

CBSE Class 11 Mathematics

Revision Notes

Chapter-12

INTRODUCTION TO THREE DIMENSIONAL GEOMETRY

1. Coordinates- axes, planes, points in 3D

2. Distance between Two Points

3. Section Formula

- **Coordinate axes:** In three dimensions, the coordinate axes of a rectangular Cartesian coordinate system are three mutually perpendicular lines. The axes are called the x-axis, y-axis and z-axis.
- **Planes:** The three planes determined by the pair of axes are the coordinate planes, called XY, YZ and ZX planes.

xy —plane i.e., $z = 0$

yz —plane i.e., $x = 0$

zx —plane i.e., $y = 0$

- **Octants:** The three coordinate planes divide the space into eight parts known as octants.
- **Points in 3D:** The coordinates of a point P in three dimensional geometry is always written in the form of triplet like (x, y, z). Here x, y and z are the distances from the YZ, ZX and XY

Any point on XY \rightarrow plane (x, y, 0)

Any point on YZ \rightarrow plane (0, y, z)

Any point on ZX \rightarrow plane (x, 0, z)

- **Distance formula between two points:** Distance between two points P (x₁, y₁, z₁) and Q (x₂, y₂, z₂) is

$$|PQ| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$$

Section Formula: The co-ordinates of R which divides a line segment joining the points P (x_1 , y_1 , z_1) and Q (x_2 , y_2 , z_2)

Internally and externally in the ratio $m : n$ respectively

Internally: $R \left(\frac{mx_2 + nx_1}{m+n}, \frac{my_2 + ny_1}{m+n}, \frac{mz_2 + nz_1}{m+n} \right)$

Externally: $S \left(\frac{mx_2 - nx_1}{m-n}, \frac{my_2 - ny_1}{m-n}, \frac{mz_2 - nz_1}{m-n} \right)$

Centroid: The coordinates of the centroid of the triangle whose vertices are (x_1 , y_1 , z_1)

(x_2 , y_2 , z_2) and (x_3 , y_3 , z_3) is

$$\left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}, \frac{z_1 + z_2 + z_3}{3} \right)$$