming problems. **Do not solve.**

1. A furniture manufacturing company manufactures dining room tables and chairs. A table requires 8 labor-hours for assembling and 2 labor-hours for finishing. A chair requires 2.5 labor-hours for assembling and 1 labor-hour for finishing. The maximum labor-hours available per day for assembly and finishing are 108 and 24, respectively. The profit made on a table is \$100 and the profit on a chair is \$20. How many tables and chairs should be produced to maximize their profit?
2. A particular salad contains 4 units of vitamin A, 4 units of vitamin B-complex, and 3 mg of fat per serving. A nutritious soup contains 6 units of vitamin A, 2 units of vitamin B-complex, and 3 mg fat per serving. If a lunch consisting of these two foods is to have at least 10 units of vitamin A, and at least 10 units of vitamin B-complex, how many servings of each food should be used to minimize the total milligrams of fat?
3. A zoologist conducts two types of experiments with lizards. An experiment of type 1 requires three brown lizards and one gray lizard, whereas an experiment of type 2 requires one brown lizard and two gray lizards. Each experiment of type 1 earns one point toward the zoologist's research, and each experiment of type 2 earns two points. There are sixty brown lizards and forty gray lizard available. How many experiments of each type should be performed to maximize the total point earned?
4. The Bright Light Sign Company makes two types of signs: regular and large. Each regular sign uses 70 light bulbs and takes 3.5 hours to construct. Each large sign uses 100 light bulbs and takes 5 hours to construct. The company must produce at least 12 large signs to meet customer demand. The company has 2500 light bulbs and 140 construction hours available. It costs \$105 to construct a regular sign and \$135 to construct a large sign. How many signs of each type should the company make in order to minimize costs?
5. A farmer can buy two types of plant food, mix A and mix B. Each cubic yard of mix A contains 20 pounds of phosphoric acid, 30 pounds of nitrogen, 5 pounds of potash, and costs \$35. Each cubic yard of mix B contains 10 pounds of phosphoric acid, 30 pounds of nitrogen, 10 pounds of potash, and costs \$30. The minimum monthly requirements are 460 pounds of phosphoric acid, 960 pounds of nitrogen, and 220 pounds of potash. How much of each plant mix should the farmer buy to minimize his monthly costs?
6. A dietician is to prepare two foods, A and B, to meet the nutritional requirements of a patient. Each pound of food A costs \$2 and contains 100 units of vitamin C, 40 units of vitamin D, and 10 units of vitamin E. Each pound of food B costs \$1.50 and contains 10 units of vitamin C, 80 units of vitamin D, and 5 units of vitamin E. The mixture of the two foods is to contain at least 260 units of vitamin C, at least 320 units of vitamin D, and no more than 150 units of vitamin E. How many pounds of each type of food should be used to minimize costs?
7. A firm makes a standard and a deluxe model of electric skillet. Each standard model costs \$25 and each deluxe model costs \$40 to make. The firm must make at least 100 of the standard model and at least 75 of the deluxe. It sells each standard model for \$30 and each deluxe model for \$75, and it must have total revenue of at least \$2250 from sales of these two models. How many of each model should be made and sold to minimize costs?
8. A road-paving firm has on hand three types of paving material. Each barrel of type A contains 2 gallons of carbon black and 2 gallons of thinning agent and costs \$5. Each barrel of type B contains 3 gallons of carbon black and 1 gallon of thinning agent and costs \$3. Each barrel of type C contains 1 gallon of carbon black and 3 gallons of thinning agent and costs \$4. The firm needs to fill an order for which the final mixture must contain at least 12 gallons of carbon black and at least 6 gallons of thinning agent. How many barrels of each type of paving material should be used to fill this order at minimum costs?

9. The chemistry department at a local college decides to stock at least 800 small test tubes and at least 500 large test tubes. It wants to buy at least 1500 test tubes to take advantage of a special price. Since the small test tubes are broken twice as often as the large, the department will order at least twice as many small tubes as large ones. If the small test tubes cost \$.30 and the large ones, made of a cheaper glass, cost \$.24 each, how many of each size should be ordered to minimize costs?
10. Suppose you won the lottery and, after taxes, you have \$100,000 at your disposal. You decide to place a portion of this money in a savings account and invest the rest in stocks and bonds. You can expect an average yearly return of 5% on your savings account, 9% on the stock investment, and 7% on the bonds. You decide to place at least as much money in your savings account as in the stocks and bonds. Moreover, you intend to invest at least twice as much money in the bonds as in the stocks. How should you invest the money so as to maximize your returns?
11. A banker has funds available to invest. She can purchase a Type A bond yielding a 5% return on the amount invested and she can purchase a Type B bond yielding a 10% return on the amount invested. Her client insists that she invest at least twice as much in A bonds as in B bonds. How much should be invested in each type of bond to maximize the client's return if not more than \$17,000 is to be invested in B bonds and at least \$5,000 must be invested in A bonds?
12. An investment banker wants to invest \$18,000 or less in three types of bonds: type A bonds yielding a 5% profit on the amount invested, type B bonds yielding a 7% profit on the amount invested, and type C bonds yielding a 10% profit on the amount invested. He wants to invest at least \$3,000 in the type A bonds, no more than \$10,000 in bonds of types A and B together, no more than \$8,000 in bonds of type B and C together, and no more than \$6,000 in bonds of type C. How much should be invested in each kind of bond to maximize the profit?
13. A political party is planning a half-hour television show for their incumbent candidates for state governor and U.S. Senate. Based on a pre-show survey, it is believed that 40,000 viewers will watch the show for each minute the senator is on and 60,000 viewers for each minute the governor is on. The senator demands to be on the air at least twice as long as the governor. The Governor will not participate if her time is less than 10 minutes. Of course, the sum of their speaking times must not exceed 30 minutes. How much time should be allotted to each candidate to maximize the total number of viewers?
14. Elite Advertising plans to expand its sales force by opening several new branch offices. Elite has \$6,250,000 in capital for the new offices and will consider opening only two types of branches: 10-person branches and 5-person branches. Expected initial cash outlays are \$550,000 for a 10-person branch and \$375,000 for a 5-person branch. Expected annual revenue is \$128,000 for a 10-person branch and \$53,000 for a 5-person branch. Elite will hire no more than 100 employees for the new offices and does not plan to open more than 12 new offices in total. If they must open at least 3 10-person branch offices, how many offices of each type should Elite open in order to maximize their revenue?