

Class 12 Mathematics - Chapter: Linear Programming

1. Introduction:

- Linear Programming is a method to achieve the best outcome (maximum or minimum) in a mathematical model.
- It deals with the optimization (maximizing or minimizing) of a linear objective function, subject to linear equality and inequality constraints.

2. Key Terminology:

- Constraints: Restrictions or limitations on the decision variables.
- Objective Function: The function to be optimized.
- Feasible Region: The region which satisfies all the constraints.
- Feasible Solution: Any point in the feasible region.
- Optimal Solution: A solution that optimizes the objective function.

3. Mathematical Formulation:

- Standard form:

Maximize/Minimize: $Z = ax + by$

Subject to:

$$a_1x + b_1y \leq c_1$$

$$a_2x + b_2y \leq c_2$$

...

$$x \geq 0, y \geq 0$$

4. Graphical Method:

- Used when there are two variables.

- Steps:

- a. Plot all constraints as inequalities.
- b. Identify the feasible region.
- c. Find corner points of the feasible region.
- d. Evaluate the objective function at each corner point.
- e. The point with maximum/minimum value gives the optimal solution.

5. Types of Linear Programming Problems:

- Diet Problem
- Manufacturing Problem
- Transportation Problem
- Allocation Problem

6. Important Notes:

- Feasible region is always convex.
- If feasible region is bounded, optimal solution exists at a corner point.
- If two or more corner points yield the same optimal value, then there are infinitely many optimal solutions.

7. Exam Tips:

- Always label graphs clearly.
- Use ruler and accurate scaling.
- Practice previous year questions.
- Show calculation for objective function at each corner point.

8. Applications:

- Business and economics
- Operations research
- Agriculture, industry, etc.

Summary:

Linear programming provides tools to make optimal decisions in real-life situations with constraints.