Unit No. 11

Loci And Construction

Basic Concepts

Locus:

A locus (plural: loci) is defined as a set of points that follow a given rule. In geometry, loci are often used to define the positions of points relative to one another or to other geometric figures.

Do you know?

"In Latin, the word locus is defined by the English term, location."

Applications of Loci:

Loci are useful for:

1. Understanding and predicting patterns.

Example: Predicting the relative positions of two people walking in a room, each maintaining a fixed distance from the other. By studying their loci, their relative positions at any given time can be predicted.

2. Tracking satellites orbiting Earth.

Applications in telecommunications and GPS technology.

Common Loci in Two Dimensions:

Triangle

Circle

Parallel lines

Perpendicular bisector

Angle bisector

Triangles:

A triangle is defined as a closed figure with three sides and three angles.

Remember!

Types of triangles with respect to sides:

Scalene triangle:

All sides are of different lengths.

Isosceles triangle:

Two sides are of equal length.

Equilateral triangle:

All sides are of equal length.

Types of triangles with respect to angles:

Acute angled triangle:

All angles are of measure less than 90°.

Obtuse angled triangle:

One angle is of measure greater than 90°.

Right angled triangle:

One angle is of measure equal to 90°.

Triangle Inequality Theorem

The sum of the measure of any two sides of a triangle is always greater than the measure of the third side.

For example, we can see in the figure adding any two lengths then this will be greater than the third side i.e.,

$5 + 7 > 8$, $5 + 8 > 7$, and $7 + 8 > 5$

Key fact!

- An equilateral triangle is an acute angled triangle.

(This is true because all angles in an equilateral triangle are 60°, which is less than 90°).

- A right angled triangle cannot be equilateral.

(This is true because an equilateral triangle has all angles as 60°, while a right-angled triangle must have one angle as 90°).

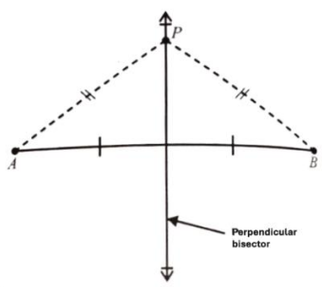
Do you know?

The Ambiguous Case (SSA) occurs when we are given two sides and the angle opposite one of these is less than 90°.

This refers to the SSA (Side-Side-Angle) criterion for triangle congruence, which is "ambiguous" because it can sometimes result in two possible triangles, one triangle, or no triangle at all, depending on the specific measurements, especially when the given angle is acute.

Perpendicular Bisector:

A perpendicular bisector is defined as a line that intersects a line segment at a right angle (90°) and divides it into two equal parts. In simpler terms, it intersects the line segment at its midpoint and forms right angles with it.



Median:

A median of a triangle is defined as a line segment that joins a vertex to the midpoint of the side opposite to that vertex.

Point of Concurrency:

A point of concurrency is defined as the single point where three or more lines, rays, or line segments intersect or meet in a geometric figure.

Circumcentre:

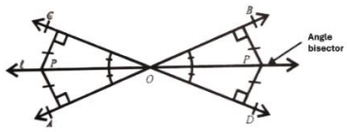
The point of concurrency of perpendicular bisector of the sides of a triangle is called circumcentre.

Centroid:

The point of concurrency of the medians of a triangle is called centroid of the triangle.

Angle Bisector of a Triangle:

An angle bisector is a line or ray that divides an angle into two equal parts, creating two smaller angles that are congruent (each having half the measure of the original angle).



Incentre:

The point of concurrency of the angle bisectors of a triangle is called incentre of the triangle.

Altitude:

Altitude is a ray drawn perpendicular from a vertex to the opposite side of the triangle. There are three altitudes of the triangle which meet at a single point i.e. the altitudes of a triangle are concurrent.

Orthocentre:

The point of concurrency of the altitudes of the triangle is called orthocentre of the triangle.

Circle:

The locus of a point whose distance is constant from a fixed point is called a circle.

Parallel Lines:

The locus of a point whose distance from a fixed line is constant is parallel lines.

Remember!

Equidistant: "Let A be a fixed point and B be a set of points. If A is at equal distance from all points of B, then A is said to be equidistant from B."

Remember!

- Locus of points equidistant from a fixed point is a circle and equidistant from two fixed points is a perpendicular bisector.
- Locus of points equidistant from a fixed line are two parallel lines and equidistant from two fixed intersecting lines is angle bisector.

Intersection of Loci:

If two or more loci intersect at a point P, then P satisfies all given conditions of the loci.

Real Life Application of Loci:

The concept of loci has many applications across fields where spatial relationships, distances, or specific constraints are important.