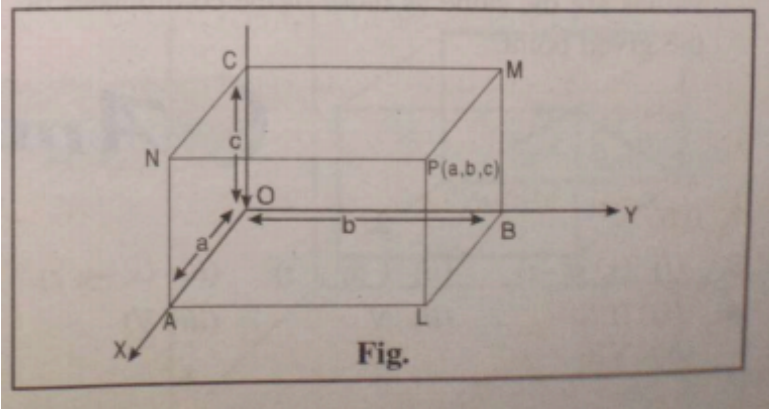# MATHS

BOOKS - MODERN PUBLICATION

INTRODUCTION TO THREE DIMENSIONAL GEOMETRY
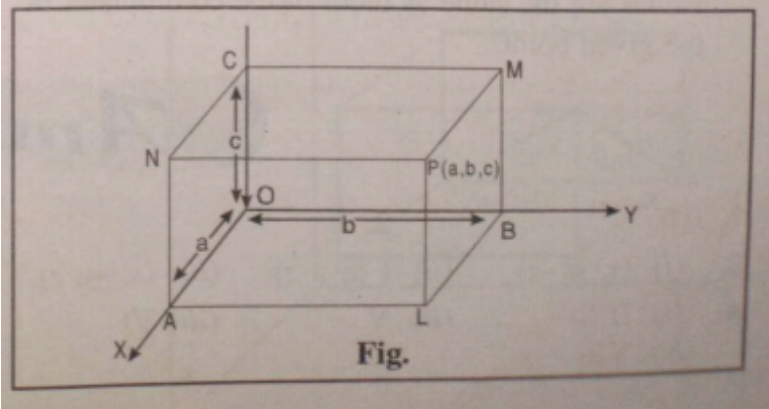
Example

1. In the figure, if P is (a, b, c), find the co-ordinates of A, B, C and L, M, N.

Fig.
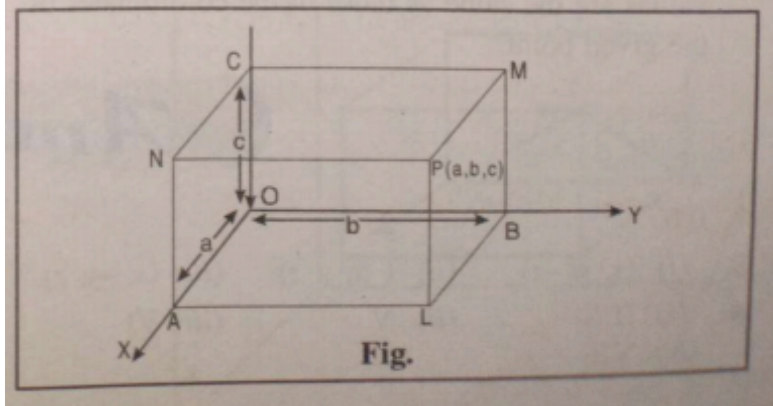
2. In the figure, if P is (2, 4, 5), find the co-ordinates of N.

Fig.

3. In the figure, find the co-ordinates of the reflection (image) of P in the XY-plane.

Fig.

4. Name the octant in which the following points lie : (1, 2, 3).

5. Name the octant in which the following points lie : (4,-2,3).

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6. Name the octant in which the following points lie : (4,-2,-5).

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7. Name the octant in which the following points lie : (4, 2, - 5) .

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8. Name the octant in which the following points lie : (- 4, 2, - 5).

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9. Name the octant in which the following points lie : (-4, 2, 5).

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10. Name the octant in which the following points lie : (- 3, -1, 6).

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11. Name the octant in which the following points lie : (2, - 4, - 7).

12. Find the distance between points : A(2,3,5) and B (4, 3, 1).

13. Find the value of x, so that the point (6,5,-3) is at a distance of 13 units from the point (x,-7,0).

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

15. Using distance formula, show that the points A(-3, 2, 4), B(- 1, 5, 9) and C (1, 8, 14) are collinear.

16. Show that the triangle with vertices (6, 10, 10), (1, 0, - 5) and (6, - 10, 0) is a right-angled triangle.

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

18. Show that the points $(5, -1, 1)$, $(7, -4, 7)$, $(1, -6, 10)$ and $(-1, -3, 4)$ are the vertices of a rhombus.

19. Find the co-ordinates of the point, which is equidistant from four points (0, 0, 0), (a, 0, 0), (0, b, 0) and (0, 0, c).

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

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

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

23. Find the co-ordinates of the point R, which divides [PQ] externally in the ratio 2: 1 and verify that Q is the mid-point of PR.

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24. A point R with x-co-ordinate 4 lies on the line segment joining the points P(2,-3,4) and Q(8,0,10). Find the co-ordinate of the point R.

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25. Find the ratio in which the plane $3x + 4y - 5z = 1$ divides the line joining the points (-2, 4, -6) and (3, - 5, 8).

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

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27. A (3, 2, 0), B(5, 3, 2), C(- 9, 6, -3) are three points forming a triangle. AD, the bisector of $anl \geq BAC$ meets [BC] at D. Find the co-ordinates of D.

28. Show that the points (3, -1, -1), (5,-4, 0), (2, 3, -2) and (0, 6, -3) are the vertices of a parallelogram*.

29. Find the third vertex of the triangle whose centroid is (7, -2, 5) and whose other two vertices are (2, 6,-4) and (4, -2, 3).

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30. Prove that the lines joining the vertices of a tetrahedron to the centroids of the opposite faces are concurrent.

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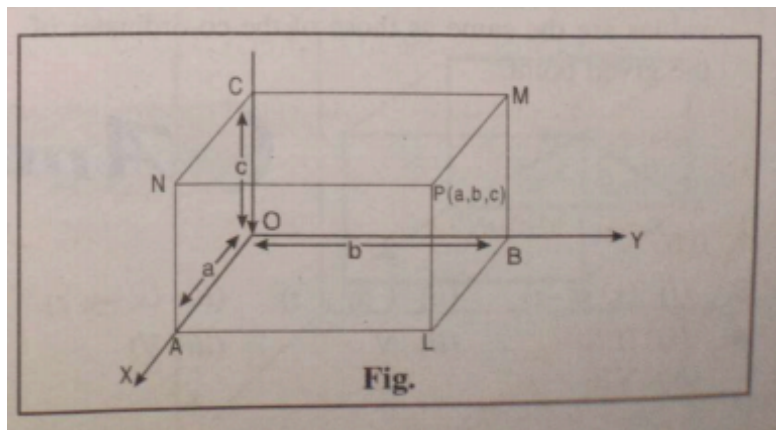**1.** A point is on x-axis. What are its y-co-ordinate and z-co-ordinate ?

▶ **Watch Video Solution**

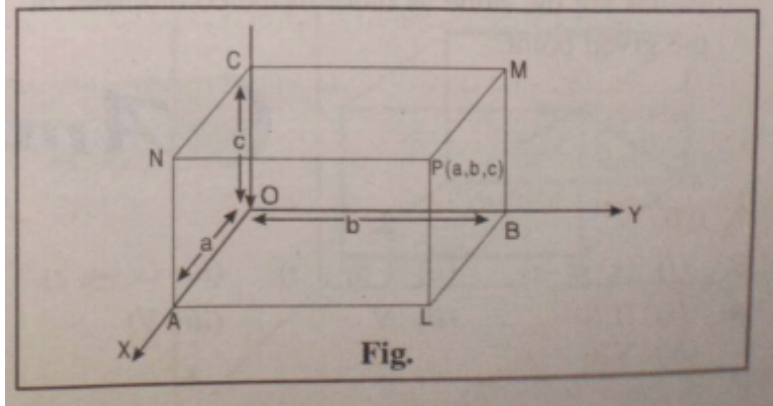**2.** A point is in the XZ-plane. What can you say about its y-co-ordinate ?

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3. In the figure, find the reflection of P(x, y, z) in the: XY-plane.
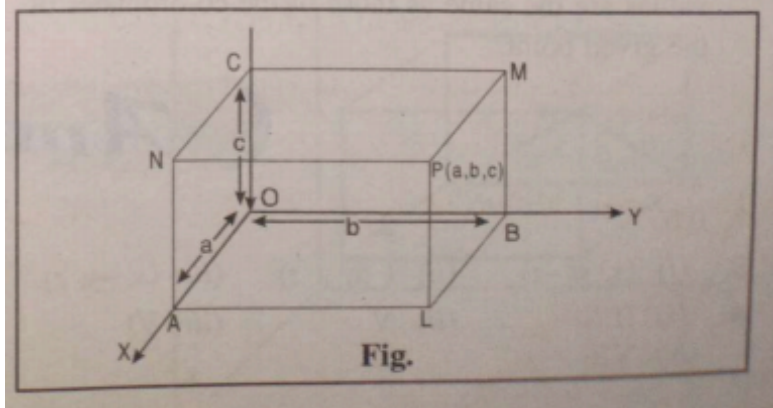

Fig.

4. In the figure, find the reflection of P(x, y, z) in the: YZ-plane.

Fig.

5. In the figure, find the reflection of P(x, y, z) in

the: ZX-plane.

Fig.

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

(- 3, 1, 2).

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

(3, 1, - 2) .

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

(- 3, 1, - 2) .

▶ Watch Video Solution

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

(- 3, - 1, - 2).

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10. Write the perpendicular distance of the point (x, y, z) from the three co-ordinate planes. (Assume that x, y, z are all positive)

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11. The co-ordinates of a point are (1, -2, 7). Find the co-ordinates of the seven points whose absolute values are the same as those of the co-ordinates of the given point.

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12. Write the co-ordinates of the feet of perpendicular from the point (a, b, c) on the co-ordinate axes.

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13. Find the image of the point in the specified plane :

(5,4,-3) in the XY-plane.

14. Find the image of the point in the specified plane :

(-2,0,0) in the XY-plane.

15. Find the image of the point in the specified plane :

(-3, 4, 7) in the YZ-plane.

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16. Find the image of the point in the specified plane :

(- 7, 2, -1) in the ZX-plane.

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17. Find the image of the point in the specified plane :

(- 4,0, 1) in the ZX-plane.

18. Find the perpendicular distances of the point P (a, b, c) from the co-ordinate axes.

19. Planes are drawn parallel to co-ordinate planes through the points (3, 0, -1) and (-2, 5, 4). Find the lengths of the edges of the parallelopiped so formed.

20. Fill in the blanks :

The x-axis and y-axis, taken together, determine a plane, known as ....

21. The co-ordinate of points in the xy-plane are of the form ....

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22. Co-ordinate planes divide the space into .... Octants.

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23. Find the distance between the points :

(1, -3,4) and (- 4, 1, 2) .

24. Find the distance between the points :

(- 3,7,2) and (2, 4, - 1) .

25. Find the distance between the points :

(- 1,3, - 4) and (1, - 3, 4) .

26. Find the distance between the points :

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

27. 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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28. Find the locus of a point, which is equidistant from the points (-1, 2, 3) and (3, 2, 1).

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29. Find the locus of a point, which moves so that its distance from (1, 2, 3) is four times its distance from YZ-plane.

30. Find the points on the X-axis, which are at a distance of $2\sqrt{6}$ units from the point (1,-2, 3).

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

32. Find k so that the distance between the points (7, 1, - 3) and (4,5, k) be 13 units.

33. Prove that the following points are collinear :

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

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34. Prove that the following points are collinear :

(2, - 1, 3), (4, 3, 1), (3, 1, 2).

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35. Prove that the following points are collinear :

$(6, -7, -1), (2, -3, 1), (4, -5, 0).$

36. Prove that the following points are collinear :

$(-1, 4, -2), (2, -2, 1), (0, 2, -1).$

37. Prove that the following points are collinear :

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

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38. Prove that the following points are collinear :

(2,- 4,1), (4, 4, 3), (3, 0, 2).

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39. Prove that the following points are collinear :

(4, 5, - 5), (0, - 11, 3), (2, - 3, -1).

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40. Prove that the following points are collinear :

(1, 2, 3), (4, 0, 4), (-2, 4, 2).

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41. Prove that the following points are collinear :

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

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42. Verify that the points (3, - 2, 4), (1, 0, - 2) and (-1,2, - 8) are collinear.

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43. Show that the triangle with vertices (0, 7, 10), (-1, 6, 6) and (- 4, 9, 6) is right-angled.

44. Are the points A (3, 6, 9), B (10, 20, 30) and C (25,- 41, 5) the vertices of a right-angled triangle ?

45. Prove that the points (0, 7,-10), (1, 6,-6) and (4,9, - 6) are the vertices of an isosceles triangle.

46. Show that $A(a,b,c), B(b,c,a)$ and $C(c,a,b)$ are the vertices of an equilateral triangle.

47. Show that the points : (0,4,1),(2,3,-1),(4,5,0) and (2,6,2) are vertices of square.

48. Show that the points $(1, 2, 3), (- 1, - 2, - 1), (2, 3, 2)$ and $(4, 7, 6)$ are the vertices of a parallelogram.

49. Show that the points (-1,2,1), (1,-2,5), (4,-7,8) and (2,-3,4) are vertices of a parallelogram.

50. Show that the points (5, - 1, 1),(7, - 4, 7), (1, - 6, 10) and (- 1, -3, 4) are the vertices of a rhombus.

51. Find the equation of the set of points P, the sum of whose distance from A(4,0,0) and B(-4,0,0) is equal to 10.

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

53. Find the co-ordinates of the point, which is equidistant from four points $(0, 0, 0)$, $(a, 0, 0)$, $(0, b, 0)$ and $(0, 0, c)$.

54. Find the co-ordinates of the point, which is equidistant from four points $(0, 0, 0)$, $(a, 0, 0)$, $(0, b, 0)$ and $(0, 0, c)$.

55. Show that (-1, 4, -3) is the circumcentre of the triangle formed by the points (3, 2, -5), (-3, 8, -5) and (- 3, 2, 1).

56. Find the co-ordinates of the point, which divides the join of (-2, 3, 5) and (1, - 4, - 6) in the ratio 2 : 3 internally.

57. Find the co-ordinates of the point, which divides the join of (-2, 3, 5) and (1, - 4, - 6) in the ratio 2 : 3 externally.

58. Find the co-ordinates of the points, which divide the join of the points (1, -2, 3) and (3, 4, -5) in the ratio 2 : 3 internally.

59. Find the co-ordinates of the points, which divide the join of the points (1, -2, 3) and (3, 4, -5) in the ratio 2 : 3 externally.

60. Find the co-ordinates of the mid-point of the join of the points A (3, 5, 7) and B(-3,-3, 1).

61. 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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62. Find the co-ordinates of the point R, which divides the join of P (0, 0, 0) and Q (4, -1, -2) in the ratio 1 : 2 externally and verify that P is the mid-point of [RQ].

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63. Find the ratio in which the line joining the points (- 2, 4, 5) and (3,- 5, 4) is divided by xz plane.

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64. Find the ratio in which the line joining the points (- 2, 4, 5) and (3,- 5, 4) is divided by xz plane.

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65. Find the ratio in which the line segment joining the points (4, 8, 10) and (6, 10, -8) is divided by yz-plane.

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66. Find the ratio in which yz-plane divides the line segment formed by Joining the points (-2, 4, 7) and (3,-5, 8).

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67. Find the ratio in which $2x + 3y + 5z = 1$ divides the line joining the points $(1, 0, -3)$ and $(1, -5, 7)$.

68. Given that A (3, 2,-4), B(5, 4, -6) and C(9, 8, -10) are collinear. Find the ratio in which B divides [AC].

69. 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.

70. 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

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

72. Show that the points (-1,2,1), (1,-2,5), (4,-7,8) and (2,-3,4) are vertices of a parallelogram.

73. Three vertices of parallelogram ABCD are A(3,-1,2), B(1,2,-4), C(-1,1,2). Find the co-ordinate of the fourth vertex.

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74. 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 parallelogram ABCD but it is not a rectangle.

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75. The vertices of triangle are $A(1, 1, 2)$, $B(4, 3, 1)$ and $C(2, 3, 5)$. A vector representing the internal bisector of the $\angle A$ is

76. Find the lengths of the medians of the triangle A (0, 0, 6), B (0, 4, 0) and C (6, 0, 0).

77. 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 coordinats of the point C.

78. 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 value of a,b and c.

79. Planes are drawn through the points (5, 0, 2) and (3, - 2, 5) parallel to the co-ordinates planes. Find the lengths of the edges of the rectangular parallelopiped so formed.

80. Prove that the lines joining the vertices of a tetrahedron to the centroids of the opposite faces are concurrent.

81. Find the lengths of the edges of the rectangular parallelopiped formed by planes drawn through the points (1, 2, 3) and (4, 7, 6) parallel to the co-ordinate planes.

82. Verify that (0, 7, 10) , (-1,6,6) and (-4, 9,6) are the vertices of a right angled triangle.

83. Show that the points : (4, 7, 8), (2, 3, 4), (- 1, - 2, 1), (1, 2, 5) are the vertices of a parallelogram.

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84. Show that the points (5, - 1, 1),(7, - 4, 7), (1, - 6, 10) and (- 1, -3, 4) are the vertices of a rhombus.

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

86. Find the co-ordinates of the point, which is equidistant from four points (0, 0, 0), (a, 0, 0), (0, b, 0) and (0, 0, c).