

# 1-1.8-10

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**Question:**

If  $\mathbf{Q}(0, 1)$  is equidistant from  $\mathbf{P}(5, -3)$  and  $\mathbf{R}(x, 6)$ , find the values of  $x$ . Also find the distances  $QR$  and  $PR$ .

**Solution:**

point	Description
$\mathbf{P}$	$(5, -3)$
$\mathbf{Q}$	$(0, 1)$
$\mathbf{R}$	$(x, 6)$

TABLE 0: Variables Used

$$PQ = QR \quad (0.1)$$

$$\sqrt{(\mathbf{P} - \mathbf{Q})^\top (\mathbf{P} - \mathbf{Q})} = \sqrt{(\mathbf{Q} - \mathbf{R})^\top (\mathbf{Q} - \mathbf{R})} \quad (0.2)$$

$$\mathbf{P} - \mathbf{Q} = \begin{pmatrix} 5 \\ -4 \end{pmatrix} \quad (0.3)$$

$$\mathbf{Q} - \mathbf{R} = \begin{pmatrix} -x \\ -5 \end{pmatrix} \quad (0.4)$$

$$\sqrt{41} = \sqrt{x^2 + 25} \quad (0.5)$$

on comparing both sides,

$$x = \pm 4 \quad (0.6)$$

$$QR = \sqrt{(\mathbf{Q} - \mathbf{R})^\top (\mathbf{Q} - \mathbf{R})} \quad (0.7)$$

$$QR = \sqrt{41} \quad (0.8)$$

$$PR = \sqrt{(\mathbf{P} - \mathbf{R})^\top (\mathbf{P} - \mathbf{R})} \quad (0.9)$$

if  $x = 4$ ,

$$PR = \sqrt{82} \quad (0.10)$$

if  $x = -4$ ,

$$PR = \sqrt{162} \quad (0.11)$$

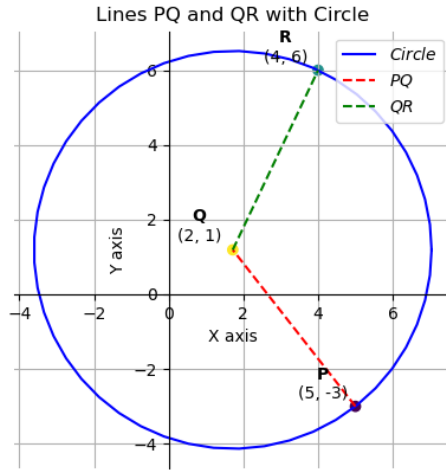


Fig. 0.1: Point Q is equidistant from P and R