# MATHS

# NCERT - NCERT MATHEMATICS(HINGLISH)

# INTRODUCTION TO THREE DIMENSIONAL GEOMETRY

Exercise 12 3

**1.** Find the coordinates of the point which divides the line segment joining the points $(2, 3, 5)$ and $(1, 4, 6)$ in the ratio

(i) $2 : 3$ internally, (ii) $2 : 3$ externally.

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**2.** Find the ratio in which the YZplane divides the line segment formed by joining the points $(-2, 4, 7)$ and $(3, -5, 8)$.

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**3.** Given that $P(3, 2, 4)$, $Q(5, 4, 6)$ and $R(9, 8, 10)$ are collinear. Find the ratio in which Q divides PR.

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**4.** Find the coordinates of the points which trisect the line segment joining the points $P(4, 2, 6)$ and $Q(10, 16, 6)$.

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**5.** Using section formula, show that the points $A(2, 3, 4),$ $B(1, 2, 1)$ and $C\left(0, \dfrac{1}{3}, 2\right)$ are collinear.

**Exercise 12 2**

**1.** Find the equation of the set of points which are equidistant from the points $(1, 2, 3)$ and $(3, 2, 1).$

**2.** Find the equation of the set of points P, the sum of whose distances from A (4, 0, 0) and B (–4, 0, 0) is equal to 10

**3.** Show that the points $(-2, 3, 5)$, $(1, 2, 3)$ and $(7, 0, -1)$ are collinear.

**4.** Verify the following:(i) $(0, 7, 10)$, $(1, 6, 6)$ and $(4, 9, 6)$are the vertices of an isosceles triangle.

**5.** Find the distance between the following pairs of points:

(i) $(2, 3, 5)$and $(4, 3, 1)$

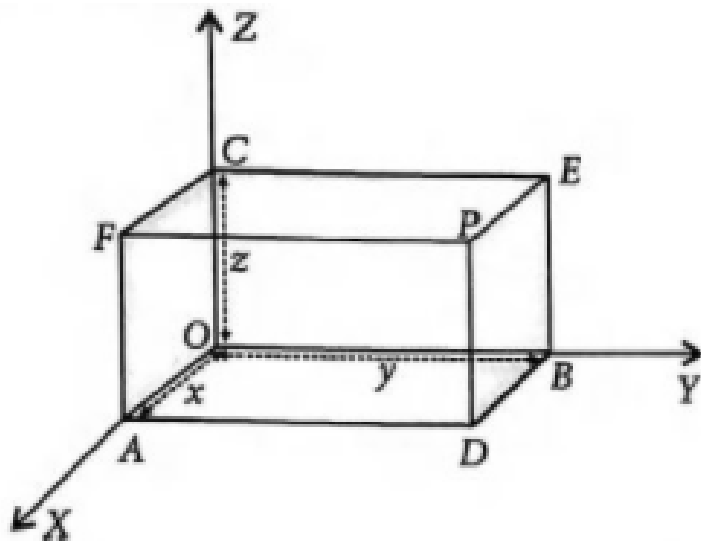(ii) $(3, 7, 2)$and $(2, 4, 1)$

(iii) $(1, 3, 4)$ and $(1, 3, 4)$

(iv) $(2, 1, 3)$ and $(2, 1, 3)$.

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**Solved Examples**

**1.** In Figure, if P is $(2, 4, 5)$, find the coordinates of F.

**2.** Find the equation of the circle with center $(-3, 2)$ and radius 4

**3.** Find the distance between the points $P(1, -3, 4)$ and $Q(-4, 1, 2)$.

**4.** Show that the points $P(-2, 3, 5)$, $Q(1, 2, 3)$ and R $(7, 0, -1)$ are collinear.

**5.** Are the points

$A(3, 6, 9),\ B(10, 20, 30) and\ C(25,\ -41, 5),$

the vertices of a right angled triangle?

**6.** Find the equation of set of points P such that $PA^2 + PB^2 = 2k^2$, where A and B are the points $(3, 4, 5) and\ (-1, 3, -7),$ respectively.

**7.** Find the coordinates of the point which divides the line segment joining the points $(1, 2, 3)$ and $(3, 4, 5)$ in the ratio $2 : 3$ (i) internally, and (ii) externally.

**8.** Using section formula, prove that the three points $(4, 6, 10)$, $(2, 4, 6)$ and $(14, 0, 2)$ are collinear.

**9.** Find the coordinates of the centroid of the triangle whose vertices are $(x_1, y_1, z_1)$, $(x_2, y_2, z_2)$ and $(x_3, y_3, z_3)$.

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**10.** Find the ratio in which the line segment joining the points $(4, 8, 10)$ and $(6, 10, -8)$ is divided by the YZplane.

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**11.** The centroid of a triangle ABC is at the point $(1, 1, 1)$. If the coordinates of A and B are $(3, 5, 7)$ and $(1, 7, 6)$, respectively, find the coordinates of the point C.

**12.** Find the equation of the set of the points P such that its distances from the points $A(3, 4, -5)$ and B $(-2, 1, 4)$ are equal.

**13.** Show that the points $A(1, 2, 3)$, $B(1, 2, 1)$, $C(2, 3, 2)$and $D(4, 7, 6)$are the vertices of a parallelogram ABCD, but it is not a rectangle.

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**Miscellaneous Exercise**

**1.** If the origin is the centroid of the triangle PQR with vertices $P(2a, 2, 6)$, $Q(4, 3b, 10)$and

$R(8, 14, 2c)$, then find the values of a, b and c.

**2.** Find the lengths of the medians of the triangle with vertices $A(0, 0, 6)$, B $(0, 4, 0)$and $(6, 0, 0)$.

**3.** A point R with xcoordinate 4 lies on the line segment joining the points $P(2, 3, 4)$and

$Q(8, 0, 10)$. Find the coordinates of the point

R.

**4.** Find the coordinates of a point on y axis

which are at a distance of $5\sqrt{2}$from the point

$P(3, 2, 5)$.

**5.** If A and B be the points $(3, 4, 5)$ and $(-1, 3, -7)$, respectively, find the equation of the set of points P such that $PA^2 + PB^2 = k^2$, where k is a constant.

**6.** Three vertices of a parallelogram ABCD are $A(3, 1, 2)$, $B(1, 2, 4)$ and $C(1, 1, 2)$. Find the coordinates of the fourth vertex.

**1.** 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____

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**2.** Name the octants in which the following points lie:$(1, 2, 3), (4, -2, 3), (4, -2, -5),$ $(4, 2, -5),$ $(-4, 2, -5),$ $(-4, 2, 5),$ $(-3, -1, 6),(2, -4, -7).$

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

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