



MATHS

BOOKS - NAGEEN MATHS (HINGLISH)

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-coordinates

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

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

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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.

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

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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.

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

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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.

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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.

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16. $A(3, 2, 0)$, $B(5, 3, 2)$ and $C(-9, 6, -3)$ are the vertices of a triangle ABC if bisector of angle BAC meets BC at D , then co-ordinates of D are



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



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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.



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



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Exercise 12 A

1. A point lies on the x-axis. Find its y and z-coordinates

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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) $(0, 4, -1)$



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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) $(-1, -2, 3)$



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



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Exercise 12 B

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

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

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

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



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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 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 $(2, -1, 3)$, $(0, 1, 2)$ and $(1, -3, 1)$ are the vertices of an isosceles right angled triangle.

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11. Determine the points in i. xy-plane ii. yz-plane and iii. zx-plane which are 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 $(5,1,-4)$.

A. $\left(0, \frac{3}{2}, 0\right)$

B. $\left(0, 0, \frac{3}{2}\right)$

C. $\left(0, \frac{3}{2}, 0\right)$

D. $\left(\frac{3}{2}, 0, 0\right)$

Answer: B



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

- A. $(7, 7, 0), (0, -1, 0)$
- B. $(0, 7, 0), (0, 1, 0)$
- C. $(0, -7, 0), (0, -1, 0)$
- D. $(0, 7, 0), (0, -1, 0)$

Answer: D



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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. Find the point which equidistant from points $O(0, 0, 0)$, $A(a, 0, 0)$, $B(0, b, 0)$ and $(0, 0, c)$

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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 $2 : 3$.

A. $\left(\frac{13}{5}, \frac{8}{5}, \frac{14}{5}\right)$

B. $\left(-\frac{13}{5}, \frac{8}{5}, \frac{14}{5}\right)$

C. $\left(\frac{13}{5}, -\frac{8}{5}, \frac{14}{5}\right)$

D. $\left(\frac{13}{5}, \frac{8}{5}, -\frac{14}{5}\right)$

Answer: A



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

A. 2:1

B. 3:1

C. 1:2

D. 3:2

Answer: C



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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 $(2, -7, 3)$.



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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.

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

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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 $B(5, -8, 3)$.



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9. (i) 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.

(ii) The 'x' co-ordinate of a point on line segment joining the points $(2, -3, 4)$ and $(8, 0, 10)$ is 4. Find the co-ordinate of this point.

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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.

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11. (i) Using section formula, show that the points A(-2, 3,5), B(1,2,3) and C(7,0,-1) are collinear.

(ii) Using division formula, prove that the points (2,3,4),(-1,-2,1) and (5,8,7) are collinear.

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

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

$(27, -9, 18)$ internally is



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



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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.



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16. The co-ordinates of two vertices of ΔABC 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 .

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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, c .

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



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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 lies on the x-axis. Find its y and z-coordinates



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

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3. Name the octant in which each of the following points lie.

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

(4,-2,-5), (iv)(4,2,-5),

(v)(-4,2,5), (iv)(-3,-1,6),

(vii)(2,-4,-7), (viii),(-4,2,-5)

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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 ___



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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).



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2. Show that the points

(- 2, 3, 5), (1, 2, 3) and (7, 0, - 1) are collinear.

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

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

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5. 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.

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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. 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 $(3, 5, 8)$.

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

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

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Miscellaneous Exercise

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.

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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 .



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4. Find the coordinates of a point on y axis which are at a distance of $5\sqrt{2}$ from the point $P(3, 2, 5)$.



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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 .



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6. If A and B be the points $(3, 4, 5)$ and $(9 - 1, 3, -7)$ respectively find the equation of set of points P such that $PA^2 + PB^2 = k^2$, where k is a constant.



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