NCERT Solutions Class 11 Maths
Chapter 11: Introduction to Three Dimensional Geometry
EXERCISE 11.1

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Quick Summary: In NCERT Solutions Class 11 Maths Chapter 11 Exercise 11.1, students learn the fundamental concepts of coordinate axes and planes in three-dimensional geometry. This exercise covers coordinate identification, octant determination, and basic properties of 3D coordinate systems which are essential for building a strong foundation in 3D geometry for CBSE Board exams and competitive tests.

Key Takeaways:

- Points on coordinate axes have specific coordinate patterns: x-axis (a, 0, 0), y-axis (0, b, 0), z-axis (0, 0, c)
- Points on coordinate planes follow set rules: XY-plane (x, y, 0), YZ-plane (0, y, z), XZ-plane (x, 0, z)
- Three-dimensional space is divided into 8 octants based on the signs of x, y, and z coordinates
- Understanding coordinate identification is crucial for applying distance formula √(x_2-x_1)^2 + (y_2-y_1)^2 + (z_2-z_1)^2 and section formula in 3D geometry

Complete Solutions

Question 1

QUESTION

A point is on the x-axis. What are its y-coordinate and z-coordinates?

SOLUTION

The question asks us to determine the y and z coordinates of a point that lies on the x-axis in a three-dimensional space.

Step 1: Visualize the Coordinate System

Imagine the three-dimensional coordinate system with the x, y, and z axes perpendicular to each other. The x-axis is the horizontal line, the y-axis is the vertical line, and the z-axis comes out of the plane.

Step 2: Understand the Location of a Point on the x-axis

If a point lies on the x-axis, it means that it has moved only along the x-axis. It has not moved in the y-direction (up or down) or in the z-direction (in or out of the plane).

Step 3: Determine the y-coordinate

Since the point has not moved in the y-direction, its y-coordinate must be 0.

Step 4: Determine the z-coordinate

Similarly, since the point has not moved in the z-direction, its z-coordinate must also be 0.

Step 5: General Form of a Point on the x-axis

Therefore, any point on the x-axis will have the form (x, 0, 0), where x can be any real number.

Final Answer: The y and z coordinates are zero.

ANSWER

y and z - coordinates are zero

Question 2

QUESTION

A point is in the XZ-plane. What can you say about its y-coordinate?

SOLUTION

The question asks about the y-coordinate of a point that lies in the XZ-plane. This tests our understanding of coordinate geometry in three dimensions.

Step 1: Visualize the XZ-plane

Imagine the three-dimensional coordinate system with the x-axis, y-axis, and z-axis mutually perpendicular to each other. The XZ-plane is the plane formed by the x-axis and the z-axis. It's like a vertical wall passing through the x-axis and z-axis.

Step 2: Consider points in the XZ-plane

Any point in the XZ-plane can be reached by moving along the x-axis and then along the z-axis. There is no movement along the y-axis required to reach any point in this plane.

Step 3: Relate to coordinates

A general point in 3D space is represented as (x, y, z), where x, y, and z are the x-coordinate, y-coordinate, and z-coordinate, respectively. The XZ-plane consists of all points where the y-coordinate is zero.

Step 4: Express mathematically

The equation of the XZ-plane is given by . This means that for any point (x, y, z) to lie in the XZ-plane, its y-coordinate must be 0. So, the point will have the form (x, 0, z).

Step 5: Conclude

Therefore, if a point is in the XZ-plane, its y-coordinate is zero.

Final Answer: y - coordinate is zero

ANSWER

y - coordinate is zero

Question 3

QUESTION

Name the octants in which the following points lie:

(1, 2, 3), (4, −2, 3), (4, −2, −5), (4, 2, −5), (−4, 2, −5), (−4, 2, 5), (−3, −1, 6), (−2, −4, −7)

SOLUTION

This question tests our understanding of the octant system in three-dimensional geometry. We need to determine the octant in which each given point lies based on the signs of its x, y, and z coordinates.

Step 1: Recall the Octant Sign Conventions

In 3D space, the coordinate axes divide the space into eight octants. The signs of the x, y, and z coordinates determine the octant. Here's a summary:

- Octant I: (+, +, +)
- Octant II: (-, +, +)
- Octant III: (-, -, +)
- Octant IV: (+, -, +)
- Octant V: (+, +, -)
- Octant VI: (-, +, -)
- Octant VII: (-, -, -)
- Octant VIII: (+, -, -)

Step 2: Analyze each point and determine its octant

(i) (1, 2, 3): All coordinates are positive (+, +, +). Therefore, it lies in **Octant I**.

(ii) (4, −2, 3): The signs are (+, -, +). Therefore, it lies in **Octant IV**.

(iii) (4, −2, −5): The signs are (+, -, -). Therefore, it lies in **Octant VIII**.

(iv) (4, 2, −5): The signs are (+, +, -). Therefore, it lies in **Octant V**.

(v) (−4, 2, −5): The signs are (-, +, -). Therefore, it lies in **Octant VI**.

(vi) (−4, 2, 5): The signs are (-, +, +). Therefore, it lies in **Octant II**.

(vii) (−3, −1, 6): The signs are (-, -, +). Therefore, it lies in **Octant III**.

(viii) (−2, −4, −7): The signs are (-, -, -). Therefore, it lies in **Octant VII**.

Step 3: Final Answer

The octants are: I, IV, VIII, V, VI, II, III, VII

ANSWER

I, IV, VIII, V, VI, II, III, VII

Question 4

QUESTION

Fill in the blanks:

(i) The x-axis and y-axis taken together determine a plane known as _____.

(ii) The coordinates of points in the XY-plane are of the form _____.

(iii) Coordinate planes divide the space into _____ octants.

SOLUTION

This question tests our understanding of the fundamental concepts of three-dimensional geometry, specifically related to coordinate axes, planes, and octants.

(i) The x-axis and y-axis taken together determine a plane known as _____.

Step 1: Visualize the axes

Imagine the x-axis as a horizontal line and the y-axis as a vertical line, both intersecting at the origin.

Step 2: Recall the definition of a plane

A plane is a flat, two-dimensional surface that extends infinitely far. In a three-dimensional coordinate system, the x and y axes define a specific plane.

Step 3: Identify the plane

The plane formed by the x and y axes is called the XY-plane.

Answer: XY - plane

(ii) The coordinates of points in the XY-plane are of the form _____.

Step 1: Understand the XY-plane

The XY-plane is a two-dimensional plane where all points have an x-coordinate and a y-coordinate.

Step 2: Consider the z-coordinate

Since the XY-plane is a subset of the three-dimensional space, each point also has a z-coordinate. However, in the XY-plane, the z-coordinate is always zero.

Step 3: Express the coordinates

Therefore, the coordinates of any point in the XY-plane are of the form (x, y, 0).

Answer: (x, y, 0)

(iii) Coordinate planes divide the space into _____ octants.

Step 1: Recall coordinate planes

In three-dimensional space, we have three coordinate planes: the XY-plane, the YZ-plane, and the ZX-plane.

Step 2: Visualize the division of space

These three planes intersect at the origin and divide the entire space into eight regions.

Step 3: Define octants

Each of these eight regions is called an octant, analogous to quadrants in a two-dimensional plane.

Answer: Eight

ANSWER

(i) XY - plane

(ii) (x, y, 0)

(iii) Eight

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📌 Key Formulas

Important Formulas for Exercise 11.1

Formula / Concept	Description
Coordinates of a Point in 3D Space	A point in three-dimensional space is represented by an ordered triplet of real numbers (x, y, z). These numbers represent the signed distances from the origin along the x, y, and z-axes, respectively.
Coordinate Axes	Three mutually perpendicular lines (x-axis, y-axis, and z-axis) that intersect at a single point called the origin (0, 0, 0).

Formula / Concept	Description
Coordinate Planes	Three planes formed by the intersection of the coordinate axes: the XY-plane, YZ-plane, and ZX-plane. Any point on the XY-plane has a z-coordinate of 0, any point on the YZ-plane has an x-coordinate of 0, and any point on the ZX-plane has a y-coordinate of 0.
Distance Formula in 3D	The distance between two points P(x_1, y_1, z_1) and Q(x_2, y_2, z_2) in three-dimensional space is given by the formula: d = √(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2
Distance from Origin	The distance of a point Q(x, y, z) from the origin O(0, 0, 0) is given by: OQ = √x^2 + y^2 + z^2
Section Formula (Internal Division)	The coordinates of a point R(x, y, z) that divides the line segment joining points P(x_1, y_1, z_1) and Q(x_2, y_2, z_2) internally in the ratio m:n are: x = (mx_2 + nx_1)/(m+n), \ y = (my_2 + ny_1)/(m+n), \ z = (mz_2 + nz_1)/(m+n)
Section Formula (External Division)	The coordinates of a point R(x, y, z) that divides the line segment joining points P(x_1, y_1, z_1) and Q(x_2, y_2, z_2) externally in the ratio m:n are: x = (mx_2 - nx_1)/(m-n), \ y = (my_2 - ny_1)/(m-n), \ z = (mz_2 - nz_1)/(m-n)
Midpoint Formula	The coordinates of the midpoint of the line segment joining points P(x_1, y_1, z_1) and Q(x_2, y_2, z_2) (which is a special case of the section formula where m:n = 1:1) are: \left((x_1 + x_2)/(2), (y_1 + y_2)/(2), (z_1 + z_2)/(2) \right)

Top FAQs

Q1. How many questions are in NCERT Solutions Class 11 Maths Chapter 11 Introduction to Three Dimensional Geometry Exercise 11.1?

Exercise 11.1 of NCERT Solutions Class 11 Maths Chapter 11 Introduction to Three Dimensional Geometry contains exactly 4 questions. These questions focus on fundamental concepts of coordinate axes and planes in three-dimensional geometry, helping students build a strong foundation for the CBSE board exam 2025-26.

Q2. Where can I download free PDF of NCERT Solutions for Class 11 Maths Chapter 11 Introduction to Three Dimensional Geometry Exercise 11.1?

You can download the free PDF of NCERT Solutions for Class 11 Maths Chapter 11 Introduction to Three Dimensional Geometry Exercise 11.1 from the official NCERT website or various educational platforms offering CBSE resources. These step by step solutions are specifically designed for the 2025-26 academic session and include detailed explanations for all 4 questions in Exercise 11.1.

Q3. How many marks does Introduction to Three Dimensional Geometry carry in CBSE Class 11 board exam 2025-26?

Introduction to Three Dimensional Geometry (Chapter 11) carries approximately 3 marks in the CBSE Class 11 board exam 2025-26 as part of Unit III - Coordinate Geometry. Students should thoroughly practice NCERT Solutions for Class 11 Maths Chapter 11 Exercise 11.1 to score well in questions based on distance formula in 3D and section formula in 3D.

Q4. Which is the most difficult question in Exercise 11.1 of NCERT Solutions Class 11 Maths Chapter 11 Introduction to Three Dimensional Geometry?

Question 4 is generally considered the most challenging in Exercise 11.1 of NCERT Solutions Class 11 Maths Chapter 11 Introduction to Three Dimensional Geometry as it requires understanding of coordinate planes and their intersections. However, with step by step solutions and regular practice, students can master this concept effectively for the CBSE board exam 2025-26.

Q5. What is the Distance Formula in 3D covered in NCERT Solutions for Class 11 Maths Chapter 11 Introduction to Three Dimensional Geometry Exercise 11.1?

The Distance Formula in 3D states that the distance between two points $P(x_1, y_1, z_1)$ and $Q(x_2, y_2, z_2)$ is $\sqrt{[(x_2-x_1)^2 + (y_2-y_1)^2 + (z_2-z_1)^2]}$. This fundamental concept is extensively used in NCERT Solutions Class 11 Maths Chapter 11 Exercise 11.1 and is crucial for solving three-dimensional geometry problems in CBSE board exam 2025-26.

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