CHAPTER 5 : Introduction to Euclid's Geometry

- **Postulates :** The basic facts which are taken for granted, without proof and which are specific to geometry are called postulates.
- **Axioms :** The basic facts which are taken for granted, without proof and which are used throughout mathematics are called axioms.
- **Statement :** A sentence which can be judged to be true or false is called a statement.
- **Theorem :** The conclusions obtained through logical reasoning based on previously proved results and some axioms constitute a statement which is known as a theorem or a proposition.
- **Corollary :** A statement, whose truthfulness can easily be deduced from a theorem, is called its corollary.

Some of Euclid's definitions :

1. A point is that which has no part.
2. A line is breadthless length.
3. The ends of a line segment are points.
4. A straight line extends indefinitely in both the directions.
5. A surface is that which has length and breadth only.
6. The edges of a surface are lines.
7. A plane surface is a surface which lies evenly with the straight lines on itself.

Euclid's Axioms :

(i) Things which are equal to the same thing are equal to one another.
(ii) If equals are added to equals, the wholes are equal.
(iii) If equals are subtracted from equals, the remainders are equal.
(iv) Things which coincide with one another are equal to one another.
(v) The whole is greater than the part.
(vi) Things which are double of the same thing are equal to one another.
(vii) Things which are halves of the same thing are equal to one another.

Euclid's Postulates :

Postulate 1 : A straight line may be drawn from any one point to any other point.
Postulate 2 : A terminated line can be produced indefinitely.
Postulate 3 : A circle can be drawn with any centre and any radius.
Postulate 4 : All right angles are equal to one another.
Postulate 5 : If a straight line falling on two straight lines makes the interior angles on the same side of it taken together less than two right angles, then the two straight lines, if produced indefinitely, meet on that side on which the sum of angles is less than two right angles.

Two equivalent versions of Euclid's fifth postulate :

(i) 'For every line l and for every point P not lying on l, there exists a unique line m passing through P and parallel to l'.
(ii) Two distinct intersecting lines cannot be parallel to the same line. ■■