

1-1.9-22

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VECTOR ARITHMETIC(CBSE)

Question(1.9.22)Find the value of y for which the distance between the points $\mathbf{P} \begin{pmatrix} 2, & -3 \end{pmatrix}$ and $\mathbf{Q} \begin{pmatrix} 10, & y \end{pmatrix}$ is 10 units.

Solution: We have the points

Parameter	Description
A	$\begin{pmatrix} 2 \\ -3 \end{pmatrix}$
B	$\begin{pmatrix} 10 \\ y \end{pmatrix}$
D	$\mathbf{B} - \mathbf{A}$

TABLE 0: Variables Used

$$\mathbf{D} = \begin{pmatrix} 8 \\ y + 3 \end{pmatrix} \quad (0.1)$$

$$\|\mathbf{D}\|^2 = \mathbf{D}\mathbf{D}^\top \quad (0.2)$$

$$\|\mathbf{D}\|^2 = \begin{pmatrix} 8 \\ y + 3 \end{pmatrix} \begin{pmatrix} 8 & y + 3 \end{pmatrix} \quad (0.3)$$

$$\|\mathbf{D}\|^2 = 8^2 + (y + 3)^2 \quad (0.4)$$

$$(0.5)$$

It has been given that the distance between the points is 10 units, so

$$\|\mathbf{D}\|^2 = 100 \quad (0.6)$$

$$100 = 73 + y^2 + 6y \quad (0.7)$$

$$\therefore y = 3, -9 \quad (0.8)$$

$$(0.9)$$

