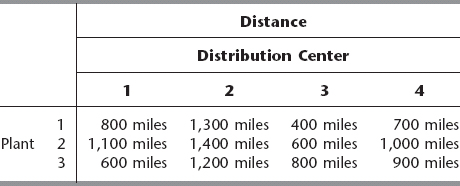
QUESTIONS

1. The ProExpert Company is producing highchairs in its three production facilities and ships the highchairs to four distribution centers. Production facilities 1, 2, and 3 produce 12, 17, and 11 shipments per month, respectively. Each distribution center needs to receive 10 shipments per month. The distance from each plant to the respective distributing centers is given below:



The freight cost for each shipment is $100 plus 50 cents per mile.

Formulate this problem as a transportation problem by constructing the appropriate parameter table.

How much should be shipped from each plant to each of the distribution centers to minimize the total shipping cost?

Solve the question using **both Excel solver and pyomo**.

represent shipment numbers made from plant i to distribution center j.

Objective Function;

Constraints;

Plant 1 to Distribution Center 3 = 2

Plant 1 to Distribution Center 4 = 10

Plant 2 to Distribution Center 2 = 9

Plant 2 to Distribution Center 3 = 8

Plant 3 to Distribution Center 1 = 10

Plant 3 to Distribution Center 2 = 1

2. The M&Com Company has two plants producing Computed Tomography (CT) machines that then are shipped to three distribution centers. The production costs are the same at the two plants, and the cost of shipping for each CT-machine is shown for each combination of plant and distribution center:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Distribution Center** | | |
|  |  | **1** | **2** | **3** |
| Plant | A | $800 | $700 | $400 |
| B | $600 | $800 | $500 |

Each plant can produce and ship any amount up to a maximum of 50 CT-machines per week, so there is considerable flexibility on how to divide the total production between the two plants so as to reduce shipping costs. However, each distribution center must receive exactly 20 CT-machines per week.

Management's objective is to determine how many CT-machines should be produced at each plant, and then what the overall shipping pattern should be to minimize total shipping cost.

(a) Formulate this problem as a transportation problem by constructing the appropriate parameter table.

(b) Solve the transportation problem **on an Excel spreadsheet**.

(c) Use Excel Solver to obtain an optimal solution. Also **use Pyomo to solve the problem.**

represent quantity of product manufactured in plant i to ship to distribution center j.

Objective Function;

Constraints;

Plant A to Distribution Center 2 = 20

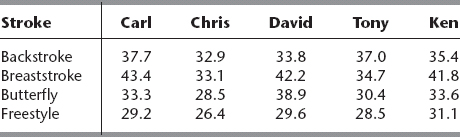
Plant A to Distribution Center 3 = 20

Plant A to Dummy Distribution Center = 10

Plant B to Distribution Center 1 = 20

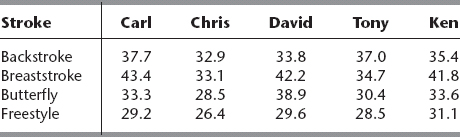
Plant B to Dummy Distribution Center = 30

3. The coach of the United States national swimming team is putting together a relay team of four swimmers for the 200-yard relay in the 2024 Olympics. Each swimmer will swim 50-yards of only one of the following strokes: breaststroke, backstroke, butterfly, or free style. There are four swimmers, and the coach believes that each swimmer will attain the times (seconds) given in the table below.



To minimize the team’s time for the race, assign each swimmer for a stroke and obtain an optimal solution. **Solve this problem only using Excel Solver**.

4. Consider question 3. Let say there is a new person, Ken in the team and now the coach of the swimming team needs to assign four swimmers out of five candidates to the strokes. The swimmers and the best times (in seconds) they have achieved in each of the strokes (for 50 yards) are



To minimize the team’s time for the race, assign each swimmer for a stroke and obtain an optimal solution. **Solve this problem only using Excel Solver**.