

VECTORS

12th Maths - EXERCISE-10.5

Find the position vector of a point R which divides the line joining two points P and Q whose position vectors are $\mathbf{P} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ and $\mathbf{Q} = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$ externally in the ratio 1:2. Also show that P is the midpoint of the line segment RQ.

Solution:

$$\mathbf{P} = \begin{pmatrix} 2 \\ 1 \end{pmatrix} \quad (1)$$

$$\mathbf{Q} = \begin{pmatrix} 1 \\ -3 \end{pmatrix} \quad (2)$$

When \mathbf{R} divides line segment joining \mathbf{P} and \mathbf{Q} externally,

$$\mathbf{R} = \frac{1\mathbf{Q} - 2\mathbf{P}}{-1} \quad (3)$$

$$= \frac{1}{-1}\mathbf{Q} - \frac{2}{-1}\mathbf{P} \quad (4)$$

$$\mathbf{R} = \begin{pmatrix} 3 \\ 5 \end{pmatrix} \quad (5)$$

Let the midpoint of RQ be \mathbf{P} . Position vector of \mathbf{P} is given by

$$\mathbf{P} = \frac{(\mathbf{R} + \mathbf{Q})}{2} \quad (6)$$

$$= \frac{1}{2} \begin{pmatrix} 3 \\ 5 \end{pmatrix} + \frac{1}{2} \begin{pmatrix} 1 \\ -3 \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \end{pmatrix} \quad (7)$$

(7) is same as (1), Hence proved.