

□ Class 11 Mathematics – Chapter: Introduction to Three Dimensional Geometry

1. Introduction

- Three Dimensional Geometry studies points, lines, and planes in 3D space.
 - Coordinates are represented as (x, y, z) in a 3D coordinate system.
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2. Coordinate Axes

- Three mutually perpendicular axes: X-axis, Y-axis, Z-axis.

- Origin $O=(0,0,0)$ $O = (0, 0, 0)$ $O=(0,0,0)$.
 - Each axis has positive and negative directions.
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3. Coordinates of a Point

- Any point P in space is denoted by (x,y,z) (x, y, z) (x,y,z) .
 - x , y , and z represent the distances from the YZ -plane, XZ -plane, and XY -plane respectively.
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4. Distance Between Two Points

For points $P(x_1, y_1, z_1)$ and $Q(x_2, y_2, z_2)$,

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

5. Section Formula in 3D

Point R dividing segment PQ in ratio $m:n$,

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

6. Midpoint Formula

Midpoint of PQ is

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}, \frac{z_1 + z_2}{2} \right)$$

7. Coordinate Planes

- XY-plane: $z=0$
- YZ-plane: $x=0$
- XZ-plane: $y=0$

8. Applications

- Used in physics, engineering, computer graphics.

- Helps in visualization of real-world objects.
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9. Exam Tips

- Practice plotting points in 3D.
 - Memorize distance and section formulas.
 - Understand concept of axes and planes clearly.
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