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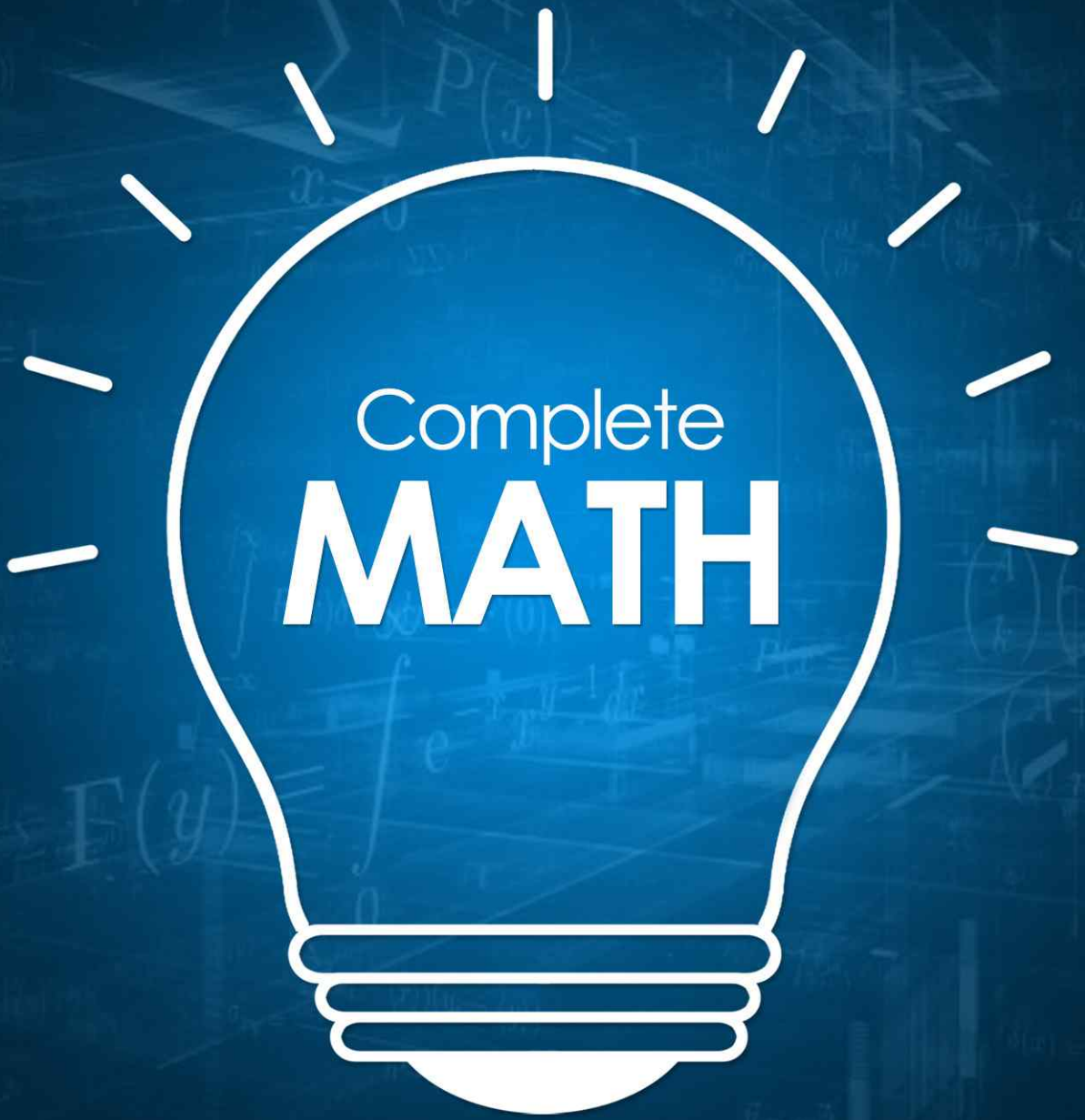

Complete MATH

IIT-JEE · CBSE eBOOKS

CLASS 11&12th

CLASS 12th

Linear Programming

01. Some Definitions

The general form of a linear programming problem is optimize (Maximize or Minimize)
$Z = c_1 x_1 + c_2 x_2 + ... + c_n x_n$
Subject to

$$a_{11} x_1 + a_{12} x_2 + ... + a_{1n} x_n \ (\leq, =, \geq) \ b_1$$
$$a_{21} x_1 + a_{22} x_2 + ... + a_{2n} x_n \ (\leq, =, \geq) \ b_2$$
$$\vdots \qquad \vdots \qquad \vdots$$
$$a_{m1} x_1 + a_{m2} x_2 + ... + a_{mn} x_n \ \{\leq, =, \geq\} \ b_m \ x_1, x_2, ..., x_n \geq 0$$

Objective Function *If $c_1, c_2, ..., c_n$ are constants and $x_1, x_2, ..., x_n$ are variables, then the linear function $Z = c_1 x_1 + c_2 x_2 + ... + c_n x_n$ which is to be maximized or minimized is called the objective function.*
Constraints *The inequations of equations in the variables of a LPP which describe the conditions under which the optimisation (maximization of minimization) is to be accomplished are called constraints.*
In the constraints given in the general form of a LPP there may be any one of the three signs $\leq, =, \geq$.
Non-Negativity Restrications These are the constraints which describe that the variables involved in a LPP are non-negative.

Mathematical Formulation of Linear Programming Problems
Problem formulation is the process of transforming the verbal description of a decision problem into a mathematical form.

Algorithm
Step I *In every LPP certain decisions are to be made. These decisions are represented by decision variable. These decision variable are those quantities whose values are to be determined. Identify the variables and denote them by x_1, x_2, x_3,..*
Step II *Identify the objective function and express it as a linear function of the variable introduced in step I.*
Step III *In a LPP, the objective function may be in the form of maximizing profits or minimizing costs. So, after expressing the objective functions as a linear function of the decision variable, we must find the type of optimization i.e. maximization or minimization. Identify the type of the objective function.*
Step IV *Identify the set of constraints, stated in terms of decision variables and express them as linear inequations or equations as the case may be..*

Some Definitions and Results
Solution *A set of values of variables $x_1, x_2, ..., x_n$ is called a solution of a LPP, if it satisfies the constraints of the LPP.*
Feasible Solution *A set of values of the variables $x_1, x_2, ..., x_n$ is called a feasible solution of a LPP, if it satisfies the constraints and non-negativity restriction of the problem.*
Infeasible Solution *A solution of a LPP is an infeasible solution, if it does not satisfy the non-negativity restrictions.*