Important Questions for Class 11 Maths Chapter 11 - Introduction to Three Dimensional Geometry

Question 1:

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

Solution:

Assume that P (x, y, z) be the point that is equidistant from two points A(1, 2, 3) and B(3, 2, –1).

Thus, we can say that, PA = PB

Take square on both the sides, we get

$PA^2 = PB^2$

It means that,

$(x-1)^2 + (y-2)^2+(z-3)^2 = (x-3)^2+(y-2)^2+(z+1)^2$

$\Rightarrow x^2 - 2x + 1 + y^2 - 4y + 4 + z^2 - 6z + 9 = x^2 - 6x + 9 + y^2 - 4y + 4 + z^2 + 2z + 1$

Now, simplify the above equation, we get:

$\Rightarrow -2x -4y - 6z + 14 = -6x - 4y + 2z + 14$

$\Rightarrow - 2x - 6z + 6x - 2z = 0$

$\Rightarrow 4x - 8z = 0$

$\Rightarrow x - 2z = 0$

Hence, the required equation for the set of points is x – 2z = 0.

Question 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.

Solution:

Assume that the point Q (5, 4, −6) divides the line segment joining points P (3, 2, −4) and R (9, 8, −10) in the ratio k:1.

Therefore, by using the section formula, we can write it as:

(5, 4, -6) = [(k(9)+3)/(k+1), (k(8)+2)/(k+1), (k(-10)-4)/(k+1)]

⇒(9k+3)/(k+1) = 5

Now, bring the L.H.S denominator to the R.H.S and multiply it

⇒9k+3 = 5k+5

Now, simplify the equation to find the value of k.

⇒4k= 2

⇒k = 2/4

⇒k=½

Therefore, the value of k is ½.

Hence, the point Q divides PR in the ratio of 1:2

Question 3:

Prove that the points: (0, 7, 10), (−1, 6, 6) and (−4, 9, 6) are the vertices of a right-angled triangle

Solution:

Let the given points be A = (0, 7, 10), B = (−1, 6, 6), and C = (−4, 9, 6)

Now, find the distance between the points

Finding for AB:

AB = $\sqrt{[(-1-0)^2 + (6-7)^2 + (6-10)^2]}$

AB = $\sqrt{[(-1)^2 + (-1)^2 + (-4)^2]}$

AB = $\sqrt{(1+1+16)}$

AB = $\sqrt{18}$

AB = $3\sqrt{2}$ …. (1)

Finding for BC:

BC= $\sqrt{[(-4+1)^2 + (9-6)^2 + (6-6)^2]}$

$BC = \sqrt{[(-3)^2 + (3)^2 + (-0)^2]}$

$BC = \sqrt{(9+9)}$

$BC = \sqrt{18}$

$BC = 3\sqrt{2}$ .....(2)

Finding for CA:

$CA = \sqrt{[(0+4)^2 + (7-9)^2 + (10-6)^2]}$

$CA = \sqrt{[(4)^2 + (-2)^2 + (4)^2]}$

$CA = \sqrt{(16+4+16)}$

$CA = \sqrt{36}$

$CA = 6$ .....(3)

Now, by Pythagoras theorem,

$AC^2 = AB^2 + BC^2$ .....(4)

Now, substitute (1),(2), and (3) in (4), we get:

$6^2 = (3\sqrt{2})^2 + (3\sqrt{2})^2$

$36 = 18+18$

$36 = 36$

The given points obey the condition of Pythagoras Theorem.

Hence, the given points are the vertices of a right-angled triangle.

Question 4:

Calculate the perpendicular distance of the point P(6, 7, 8) from the XY – Plane.

(a)8 (b)7 (c)6 (d) None of the above

Solution:

A correct answer is **option (A)**

Explanation:

Assume that A be the foot of perpendicular drawn from the point P (6, 7, 8) to the XY plane and the distance of this foot A from P is the z-coordinate of P, i.e., 8 units

Hence, the correct answer is option (a)

Question 5:

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

Solution:

Let A = (2, 3, 5), B = (5, 9, 7)

To find the length of the edges of a parallelopiped = 5 – 2, 9 – 3, 7 – 5

It means that 3, 6, 2.

Now, to find the length of a diagonal = $\sqrt{(3^2 + 6^2 + 2^2)}$

= $\sqrt{(9+36+4)}$

= $\sqrt{49}$

= 7

Therefore, the length of a diagonal of a parallelopiped is 7 units.