# 1-1.9-24

AI24BTECH11015 - Harshvardhan Patidar

Question:
The $x$-coordinate of a point **P** twice its $y$-coordinate. If **P** is equidistant from the points $\mathbf{Q}\begin{pmatrix}2 & -5\end{pmatrix}$ and $\mathbf{R}\begin{pmatrix}-3 & 6\end{pmatrix}$, find the coordinates of **P**.

**Solution:**

| Variable | Description |
|---|---|
| **P** | $\begin{pmatrix}2a & a\end{pmatrix}$ point |
| **Q** | $\begin{pmatrix}2 & -5\end{pmatrix}$ point |
| **R** | $\begin{pmatrix}-3 & 6\end{pmatrix}$ point |
| **a** | $y$-coordinate of **P** |

TABLE 0: Variables Used

Now, since **P** is equidistant from **Q** and **R**,

$$\|P-Q\| = \|P-R\| \tag{0.1}$$

$$\sqrt{(P-Q)^T (P-Q)} = \sqrt{(P-R)^T (P-R)} \tag{0.2}$$

$$(P-Q) = \begin{pmatrix}2a-2\\ a+5\end{pmatrix}, (P-R) = \begin{pmatrix}2a+3\\ a-6\end{pmatrix}$$

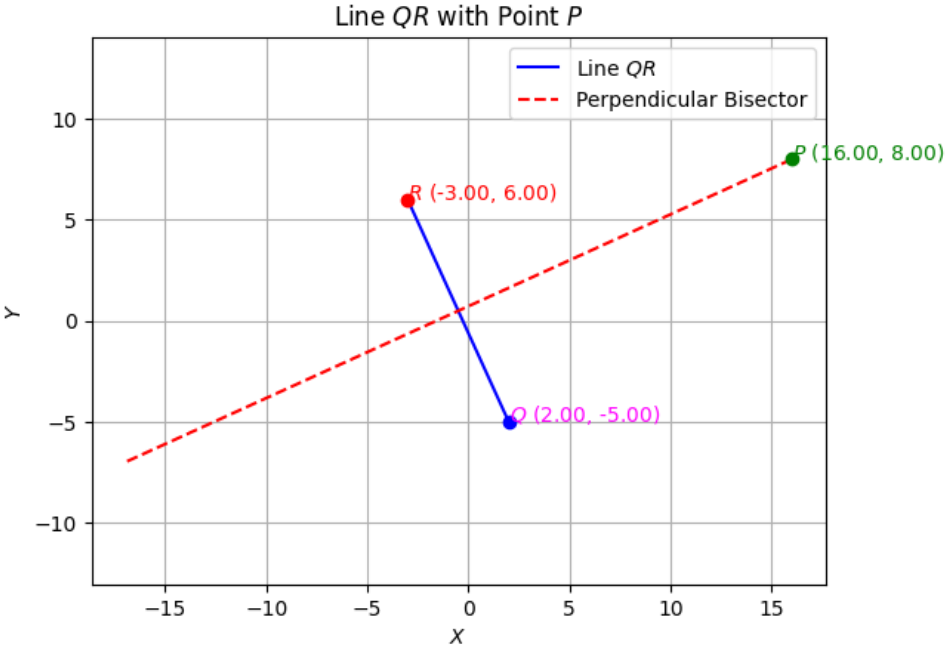
Putting values into equation (0.2) and squaring,

$$(2a-2)^2 + (a+5)^2 = (2a+3)^2 + (a-6)^2 \tag{0.3}$$

$$a = 8 \tag{0.4}$$

So,

$$\mathbf{P} = \begin{pmatrix}16\\ 8\end{pmatrix} \tag{0.5}$$


Line QR with Point P
Line QR
Perpendicular Bisector
P (16.00, 8.00)
R (-3.00, 6.00)
Q (2.00, -5.00)
10
5
0
−5
−10
Y
−15
−10
−5
0
5
10
15
X