CHAPTER-7
COORDINATE GEOMETRY

# Excercise 7.2.9

1. Find the coordinates of the point which divides the line segment joining $(-2, 2)$ and $(2, 8)$ into four equal parts

**Solution:**

Let the points **A**,**B**,**C** which divide the line into 4 equal parts

| point | ratio | value |
|-------|-------|-------|
| A | $\left(PAQ\right)$ | 3:1 |
| B | $\left(PBQ\right)$ | 2:2 |
| C | $\left(PCQ\right)$ | 1:3 |

Table 1:

coordinates and ratio are given as:

$$\mathbf{P} = \begin{pmatrix} -2 \\ 2 \end{pmatrix}, \mathbf{Q} = \begin{pmatrix} 2 \\ 8 \end{pmatrix}, \tag{1}$$

1. Using section formula for n:

$$n = \frac{3}{1} \tag{2}$$

$$\mathbf{R} = \frac{\mathbf{Q} + n\mathbf{P}}{1 + n} \tag{3}$$

$$= \frac{1}{1 + \frac{3}{1}} \left( \begin{pmatrix} 2 \\ 8 \end{pmatrix} + \frac{3}{1} \begin{pmatrix} -2 \\ 2 \end{pmatrix} \right) \tag{4}$$

$$= \frac{1}{\frac{4}{1}} \left( \begin{pmatrix} 2 \\ 8 \end{pmatrix} + \frac{1}{1} \begin{pmatrix} -6 \\ 6 \end{pmatrix} \right) \tag{5}$$

$$= \frac{1}{4} \begin{pmatrix} -4 \\ 14 \end{pmatrix} \tag{6}$$

$$= \begin{pmatrix} -1 \\ \frac{7}{2} \end{pmatrix} \tag{7}$$

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2. Using section formula for n:

$$n = \frac{2}{2} \tag{8}$$

$$\mathbf{R} = \frac{\mathbf{Q} + n\mathbf{P}}{1 + n} \tag{9}$$

$$= \frac{1}{1 + \frac{2}{2}} \left( \begin{pmatrix} 2 \\ 8 \end{pmatrix} + \frac{2}{2} \begin{pmatrix} -2 \\ 2 \end{pmatrix} \right) \tag{10}$$

$$= \frac{1}{\frac{4}{2}} \left( \begin{pmatrix} 2 \\ 8 \end{pmatrix} + \frac{1}{1} \begin{pmatrix} -2 \\ 2 \end{pmatrix} \right) \tag{11}$$

$$= \frac{1}{2} \begin{pmatrix} 0 \\ 10 \end{pmatrix} \tag{12}$$

$$= \begin{pmatrix} 0 \\ 5 \end{pmatrix} \tag{13}$$

3. Using section formula for n:

$$n = \frac{1}{3} \tag{14}$$

$$\mathbf{R} = \frac{\mathbf{Q} + n\mathbf{P}}{1 + n} \tag{15}$$

$$= \frac{1}{1 + \frac{1}{3}} \left( \begin{pmatrix} 2 \\ 8 \end{pmatrix} + \frac{1}{3} \begin{pmatrix} -2 \\ 2 \end{pmatrix} \right) \tag{16}$$

$$= \frac{1}{\frac{4}{3}} \left( \begin{pmatrix} 2 \\ 8 \end{pmatrix} + \begin{pmatrix} \frac{-2}{3} \\ \frac{2}{3} \end{pmatrix} \right) \tag{17}$$

$$= \frac{3}{4} \begin{pmatrix} \frac{4}{3} \\ \frac{26}{3} \end{pmatrix} \tag{18}$$

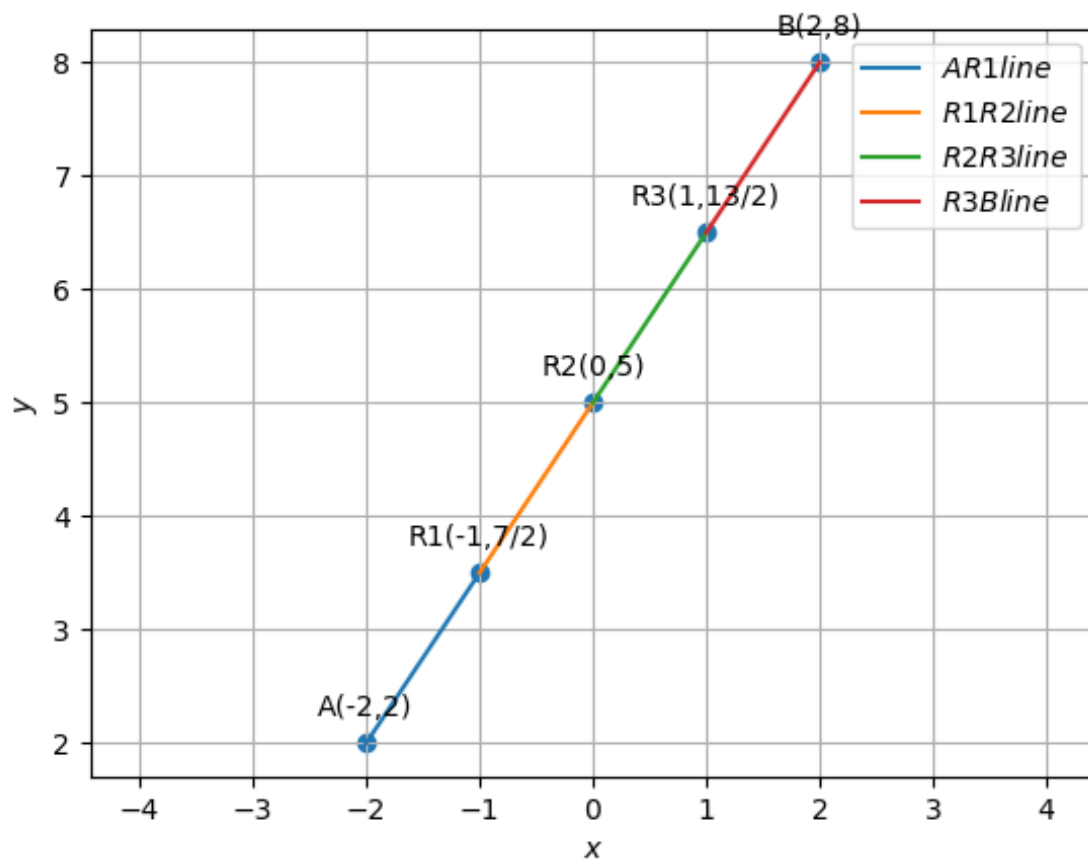$$= \begin{pmatrix} 1 \\ \frac{13}{2} \end{pmatrix} \tag{19}$$

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Figure 1: