OM Spring 2018 Lab-1

February 12, 2018

Problem 1

A plant produces two types of refrigerators, A and B. There are two production lines, one dedicated to producing refrigerators of Type A, the other to producing refrigerators of Type B. The capacity of the production line for A is 60 units per day, the capacity of the production line for B is 50 units per day. A requires 20 minutes of labor whereas B requires 40 minutes of labor. Presently, there is a maximum of 40 hours of lab or per day which can be assigned to either production line. Profit contributions are ₹20 per refrigerator of Type A produced and ₹30 per Type B produced. What should the daily production be?

Problem 2

A Car manufacturing company makes a profit of ₹100 on each Type-A car, ₹200 on each Type-B car, and ₹400 on each Type-C car. These cars get a mileage of 20, 17, and 14 kilometers per liter respectively, and it takes respectively 1, 2, and 3 minutes to assemble one Type-A car, one Type-B car, and one Type-C car. Assume the company is mandated by the government that the average car has a fuel efficiency of at least 18 kilometers per liter. Under these constraints, determine the optimal number of cars, maximizing the profit, which can be assembled in one 8-hour day.

Problem 3

Suppose an angel investor has a choice between three types of shares. Type A pays 4%, type B pays 6%, and type C pays 9% interest. The investor has ₹100,000 available to buy shares and wants to maximize the interest, under the following constraints:

1. No more than ₹20,000 can be spent on shares of type C
2. At least ₹10,000 of the portfolio should be spent on shares of type A

Find the maximum interest the investor can get.

Problem 4

There are 3 cities named A, B and C in Berland. Berland Government decided to manage a road network whose roads have vehicle traffic bandwidths as shown in the figure below. There exists vehicle traffic between all 3 pairs of cities: between cities A and B, between cities B and C, and between cities A and C. There exist both long and short routes between two cities. For example, the short route between cities A and B is via A-a-b-B and the long route is via A-a-c-b-B. The vehicle traffic between cities can be routed in two ways, a long path and a short path, or by a combination: for instance, two units of vehicle traffic via the short route, one via the long route. There exists at least two units of vehicle traffic between any two cities. Vehicles commuting between cities A and B pay $3 per unit of vehicle traffic, and vehicles commuting between B and C and A and C pay $2 and $4, respectively. Berland Government is poor and wants to maximize its road network's revenue for its functioning. Formulate and solve an LP to help them.