

I. MATHEMATICAL FORMULATION OF LINEAR PROGRAMMING PROBLEM

Exercise N°1

A bakery produces two types of cookies: chocolate chip and oatmeal. Each chocolate chip cookie requires 2 cups of flour and 1 hour of labor, while each oatmeal cookie requires 1 cup of flour and 2 hours of labor. The bakery has a maximum of 100 cups of flour and 80 hours of labor available per week. The profit from each chocolate chip cookie is \$3, and from each oatmeal cookie is \$2.

❖ Write the linear programming model?

Exercise N°2

The company wants to maximize its profit from producing products A and B. Each unit of product A requires 50 minutes on machine M1 and 30 minutes on machine M2, while each unit of product B requires 24 minutes on machine M1 and 33 minutes on machine M2. The available processing time for machine M1 is 40 hours (2400 minutes) and for machine M2 is 35 hours (2100 minutes).

❖ Write the linear programming model?

Exercise N°3

A factory produces two products, A and B. The profit from product A is \$3 per unit, and the profit from product B is \$5 per unit. The factory has the following constraints:

1. Resource Constraints:

- Each unit of product A requires 2 hours of labor.
- Each unit of product B requires 3 hours of labor.
- The total labor available is 12 hours.

2. Demand Constraints:

- The factory can produce a maximum of 4 units of product A.
- There is no limit on the production of product B.

❖ Write the linear programming problem?

Exercise N°4

A person wants to decide the constituents of a diet which will fulfill his daily requirements of proteins, carbohydrates at the minimum cost. The choice is to be made from four different types of foods. The yield per unit of these foods are given in the Table :

<i>Food type</i>	<i>Yield per unit</i>			<i>Cost per units</i>
	<i>Proteins</i>	<i>Fats</i>	<i>Carbohydrates</i>	<i>(€)</i>
1	3	2	6	45
2	4	2	4	40
3	8	7	7	85
4	6	5	4	65
Minimum requirement	800	200	700	

❖ Formulate the linear programming model for the problem.?

Exercise N°5:

A firm manufactures three products *A*, *B*, *C*. There is demand for at least 300, 250, 200 units of products *A*, *B* and *C* and the profit earned per unit is 50 €, 40€,70€, respectively. The relevant data is given in Table below:

Formulate the problem as a linear programming problem.

<i>Raw material</i>	<i>Requirements per unit of product (kg)</i>			<i>Total availability</i>
	<i>A</i>	<i>B</i>	<i>C</i>	<i>(KG)</i>
P	6	5	9	5000
Q	4	7	8	6000

Exercise N°6

A company manufactures two products *A* and *B*, which require, the following resources. The resources are the capacities machine *M1*, *M2*, and *M3*. The available capacities are 50, 25, and 15 hours respectively in the planning period. Product *A* requires 1 hour of machine *M2* and 1 hour of machine *M3*. Product *B* requires 2 hours of machine *M1*, 2 hours of machine *M2* and 1 hour of machine *M3*. The profit contribution of products *A* and *B* are 5€ and 4€ respectively

❖ Formulate a linear programming model?

Exercise N°7:

The objective of a diet problem is to ascertain the quantities of certain foods that should be eaten to meet certain nutritional requirement at a minimum cost. The number of milligrams of each of these vitamins contained with a unit of each food is given below:

vitamins	Gallon of MILK	Pound of BEEF	Dozens of EGGS	Minimum daily requirement
A	2	1	10	1 mg
B	100	10	12	50 mg
C	11	100	14	10 mg
Cost (€)	1€	1.10 €	0.5 €	-----

❖ Write the linear programming formulation?

Exercise N°8:

A company has two grades of inspectors: type I and type II, who are to be assigned for a quality control inspection. It is required that at least 2000 pieces be inspected per 8 hours/day.

Grade I inspectors can check pieces at the rate of 50/ hour;

Grade II inspectors can check pieces at the rate of 40/hour;

The wage rate of grade I inspector is 4.5 €/hour and that of grade II is 2.5€/hour;

The company has available for the inspection job at most 10 grade I and 5 gradeII

❖ Formulate the problem?

Exercise N°9:

A manufacturer produces two types of models M and N . Each M model requires 4 hours of grinding and 2 hours of polishing, whereas each N model requires 2 hours of grinding and 5 hours of polishing. The manufacturer has 2 grinders and 3 polishers. Each grinder works for 40 hours a week and each polisher works for 60 hours a week. Profit on model M is Rs. 3 and model N is Rs. 4. Whatever is produced in a week is sold in the market.

- ❖ How should the manufacturer allocate his production capacity to the two types of models so that he may make the maximum profit in a week?