Chapter 4 (Linear Programming: Modeling Examples) In QM for Windows

Problems 11, 16, 24, and 37 (include both model formulation and computer solution)

11. The Pyrotec Company produces three electrical products- clocks, radios, and toasters. These products have the following requirements.

The manufacturer ha s a daily production budget of $2000 and a maximum of 660 hours of labor. Maximum daily customer demand is for 200 clocks, 300 radios, and 150 toasters. Clocks sell for $15, radios for $20, and toasters for $12. The company wants to know the optimal product mix that will maximize profit.

1. Formulate linear programming model for this problem.
2. Solve the model by using the computer.

Resource Requirements

|  |  |  |
| --- | --- | --- |
|  | Cost/ Unit | Labor Hours/ Unit |
| Clock | $7 | 2 |
| Radio | 10 | 3 |
| Toaster | 5 | 2 |

16. The Hickory Cabinet and Furniture Company produces sofas, tables, and chairs at its plant in Greensboro, North Carolina. The plant uses three main resources to make furniture-wood, upholstery, and labor. The resources requirements for each piece of furniture and the total resources available week are as follows:

Resource Requirements

Wood (lb.) Upholstery (yd.) Labor (hr.)

|  |  |  |  |
| --- | --- | --- | --- |
| Sofa | 7 | 12 | 6 |
| Table | 5 | - | 9 |
| Chair | 4 | 7 | 5 |
| Table available resources | 2,250 | 1,000 | 240 |

The furniture is produced on a weekly basis and stored in a warehouse until the end of the week, when it is shipped out. The warehouse has a total capacity of 650 pieces of furniture. Each sofa earns $400 in profit, each table, $275, each chair, $190. The company wants to know how many pieces of each type of furniture to make per week to maximize profit.

1. Formulate a linear programming model for this problem.
2. Solve the model by using the computer.

24. Brooks City has three consolidated high schools, each with a capacity of 1,200 students. The school board has partitioned the city into five busing districts-north, south, east, west, and central-each with different high school student populations. The three schools are located in the central, west, and south districts. Some students must be bused outside their districts, and the school board wants to minimize the total bus distance traveled by these students. The average distances from each district to the three schools and the total student population in each district are as follows:

The school board wants to determine the number of students to bus from each district to each school to minimize the total busing miles traveled.

1. Formulate a linear programming model for this problem.
2. Solve the model by using the computer.

Distance (miles)

District Central School West School South School Student Population

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| North | 8 | 11 | 14 | 700 |
| South | 12 | 9 | - | 300 |
| East | 9 | 16 | 10 | 900 |
| West | 8 | - | 9 | 600 |
| Central | - | 8 | 12 | 500 |

37. Green Valley Mills produces carpet at plants in St. Louis and Richmond. The plants ship the carpet to two outlets in Chicago and Atlanta. The cost per ton of shipping carpet from each of the two plants to the two warehouses is as follows:

From Chicago Atlanta

|  |  |  |
| --- | --- | --- |
| St. Louis | $40 | $65 |
| Richmond | 70 | 30 |

The plant at St. Louis can supply 250 tons of carpet per week, and the plant at Richmond can supply 400 tons per week. The Chicago outlet has a demand of 300 tons per week; the outlet at Atlanta demands 350 tons per week. Company managers want to determine the number of tons of carpet to ship from each plant to each outlet in order to minimize the total shipping cost.

Formulate a linear programming model for this problem.

1. Solve the model by using the computer.