

Problem #1:

Let initial centroids be: $k_1 = 3, 4$ $k_2 = 6, 7$
So, By using Euclidean Distance. $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

X	Y	k_1	k_2	clusters
2	3	1.41	5.65	k_1
3	4	0	4.24	k_1
5	6	2.82	1.14	k_2
6	7	4.24	0	k_2
8	9	7.07	2.82	k_2

For k_1 : $\sqrt{(3-2)^2 + (4-3)^2} = 1.41$, $\sqrt{(5-3)^2 + (6-4)^2} = 2.82$
 $\sqrt{(6-3)^2 + (7-4)^2} = 4.24$, $\sqrt{(8-3)^2 + (9-4)^2} = 7.07$

For k_2 : $\sqrt{(2-6)^2 + (3-7)^2} = 5.65$, $\sqrt{(3-6)^2 + (4-7)^2} = 4.24$
 $\sqrt{(5-6)^2 + (6-7)^2} = 1.14$, $\sqrt{(8-6)^2 + (9-7)^2} = 2.82$

So, new clusters are:

$$k_1 = \left(\frac{2+3}{2}, \frac{3+4}{2} \right) = (2.5, 3.5)$$

$$k_2 = \left(\frac{5+6+8}{3}, \frac{6+7+9}{3} \right) = (6.33, 7.33)$$

X	Y	k_1	k_2	cluster
2	3	0.707	6.12	k_1
2.5	3.5	0.707	4.70	k_1
5	6	3.53	1.88	k_2
6.33	7.33	4.94	0.46	k_2
8	9	7.77	2.36	k_2

So as clusters are same. So our clusters formed are:

$$k_1 = (2.5, 3.5)$$

$$k_2 = (6.33, 7.33)$$