

1 NCERT 12.10.5.9

Find the position vector of a point R which divides the line joining two points P and Q whose Position Vectors are $2\vec{a} + \vec{b}$ and $\vec{a} - 3\vec{b}$ externally in the ratio 1 : 2. Also, Show that P is the mid point of the line segment QR

Solution: let us assume a and b and the given ratio is

Symbol	Value
a	$\begin{pmatrix} 1 \\ -3 \end{pmatrix}$
b	$\begin{pmatrix} 0 \\ 2 \end{pmatrix}$
<i>k</i>	2

Table 1: vectors a,b and Ratio k

using section formula

$$\mathbf{R} = \frac{\mathbf{Q} - k.\mathbf{P}}{1 - k} \quad (1)$$

where P and Q depends on a and b then,

$$\mathbf{P} = (2a + b) = 2 \begin{pmatrix} 1 \\ -3 \end{pmatrix} + \begin{pmatrix} 0 \\ 2 \end{pmatrix} = \begin{pmatrix} 2 \\ -4 \end{pmatrix} \quad (2)$$

$$\mathbf{Q} = (a - 3b) = \begin{pmatrix} 1 \\ -3 \end{pmatrix} - 3 \begin{pmatrix} 0 \\ 2 \end{pmatrix} = \begin{pmatrix} 1 \\ -9 \end{pmatrix} \quad (3)$$

where R can be calculated as

$$\mathbf{R} = \frac{(a - 3b) - k.(2a + b)}{1 - k} \quad (4)$$

by substituting a and b values we get R as

$$\mathbf{R} = \begin{pmatrix} 3 \\ 1 \end{pmatrix} \quad (5)$$

Symbol	Value
P	$(2a + b)$
Q	$(a - 3b)$
R	$\frac{(a-3b)-k.(2a+b)}{1-k}$

Table 2: vectors P,Q,R

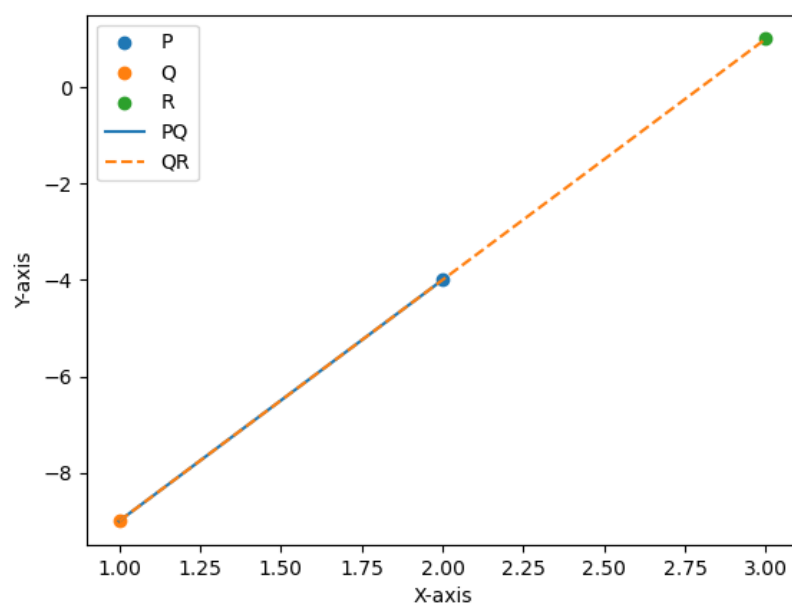


Figure 1: point vectors P,Q,R