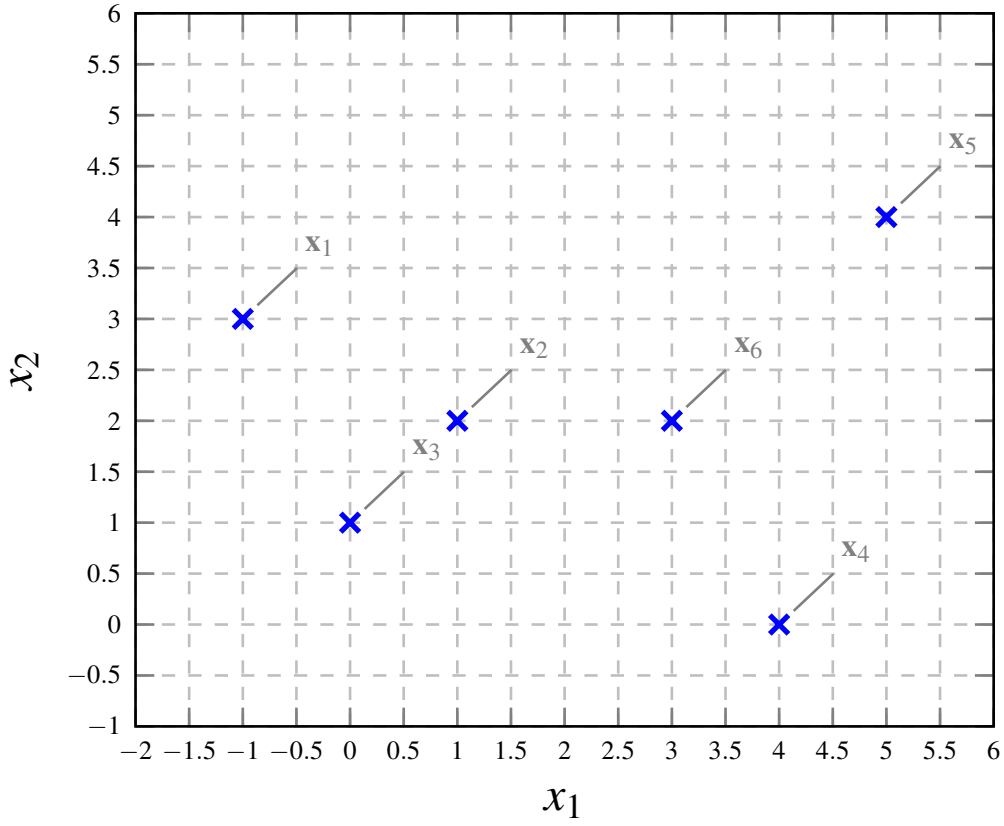
Example: Given the data set S and the initial centres as $\mathbf{m}_1 = \mathbf{x}_1$ and $\mathbf{m}_2 = \mathbf{x}_6$, perform the K-means algorithm with $K = 2$ until the means converge.

$$S = \{\underbrace{(-1,3)}_{\mathbf{x}_1}, \underbrace{(1,2)}_{\mathbf{x}_2}, \underbrace{(0,1)}_{\mathbf{x}_3}, \underbrace{(4,0)}_{\mathbf{x}_4}, \underbrace{(5,4)}_{\mathbf{x}_5}, \underbrace{(3,2)}_{\mathbf{x}_6}\}$$



Example: Initialisation: $c = 2$; $\mathbf{m}_1 = (-1,3)$ and $\mathbf{m}_2 = (3,2)$

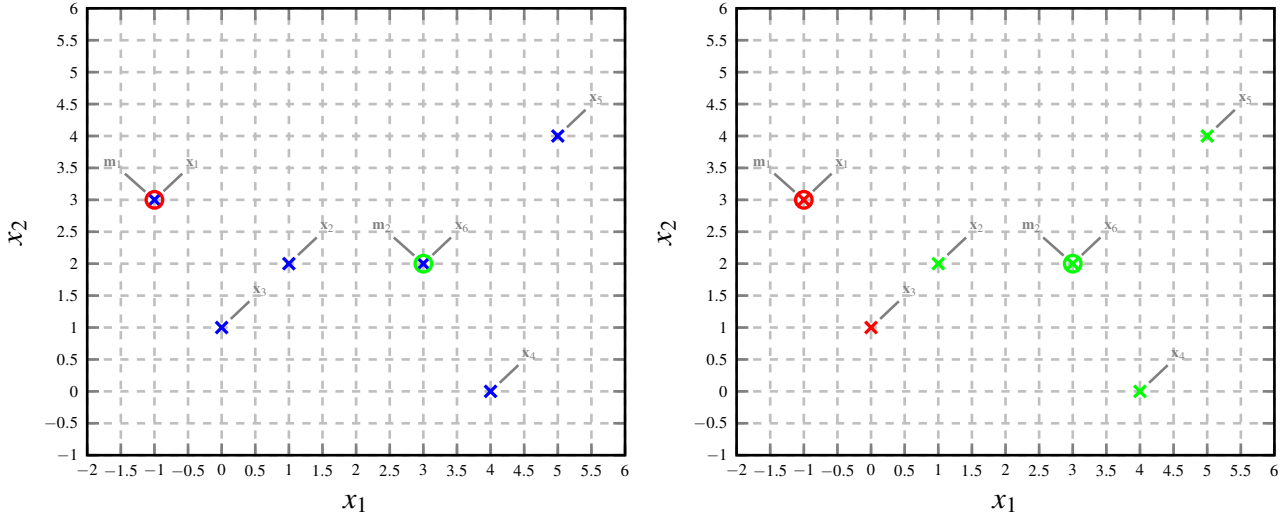
First iteration:

Step 1: Compute $\|\mathbf{x}_i - \mathbf{m}_j\|$, $i = 1, 2, \ldots, 6$; $j = 1, 2$ and classify samples.

i	$\mathbf{x}_i$	$\|\mathbf{x}_i - \mathbf{m}_1\|$	$\|\mathbf{x}_i - \mathbf{m}_2\|$	Assigned Cluster
1	$(-1,3)$	0	4.1231	1
2	$(1,2)$	2.2361	2.0000	2
3	$(0,1)$	2.2361	3.1623	1
4	$(4,0)$	5.8310	2.2361	2
5	$(5,4)$	6.0828	2.8284	2
6	$(3,2)$	4.1231	0.0000	2

Step 2: Recompute $\mathbf{m}_j$.

$$\mathbf{m}_1 = \frac{(-1,3)+(0,1)}{2} = (-0.5,2),\ \mathbf{m}_2 = \frac{(1,2)+(4,0)+(5,4)+(3,2)}{4} = (3.25,2),$$



Example:

Second iteration:

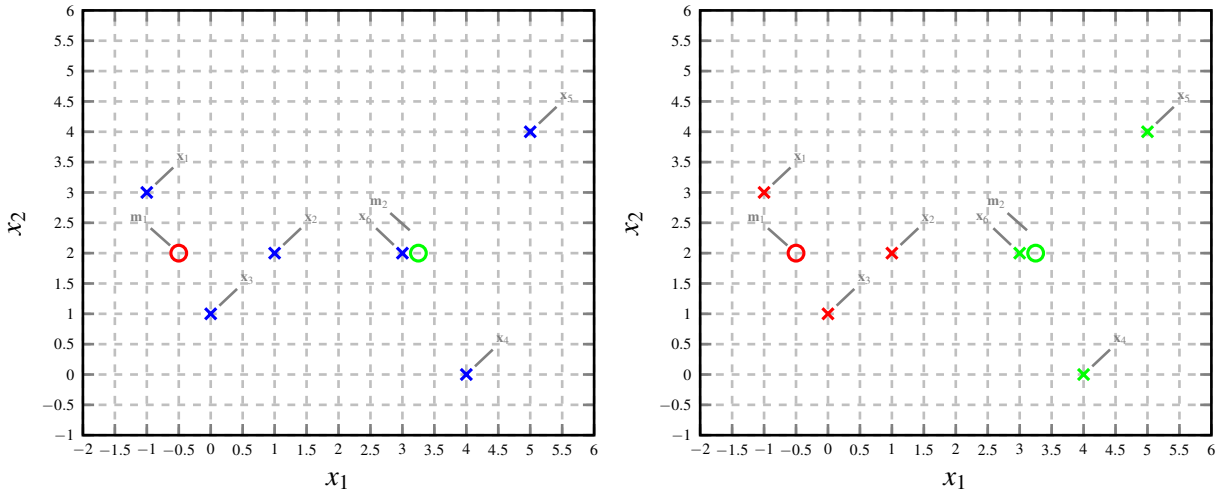
$\mathbf{m}_1 = (-0.5, 2)$ and $\mathbf{m}_2 = (3.25, 2)$

Step 1: Compute $\|\mathbf{x}_i - \mathbf{m}_j\|$, i = 1, 2, ..., 6; j = 1, 2 and classify samples.

i	$\mathbf{x}_i$	$\|\mathbf{x}_i - \mathbf{m}_1\|$	$\|\mathbf{x}_i - \mathbf{m}_2\|$	Assigned Cluster
1	$(-1,3)$	1.1180	4.3661	1
2	$(1,2)$	1.5000	2.2500	1
3	$(0,1)$	1.1180	3.4004	1
4	$(4,0)$	4.9244	2.1360	2
5	$(5,4)$	5.8523	2.6575	2
6	$(3,2)$	3.5000	0.25	2

Step 2: Recompute $\mathbf{m}_j$.

$\mathbf{m}_1 = \frac{(-1,3)+(1,2)+(0,1)}{3} = (0,2)$, $\mathbf{m}_2 = \frac{(4,0)+(5,4)+(3,2)}{3} = (4,2)$.



Example:

Third iteration: $\mathbf{m}_1 = (0, 2)$ and $\mathbf{m}_2 = (4, 2)$ do not change.