CMPE 256.

K Mean Cluster (Shopping Index & Income Index: Assignment.

Part A → We will use K-means clustering with K=2.

Let's choose our Initial clusters as (2,6) ~~(4,5)~~, ~~(8,3)~~ (9,1) as they are farthest points

	Individual	Centroid
Cluster 1	~~4~~	(4,5)
Cluster 2	~~16~~	(8,3)

	Individual	Centroid
Cluster 1	4	(2,6)
Cluster 2	16	(9,1)

The remaining individuals are now examined in sequence and allocated to the cluster to which they are closest, in terms of Euclidean distance to the cluster mean.

	Cluster 1		Cluster 2	
step	shopper	Centroid	shopper	Centroid
1.	4	(2,6)	16	(9,1)
2	1,4	(2.5, 5.5)	16	(9,1)
3	1,2,4	(2.6, 5)	16	(9,1)
4.	1,2,3,4	(3.25, 5.25)	16	(9,1)
5	1,2,3,4,5	(3.4, 5.2)	16	(9,1)
6.	1,2,3,4,5,6	(3.8, 5.6)	16	(9,1)
7	1,2,3,4,5,6	(3.8, 5.6)	16,7	(7.5, 1.5)
8	1,2,3,4,5,6,8	(4.14, 5.28)	7,16	(7.5, 1.5)
9.	1,2,3,4,5,6,8,9	(4.25, 5.38)	7,16	(7.5, 1.5)
10	1,2,3,4,5,6,8,9,10	(4.44, 5.55)	7,16	(7.5, 1.5)
11	1,2,3,4,5,6,8,9,10	(4.44, 5.55)	7,11,16	(7.33, 1.66)
12	1,2,3,4,5,6,8,9,10	(4.44, 5.55)	7,11,12,16	(7.5, 2.5)
13	1,2,3,4,5,6,8,9,10	(4.44, 5.55)	7,11,12,13,16	(7.8, 2.2) ~~(6.44, 2.77)~~
14	1,2,3,4,5,6,8,9,10	(4.44, 5.55)	7,11,12,13,14,16	(7.83, 2.16)
15	1,2,3,4,5,6,8,9,10	(4.44, 5.55)	7,11,12,13,14,15,16	(8, 2.7)

	Cluster 1		Cluster 2	
Step	Shopper	Centroid	Shopper	Centroid.
17	1,2,3,4,5, 6,8,9,10	(4.44, 5.55)	7,11,12,13, 14,15,16,17	(8, 2.75)

Now, lets compare the, each shopper's distance to its own individual cluster mean and to that of other cluster

Shopper	Distance to centroid of Cluster 1 (4.44, 5.55)	Distance to centroid of Cluster 2 (8, 2.75)
1	1.5	5.48
2	2.11	5.15
3	0.78	4.42
4	2.48	6.82
5	0.70	4.58
6	2.90	5.62
7	3.87	2.14
8	2.98	2.02
9	0.72	4.42
10	2.13	4.69
11	4.37	1.25
12	3.60	2.25
13	6.44	2.02
14	5.03	0.75
15	4.58	3.40
16	6.44	2.02
17	4.37	0.25

Since, distance to centroid of Cluster 2 to point 8=(6,3) is closer than that to centroid of Cluster 1. Therefore, point 8=(6,3) is relocated to cluster 2.

	Cluster 1		Cluster 2	
Step	Shopper	Centroid	Shopper	Centroid.
	1,2,3,4,5, 6,9,10	(4.25, 5.9)	7,8,11,12,13, 14,15,16,17	(7.77, 2.77)

Now, again lets compare if all points belongs to correct cluster.

Shopper	Distance to Centroid of Cluster 1 (4.25, 5.9)	Distance to Centroid of Cluster 2 (7.77, 2.77)
1	1.54	5.26
2	2.27	4.92
3	0.75	4.25
4	2.25	6.61
5	0.93	4.38
6	2.73	5.52
7	4.27	1.93
8	3.38	1.78
9	0.75	4.25
10	2.06	4.5
11	4.77	1.08
12	3.85	2.24
13	6.82	2.15
14	5.41	0.8
15	4.75	3.4
16	6.82	2.15
17	4.24	0.32

Since, we verified that all points are in correct cluster. Therefore, Our final clusters are.

	Shopper.	Centroid.
Cluster 1	1, 2, 3, 4, 5, 6, 9, 10	(4.25, 5.9)
Cluster 2	7, 8, ~~9, 10~~ 11, 12, 13, 14, 15, 16, 17	(7.77, 2.77