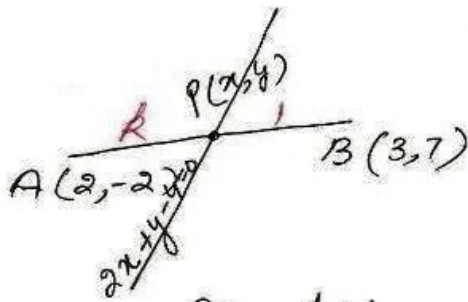


①



Let $AP:PB = k:1$

$$x = \frac{3k+2}{k+1}, y = \frac{7k+(-2)}{k+1}$$

P lies on the given line

$$\therefore 2\left(\frac{3k+2}{k+1}\right) + \frac{7k-2}{k+1} - 4 = 0$$

$$\Rightarrow \frac{6k+4+7k-2}{k+1} = 4$$

$$\Rightarrow 13k+2 = 4(k+1)$$

$$\Rightarrow 13k+2 = 4k+4$$

$$\Rightarrow 13k-4k = 4-2$$

$$\Rightarrow 9k = 2$$

$$\Rightarrow k = \frac{2}{9}$$

\therefore required ratio
 $= 2:9$

② $A(x, y), B(1, 2), C(7, 0)$

Points A, B, C are collinear

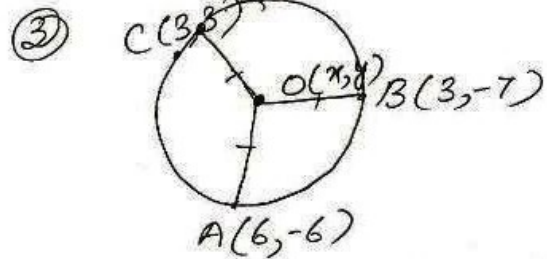
\therefore ar(ΔABC) = 0

$$\frac{1}{2} [x(2-0) + 1(0-y) + 7(y-2)] = 0$$

$$\Rightarrow 2x - 0 + 0 - y + 7y - 14 = 0$$

$$\Rightarrow 2x + 6y - 14 = 0$$

$$\begin{aligned} &(-2) \\ &x + 3y - 7 = 0 \end{aligned}$$



$OA = OB = OC$ (radii of same circle)

$$\Rightarrow OA^2 = OB^2 = OC^2$$

$$(6-x)^2 + (-6-y)^2 = (3-x)^2 + (-7-y)^2$$

$[OA^2 = OB^2]$

$$36 + x^2 - 12x + 36 + y^2 + 12y = 9 + x^2 - 6x + 49 + y^2 + 14y$$

$$\Rightarrow -12x + 6x + 12y - 14y = 58 - 72$$

$$\Rightarrow -6x - 2y = -14$$

$$\begin{aligned} &(-2) \\ &-3x - y = -7 \dots \textcircled{1} \end{aligned}$$

$$(3-x)^2 + (-7-y)^2 = (3-x)^2 + (3-y)^2$$

$[OB^2 = OC^2]$

$$49 + y^2 + 14y = 9 + y^2 - 6y$$

$$\Rightarrow 20y = -40$$

$$\Rightarrow y = -2$$

Sub ①

$$-3x + 2 = -7$$

$$\Rightarrow -3x = -9$$

$$\Rightarrow x = 3$$

$$\therefore O(3, -2)$$