***Linear Programming Problem (LPP):***

The term programming refers to the process of determining a plan of action .LP is a technique for determining an optimal schedule of independent activities in view of the available resources. Linear relationship b/w two or more variables is one in which the variables are directly or precisely proportional.

The general LPP calls for optimizing (max/min) a linear function of variables called the objective function subject to a set of linear equation and / or inequalities called the constraints or restriction.

1) There must be a well-defined objective function which is to be either max or min and has to be expressed as a linear function of the decision variable.
2) There must be constraints on the objective function and these constraints are expressed as linear equalities or inequalities in term of variables.
3) There must be an inequalities causes of action.
4) Another necessary requirement is that decision variables should be interrelated and non-negative.
5) The resource must be limited.

***Mathematical Formulation of Linear Programming Problem:***

The procedure for Mathematical Formulation of Linear Programming Problem consists of the following steps.

1) Identify the decision variables of the problem. For example $x_1, x_2$
2) Formulate the objective function to be optimized as a linear function of the decision variables. For example $z = ax_1 + bx_2$
3) Formulate the constraints of the problem such as resource limitations, market conditions interrelation b/w variables and other as linear equation or inequalities in term of the decision variables. For example $ax_1 + bx_2 \leq c$ , $ax_1 + bx_2 \geq d$
4) Add the non-negativity constraints so that negative values of the decision variables do not have any valid physical interpretation. For example $x_1 \geq 0, x_2 \geq 0$

## Terminology:

### Decision Variables:

The Problem variables $x_1$ and $x_2$ are called decision variables and they represent the solution or the output decision from the problem.

### 2- Objective Function:

The Basic structure of a linear Progrig is either to maximize or minimize an objective functio

The Profit function that the manufacturer ~~wishes~~ wishes to increase, represents the objective of making the decisions on the production quantities and is called the objective function.

Profit level, total Revenue, total cost, Pollution levels, market share.

### 3- Constraints:

the ~~conditions~~ conditions limiting the resource availability and resource requirement are called constraints. The constraints of an LPP can be represented by Eq. or by inequalities ($\leq$, $=$, or $\geq$).

### 4- Non-Negativity Restriction:

The decision variable should take non-negative values. This is true for all LPP. This is call N.N.R

### 5- Problem Formulation

The Problem that we have written down in the algebraic form represents the mathematical model of the given system and it called Problem formulation.

### Optimum:

The best feasible sol. that maximize the total Profit.

Objective Function $Z = a x_1 + b x_2$

$a$ is coefficient of $x_1$

$b$ is " of $x_2$

$Z$ = is defined as the total contribution to fixed cost ~~or~~ or Profit.