

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. 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.

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

9. Day Trader wants to invest a sum of money that would generate an annual yield of at least \$10,000. Two stock groups are available: blue chips and high tech, with average annual yields of 10% and 25%, respectively. Though high-tech stocks provide higher yield, they are more risky, and Trader wants to limit the amount invested in these stocks to no more than 60% of the total investment. What is the minimum amount Trader should invest in each stock group to accomplish the investment goal?

10. Top Toys is planning a new radio and TV advertising campaign. A radio commercial

costs \$300 and a TV ad costs \$2000. A total budget of \$20,000 is allocated to the campaign. However, to ensure that each medium will have at least one radio commercial and one TV ad, the most that can be allocated to either medium cannot exceed 80% of the total budget. It is estimated that the first radio commercial will reach 5000 people, with each additional commercial reaching only 2000 new ones. For TV, the first ad will reach 4500 people, and each additional ad an additional 3000. How should the budgeted amount be allocated between radio and TV?

11. A furniture company manufactures desks and chairs. The sawing department cuts the lumber for both products, which is then sent to separate assembly departments. Assembled items are sent to the painting department for finishing. The daily capacity of the sawing department is 200 chairs or 80 desks. The chair assembly department can produce 120 chairs daily, and the desk assembly department 60 desks daily. The paint department has a daily capacity of either 150 chairs or 110 desks. Given that the profit per chair is \$50 and that of a desk is \$100, determine the optimal production mix for the company ?