The *x*-coordinate, *y*-coordinate, and *z*-coordinate of point (-3, -1, 6) are negative, negative, and positive respectively. Therefore, this point lies in octant **III**.

The *x*-coordinate, *y*-coordinate, and *z*-coordinate of point (2, -4, -7) are positive, negative, and negative respectively. Therefore, this point lies in octant **VIII**.

Q4 :

Fill in the blanks:

Answer :

(i) The *x*-axis and *y*-axis taken together determine a plane known as $\underline{\text{XY}-\text{plane}}$.

(ii) The coordinates of points in the XY-plane are of the form $\underline{(x, y, 0)}$.

(iii) Coordinate planes divide the space into $\underline{\text{eight}}$ octants.

Exercise 12.2 : Solutions of Questions on Page Number : **273**

Q1 :

Find the distance between the following pairs of points:

(i) (2, 3, 5) and (4, 3, 1) (ii) (-3, 7, 2) and (2, 4, -1)

(iii) (-1, 3, 4) and (1, 3, 4) (iv) (2, -1, 5) and (-2, -1, 5)

Answer :

The distance between points P(x_1, y_1, z_1) and P(x_2, y_2, z_2) is given by $\text{PQ} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$

(i) Distance between points (2, 3, 5) and (4, 3, 1)

$$= \sqrt{(4-2)^2 + (3-3)^2 + (1-5)^2}$$
$$= \sqrt{(2)^2 + (0)^2 + (-4)^2}$$
$$= \sqrt{4+16}$$
$$= \sqrt{20}$$
$$= 2\sqrt{5}$$

(ii) Distance between points (â€“3, 7, 2) and (2, 4, â€“1)

Using section formula, show that the points A (2, â€“3, 4), B (â€“1, 2, 1) and $C\left(0,\frac{1}{3},2\right)$ are collinear.

Answer :

The given points are A (2, â€“3, 4), B (â€“1, 2, 1), and $C\left(0,\frac{1}{3},2\right)$.

Let P be a point that divides AB in the ratio *k*:1.

Hence, by section formula, the coordinates of P are given by

$$\left(\frac{k(-1)+2}{k+1},\frac{k(2)-3}{k+1},\frac{k(1)+4}{k+1}\right)$$

Now, we find the value of *k* at which point P coincides with point C.

By taking $\frac{-k+2}{k+1}=0$, we obtain *k* = 2.

For *k* = 2, the coordinates of point P are $\left(0,\frac{1}{3},2\right)$.

i.e., $C\left(0,\frac{1}{3},2\right)$ is a point that divides AB externally in the ratio 2:1 and is the same as point P.

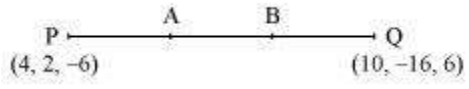
Hence, points A, B, and C are collinear.

Q5 :

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

Answer :

Let A and B be the points that trisect the line segment joining points P (4, 2, â€“6) and Q (10, â€“16, 6)



Point A divides PQ in the ratio 1:2. Therefore, by section formula, the coordinates of point A are given by

$$\left(\frac{1(10)+2(4)}{1+2},\frac{1(-16)+2(2)}{1+2},\frac{1(6)+2(-6)}{1+2}\right)=(6,-4,-2)$$

Point B divides PQ in the ratio 2:1. Therefore, by section formula, the coordinates of point B are given by