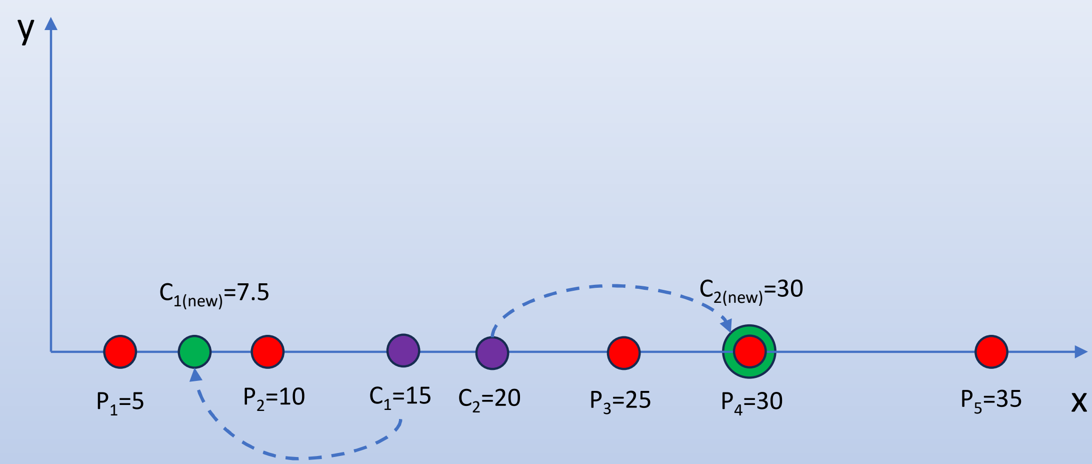
K-means case study:



i	x	y	c_1 X=15, Y=0	c_2 X=20, Y=0	cluster
1	5	0	$\overline{c_1.p_1} = \sqrt{(15-5)^2+(0-0)^2}$=**10**	$\overline{c_2.p_1} = \sqrt{(20-5)^2+(0-0)^2}$=**15**	$\overline{c_1.p_1} < \overline{c_2.p_1} \to 10 < 15 \to \boldsymbol{C_1}$
2	10	0	$\overline{c_1.p_2} = \sqrt{(15-10)^2+(0-0)^2}$=**5**	$\overline{c_2.p_2} = \sqrt{(20-10)^2+(0-0)^2}$=**10**	$\overline{c_1.p_2} < \overline{c_2.p_2} \to 5 < 10 \to \boldsymbol{C_1}$
3	25	0	$\overline{c_1.p_3} = \sqrt{(15-25)^2+(0-0)^2}$=**10**	$\overline{c_2.p_3} = \sqrt{(20-25)^2+(0-0)^2}$=**5**	$\overline{c_1.p_3} > \overline{c_2.p_3} \to 10 > 5 \to \boldsymbol{C_2}$
4	30	0	$\overline{c_1.p_4} = \sqrt{(15-30)^2+(0-0)^2}$=**15**	$\overline{c_3.p_4} = \sqrt{(20-30)^2+(0-0)^2}$=**10**	$\overline{c_1.p_4} > \overline{c_2.p_4} \to 15 > 10 \to \boldsymbol{C_2}$
5	35	0	$\overline{c_1.p_5} = \sqrt{(15-35)^2+(0-0)^2}$=**20**	$\overline{c_4.p_5} = \sqrt{(20-35)^2+(0-0)^2}$=**15**	$\overline{c_1.p_5} > \overline{c_2.p_5} \to 20 > 15 \to \boldsymbol{C_2}$

Distances between points and centroids:

$$\overline{c_j.p_i} = \sqrt{\left(c_{jx}-p_{ij}\right)^2 + \left(c_{jy}-p_{iy}\right)^2}$$

New centroids:

$$c_{jx(new)} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

$$c_{jy(new)} = \frac{1}{n}\sum_{i=1}^{n} y_i$$

New centroids - calculation:

$$c_{1x(new)} = \frac{1}{n}\sum_{i=1}^{n} x_i = \frac{(10+5)}{2} = 7.5$$

$$c_{1y(new)} = 0$$

$$c_{2x(new)} = \frac{1}{n}\sum_{i=1}^{n} x_i = \frac{(25+30+35)}{3} = 30$$

$$c_{2y(new)} = 0$$