MATHS

BOOKS - RD SHARMA MATHS (HINGLISH)

INTRODUCTIONS TO 3-D COORDINATE GEOMETRY

Solved Examples And Exercises

1. 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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2. Find the coordinates of the point which divides the joint of $P(2, -1, 4) and q(4, 3, 2)$ in the ratio 2:3 (i) internally (ii) externally.
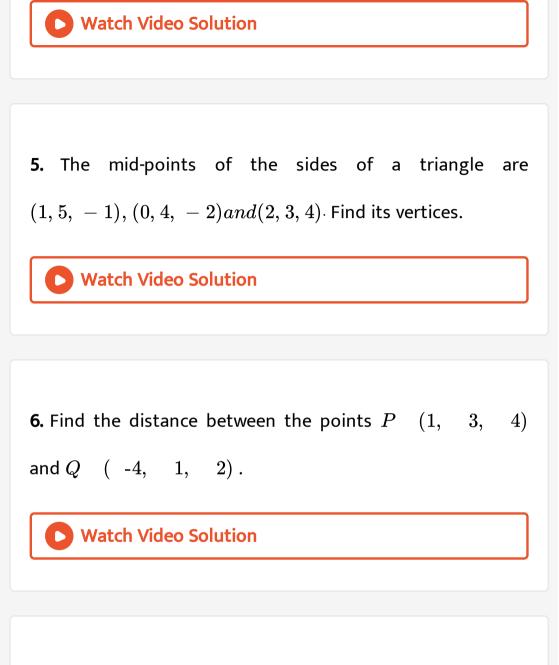
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3. Show that the plane $ax + by + cz + d = 0$ divides the line joining the points $(x_1, y_1, z_1) and (x_2, y_2, z_2)$ in the ratio $\dfrac{ax_1 + by_1 + cz_1 + d}{ax_2 + by_2 + cz_2 + d}$.

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4. 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.

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

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

7. Prove by using distance formula that the points $A(1, 2, 3), B(-1, -1, -1)$ and $C(3, 5, 7)$ are collinear.

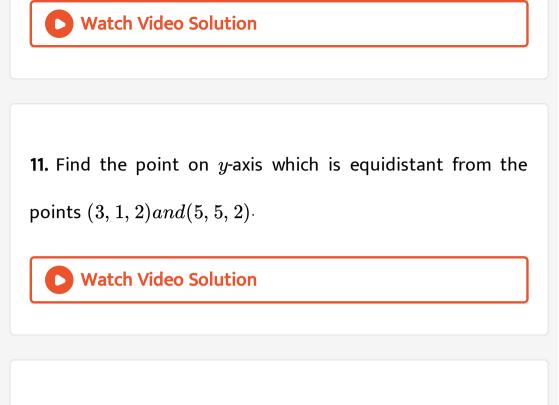**8.** Determine the point in $XY - plane$ whcih is equidistant from three points $A(2, 0, 3)$, $B(0, 3, 2) and C(0, 0, 1)$.

9. Show that the points $A(0, 1, 2)$, $B(2, -1, 3) and C(1, -3, 1)$ are vertices of an isosceles right-angled triangle.
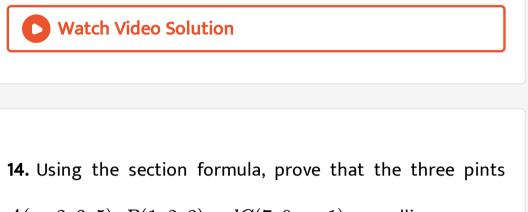
10. Find the coordinates of a point equidistant from th four points $O(0, 0, 0)$, $A(l, 0, 0)$, $B(0, m, 0) and C(0, 0, n)$.

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

12. Prove that the triangle formed by joining the three points whose coordinates ere $(1, 2, 3), (2, 3, 1) and (3, 1, 2)$ is an equilateral triangle.

13. The lines joining the vertices of a tetrahedron to the centroids of opposite faces are concurrent.

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

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

16. 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.

17. In fig. 28.7 if the coordinates of point P are (a, b, c) then Write the coordinates of points A, B, C, D, E and F. Write the coordinates of the feet of the perpendiculars from the point P to the coordinate axes. Write the coordinates of the feet of the perpendicular from the point P on the coordinate planes $XY, YZ and ZX$. Find the perpendicular distances of point P from $XY, YZ and ZX -$ planes. Find the perpendicular distances of the point P fro the coordinate

axes. Find the coordinates of the reflection of P are (a, b, c).

Therefore $OA = a,\ OB = b\ nd\ OC =\ $ ·
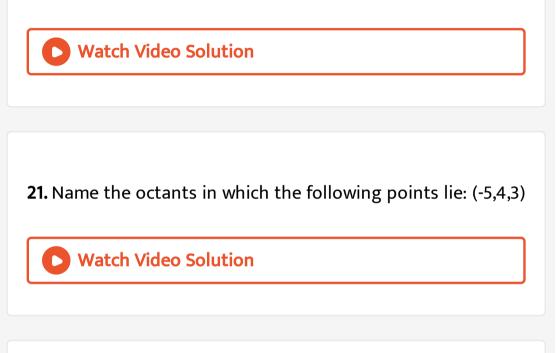
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18. Planes r drawn parallel to the coordinate planes through the point $P(x_1, y_1,\ z_1)$ and $Q(x_2, y_2, z_2)$. Find the length of the edges of the parallelepiped so formed.

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19. Name the octants in which the following points lie: (5,2,3)

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

(-5,-4,7)

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

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

(-5,-3,-2)

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

(4,-3,5)

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

(2,-5,-7)

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

(7,4,-3)

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

(-7,2,-5)

27. Find the image of: (-2,3,4) in the yz-planes.
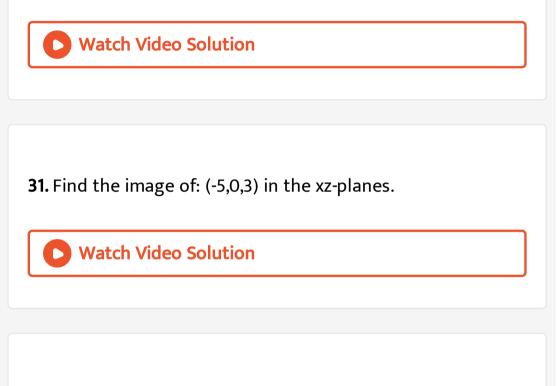
28. Find the image of: 5,2,-7) in the xy-planes.

29. Find the image of: (-4,0,0) in the xy-planes.

30. Find the image of: (-5,4,-3) in the xz-planes.

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31. Find the image of: (-5,0,3) in the xz-planes.

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32. A cube of side 5 has one vertex at the point (1,0,1) and the three edges from this vertex are respectively, parallel to the negative $x \, and \, y$ axes and positive z-axis. Find the coordinates of the other vertices of the cube.

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33. 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 he parallelepiped so formed.

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34. Planes are drawn through the points (5,0,2) and(3,2,-5) parallel to the coordinate planes find the lengths of the edges of the rectangular prallelopiped so formed.

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35. Find the distances of the point $P(-4, 3, 5)$ from the coordinate axes.

36. The coordinates of a point are (3,-2,5). Write down the coordinates of seven points such that the absolute values of their coordinates are the same as those of the coordinates of the given point.
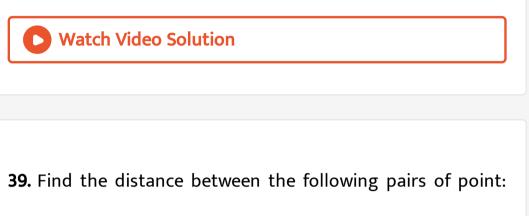
37. Find the locus of the point which is equidistant from the points $A(0, 2, 3) and (2, -2, 1)$.

38. Find the distance between the following pairs of point:

$P(1, -1, 0) and Q(2, 1, 2)$

39. Find the distance between the following pairs of point:

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

40. Find the distance between the points $P and Q$ having coordinates (-2,3,1) and (2,1,2).

41. 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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42. Using distance formula prove that the following points are collinear:

$$P(0, 7, \ -7), \ Q(1, 4, \ -5) \, and R(\ -1, 10, \ -9)$$

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43. Using distance formula prove that the following points are collinear:

$$A(3, \ -5, 1), \ B(\ -1, 0, 8) \ and C(7, \ -10, \ -6)$$

44. Determine the points in i. xy-plan e ii. yz-plane and iii zx-plane which re equidistant from the points $A(1, -1, 0), \ B(2, 1, 2), \ and \ C(3, 2, -1)$
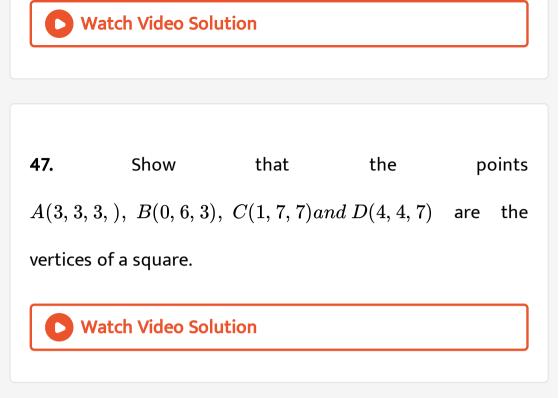
45. Find the points on z-is which are at distance $\sqrt{21}$ from the point (1,2,3).

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

47. 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.

48. 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.

49. 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.

50. Prove that the tetrahedron with vertices at the points

$O(0, 0, 0), \ A(0, 1, 1), \ B(1, 0, 1) \, and \ C(1, 1, 0)$ is a regular
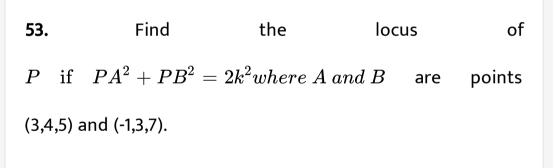
one.

51. 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.

52. Find the coordinates of the point which is equidistant from the four points $O(0, 0, -0)$, $A(2, 0, 0)$, $B(0, 3, 0)$ and $C(0, 0, 8)$.

53. Find the locus of P if $PA^2 + PB^2 = 2k^2$ where A and B are points (3,4,5) and (-1,3,7).

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

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

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57. 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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58. 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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59. Find the locus of the points which are equidistant from the points (1,2,3) and (3,2,11).

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60. 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.

61. 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.

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

63. 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.

64. 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.

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

66. Let $A(3, 2, 0)$, $B(5, 3, 2)$, $C(-9, 6, -3)$ be three points forming a triangle. The bisector AD of $\angle BAC$ meets sides in D. Find the coordinates of D.

67. If the origin is the centroid of the triangle with vertices $P(2a, \ 2, 6)$, $Q(-4, 3b, \ -10) abnd R(8, 14, 2c)$, find the values of $a \ and \ b$.

68. 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

69. Show that the coordinates off the centroid of the triangle with vertices $A(x_1, y_1, z_1),\ B(x_2, y_2, z_2) and\ (x_3, y_3, z_3)$ are $\left(\dfrac{x_1 + x_2 + x_3}{3}, \dfrac{y_1 + y_2 + y_3}{3}, \dfrac{z_1 + z_2 + z_3}{3} \right)$

70. 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 themed point of PR .

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

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

73. Show that the three points

$$A(2, 3, 4),\ B(-1, 2,\ -3)\,and\ C(-4, 1,\ -10)$$ are

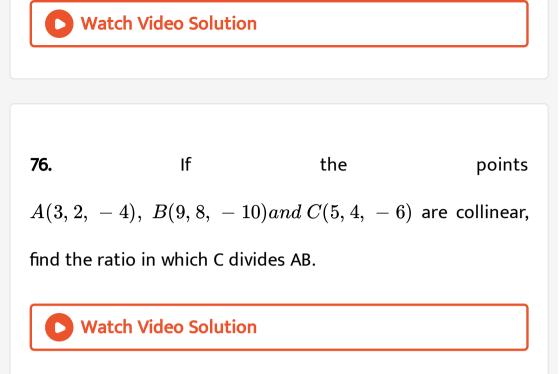collinear and find the ratio in which C divides AB.

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

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

76. 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.
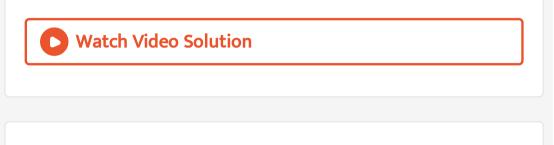
77. The id points of the sides of a triangle ABC are given by $(\ -2, 3, 5), (4, \ -1, 7) and \ (6, 5, 3).$ Find the coordinates of the angle $\angle BAC$ meets BC.

78. 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).

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

80. 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.

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

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82. 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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83. 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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84. Find the ratio in which the segment joining the points (4,8,10) and (6,10,-8) is divided by the yz-plane.

85. Write the distance of the point $P(2, 3, 5)$ from the xy-plane.

86. Write the distance of the point $P(3, 4, 5)$ from z-axis.

87. If the distance between the points $P(a, 2, 1) and Q(1, -1, 1)$ is 5 units find the value of a.

88. The coordinates of the mid points of sides AB, BC and CA of ABC are $D(1, 2, -3), E(3, 0, 1) and F(-1, 1, -4)$ respectively. Write the coordinates of its centroid.
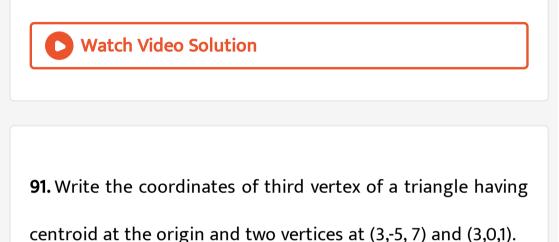
89. Write the coordinates of the foot of the perpendicular from the point (1,2,3) on y-axis.

90. Write the length of the perpendicular drawn from the point $P(3, 5, 12)$ on x-axis.
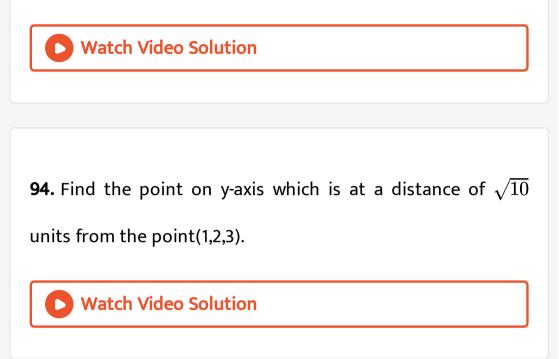
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91. Write the coordinates of third vertex of a triangle having centroid at the origin and two vertices at (3,-5, 7) and (3,0,1).

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92. What is the locus of a point (x, y, z) for which $y = 0, z = 0$?

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93. Find the ratio in which the line segment joining the points (2,4,5) and (3,-5,4) is divide by the yz-plane.

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94. Find the point on y-axis which is at a distance of $\sqrt{10}$ units from the point(1,2,3).

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95. Find the point on x-axis which is equidistant from the points $A(3, 2, 2) and B(5, 5, 4)$.

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96. Find the coordinates of a point equidistant from the origin and pints $A(a, 0, 0),\ B(0, b, 0)$ and $C(0, 0, c)$.

97. Write the coordinates of the point P which is five sixth of the way from $A(-2, 0, 6) \rightarrow B(10, -6, -12)$.

98. If a parallelepiped is formed by the planes drawn through the points (2,3,50 and (5,9,7) parallel to the coordinate planes, then write the lengths of edges of the parallelopiped and length of the diagonal.

99. Determine the point on yz-plane which is equidistant from points $A(2, 0, 3), \ b(0, 3, 2) and \ C(0, 0, 1).$

100. 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 $a, b, \ \cdot$

101. The ratio in which the line joining (2,4,5) and (3,5,-9) is divided by the yz-plane is a. 2:3   b. 3:2   c.

-2:3   d. 4:3

102. The ratio in which the line joining the points $(a, b, c) and (- a, - c, - b)$ is divided by the xy-plane is A.) $a : b$ B.) $b : c$ C.) $c : a$ D.) $c : b$

103. If $P(0, 1, 2), Q(4, - 2, 1) and O(0, 0, 0)$ are three points then $\angle POQ = $ a. $\dfrac{\pi}{6}$ b. $\dfrac{\pi}{4}$ c. $\dfrac{\pi}{3}$ d. $\dfrac{\pi}{2}$

104. If the extremities of the diagonal fo a square are (1,-2,3) and (2,-3,5), then the length of the side is $\sqrt{6}$ b. $\sqrt{3}$ c. $\sqrt{5}$ d. $\sqrt{7}$
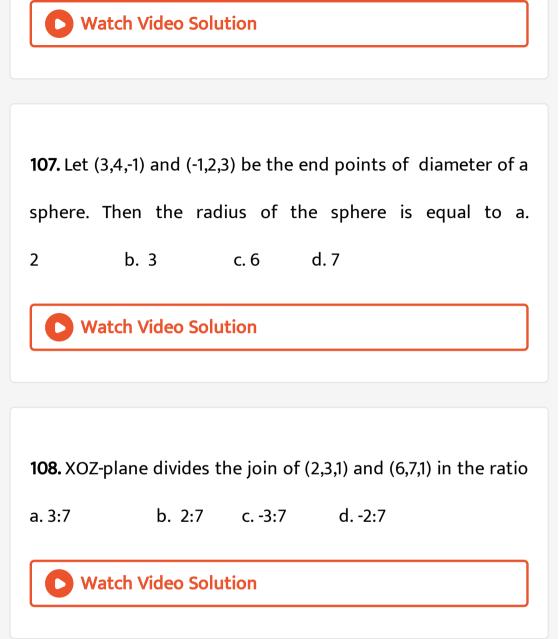
105. The points (5,-4,2), (4,-3,1), (7,6,4) and (8,-7,5) are the vertices of a. a rectangle   b. a square   c. a parallelogram   d. none of these

106. In a three dimensional space the equation $x^2 - 5x + 6 = 0$ represents a. points b. planes c. curves d. pair of straight lines

107. Let (3,4,-1) and (-1,2,3) be the end points of diameter of a sphere. Then the radius of the sphere is equal to a. 2   b. 3   c. 6   d. 7

108. XOZ-plane divides the join of (2,3,1) and (6,7,1) in the ratio a. 3:7   b. 2:7   c. -3:7   d. -2:7

109. What is the locus of a point for which $y = 0, z = 0$? a. x-axis b. y-axis c. z-axis d. yz-plane

110. The coordinates of the foot of the perpendicular drawn from the point $P(3, 45)on$ the yz-plane are a. (3,4,0) b. (0,7,0) c. (0,0,8) d. (0,7,8)
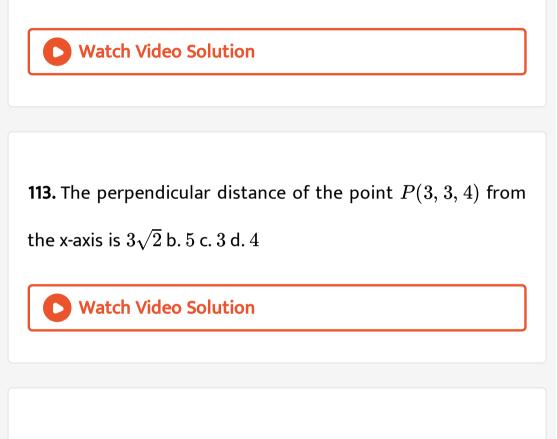
111. The perpendicular distance of the point $P(6, 7, 8)$ from xy-plane is a. 8 b. 7 c. 6 d. 10

112. The length of the perpendicular drawn from the point $P(3, 4, 5)$ on y-axis is a. $3\sqrt{2}$ b. 5 c. $\sqrt{113}$ d. $5\sqrt{2}$ e. $\sqrt{34}$

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113. The perpendicular distance of the point $P(3, 3, 4)$ from the x-axis is $3\sqrt{2}$ b. 5 c. 3 d. 4

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

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