

MATHEMATICS • CLASS 11

CHAPTER 11

Introduction to Three Dimensional Geometry

NCERT SOLUTIONS



EXERCISE 11.1 – QUESTIONS 1, 2 & 4

Q1. Find the form of a point on the x -axis.

Solution:

A point on the x -axis has its y - and z -coordinates both equal to 0.

Hence, a point on the x -axis has the form

$$(x, 0, 0)$$

Q2. Find the form of a point in the XZ -plane.

Solution:

A point in the XZ -plane has its y -coordinate equal to 0.

Hence, a point in the XZ -plane has the form

$$(x, 0, z)$$

Q4.

(i) Show that the x -axis and y -axis determine the XY -plane.

Solution:

The x -axis and y -axis determine the XY -plane.

(ii) Find the form of points in the XY -plane.

Solution:

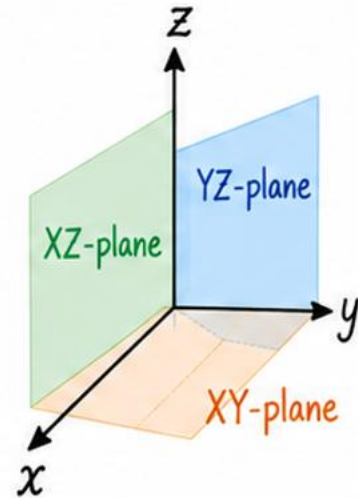
Points in the XY -plane have the form

$$(x, y, 0)$$

(iii) How many octants do the three coordinate planes divide the space into?

Solution:

The three coordinate planes divide the space into eight octants.



EXERCISE 11.1 – QUESTION 3

Find the octant in which each of the following points lies.

Solution:

Point (x, y, z)	Signs of (x, y, z)	Octant
$(1, 2, 3)$	$(+, +, +)$	I
$(4, -2, 3)$	$(+, -, +)$	IV
$(4, -2, -5)$	$(+, -, -)$	VIII
$(4, 2, -5)$	$(+, +, -)$	V
$(-4, 2, -5)$	$(-, +, -)$	VI
$(-4, 2, 5)$	$(-, +, +)$	II
$(-3, -1, 6)$	$(-, -, +)$	III
$(-2, -4, -7)$	$(-, -, -)$	VII

EXERCISE 11.2 – QUESTION 1

(i) Solution (i):

Using distance formula in 3D,
for $(2, 3, 5)$ and $(4, 3, 1)$,

$$\begin{aligned}d &= \sqrt{(4-2)^2 + (3-3)^2 + (1-5)^2} = \sqrt{(-2)^2 + 0^2 + 4^2} \\&= \sqrt{20} = 2\sqrt{5}.\end{aligned}$$

(ii) Solution (ii):

Using distance formula in 3D,
for $(-3, 7, 2)$ and $(2, 4, -1)$,

$$\begin{aligned}d &= \sqrt{(2-(-3))^2 + (4-7)^2 + (-1-2)^2} = \sqrt{5^2 + (-3)^2 + (-3)^2} \\&= \sqrt{43}.\end{aligned}$$

(iii) Solution (iii):

Using distance formula in 3D,
for $(-1, 3, -4)$ and $(1, -3, 4)$,

$$\begin{aligned}d &= \sqrt{(1-(-1))^2 + (-3-3)^2 + (4-(-4))^2} = \sqrt{2^2 + (-6)^2 + 8^2} \\&= \sqrt{104} = 2\sqrt{26}.\end{aligned}$$

(iv) Solution (iv):

Using distance formula in 3D,
for $(2, -1, 3)$ and $(-2, 1, 3)$,

$$\begin{aligned}d &= \sqrt{(-2-2)^2 + (1-(-1))^2 + (3-3)^2} = \sqrt{(-4)^2 + 2^2 + 0^2} \\&= \sqrt{20} = 2\sqrt{5}.\end{aligned}$$

EXERCISE 11.2 – QUESTIONS 2 & 3(i)

Q2. The points $A(-2, 3, 5)$, $B(1, 2, 3)$ and $C(7, 0, -1)$ are given. Show that the points A , B and C are collinear and find the order in which they lie on a line.

Displacement vectors:

$$\begin{aligned}\vec{AB} &= (1 - (-2), 2 - 3, 3 - 5) \\ &= (3, -1, -2)\end{aligned}$$

$$\begin{aligned}\vec{BC} &= (7 - 1, 0 - 2, -1 - 3) \\ &= (6, -2, -4) = 2(3, -1, -2) = 2\vec{AB}\end{aligned}$$

Since $\vec{BC}$ is a scalar multiple of $\vec{AB}$, the points A , B and C are collinear.

As $\vec{BC} = 2\vec{AB}$, the order is A, B, C .

Q3(i). The points $A(0, 7, -10)$, $B(1, 6, -6)$ and $C(4, 9, -6)$ are given. Show that the triangle ABC is an isosceles triangle.

Calculations:

$$\begin{aligned}AB^2 &= (1 - 0)^2 + (6 - 7)^2 + (-6 - (-10))^2 \\ &= 1 + 1 + 16 = 18\end{aligned}$$

$$\begin{aligned}BC^2 &= (4 - 1)^2 + (9 - 6)^2 + (-6 - (-6))^2 \\ &= 9 + 9 + 0 = 18\end{aligned}$$

$$\begin{aligned}AC^2 &= (4 - 0)^2 + (9 - 7)^2 + (-6 - (-10))^2 \\ &= 16 + 4 + 16 = 36\end{aligned}$$

Thus $AB = BC = 3\sqrt{2}$. Hence the triangle ABC is an isosceles triangle.



FREE PREVIEW

[Click here to visit our website](#)

SCHOOL NOTES & NCERT SOLUTIONS

Complete notes and
NCERT solutions are
available on
FirstHope app only.



[Scan or click here](#)

Click here to get the app

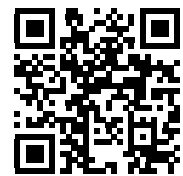


Available on Google Play

JOIN THE FIRSTHOPE COMMUNITY

Join our Telegram channel

Click here to join Telegram



[Scan or click here](#)

@FirstHope_CBSE_Notes

Instagram

@firsthope.school

[Click here to follow >](#)

YouTube channel

@firsthope.school

[Click here to watch >](#)

FirstHope website

firsthope.co.in

[Click here to visit our website >](#)

CBSE / Class 9 / Class 10 / Class 11 / Class 12

Preview notes and NCERT solutions. Full PDFs in the FirstHope app.