

	A	B	C	D	E
A	0				
B	9	0			
C	3	7	0		
D	6	5	9	0	
E	11	10	2	8	0

Solution

Combining ~~A and B~~ C and E

	AB
AB	

	A	B	CE	D
A	0			
B	9	0		
CE	3	7	0	
D	6	5	9	0

Combining CE and A

	ACE	B	D
ACE	0		
B	3	0	
D	6	5	0

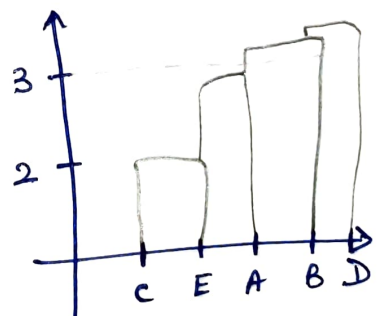
Combining ACE and B

	ACEB	D
ACEB	0	
D	3	0

Combining all

	ACEBD
ACEBD	0

Dendrogram



	x	y
1)	1	1
2)	1.5	2
3)	3	4
4)	5	7
5)	3.5	5
6)	4.5	5
7)	3.5	4.5

Initially take two clusters

$$C-1 \Rightarrow (1, 1)$$

$$C-2 \Rightarrow (4.5, 5)$$

$$C_1 \Rightarrow (1, 2)$$

$$C_2 \Rightarrow (6, 3, 4, 5, 7)$$

point $\Rightarrow (1.5, 2)$

$$\begin{array}{l} C_1 \rightarrow \sqrt{(1.5-1)^2 + (2-1)^2} \Rightarrow \sqrt{(0.5)^2 + 1^2} \Rightarrow 1.11 \\ C_2 \rightarrow \sqrt{(1.5-4.5)^2 + (5-1)^2} \Rightarrow \sqrt{3^2 + 4^2} \Rightarrow \sqrt{25} \Rightarrow 5 \end{array}$$

so point $(1.5, 2)$ belongs to cluster C-1

so the centroid of C-1 changes

$$\Rightarrow \left(\frac{1+1.5}{2} ; \frac{1+2}{2} \right)$$

$$C_1 \Rightarrow (1.75, 1.5)$$

new centroid

point $\Rightarrow (3, 4)$

$$\begin{array}{l} C_1 \rightarrow \sqrt{(3-1.75)^2 + (4-1.5)^2} \Rightarrow 2.795 \\ C_2 \rightarrow \sqrt{(3-4.5)^2 + (4-5)^2} \Rightarrow 1.802 \end{array}$$

so point $(3, 4)$ belongs to the cluster C-2

so the centroid of C-2 changes

$$\Rightarrow \left(\frac{3+4.5}{2} ; \frac{4+5}{2} \right) \Rightarrow (3.75 ; 4.5)$$

$$C_2's \text{ New centroid} \Rightarrow 3.75, 4.5$$

point (5, 7) $\begin{cases} c_1 \rightarrow \sqrt{(5-1.75)^2 + (7-1.5)^2} \Rightarrow \sqrt{653/16} \Rightarrow 6.388 \\ c_4 \rightarrow \sqrt{(5-3.75)^2 + (7-4.5)^2} \Rightarrow \sqrt{15/2} \Rightarrow 2.738 \end{cases}$

point (5, 7) belongs to the cluster c_4

so the centroid of c_2 changes

$$\Rightarrow \left(\frac{4.5 + 3 + 5}{3} ; \frac{5 + 4 + 7}{3} \right)$$

$$\Rightarrow (4.166 ; 5.33)$$

c_2 's New centroid $\Rightarrow (4.166, 5.33)$

point (3.5, 5) $\begin{cases} c_1 \rightarrow \sqrt{(3.5-1.75)^2 + (5-1.5)^2} \Rightarrow 3.473 \\ c_2 \rightarrow \sqrt{(3.5-4.166)^2 + (5-5.33)^2} \Rightarrow 0.743 \end{cases}$

so the point (3.5, 5) belongs to the cluster c_2

Centroid of $c_2 \Rightarrow \left(\frac{4.5 + 3 + 5 + 3.5}{4} ; \frac{5 + 4 + 7 + 5}{4} \right)$

$c_2 \Rightarrow (4 ; 5.25)$

point (3.5, 4.5) $\begin{cases} c_1 \rightarrow \sqrt{(3.5-1.75)^2 + (4.5-1.5)^2} \Rightarrow 3.473 \\ c_2 \rightarrow \sqrt{(3.5-4)^2 + (4.5-5.25)^2} \Rightarrow 0.901 \end{cases}$

point (3.5, 4.5)

belongs to the cluster c_2

cluster $c_1 \Rightarrow (1, 2)$

cluster $c_2 \Rightarrow (6, 3, 4, 5, 7)$