MAT540

Week 6 Homework

Chapter 2

1. A company produces two products that are processed on two assembly lines. Assembly line 1 has 100 available hours, and assembly line 2 has 42 available hours. Product 1 requires 10 hours of processing time on line 1 and product 2 requires 14 hours of processing on line 1. , On line 2, product 1 requires 7 hours and product 2 requires 3 hours. The profit for product 1 is $6 per unit, and the profit for product 2 is $4 per unit.
    a. Formulate a linear programming model for this problem.
    b. Solve the model by using graphical analysis.

2. The Pinewood Furniture Company produces chairs and tables from two resources – labor and wood. The company has 80 hours of labor and 36 board-ft. of wood available each day. Demand for chairs is limited to 6 per day. Each chair requires 8 hours of labor and 2 board-ft. of wood, whereas a table requires 10 hours of labor and 6 board-ft. of wood. The profit derived from each chair is $400 and from each table, $100. The company wants to determine the number of chairs and tables to produce each day in order to maximize profit. Formulate a linear programming model for this problem.
    a. Formulate a linear programming model for this problem.
    b. Solve the model by using graphical analysis.

3. In Problem 2, how much labor and wood will be unused if the optimal numbers of chairs and tables are produced?

4. The Elixer Drug Company produces a drug from two ingredients. Each ingredient contains the same three antibiotics, in different proportions. One gram of ingredient 1 contributes 3 units and one gram of ingredient 2 contributes 1 unit of antibiotic 1; the drug requires 6 units. At least 4 units of antibiotic 2 are required and the ingredients contribute 1 unit each per gram. At least 12 units of antibiotic 3 are required; a gram of ingredient 1 contributes 2 units, and a gram of ingredient 2 contributes 6 units. The cost for a gram of ingredient 1 is $80, and the cost for a gram of ingredient 2 is $50. The company wants to formulate a linear programming model to determine the number of grams of each ingredient that must go into the drug in order to meet the antibiotic requirements at the minimum cost.
    a. Formulate a linear programming model for this problem.
    b. Solve the model by using graphical analysis.

5. A clothier makes coats and slacks. The two resources required are wool cloth and labor. The

clothier has 150 square yards of wool and 200 hours of labor available. Each coat requires 3 square yards of wool and 10 hours of labor, whereas each pair of slacks requires 5 square yards of wool and 4 hours of labor. The profit for a coat is $50, and the profit for slacks is $40. The clothier wants to determine the number of coats and pairs of slacks to make so that profit will be maximized.

a. Formulate a linear programming model for this problem.
b. Solve the model by using graphical analysis.

6. Solve the following linear programming model graphically:

Maximize $Z = 5x_1 + 8x_2$

Subject to

$4x_1 + 5x_2 \leq 50$

$2x_1 + 4x_2 \leq 40$

$x_1 \leq 8$

$x_2 \leq 8$

$x_1, x_2 \geq 0$