

TD - Week 1

October 2025

Questions

1. A company produces two products, A and B. The sales volume for product A is at least 80% of the total sales of both A and B. However, the company cannot sell more than 110 units of A per day. Both products use one raw material, of which the maximum daily availability is 300 lb. The usage rates of the raw material are 2 lb per unit of A and 4 lb per unit of B. The profit per unit for A and B are \$40 and \$90, respectively. Formulate the Linear Programming model to determine the optimal number of units of products A and B the company should produce per day to maximize total profit, subject to the given constraints.

2. An individual wishes to invest \$5000 over the next year in two types of investment: Investment A yields 5%, and investment B yields 8%. Market research recommends an allocation of at least 25% in A and at most 50% in B. Moreover, investment in A should be at least half the investment in B. Formulate a Linear Programming model to maximize total return, subject to the given constraints.

3. Show & Sell can advertise its products on local radio and television (TV). The advertising budget is limited to \$10,000 a month. Each minute of radio advertising costs \$15, and each minute of TV commercials \$300. Show & Sell likes to advertise on radio at least twice as much as on TV. In the meantime, it is not practical to use more than 400 minutes of radio advertising a month. From past experience, advertising on TV is estimated to be 25 times as effective as on radio. Determine the optimum allocation of the budget to radio and TV advertising. Formulate a Linear Programming model to maximize advertising effectiveness, subject to the given constraints.

4. A factory produces three products: A, B, and C. Each product requires labor, machine time, and raw material as given below:

Product	Labor (hrs)	Machine (hrs)	Raw Material (kg)	Profit (\$)
A	2	1	3	40
B	1	2	2	50
C	2	3	4	60

Available resources per week: Labor = 100 hrs, Machine = 120 hrs, Raw Material = 150 kg.

Question: Formulate a Linear Programming model to determine how many units of products A, B, and C should be produced to maximize total profit.

5. A nutritionist wants to design a diet using four foods F1, F2, F3, and F4. The nutritional content and cost per unit are as follows:

Food	Protein (g)	Fat (g)	Carbs (g)	Cost (\$)
F1	10	5	20	2
F2	15	10	5	3
F3	5	5	30	1
F4	20	10	10	4

Daily requirements: Protein ≥ 50 g, Fat ≤ 30 g, Carbs ≥ 60 g.

Question: Formulate a Linear Programming model to minimize the total cost of the diet while meeting the nutritional requirements.

6. Solve Question 1 (Product Mix Problem) using the graphical method.

7. Solve Questions 2 (Investment Problem) using the graphical method.

5. Solve Questions 3 (Advertising Problem) using the graphical method.