Linear Programming

Graphical Method of Solving LPP

- **Step I** — Write the given LPP in mathematical form
- **Step II** — Consider all constraints as linear equations
- **Step III** — Draw the graph
- **Step IV** — Shade the common region *i.e.*, find the feasible region
- **Step V** — Check the feasible region is bounded or unbounded
- **Step VI** — If region is bounded, then the obtained value is required maximum or minimum value of the objective function
- **Step VII** — If region is unbounded, then no need to go to next step

Mathematical Formulation of an LPP and its Solution

- **Step I** — Maximise or minimise $Z = ax + by$ subject to the constraints
  a_1x+b_1y ($\leq$ or $\geq$) C_1
  a_2x+b_2y ($\leq$ or $\geq$) C_2
  $x \geq 0, y \geq 0$
- **Step II** — Find the solutions and feasible region of inequation by mathematical method
- **Step III** — Find the optimal solution

Optimal Feasible Solution

When a feasible solution optimises the objective function

Feasible and Infeasible Solution

- **Feasible** — Set of all points available in the feasible region.
- **Infeasible** — Any point outside the feasible region

Bounded and Unbounded Region

- **Bounded** — Feasible region of system of linear inequalities is said to be bounded, if it can be enclosed.
- **Unbounded** — Otherwise, it is said to be unbounded.

Feasible and Infeasible Region

- **Infeasible** — The region other than the feasible region is called infeasible region.
- **Feasible** — The common region determined by all the constraints including non-negative constraints $x \geq 0, y \geq 0$ of a linear programming problem.

Different Type of Linear Programming Problems

- Diet problems
- Manufacturing problem

Related Terminology

- **Optimisation problem**
  - Problem which seeks to maximise or minimise a linear function
  - Linear programming problems are spacial type of optimisation problems.
- **Constraints** — Inequations or equations in the variables of a linear programming problem which describe the conditions under which the optimisation is to be accomplish
- **Objective Function** — The linear function $z = k_1 x_1 + k_2 x_2 + \ldots\ldots + k_n x_n$ which is to be maximised or minimised
- **Optimal value** — Maximum value of an objective function

What is Linear Programming Problem ?

A linear programming problem is a simple technique for finding the optimal value (maximum or minimum) value of a linear function of several variables.

Trace the Mind Map

First Level · Second Level · Third Level