Unit 5 Linear Equations and Inequalities

1. Define linear equation.

An equation of the form $ax + b = 0$, where a and b are constants, $a \neq 0$, and x is a variable, is called a $linear\ equation$ in one variable.

The general form can also be expressed as:

$$ax + b = 0, \quad where\ \ a \neq 0$$

Note: In a linear equation, the $highest\ power$ of the variable is always 1.

2. Define inequality.

A mathematical statement that expresses a relationship between two expressions that are not equal.

Inequalities are expressed using the following **symbols**:

- **(i)** $>$ Greater than
- **(ii)** $<$ Less than
- **(iii)** $\geq$ Greater than or equal to
- **(iv)** $\leq$ Less than or equal to

3. Define linear inequality in one variable. $(\boldsymbol{ALP})$

A linear inequality is one variable x is of the form,

$$ax + b < 0, \qquad a, b \in R, \qquad a \neq 0$$

We may replace the symbol $<$ by $>$, $\leq$ or $\geq$.

4. What are problem constraints in real-world problem solving?

In real-world problem solving, each linear inequality associated with a particular problem is called a problem constraint.

The collection of these linear inequalities for a given problem is referred to as problem constraints.

5. What are decision variables in a system of inequalities?

The variables used in these systems of inequalities must satisfy non-negative constraints, meaning they can only take zero or positive values. These variables are crucial for decision-making and are therefore called decision variables.

6. What is the feasible region?

The area confined to the first quadrant that satisfies all given constraints is known as the feasible region.

7. What is a feasible solution?

Every point within the feasible region represents a valid feasible solution to the system of linear inequalities.

8. What is a corner point (vertex)?

A point of a solution region where two of its boundary lines intersect is called a $corner\ point$ or $vertex$ of the solution region.

9. What is an objective function?

A function which is to be maximized or minimized is called an objective function.

10. What is an optimal solution?

The feasible solution which maximizes or minimizes the objective function is called the optimal solution.