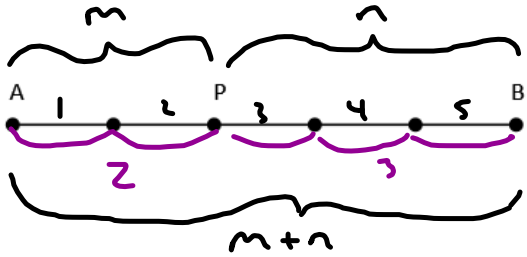
Lesson 3 – *Division Point of a segment*

Definition: The point ***P*** divides $\overline{AB}$ in a given ratio (m:n).

Ex.

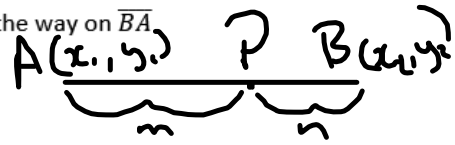


Point P divides $\overline{AB}$ with a 2:3 ratio

AND

P is $\frac{2}{5}$ of the way on $\overline{AB}$.

Note: Alternatively we can say that P divides $\overline{BA}$ with a 3:2 ratio and P is $\frac{3}{5}$ of the way on $\overline{BA}$.



The find P(x_p, y_p) (ie the coordinates of P) dividing $\overline{AB}$ in the ratio m:n we use the following formulas:

Part : Part

$$x_p = x_1 + \frac{m}{m+n}(x_2 - x_1) \qquad y_p = y_1 + \frac{m}{m+n}(y_2 - y_1)$$

Part : Whole

x_1, y_1 x_2, y_2

Ex. Given A (-3,4) and B(6, 1) find the coordinates point P which divides $\overline{AB}$ with a 2:1 ratio.

$$x_p = x_1 + \frac{m}{m+n}(x_2 - x_1) \qquad y_p = y_1 + \frac{m}{m+n}(y_2 - y_1)$$

$$x_p = -3 + \frac{2}{2+1}(6 - -3) \qquad y_p = 4 + \frac{2}{2+1}(1 - 4)$$

$$x_p = -3 + \frac{2}{3}(9) \qquad y_p = 4 + \frac{2}{3}(-3)$$

$$x_p = -3 + 6 \qquad y_p = 4 + -2$$

$$x_p = 3 \qquad y_p = 2$$

Therefore the coordinates of P are (3,2).

Ex. Point P divides segment $\overline{AB}$ in a ratio of 3:1 whose endpoints are A(3, 7) and B(-4, -10). What are the coordinates of point P?

x_1 y_1 x_2 y_2 m n

$$x_p = x_1 + \frac{m}{m+n}(x_2 - x_1)$$

$$3 + \frac{3}{3+1}(-4-3)$$

$$3 + \frac{3}{3+1}(-7)$$

$$3 + \frac{3}{4}(-7)$$

$$3 + -5.25$$

$$-2.25$$

$$y_p = y_1 + \frac{m}{m+n}(y_2 - y_1)$$

$$7 + \frac{3}{3+1}(-10-7)$$

$$7 + \frac{3}{4}(-17)$$

$$7 + -12.75$$

$$-5.75$$

$$P(-2.25, -5.75)$$

Homework

Textbook Volume 1

P. 18 #10

P. 20 #15

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