

# 1.9.17

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## Question:

Write the coordinates of a point  $\mathbf{P}$  on the  $x$ -axis which is equidistant from the points  $A(-2, 0)$  and  $B(6, 0)$ .

## Solution:

Let the point  $P$  lie on the  $x$ -axis with coordinates

$$\mathbf{P} = (x, 0) \quad (1)$$

The position vectors of points  $A$ ,  $B$ , and  $P$  are

$$\mathbf{A} = \langle -2, 0 \rangle \quad (2)$$

$$\mathbf{B} = \langle 6, 0 \rangle \quad (3)$$

$$\mathbf{P} = \langle x, 0 \rangle \quad (4)$$

Since  $P$  is equidistant from  $A$  and  $B$ , their distances are equal:

$$|\mathbf{P} - \mathbf{A}| = |\mathbf{P} - \mathbf{B}| \quad (5)$$

Using vector subtraction:

$$\mathbf{P} - \mathbf{A} = \langle x - (-2), 0 - 0 \rangle = \langle x + 2, 0 \rangle \quad (6)$$

$$\mathbf{P} - \mathbf{B} = \langle x - 6, 0 - 0 \rangle = \langle x - 6, 0 \rangle \quad (7)$$

Now equate the magnitudes:

$$\sqrt{(x+2)^2 + 0^2} = \sqrt{(x-6)^2 + 0^2} \quad (8)$$

Simplifying, we get:

$$|x + 2| = |x - 6| \quad (9)$$

Consider the two cases:

### Case 1:

$$x + 2 = x - 6 \implies 2 = -6 \quad (\text{not possible}) \quad (10)$$

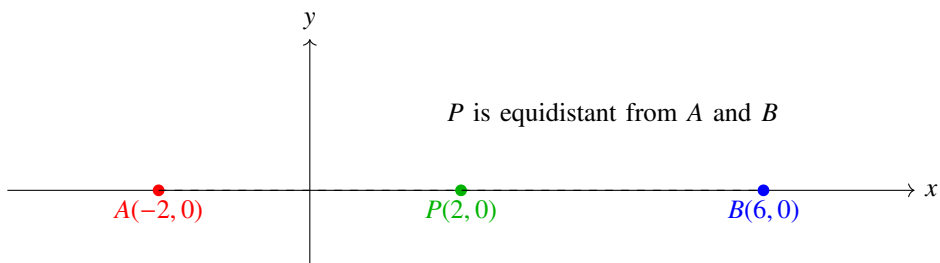
### Case 2:

$$x + 2 = -(x - 6) \implies x + 2 = -x + 6 \implies 2x = 4 \implies x = 2 \quad (11)$$

Therefore, the coordinates of point  $P$  are

$$\boxed{(2, 0)} \quad (12)$$

## Graphical Representation:

**Fig. 0**