



MATHS

BOOKS - KC SINHA ENGLISH

INTRODCTION TO 3D GEOMETRY

Solved Examples

1. Name the octants in which the following points lie :

$(3, -1, -2)$



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2. Name the octants in which the following points lie :

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



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3. Name the octants in which the following points lie :

$(3, 1, -2)$



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4. The coordinates of a point are $(-5, -3, 2)$.

Write down the coordinates of seven points whose

absolute values are the same as those of the coordinates of the given point.



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5. Let A,B,C be the feet of perpendiculars drawn from a point P to x, y and z-axes respectively. Find the coordinates of A,B,C if coordinates of P are: (3,1,2)



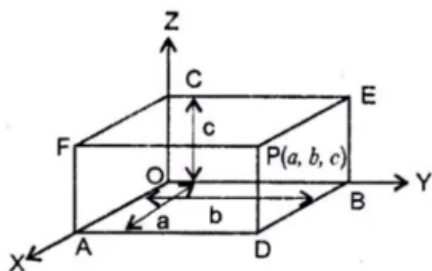
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6. Let A,B,C be the feet of perpendiculars drawn from a point P to x, y and z-axes respectively. Find the coordinates of A,B,C if coordinates of P are: (3,-6,2)



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7. In the adjoining figure if the coordinates of point P are (a, b, c) write the coordinates of A, B, C, D, E and F.



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8. Write down the perpendicular distances of the point (x, y, z) from the three coordinate planes



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9. If O be the origin and $OP=r$ and OP makes an angle θ with the positive direction of x-axis and lies in the XY plane find the coordinates of P.



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10. Find the reflection of the point (α, β, γ) in the XY-plane, YZ-plane.



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11. Find the distance of point $(2, -3, -4)$ from X, Y and Z-axes.



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12. Planes are drawn parallel to the coordinate planes through the points $(1,2,3)$ and $(3,-4,-5)$. Find the lengths of the edges of the parallelopiped so formed.



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13. A cube of side 3 units has one vertex at point $(1,1,1)$ and the three edges from this vertex are respectively

parallel to positive x-axis and negative y and z-axes.

Find the coordinates of other vertices of the cube.



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14. Find the distance between the point $(4, 3, -6)$ and $(-2, 1, -3)$



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15. Find the value of a if the distance between points $P(a, -8, 4)$ and $Q(3, -5, 4)$ is 5.



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16. Show that the points $(0,7,10)$, $(-1,6,6)$ and $(-4,9,6)$ form a right angled isosceles triangle .



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17. Show by using distance formula that the points $(4,5,-5)$, $(0,-11,3)$ and $(2,-3,-1)$ are collinear.



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18. Show that the coplanar points $(0, 4, 1)$, $(2, 3, -1)$, $(4, 5, 0)$ and $(2, 6, 2)$ are the vertices of a square.



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19. 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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20. Find the locus of a point which moves such that the sum of the of its distances from points $A(0, 0 - \alpha)$ and $B(0, 0, \alpha)$ is constant.



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21. Find the coordinates of a point which divides the join of points $(3,3,7)$ and $(8,3,2)$ internally in the ratio $2:3$.



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22. 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.



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23. Find the points of trisection of the line segment joining the points $(2, -2, 7)$ and $(5, 1, -5)$



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24. Show that the three points $A(2, 3, 4)$, $B(-1, 2, -3)$ and $C(-4, 1, -10)$ are collinear and find the ratio in which C divides AB.



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25. Determine the values of a and b so that the points $(a, b, 3)$, $(2, 0, 1)$ and $(1, -1, -3)$ are

colinear.



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



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28. Find the ratio in which the line joining the points $(4, 4, -10)$ and $(-2, 2, 4)$ is divided by the XY -plane.



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29. If the points P, Q, R, S are $(4, 7, 8)$, $(-1, -2, 1)$, $(2, 3, 4)$ and $(1, 2, 5)$ respectively show that PQ and RS intersect. Also find the point of intersection.



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30. 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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31. Prove analytically that the medians of a triangle are concurrent.



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32. Two vertices of a triangle are $A(3, 4, 2)$ and $B(1, 3, 2)$. The medians of the triangle intersect at $(2, 4, 3)$. Find the remaining vertex C of the triangle.



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33. 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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1. Name the octants in which the points lie: $(1, 2, 5)$



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2. Name the octants in which the points lie:

$(-3, -1, 2)$



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3. Name the octants in which the points lie:

$(3, -1, 2)$



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4. Name the octants in which the points lie:

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



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5. Name the octants in which the points lie:

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



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6. Name the octants in which the points lie:

$$(-3, 5, -2)$$



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7. Name the octants in which the points lie:

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



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8. Name the octants in which the points lie:

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



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9. Name the octants in which the points lie:

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



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10. Name the octants in which the points lie:

$(-3, -1, 6)$



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11. Name the octants in which the points lie: $(1, 2, 3)$



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12. Name the octants in which the points lie:

$(-4, 2, -5)$



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13. Where are the point: $(0, 0, -4)$



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14. Where are the point: $(0, 3, -2)$



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



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16. Let $P(2, 4, 5)$ be a point and F be the foot of perpendicular drawn from P to Xz-plane. Find the coordinates of F.

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17. The coordinates of a point P are $(1, 2, 3)$. Find the coordinates for the seven points such that the absolute values of their coordinates are the same as those of coordinates of P.

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18. The coordinates of a point are $(1, -2, 7)$. Write down the coordinates of seven points, whose absolute values are the same as those of the coordinates of the given point.



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19. Find the image of the point in the specified plane:
 $(0, 0, -4)$ in xy -plane.



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

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



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

$(5, 4, -3)$ in xy-plane.



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

$(-7, 2, -1)$ in zx-plane.



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

$(-4, 0, 1)$ in zx -plane.



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

$(-2, 0, 0)$ in xy -plane.



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25. Let A,B,C be the feet of perpendicular drawn from a point P to x,y and z -axes respectively. Find the

coordinates of A,B,C if coordinates of P are :
 $(4, -3, -7)$



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26. Let A,B,C be the feet of perpendicular drawn from a point P to x,y and z-axes respectively. Find the coordinates of A,B,C if coordinates of P are : $(3, 4, 2)$



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27. Let A,B,C be the feet of perpendicular drawn from a point P to x,y and z-axes respectively. Find the

coordinates of A,B,C if coordinates of P are :

$$(3, -5, 1)$$



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28. Let A,B,C be the feet of perpendicular drawn from a point P to x,y and z-axes respectively. Find the coordinates of A,B,C if coordinates of P are :

$$(4, -2, -6)$$



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29. Find the length of perpendicular from point $(1, -2, -5)$ to the coordinate planes.



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30. Find the distance of point $(-1, 6, 4)$ from x, y and z -axes.



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31. Planes are drawn through points $(1, -3, 4)$ and $(4, 7, -2)$ parallel to coordinate planes. Find the lengths of the edges of the rectangular parallelepiped so formed.



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32. Planes are drawn parallel to the coordinate planes through the points $(3,0,-1)$ and $(-2,5,4)$. Find the lengths of the edges of the parallelepiped so formed.



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33. A rectangular parallelepiped is formed by drawing planes through the points $(1, 2, 5)$ and $(-1, -1, -1)$, and parallel to the co-ordinate planes. The length of diagonal of the parallelepiped is



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34. Find the distance of the following pair of point:

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



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35. Find the distance of the following pair of point:

$$(-1, 3, -4), (1, -3, 4)$$



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36. Find the distance of the following pair of point:

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



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37. Find the distance of the following pair of point:

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



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38. Find the distance of the following pair of point:

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



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39. Find the distance of the following pair of point:

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



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40. Find the distance of the following pair of point:

$$(-3, 7, 2), (2, 4, -1)$$



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41. 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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42. 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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43. Prove that the points $(5, 3, 2)$, $(3, 2, 5)$ and $(2, 5, 3)$ are the vertices of an equilateral triangle.



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44. Show that the points (a, b, c) , (b, c, a) and (c, a, b) are the vertices of an

equilateral triangle.



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45. Find out whether the points $(0, 7, 10)$, $(-1, 6, 6)$ and $(-4, 9, 6)$ are the vertices of a right angled triangle.



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



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



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48. Examine whether following points are collinear or not $(3, -2, 4)$, $(1, 0, -2)$, $(-1, 2, -8)$



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49. Examine whether following points are collinear or not $(-3, 7, -2)$, $(2, 4, -1)$ and $(12, -2, -7)$



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50. Show that the points

$P(-3, -2, 4)$, $Q(-9, -8, 10)$ and $R(-5, -4, 6)$

are collinear and R divides PQ in the ratio 1:2



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51. Show that $(-1, 4, -3)$ is the circumcentre of

the triangle formed by the points

$(3, 2, -5)$, $(-3, 8, -5)$ and $(-3, 2, 1)$



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52. Show that the points $(3,2,2)$, $(-1,4,2)$, $(0,5,6)$, $(2,1,2)$ lie on a sphere whose centre is $(1,3,4)$. Find the also its radius.



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53. Find the radius of the sphere through the points $(0, 5, 0)$, $(4, 3, 0)$, $(4, 0, 3)$ and $(0, 4, 3)$



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54. Find the distance a from origin of the foot of perpendicular of point (a, b, c) on xy -plane.



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55. Verify the following: $(-1,2,1)$, $(1,-2,5)$, $(4,-7,8)$ and $(2,-3,4)$ are vertices of a parallelogram.



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56. Verify the following: $(5,-1,1)$, $(7,-4,7)$, $(1,-6,10)$ and $(-1,-3,4)$ are the vertices of a rhombus.



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57. Show that the coplanar points $(1, 5, 2)$, $(3, 4, 0)$, $(5, 6, 1)$ and $(3, 7, 3)$ are the vertices of a square.



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58. Examine whether the coplanar points $(-2, 6, -2)$, $(0, 4, -1)$, $(-2, 3, 1)$ and $(-4, 5, 0)$ are the vertices of a square.



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



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60. Find the coordinates of the point equidistant from the points $(0, 0, 0)$, $(2, 0, 0)$, $(0, 4, 0)$ and $(0, 0, 6)$



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61. Determine the points in i. xy-plane which are equidistant from the points

$A(1, -1, 0)$, $B(2, 1, 2)$, and $C(3, 2, -1)$



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62. Using distance formula, calculate the cosine of angle A of the triangle with vertices $A(1, -1, 2)$, $B(6, 11, 2)$ and $C(1, 2, 6)$



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63. Find the locus of a point which moves so that its distances from the points $(3, 4, -5)$ and $(-2, 1, 4)$ are equal.



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64. 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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65. 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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66. Find the locus of point P if $AP^2 - BP^2 = 18$ where $A \equiv (1, 2, -3)$ and $B \equiv (3, -2, 1)$.



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67. Find the locus of a point which moves so that its distances from the points $(3, 4, -5)$ and $(-2, 1, 4)$ are equal.



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



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69. If $A(3, 1, -2)$ and $B(1, -3, -1)$ be two points find the coordinates coordinates of the point which divides the line segment AB. Internally in the ratio 1:3



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70. If $A(3, 1, -2)$ and $B(1, -3, -1)$ be two points find the coordinates coordinates of the point which divides the line segment AB. Externally in the ratio 3:1



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71. Find the coordinates of the point which divides the join of $(-2, 3, 5)$ and $(1, -4, -6)$ in the ratio: 2:3 internally



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72. Find the coordinates of the point which divides the join of $(-2, 3, 5)$ and $(1, -4, -6)$ in the ratio: 2:3 externally



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73. Let P and Q be any two points. Find the coordinates 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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74. Find the coordinates 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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75. Using section formula, prove that the three points $A(-2, 3, 5)$, $B(1, 2, 3)$ and $C(7, 0, -1)$ are collinear.



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76. Using section formula show that the points are collinear: $(2, -1, 3)$, $(4, 3, 1)$, $(3, 1, 2)$



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77. Using section formula show that the points are collinear: $(-1, 4, -2)$, $(2, -2, 1)$, $(0, 2, -1)$



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78. 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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79. 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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80. Find the ratio in which the YZ plane divides the line segment joining the following pair of points:
(4,8,10) and (6,10,-8)



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81. Find the ratio in which the YZ plane divides the line segment joining the following pair of points: (-2,7,4) and (3,-5,8)



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



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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. Verify the following: $(5,-1,1)$, $(7,-4,7)$, $(1,-6,10)$ and $(-1,-3,4)$ are the vertices of a rhombus.



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85. 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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86. If three consecutive vertices of a parallelogram be $(3,4,1)$, $(7,10,-3)$ and $(8,1,9)$, find the fourth vertex.



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87. 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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88. Find the ratio in which the plane $3x + 4y - 5z = 1$ divides the line segment joinin

$(-2, 4, -6)$ and $(3, -5, 8)$.



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89. A point C with z-coordinate 8 lies on the line segment joining the point $A(2, -3, 4)$ and $B(8, 0, 10)$. Find its coordinates.



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90. A point R with x - coordinate 4 lies on the line segment joining the points $P(2,3,4)$ and $Q(8, 0, 10)$.
The coordinates of R are



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91. Two vertices of a triangle are $(4, -6, 3)$ and $(2, -2, 1)$ and its centroid is $\left(\frac{8}{3}, -1, 2\right)$. Find the third vertex.

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92. 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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93. If the centroid of a triangle with vertices $(\alpha, 1, 3)$, $(-2, \beta, -5)$ and $(4, 7, \gamma)$ is the origin then $\alpha\beta\gamma$ is equal to



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94. 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.



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95. Find the centroid of a triangle, the mid-point of whose sides are

D (1,2,-3) , E (3,0,1) and F (-1,1, -4).



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96. for every point (x, y, z) on the y-axis: (A)

$x = 0, y = 0$ (B) $x = 0, z = 0$ (C) $y = 0, z = 0$ (D)

$y \neq 0, x = 0, z = 0$



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97. Two lines not lying in the same plane are called (A) parallel (B) coincident (C) intersecting (D) skew



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98. The graph of the equation $x^2 + y^2 = 0$ in the three dimensional space is (A) x-axis (B) y-axis (C) z-axis (D) xy-plane



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99. The distance of the point (x, y, z) from xy-plane is
(A) $|x|$

(B) $|y|$

(C) z

(D) $|z|$



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100. A point (x, y, z) moves parallel to xy -plane.

Which of the three variables x, y, z remains fixed?

(A) x

(B) y

(C) z

(D) x and y



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101. A point (x, y, z) moves parallel to x axis. Which of the three variables x, y, z remains fixed?
(A) x and y (B) y and z (C) z and x (D) none of these



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102. The distance of the point $(3, 4, 5)$ from x -axis is
(A) 3 (B) 5 (C) $\sqrt{34}$ (D) $\sqrt{41}$



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103. The length of the perpendicular drawn from the point $P(a, b, c)$ from z-axis is $\sqrt{a^2 + b^2}$ b. $\sqrt{b^2 + c^2}$ c. $\sqrt{a^2 + c^2}$ d. $\sqrt{a^2 + b^2 + c^2}$



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104. The number of values of a for which the distance between point $(3, -5, 4)$ and $(9a, -8, 4)$ is 5 is (A) 1 (B) 2 (C) 3 (D) infinitely many



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105. The area of the triangle having vertices $P(1, 2, 3)$, $Q(4, 0, 4)$, $R(-2, 4, 2)$ is (A) 5 units (B) 10 units (C) 4 units (D) none of these



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106. 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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107. The area of the quadrilateral ABCD where $A(0, 4, 1)$, $B(2, 3, -1)$, $C(4, 5, 0)$ and $D(2, 6, 2)$ is

to :



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108. A parallelopiped is formed by planes drawn through the points $(1, 2, 3)$ and $(9, 8, 5)$ parallel to the coordinate planes, then which of the following is not length of an edge of this rectangular parallelopiped?



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109. A parallelopiped is formed by planes drawn through the points $(1,2,3)$ and $(9,8,5)$ parallel to the

coordinate planes. The length of its diagonal is (A) $2\sqrt{14}$ units (B) $2\sqrt{26}$ units (C) $6\sqrt{3}$ units (D) $2\sqrt{21}$ units



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110. The xy -plane divides the line segment joining $(1,2,3)$ and $(-3,4,-5)$ (A) internally in the ratio 3:4 (B) externally in the ratio 5:3 (C) internally in the ratio 3:5 (D) none of these



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



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112. The point equidistant from the point $(0, 0, 0)$, $(1, 0, 0)$, $(0, 2, 0)$ and $(0, 0, 3)$ is



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113. The plane XOZ divides the join of $(1, -1, 5)$ and $(2, 3, 4)$ in the ratio of $\lambda:1$, then λ is



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114. 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 $2 : 3$.



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115. Find the ratio in which the line joining the points $(2, 4, 5)$, $(3, 5, -4)$ is divided by the yz -plane.



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