INDIAN SCHOOL NIZWA - WORKSHEET

SUBJECT: MATHEMATICS
CH-8 LINEAR PROGRAMMING PROBLEM
Name: _____ Date: _____ Class: XII B

1. Write the objective function and constraints for the following:
   A company produces two products A and B. Each unit of A requires 2 hours of labour and 3 units of raw material, while each unit of B requires 3 hours of labour and 2 units of raw material. The company has at most 18 labour hours and 15 units of raw material available. If the profit on A is ₹30 and on B is ₹40, formulate an LPP to maximize profit.
2. Define the feasible region, feasible solution, and optimal solution in a Linear Programming Problem with the help of a sketch.
3. Write the mathematical form of a Linear Programming Problem and list its essential conditions.
4. Explain why the feasible region for an LPP is always a convex set.
5. Solve graphically the following LPP:
   Maximize $Z = 5x + 3y$
   subject to
   $x + 2y \leq 10$
   $3x + y \leq 12$
   $x, y \geq 0$
6. A manufacturer produces two types of products, P and Q. Each product requires labour and material. The requirements are as follows:

Product	Labour (hours/unit)	Material (kg/unit)	Profit (₹/unit)
P	2	3	60
Q	3	2	50

   Available: 60 labour hours and 60 kg of material.
   Formulate an LPP to maximize profit and find the optimal production using the graphical method.
7. A dietician wants to mix two types of foods, A and B, to obtain at least 6 units of vitamin A and 7 units of vitamin B. Each kg of food A contains 2 units of vitamin A and 1 unit of vitamin B. Each kg of food B contains 1 unit of vitamin A and 2 units of vitamin B. If food A costs ₹50 per kg and food B costs ₹70 per kg, formulate the LPP to minimize the cost and solve graphically.
8. Solve graphically:
   Minimize $Z = 3x + 9y$
   subject to
   $x + y \geq 2$
   $x + 3y \geq 3$

$x, y \geq 0$

9. A small firm manufactures chairs and tables. Each chair requires 2 hours of carpentry and 3 hours of painting; each table requires 3 hours of carpentry and 2 hours of painting. The firm has 36 hours of carpentry and 30 hours of painting available per week. The profit on a chair is ₹200 and on a table is ₹300. Formulate an LPP to maximize profit, find the feasible region, and determine the optimum number of chairs and tables to be produced.
10. A farmer has 10 hectares of land on which he grows wheat and barley. The profit from wheat is ₹300 per hectare and from barley ₹200 per hectare. Each hectare of wheat requires 2 workers and 4 units of fertilizer, while each hectare of barley requires 3 workers and 3 units of fertilizer. The farmer has 30 workers and 40 units of fertilizer available. Formulate and solve the LPP to maximize profit.
11. A company produces two items X and Y using two machines M1 and M2. The time required (in hours) per unit of each item is:

Machine	Item X	Item Y	Available Hours
M_1	2	3	60
M_2	3	2	60

The profit on X is ₹40 and on Y is ₹50. Formulate the LPP to maximize profit and find the number of units of X and Y to be produced.

12. A school wants to prepare a diet mix for lunch containing rice and dal. Each kg of rice provides 2 units of protein and 4 units of carbohydrate. Each kg of dal provides 3 units of protein and 2 units of carbohydrate. The lunch must contain at least 8 units of protein and 8 units of carbohydrate. The cost per kg of rice is ₹60 and of dal is ₹80. Formulate an LPP to minimize the cost and find the quantities of rice and dal to be used.
13. A transport company is planning to allocate trucks for two routes. Route A earns ₹1,000 per trip and Route B earns ₹1,500 per trip. Each trip on Route A requires 10 litres of fuel and 2 driver hours; Route B requires 15 litres of fuel and 3 driver hours. The company has at most 150 litres of fuel and 30 driver hours available. Formulate the LPP to maximize revenue and solve graphically.