Cluster using Single Link → Agglomerative Hierarchy

Sample No.	X	Y
P1	0.40	0.53
P2	0.22	0.38
P3	0.35	0.32
P4	0.26	0.19
P5	0.08	0.41
P6	0.45	0.30

① Compute the distance matrix, using Euclidean distance.

$$d(P_1, P_2) = \sqrt{(0.22-0.40)^2 + (0.38-0.53)^2} = 0.23$$

$$d(P_1, P_3) = \sqrt{(0.35-0.40)^2 + (0.32-0.53)^2} = 0.22$$

	P1	P2	P3	P4	P5	P6
P1	0					
P2	0.23	0				
P3	0.22	0.14	0			
P4	0.37	0.19	0.13	0		
P5	0.34	0.14	0.28	0.23	0	
P6	0.24	0.24	0.10	0.22	0.39	0

② Merge 2 closest members.

Minimum value is 0.10 so we combine P3 and P6.

Now, form clusters corresponding to minimum value and update distance matrix.

	P1	P2	P3, P6	P4	P5
P1	0				
P2	0.23	0			
P3, P6	0.22	0.14	0		
P4	0.37	0.19	0.13	0	
P5	0.34	0.14	0.28	0.23	0

We merged P3 and P6 where in distance matrix P6 row and column were removed.

③ We again need to find minimum distance from above matrix. It is 0.13 for P4 row.

So, now we merge row and column of P4 with P3, P6.

	P1	P2	P3, P6, P4	P5
P1	0			
P2	0.23	0		
P3, P6, P4	0.22	0.14	0	
P5	0.34	0.14	0.28	0

④ If we consider 3 digits after decimal then 0.14 (P5) is smallest distance. We merge P5 with P2 and P5 row and column will be removed.

	P1	P2, P5	P3, P6, P4
P1	0		
P2, P5	0.23	0	
P3, P6, P4	0.22	0.14	0

⑤ So, now out of this, we have to find minimum distance which is 0.14. So we merge (P3, P6, P4) with (P2, P5) and remove row and column of (P3, P6, P4).

	P1	P2, P5, P3, P6, P4
P1	0	
P2, P5, P3, P6, P4	0.22	0

⑥ Now, 0.22 is minimum value so we merge it with P1.
So, the clusters that we get,

$[\{(P3, P6), P4\}, (P2, P5)], P1.$

⑦ We can't consider 0 because otherwise all will be merged.

⑧ Now, we create dendrogram which is a tree structure showing how clusters are formed.