

Introduction to Three Dimensional Geometry

CBSE Class 11 Maths · Knowledge organiser

KEY DEFINITIONS

Octant

One of the eight regions the three coordinate planes divide space into.

Coordinates in space

(x, y, z) : signed distances from the yz -, zx - and xy -planes.

Distance in 3D

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

KEY FORMULAS

Octants I-IV $z > 0$, V-VIII $z < 0$; on the x -axis $(x, 0, 0)$, in the xy -plane $(x, y, 0)$

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

WORKED EXAMPLE

Find the distance between $(2, -1, 3)$ and $(-2, 1, 3)$.

$$\sqrt{16 + 4 + 0} = \sqrt{20} = 2\sqrt{5}.$$

YOU SHOULD BE ABLE TO...

- Place points in octants and on axes and planes, and use the distance formula.
- Find unknown coordinates from distances and test triangles and collinearity.
- Classify quadrilaterals in space and handle loci with the distance formula.
- Find distances from axes and loci of equidistant points.

COMMON MISTAKES

- ✗ Forgetting the z term in the distance formula.
- ✗ Distance from the x -axis taken as $|a|$: it is $\sqrt{b^2 + c^2}$.
- ✗ Confusing "on the x -axis" $(x, 0, 0)$ with "in the xy -plane" $(x, y, 0)$.
- ✗ Claiming collinearity from two equal distances instead of $AB + BC = AC$.