

Q3)

minimum  $\rightarrow A \text{ to } B = 1$ merge A, B  $\Rightarrow$ 

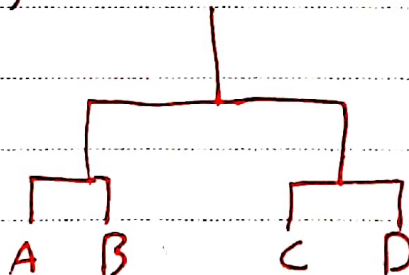
	A, B	C	D
A, B	0	3	5
C		0	2
D			0

minimum  $\rightarrow C \text{ to } D = 2$ merge C, D  $\Rightarrow$ 

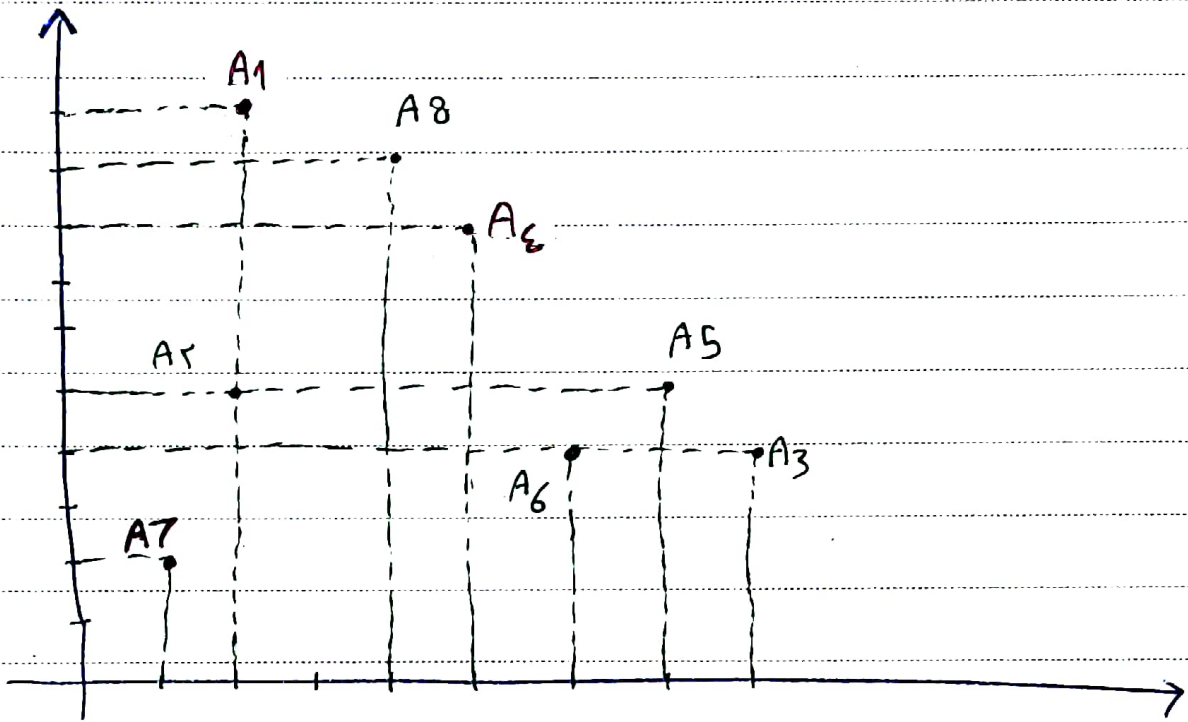
	A, B	C, D
A, B	0	3
C, D		0

minimum  $\rightarrow (A, B) \text{ to } (C, D) = 3$ merge A, B & C, D  $\Rightarrow$ 

hierarchical



Q1)



distances :

		(2, 10)	(2, 9)	(1, 8)	
		$A_1$	$A_8$	$A_2$	
(1, 0)	$A_2$	5	$3\sqrt{2}$	$\sqrt{10}$	$\Rightarrow A_7$
(1, 2)	$A_3$	$4\sqrt{2}$	5	$\sqrt{13}$	$\Rightarrow A_4$
(3, 0)	$A_5$	$2\sqrt{2}$	$\sqrt{13}$	$3\sqrt{5}$	$\Rightarrow A_4$
(4, 2)	$A_6$	$2\sqrt{13}$	$\sqrt{14}$	$\sqrt{29}$	$\Rightarrow A_4$
(2, 9)	$A_8$	$\sqrt{10}$	$\sqrt{2}$	$\sqrt{11}$	$\Rightarrow A_4$

① clusters  $\rightarrow A_1$  $\hookrightarrow A_8, A_3, A_5, A_6$  $\hookrightarrow A_7, A_2$ 

(الف)

↳ New centers :  $A_1 \rightarrow A_1$

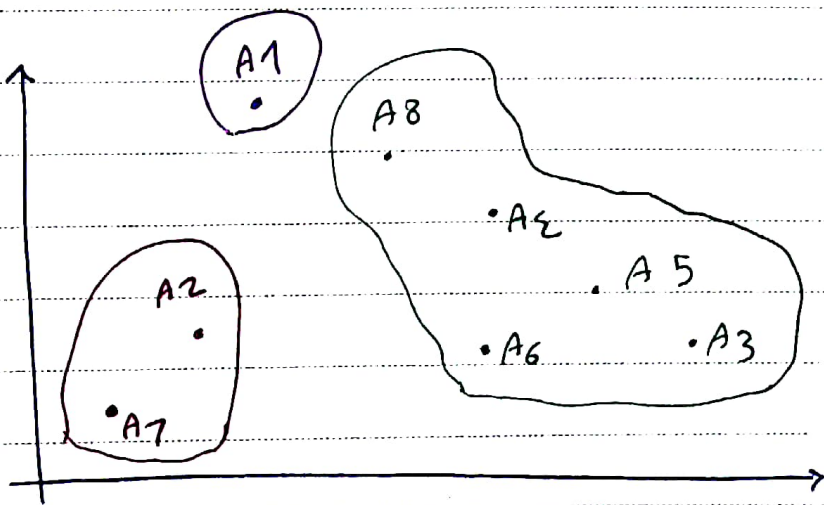
$$\text{cluster 2 : } \sum x_i = 0 + 2 + 1 + 4 + 9 = \frac{30}{5} = 6$$

$$\sum y_i = 1 + 4 + 2 + 0 + 2 = \frac{30}{5} = 6$$

$$\text{cluster 3 } \sum x_i = 1 + 2 = \frac{3}{2} = 1,5$$

$$\sum y_i = 2 + 0 = \frac{2}{2} = 1,5$$

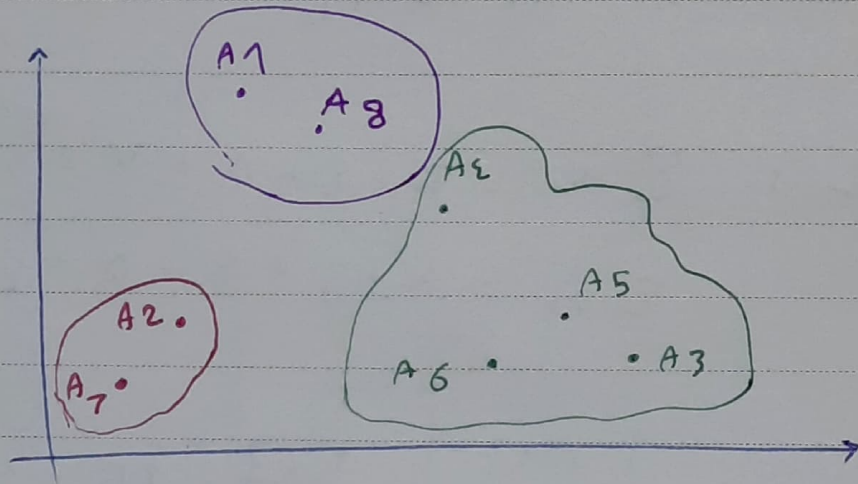
✓ New centers :  $(2, 1)$ ,  $(6, 6)$ ,  $(1,5, 3,5)$



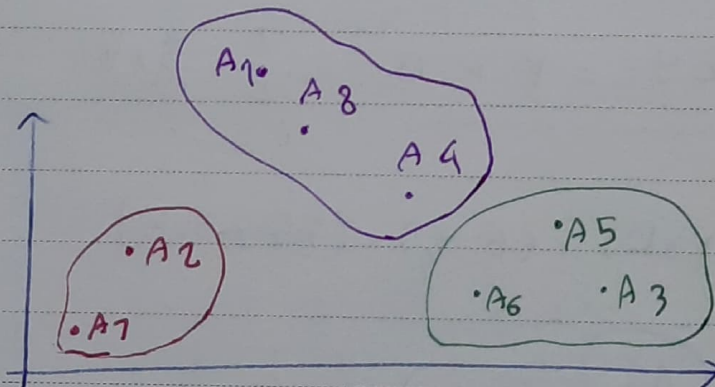
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>)

Iteration 1  $\Rightarrow$



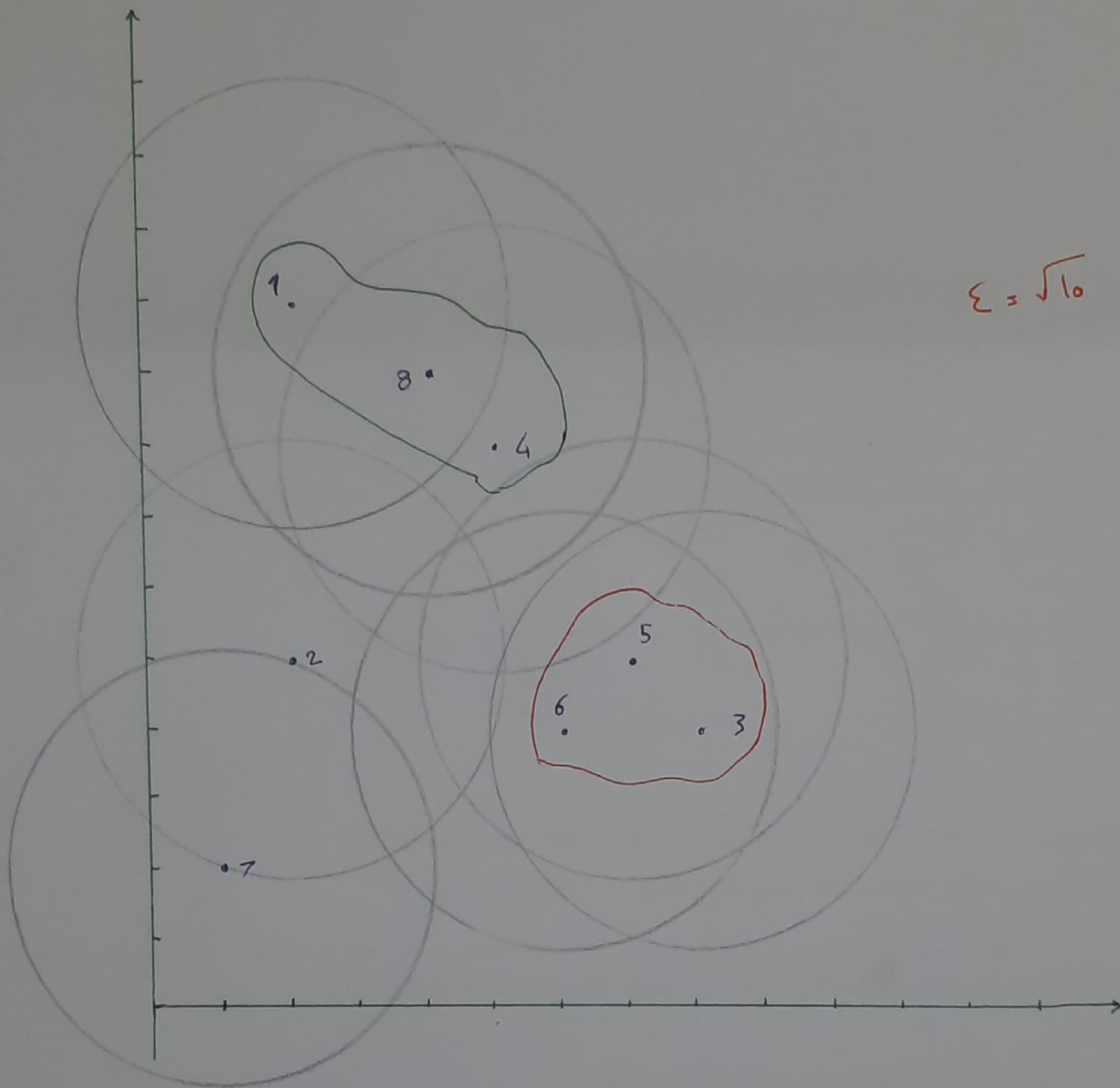
Iteration 2  $\Rightarrow$



( ) بعد 3 مرده دیر cluster ها تغییر نمی کنند !







$$\epsilon = \sqrt{10}$$

$\epsilon = \sqrt{10} \Rightarrow$  core: {3, 5, 6, 8}  
 border: {1, 4}  
 noise: {2, 7}

{1, 8}, {2, 5, 6}, {2, 7}, {1, 8} ←  $\epsilon$ -neighborhood

$$C_1 = C_2 = \{3, 5, 6\}$$

$$C_3 = \{1, 4, 8\}$$