Assignment-2 1-1.5-28

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$\mathbf{P}(5, -3)$ and $\mathbf{Q}(3, y)$ are the points of trisection of the line segment joining $\mathbf{A}(7, -2)$ and $\mathbf{B}(1, -5)$. Then y equals

Solution: Given $\mathbf{P}(5, -3)$, $\mathbf{A}(7, -2)$, $\mathbf{B}(1, -5)$ and $\mathbf{Q}(3, y)$

Also given that $\mathbf{P} and \mathbf{Q}$ are the points of tricection of AB.

Let $\mathbf{Q}$ divides the line segment AB in the ratio $k : 1$. That implies $\mathbf{P}$ divides line segment AB in the ratio $1 : k$.

$$\mathbf{P} = \frac{k\mathbf{A} + \mathbf{B}}{k + 1}$$

lets solve x coordinate

$$5 = \frac{7k + 1}{k + 1}$$
$$k = 2$$

Therefore $\mathbf{Q}$ divides AB in the ratio $2 : 1$

$$\begin{pmatrix} 3 \\ y \end{pmatrix} = \frac{\mathbf{B} + \frac{1}{2}\mathbf{A}}{1 + \frac{1}{2} + 1}$$
$$y = \frac{(-5) + (-2)\frac{1}{2}}{\frac{3}{2}}$$
$$y = -4$$

Point	Description
P(5,-3)	This point divides A(7,-2) and B(1,-5) in the ratio 1:2
Q(3,-4)	This point divides A(7,-2) and B(1,-5) in the ratio 2:1

Trisection of Line Segment AB with Labeled Points