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## MATHS

## BOOKS - KC SINHA MATHS (HINGLISH)

## 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 asre $\mathrm{e}(-5,-3,2)$. Write down the coordinates of seven points whose absolute values are the same as those of the coordinates of the given point.
5. Let $A, B, C$ be the feet of perpendiculars drawn from a point $P$ to $x, y$ aned $z$-axses 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 $x, y$ aned $z$-axses respectively. Find the coordinates of $A, B, C$ if coordinates of $P$ are: $(3,-6,2)$

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7. In the adoining figure if the coordinates of point $P$ are ( $a, b, c$ ) write the coordinates of $\mathrm{A}, \mathrm{B}, \mathrm{C}, \mathrm{D}, \mathrm{E}$ and F .

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8. Write down the perpendicular distances of the pont $(x, y, z)$ from the three coordinates planes

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9. If $O$ be the origin and $O P=r$ and $O P$ makes an angle $\theta$ with the positive direction of $x$-axis and lies in the $X Y$ plane find the coordinates of P .

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10. Find the reflection of the point $(\alpha, \beta, \gamma)$ in the XY-plane,

YZ-plane and ZX plane.

## - Watch Video Solution

11. Findthe distance of $P(a, b, c)$ from $\mathrm{x}, \mathrm{y}$ 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. Findthe 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.
$(0,7,10),(-1,6,6)$ and $(-4,9,6)$ form a right angled isosceles triangle.

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

## ( Watch Video Solution

18. Show that the coplanar points

$$
(0,4,1),(2,3,-1),(4,5,0) \text { and } 92,6,2) \text { are the vertices }
$$

of a square.

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19. Find the point which equisdistant from 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 pont which mioves 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 coordinates of the point which divides the join of the points $A(2,-1,3)$ and $B(4,31)$ externallyb in the rartio 3:4

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23. Find the ponts of trisectioin of the line segment joinint the points $(2,-2,7)$ and $(5,1,-5)$
$A(2,3,4), B(-1,2,-3)$ and $C(-4,1,-10) \quad$ are
collinear. Also find the ratio in which $C$ divides $A B$.

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

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26. The vertices of a triangle are
$A(5,4,6), B(1,-1,3)$ and $(4,3,2)$. The internal bisector of $\angle B A C$ meets BC in D . Find AD .

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27. Find the ratio in which the plane $2 x+3 y+5 z=1$ 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.

## ( Watch Video Solution

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

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30. Find the coordinates of the centroid of a triangle having vertices $P\left(x_{1}, y_{1}, z_{1}\right), Q\left(x_{2}, y_{2}, z_{2}\right)$ and $R\left(x_{3}, y_{3}, z_{3}\right)$

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31. Prove that the medians of a triangle are concurrent and find the position vector of the point of concurrency (that is, the centroid of the triangle)
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 triangles are ${ }^{`}(1,5,-1)$,
$(0,4,-2)$ and $(2,3,4)$. Find its vertices.

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## Exercise

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

## - Watch Video Solution

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

## ( Watch Video Solution

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

## D Watch Video Solution

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

## ( Watch Video Solution

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

## D Watch Video Solution

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

## - Watch Video Solution

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

## - Watch Video Solution

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

## - Watch Video Solution

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

## - Watch Video Solution

12. Name the octants in which the points lie: $(-4,2,-5)$

## ( Watch Video Solution

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

## D Watch Video Solution

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

## D Watch Video Solution

15. A point lies on the $x$-axis. Find its $y$ and $z$-cordinates
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 ofi as point $P$ are (1,2,3). Find the coordinates fothe seven pints such that the absolute vaues of their coordinates are the same as those of coordinates of P.
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.
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.

## ( Watch Video Solution

23. Find the image of the point in the specified plane:
$(-4,0,1)$ in zx-plane.

## ( Watch Video Solution

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

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33. A rectangular parallelopiped is formed by drawing planes through the points $(1,2,5)$ and $(-1,-1,-1)$ parallel to the coordinate planes. Find the length of the diagnol of the parallelopiped.

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

## - Watch Video Solution

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

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

## - Watch Video Solution

39. Find the distance of the following pair of point:
$(2,-1,3),(-2,-1,3)$

- Watch Video Solution

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 the points on $y$-axis which are at a distance of $5 \sqrt{2}$ form 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 triangle.
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 $(a, b, c),(b, c, a),(c, a, b)$ are the vertices of an equilateral triangle.

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45. 

Show
that
the
points
$(0,7,10),(-1,6,6)$ and $(-4,9,6)$ are the vertices of as right angled triangle
46.

Are
the
points
$A(3,6,9), B(10,20,30)$ and $C(25,-41,5)$ the vertices of are right angle triangle?

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

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48. Examine whether following points are collinear or not

$$
(3,-2,4),(1,0,-2),(-1,2,-8)
$$

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 collineasr 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 $(3,2,2),(-1,1,3),(0,5,6),(2,1,2)$ lie on a sphere whose centre is ( $1,3,4$ ). Find 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 orign of the foot of perpendicular of point $(a, b, c)$ on $x y$-plane.

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> 55. Show that the coplanar points
> $(-1,2,1),(1,-2,5),(4,-7,8)$ and $(2,-3,4)$ are the vertices of a parallelogram.

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> 56. Show that the coplanar points
> $(-1,-6,10),(1,-3,4),(-5,-1,1)$ and $(-7,-4,7)$
are the vertices of a rhombus.
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 ponts $(5,5,2)$ and (3, 1, 2).

## - Watch Video Solution

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 point in $X Y$ plane which is equidistant from the point $A(1,-1,0), B(2,1,2)$ and $C(3,2,-1)$

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62. Using distance formula, calculate the cosine of ngle A of
$A(1,-1,2), B(6,11,2)$ 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.

## - Watch Video Solution

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 $P(-2,2,3)$ and $Q(13,-3,13)$ are two points. Find the locus of point R which moves such that $3 P R=2 Q R$

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66. Find the locus of point P if $A P^{2}-B P^{2}=18$ where

$$
A \equiv(1,2,-3) \text { and } B \equiv(3,-2,1)
$$

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67. Find the equation of the set of points $P$ which moves so that its distances from the points
$A(3,4,-5)$ and $B(-2,1,4)$ are equal.
68. If A and B be the points $(3,4,5)$ and $(-1,3,-7)$ respectively find the equation of set of ponts $P$ such that $P A^{2}+P B^{2}=k^{2}$, where $k$ is a constant.

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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 $A B$. Internally in the ratio 1:3

## ( Watch Video Solution

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 $A B$. 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

## ( Watch Video Solution

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

## (D) Watch Video Solution

73. Find the coordinates of the point $R$ which divides $P Q$ 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 show that the points are collinear:
$(-2,3,5),(1,2,3),(7,0,-1)$
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 PQ formed by joining the points
$P(4,2,-6)$ and $Q(10,-16,6)$

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79. 

Given
$P(3,2,-4), Q(5,4,-6)$ 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 $Y Z$ plane divides the line segment joining the following pair of points: $(4,8,10)$ and $(6,10,-8){ }^{\prime}$

- Watch Video Solution

81. Find the ratio in which the $Y Z$ plane divides the line segment joining the following pair of points: $(-2,7,4)$ and $(3,-5,8)^{\prime}$

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82. $A(3,2,0), B(5,3,2),(-9,6,-3)$ are the vertices of $\triangle A B C$ and AD is the bisector of $\angle B A C$ which meets at D .

Find the coordinates of $D$,

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$$
\begin{aligned}
& \text { 83. Show that the points } \\
& (4,7,8),(2,3,4),(-1,-2,1),(1,2,5) \text { are the vertices }
\end{aligned}
$$

of a paralelogram.

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84. 

Prove
that
the
points
$(5,-1,1),(7,-4,7),(1,-6,10)$ and $(-1,-3,40$
are the vertices ofa 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 $A B C D$ but it is not $a$ rectangle.
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. Threevertices ofa parallelograsm ABCDasre
$A(3,-1,2), B(1,2,-4)$ and $C(-1,1,2)$. Find the
coordinastes of the fourth vertex.

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88. Find the ratio in which the plane $3 x+4 y-5 z=1$

$$
\begin{aligned}
& \text { divides the line } \\
& (-2,4,-6) \text { and }(3,-5,8) .
\end{aligned}
$$

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89. A point R with z -coordinates 8 lies on the line segment joining the points $P(2,-3,4)$ and $Q(8,0,10)$. Find the coordinates of $R$.

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90. A point $R$ with $x$-coordinate 4 lies on the line segment join the points $P(2,-3,4)$ and $Q(8,0,10)^{\prime}$. Find the coordinates of $R$.
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91. Two vertives 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. The origin is the centroid of $\triangle A B C$ with the vertices
$A(\alpha, 1,3), B(-2, \beta,-5)$ and $C(4,7, \gamma)$ find the values of $\alpha, \beta, \gamma$.
94. The origin is the centroid of a triangle $A B C$ is at the point $G(1,1,1)$. If the coordinates of A and B are ( $3,-5,7$ ) an $(-1,7,-6)^{\prime}$ respectively, then find the coordinates of the point C .

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95. Find the centroid of the triangle mid points of whose sides are $(1,2,-3),(3,0,1)$ and $(-1,1,4)$

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96. for every point ( $x, y, z$ ) on the y -axis: (A) $x=0, y=0$

$$
\text { (B) } x=0, z=0 \text { (C) } y=0, z=0 \text { (D) } y \neq 0, x=0, z=0
$$

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

## (D) Watch Video Solution

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

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100. A point $(x, y, z)$ moves parallel to $x y$-plane. Which of the three variables $x, y, z$ remains fixed? (A) $\mathrm{x}(\mathrm{B}) \mathrm{y}(\mathrm{C}) \mathrm{z}(\mathrm{D})$ xand $y$

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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
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 shortest distance of the point $(a, b, c)$ from x -axis
(A) $\sqrt{a^{2}+b^{2}}$
(B) $\sqrt{b^{2}+c^{2}}$
(C) $\sqrt{c^{2}+a^{2}}$
(D) $\sqrt{a^{2}+b^{2}+c^{2}}$

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104. The number of values of as for which the distance between point ${ }^{`}(3,-5,4)$ and $\left.9 a,-8,4\right)$ is 5 is (A) 1 (B) 2 (C) 3 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. The points $P(0,7,10), Q(-1,6,6), R(-4,9,6)$ are the vertices of (A) an equilaterla triangle (B) an isosceles rilghat angled triangle (C) a scalene triangle (D) an isosceles triangle which is not righat angled
107. Area of the quadrilateral having vertices ( $0,4,1$ ), ( $2,3,-1$ )
$(4,5,0),(2,6,2)^{\prime}$ is (A) 27 sq. units (B) 9 sq. units (C) 81 sq. units
(D) none of these

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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 the length of an edge of the rectangular parallelopiped (A) 2 (B) 4 (C) 6 (D) 8

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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. The coordinates of the point where the line joining
$P(3,4,1)$ and $Q(5,1,6)$ crossesthe XYPLANE
$\left(-\frac{13}{5},-\frac{23}{5}, 0\right)$
(B) $\left(\frac{13}{5}, \frac{23}{5}, 0\right)$
(C) $\left(\frac{13}{5},-\frac{23}{5}, 0\right)$
(D) $\left(-\frac{13}{5}, \frac{23}{5}, 0\right)$

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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 (A) $\left(\frac{1}{3}, \frac{2}{3}, 2\right)$
(B) $(1,0,2) e(C)\left(1 / 2,1,3 / 20(D)(-1,2,1 / 2)^{`}\right.$

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113. The plane XOZ divides the join of
$(1,-1,5)$ and $(2,3,4)$ in the ratio $\lambda: 1$ Then $\lambda$ is (A) -3
(B) $-\frac{1}{3}$ (C) 3 (D) $\frac{1}{3}$

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114. The coordinates of the point which divides the line segment joining the points ( $5,4,20$ and ( $-1,-2,4$ ) in the ratio 2:3 externally is (A) $\left(\frac{13}{5}, \frac{8}{5}, \frac{14}{5}\right)$
$\left(\frac{17}{5}, \frac{16}{5},-\frac{2}{5}\right)$ (C) $(17,16,-2-)$ (D) none of these

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115. The ratio in which the line joinng $(2,4,5),(3,5,-4)$ is divided by the zyplane is (A) $2: 3$ (B) $3: 2$ (C) $-2: 3$ (D) $4: 3$

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