# Case TM1

Steelco manufactures three types of steel at different plants. The time required to manufacture 1 ton of steel and the costs at each plant are shown. Each week, 100 tons of each ton of steel (1, 2, 3) must be produced. Each plant is open 40 hours per week.

| **Plant** | **Cost ($)** | | | **Time (minutes)** |
|---|---|---|---|---|
| | **Steel 1** | **Steel 2** | **Steel 3** | |
| **Plant 1** | 60 | 40 | 28 | 20 |
| **Plant 2** | 50 | 30 | 30 | 16 |
| **Plant 3** | 40 | 20 | 20 | 15 |

# Case TM2

Nowjuice, Inc. produces bottled juice. A planner has developed an aggregate forecast for demand (in cases) for the next six months. Develop a least-cost aggregate plan using the following information. Assume zero (0) beginning inventory.

Setup the relevant transportation tableau for this problem.

| **Mode of Production** | **Mo Capacity (in cases)** | **Production Cost per Case ($)** |
|---|---|---|
| Regular | 5,000 | 10 |
| Overtime | 500 | 16 |
| Subcontracting | n/a | 20 |
| Holding Cost Per Month | | $1 |

| **Month** | May | June | July | Aug | Sep | Oct |
|---|---|---|---|---|---|---|
| **Forecast** | 4,000 | 4,800 | 5,600 | 7,200 | 6,400 | 5,000 |

# Case IP1

A department works from 1:00 PM to 11:00 PM, and is scheduled to process all the chips that arrive by 11:00 PM. The department currently has 13 machines, each of which can process up to 500 chips per hour. It takes one worker to operate each machine. The company hires both full-time and part-time workers. At least three full-time workers should be hired due to labor negotiations. Full time employees work 1:00 – 9:00, 2:00 – 10:00, 3:00 – 11:00 PM, and are paid $160 per day. Part-time workers work either 5:00 – 10:00 or 6:00 – 11:00 PM, and are paid $75 daily. The number of chips received by the department per hour is given.

| Time | Chips Received |
|---|---|
| 1:00 | 5,000 |
| 2:00 | 4,000 |
| 3:00 | 3,000 |
| 4:00 | 4,000 |
| 5:00 | 2,500 |
| 6:00 | 3,000 |
| 7:00 | 4,000 |
| 8:00 | 4,500 |
| 9:00 | 3,500 |
| 10:00 | 3,000 |

# Case IP2

A company is considering to opening warehouses in four cities: NY, LA, Chicago, and Atlanta. The company wants to minimize total cost of meeting the weekly demand.

| | | Cost of Transpo/unit to Demand Centers (Regions) | | | |
|---|---|---|---|---|---|
| Possible Location | FC/week (if open) | Region 1 | Region 2 | Region 3 | Weekly Capacity |
| NY | $400 | $ 10 | $ 11 | $ 18 | 100 |
| LA | $500 | $ 6 | $ 7 | $ 7 | 100 |
| Chicago | $300 | $ 7 | $ 8 | $ 5 | 100 |
| Atlanta | $150 | $ 5 | $ 6 | $ 4 | 100 |
| Weekly Demand | | 80 | 70 | 40 | |

# Case IP3

Revise the original ILP to accommodate the following (independent) additional restrictions.

- If the NY warehouse is opened, the LA warehouse must be opened.
- At most two warehouses can be opened.
- Either the Atlanta or the LA warehouse must be opened.

# Case IP4

## Assignment Model

The Gotham City police have just received three calls for police. Five cars are available. The distance (in city blocks) of each car from each call is given below. Gotham City wants to minimize the total distance cars must travel to respond to the three police calls.

| | Distance (in city blocks) | | |
|---|---|---|---|
| Car | Call 1 | Call 2 | Call 3 |
| 1 | 10 | 11 | 18 |
| 2 | 6 | 7 | 7 |
| 3 | 7 | 8 | 5 |
| 4 | 5 | 6 | 4 |
| 5 | 9 | 4 | 7 |

# Case IP5

## Assignment Model

Given are the processing times of each of the ten company products (A – J) in different machines (1 – 10). If each product should be exclusively assigned to one machine only, determine the best assignment.

| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
|---|---|---|---|---|---|---|---|---|---|---|
| **A** | 10 | 7 | 21 | 20 | 17 | 21 | 18 | 12 | 18 | 16 |
| **B** | 24 | 14 | 6 | 19 | 15 | 17 | 15 | 11 | 17 | 19 |
| **C** | 25 | 13 | 20 | 6 | 24 | 13 | 11 | 16 | 16 | 23 |
| **D** | 24 | 10 | 12 | 7 | 20 | 12 | 25 | 25 | 23 | 7 |
| **E** | 22 | 23 | 7 | 13 | 19 | 23 | 7 | 19 | 7 | 14 |
| **F** | 20 | 15 | 13 | 21 | 15 | 8 | 19 | 10 | 24 | 15 |
| **G** | 17 | 17 | 17 | 21 | 18 | 12 | 16 | 12 | 10 | 19 |
| **H** | 5 | 21 | 10 | 20 | 12 | 14 | 5 | 17 | 24 | 12 |
| **I** | 9 | 22 | 12 | 24 | 20 | 10 | 17 | 10 | 13 | 5 |
| **J** | 18 | 13 | 18 | 17 | 25 | 21 | 11 | 11 | 24 | 22 |

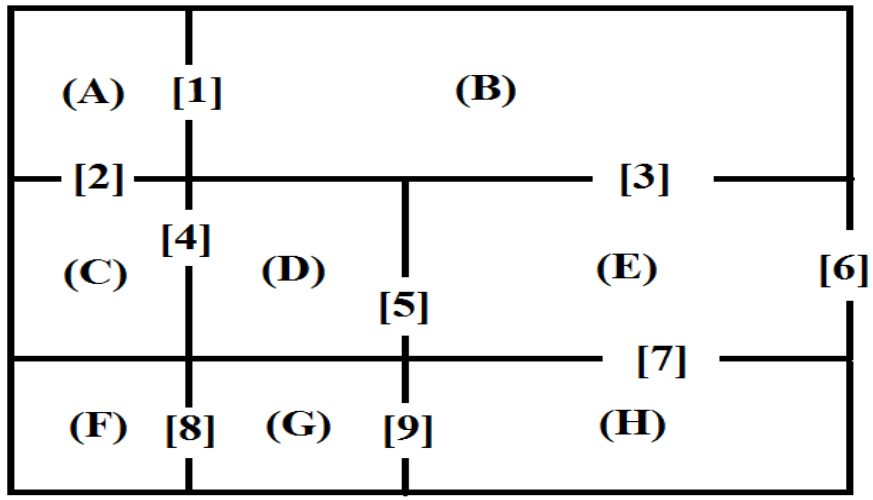
# Case IP6

Jobco uses a single machine to process three jobs. Both the processing time and the due date (in days) for each job are given in the following table. The due dates are measured from zero, the assumed start time of the first job. The objective of the problem is to determine the minimum late-penalty sequence for processing the three jobs.

| Job | Processing time (in days) | Due date (days) | Late penalty ($ per day) |
|---|---|---|---|
| 1 | 5 | 25 | 19 |
| 2 | 20 | 22 | 12 |
| 3 | 15 | 35 | 34 |

# Case IP7

The treasures of King Tut are on display in a museum in New Orleans. The layout of the museum is shown below, with different rooms joined by opened doors. A guard




standing at the door can watch two adjoining rooms. The museum wants to ensure guard presence in every room, using minimum number of guards. In the layout below, [X] and (Y) represent door number and room letter, respectively.

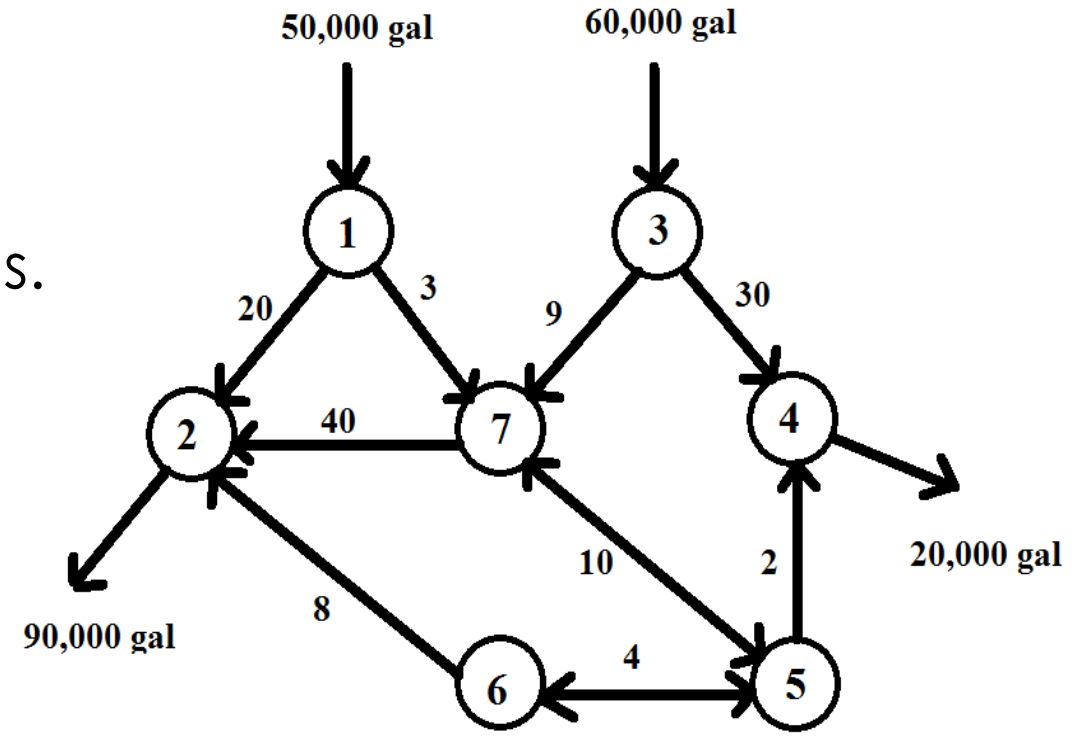
# Case IP8

Three components will be connected in series to form an assembly. To increase the reliability of the system, the designers may opt to add one or two additional parallel units per component. However, the designers are limited to a $10,000 budget. Given in the table below are the cost and associated reliability of the component given the number of parallel units per component. Determine the number of units per component subject to the budget constraint.

| No of Parts | Component 1 | | Component 2 | | Component 3 | |
|---|---|---|---|---|---|---|
| | Reliability | Cost | Reliability | Cost | Reliability | Cost |
| 1 | 0.6 | $ 1,000 | 0.7 | $ 3,000 | 0.5 | $ 2,000 |
| 2 | 0.8 | $ 2,000 | 0.8 | $ 5,000 | 0.7 | $ 4,000 |
| 3 | 0.9 | $ 3,000 | 0.9 | $ 6,000 | 0.9 | $ 5,000 |

# Case NM1

Consider the oil pipeline network shown below. The different nodes represent pumping and receiving stations. Distances in miles between the stations are shown on the network. The transportation cost per gallon between two nodes is directly proportional to the length of the pipeline.



# Case NM2

Determine the shortest route from A to B.