MATHS

BOOKS - NAGEEN PRAKASHAN ENGLISH

INTRODUCTION OF THREE DIMENSIONAL GEOMETRY

Example

1. Find the octant in which the following points lie :

(i) (2,3,-5) (ii) (-3,1,4)

(iii) (-1,-1,2) (iv) (1,1,3)

(v) (-5,-4,-1) (vi) (4,-1,2)

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2. Find the planes in which following points lie :

(i) (5,0,-3) (ii) (1,2,0)

(iii) (0,-1,3)

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3. A point lies on the x-axis. Find its y and z-cordinates

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4. Find the distance between the points A(-2,1,3) and B(1,2,6).

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5. Using distance formula prove that the following points are collinear: $A(4, -3, -1)$, $B(5, -7, 6)$ and $C(3, 1, -8)$

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6. Show that the points A(2,-1,3),B(1,-3,1) and C(0,1,2) are the vertices of an isosceles right angled triangle.

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7. Show that the points A(2,3,5),B(-4,7,-7),C(-2,1,-10) and D(4,-3,2) are the vertices of a rectangle.

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8. Find the locus of a point whose each point is equidistant from the points A(2,3,-4) and B(-1,2,3).

9. Find the point on y-axis which is equidistant from the points $(3, 1, 2)$ and $(5, 5, 2)$.

10. Find the locus of the point, the sum of whose distances from the points $A(4, 0, 0) and B(- 4, 0, 0)$ is equal to 10.

11. If the distance between the points (1,-8,a) and (-3,-5,4) is 5 units then find the value of 'a'.

12. Find the co-ordinates of the point which divides the line segment joining the points $(2, 3, -4)$ and $(4, -1, 2)$ in the ratio (i) $2:3$ internally, (ii) $4:3$ externally.

13. Find the co-ordinates of the points of trisection of the line segment joining the points A(2, -3, 5) and B(6, 0, -1).

14. Find the ratio in which yz-plane divides the line segment joining the points P(-1, 3,2) and Q(3, -4,5). Also find the co-ordinates of point of division.

15. Find the ratio in which the plane 2x-3y+z=8 divides the line segment joining the points A(3, -2,1) and B(1, 4, -3). Also find the point of intersection of the line and the plane.

16. $A(3, 2, 0), B(5, 3, 2)C(-9, 6, -3)$ are three points forming a triangle. AD, the bisector of angle BAC meets BC in D. Find the coordinates of the point D.

17. Using section formula, prove that the three points $A(-2, 3, 5)$, $B(1, 2, 3)$ and $C(7, 0, -1)$ are collinear.

18. The three vertices of a parallelogram ABCD are A(-1,3,4), B(2,-1,3) and C(5,1,2). Find the co-ordinates of its 4th vertex D.

19. Find the ratio, in which the plane $x + y + z = \dfrac{1}{5}$ divides the line joining the points $(3, 1, 4)$ and $(4, 2, 5)$.

Exercise 12 A

1. If a point lies on X-axis, then what are its y and z co-ordinates ?

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2. If a point lies in xz-plane, what is its y co-ordinate ?

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3. In which plane the following points lie :

(i) (1,3, 0)

(ii) (-2, 0, 4)

(iii) (0, 4, -1)

4. In which octant the following points lie :

(i) (2, 1, 4) (ii) (-1,2,4)

(iii) (1,-3, 2) (iv) (1, 5,-6)

(v) (2, -1, -3) (vi) (-2, 3, -5)

(vii) (-4, -1, 3) (viii) (-1, -2, 3)

5. Findthe distance of $P(a, b, c)$ from x,y and z-axes.

1. Find the distance between the following pairs of points :

(i) (-2, 1, -3) and (4, 3, -6)

(ii) (9, -12, -8) and (0,0,0)

(iii) (2,1,-3) and (2, 3, -3)

(iv) (1,0,0) and (4, 4, 5)

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2. Show that the following points are collinear :

(i) (0,7,-7), (1,4,-5), (-1, 10,-9)

(ii) (3,-5,1), (-1,0,8), (7,-10,-6)

(iii) (-2,3,5),(7,0,-1),(1,2,3)

3. Show that the points (0,7,10), (-1,6,6) and(-4,9,6) are the vertices of an isosceles right angled triangle.

4. Show that the points (-4,-4,-1),(0,2,3) and (4,6,-3) are the vertices of an isosceles triangle.

5. Show that the points (-2,4,1),(-1,5,5),(2,2,5) and (1,1,1) are the vertices of a square.

6. Prove that the point

$$A(1, 3, 0), \ B(-5, 5, 2), \ C(-9, \ -1, 2) \ and \ D(-3, \ -3, 0)$$

taken in order are the vertices of a parallelogram. Also, show

that ABCD is not a rectangle.

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7. Show that the points

$$A(1, 3, 4), \ B(-1, 6, 10), \ C(-7, 4, 7) and \ D(-5, 1, 1)$$

are have vertices of a rhombus.

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8. Show that the points

$A(3, 3, 3,), \ B(0, 6, 3), \ C(1, 7, 7) and \ D(4, 4, 7)$ are the vertices of a square.

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9. 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 not a rectangle.

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10. Show that the points A(2,-1,3),B(1,-3,1) and C(0,1,2) are the vertices of an isosceles right angled triangle.

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11. Determine the points in i. xy-plane which re equidistant from the points $A(1, \ -1, 0), \ B(2, 1, 2), \ and \ C(3, 2, \ -1 \,)$

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12. Find a point on Z-axis which is equidistant from the points (1,5,7) and (5,1,-4).

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13. Find the points on z-is which are t a distance $\sqrt{21}$ from the point (1,2,3).

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14. If $A(-2, 2, 3) and B(13, -3, 13)$ are two points. Find the locus of a point P which moves in such a way that $3PA = 2PB.$

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15. If A(3,4,1) and B(-1,2,3) are two points, then find the locus of a moving point P such that $PA^2 + PB^2 = 2k^2.$

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16. The coordinates of the point which is equidistant from the points O(0,0,0) A (a,0,0), B(0,b,0) and C(0,0,c)

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17. Find the locus of a point which moves in such a way that the sum of its distances from the points $(a, 0, 0)$ and $(a, 0, 0)$ is constant.

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18. A moving point 'P' moves such that $AP^2 + BP^2 = 10$ where the co-ordinates of the points A and B are respectively (2,3,-4) and (0,0,1).

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Exercise 12 C

1. Find the co-ordinates of a point which divides the line segment joining P(5, 4, 2) and Q(-1, -2, 4) in the ratio 2 : 3.

2. If the given points A(3, 3, -4), B(5, 4, -6) and C(9, 8, -10) are collinear, then the ratio in which

A divides BC is

3. (i) Find the ratio in which yz-plane divides the join of points (2, 4, 7) and (-3,5,8).

(ii) Find the ratio in which yz-plane divides the line joining of the points (-3,1,4) and (2, -7, 3).

4. Find the ratio in which the line segment having the end points $A(- 1, - 3, 4)$ and $B(4, 2, - 1)$ is divided by the $xz -$ plane. Also, find the coordinates of the point of division.

5. Find the coordinates of the point where the line through $(3, 4, 1)$ and $(5, 1, 6)$ crosses XY-plane.

6. Find the ratio in which the line joining the points $(1, 2, 3) and (- 3, 4, - 5)$ is divided by the $xy - plane$. Also, find the coordinates of the point of division.

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7. Find the ratio in which the join the $A(2, 1, 5) and B(3, 4, 3)$ is divided by the plane $2x + 2y - 2z = 1$. Also, find the coordinates of the point of division.

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8. Find the coordinates of the points which trisect the line segment AB, given that $A(2, 1, - 3)$ and $B(5, - 8, 3)$

9. Find the co-ordinates of a point which divides the line segment joining the points $A(2, -1, 3)$ and $B(4, 3, 1)$ in the ratio $3 : 4$ externally.

10. The co-ordinates of the vertices of a parallelogram ABCD are A(-1,2,3), B(2, -4,1) and C(1,2,-1). Find the co-ordinates of its 4th vertex.

11. Show that the points $(2, 3, 4), (-1, -2, 1), (5, 8, 7)$ are collinear.

12. Find the ratio in which the line segment joining the points (2,-1,3) and (-1,2,1) is divided by the plane $x + y + z = 5$.

13. Find the ratio in which the sphere $x^2 + y^2 + z^2 = 504$ divides the line joining the points (12,-4,8) and (27,-9,18).

14. The vertices f the triangle are $A(5, 4, 6),\ B(1,\ -1,\ 3)nad\ C(4,\ 3,\ 2).$ The internal bisector of angle A meets BC at D. Find the coordinates of D and the length AD.

15. The co-ordinates of two vertices of $\triangle ABC$ are A(-5,7,3) and B(7,-6,-1). The co-ordinates of its centroid are (1,1,1). Find the co-ordinates of vertex C.

16. The co-ordinates of two vertices of $\triangle ABC$ are A(3,2,-4) and B(-2,3,-1). If its centroid is (3,1,0), then find the co-

ordinates of vertex C.

17. If the origin is the centroid of a triangle ABC having vertices $A(a, 1, 3), \ B(-2, b, -5) and \ C(4, 7, c)$, find the values of $a, b,$ ·

18. The mid points of the sides of as triangle are (1, 5, -1), (0, 4, -2) and (2, 3, 4). Find its vertices.

19. The co-ordinates of two vertices of $\triangle ABC$ are A(8,-9,8) and B(1,2,3). The medians of the triangle meet at the point (5,-2,4). Find the co-ordinates of the vertex C.

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Exercise 12 1

1. A point is on the xaxis. What are its ycoordinate and zcoordinates?

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2. A point is in the XZplane. What can you say about its ycoordinate?

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

4. Fill in the blanks: (i) The xaxis and yaxis taken together determine a plane known as____ (ii) The coordinates of points in the XYplane are of the form_____ (iii) Coordinate planes divide the space into ____ octants___

Exercise 12 2

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

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

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

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

5. Find the locus of the point, the sum of whose distances from the points $A(4, 0, 0)$ and $B(-4, 0, 0)$ is equal to 10.

1. Find the coordinates of the point which divides that line segment joining the points

(-2, -2, -2) and (1, 4, 6) in the ratio (i) 2 : 3 internally, (ii) 2 : 3 externally.

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

4. 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.

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

1. 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 D.

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

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3. 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.

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. A point R with x-coordinates 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.

6. If A and B be the points $(3, 4, 5)$ and $(-1, 3, -7)$ respectively, find the locus of P such that $PA^2 + PB^2 = k^2$.