

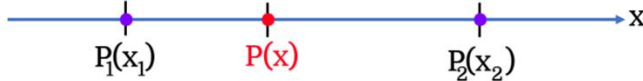
DIVIDING A LINE SEGMENT GIVEN A RATIO



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DIVISION OF A LINE SEGMENT IN A GIVEN RATIO

If $P_1(x_1)$ and $P_2(x_2)$ are the endpoints of a line segment; and $P(x)$ is any point on the line $\overline{P_1P_2}$. Then, "P" divides the line segment in two parts $\overline{P_1P}$ and $\overline{PP_2}$, with the same direction given a ratio "r".



The ratio is defined as:

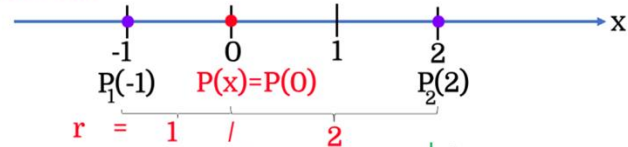
$$r = \frac{\overline{P_1P}}{\overline{PP_2}} \quad \vee \quad r = \overline{P_1P} : \overline{PP_2}$$

Hence:

$$r = \frac{x - x_1}{x_2 - x} \quad \text{if } x_2 \neq x \quad \boxed{x = \frac{x_1 + rx_2}{1 + r}} \quad \text{if } r \neq -1$$

EXAMPLE: What is the coordinate of the division point of the segment defined by the endpoints $P_1(-1)$, $P_2(2)$ given the ratio $r = \frac{\overline{P_1P}}{\overline{PP_2}} = \frac{1}{2}$?

SOLUTION: 1) Plotting:



2) Using the formula to calculate the point that divides a segment given a ratio:

$$x = \frac{x_1 + rx_2}{1 + r}$$

3) Substituting:

$$x = \frac{-1 + (\frac{1}{2})(2)}{1 + (\frac{1}{2})}$$

4) Isolating "x":

$$x = \frac{-1 + (\frac{1}{2})(2)}{1 + (\frac{1}{2})} \quad x = \frac{0}{\frac{3}{2}} \quad x = 0$$



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