

K-D TREE

Binary Search Tree

- Consider the following data :

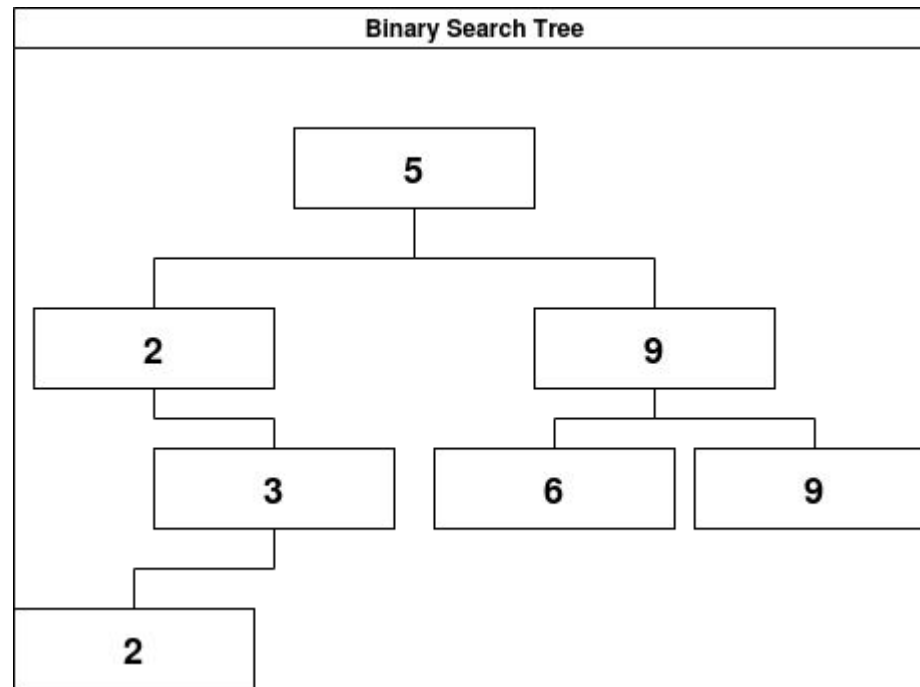
Binary search Tree Construction

- Consider the following data :

Object	Position in X
A	5
B	2
C	3
D	2
E	9
F	6
G	9

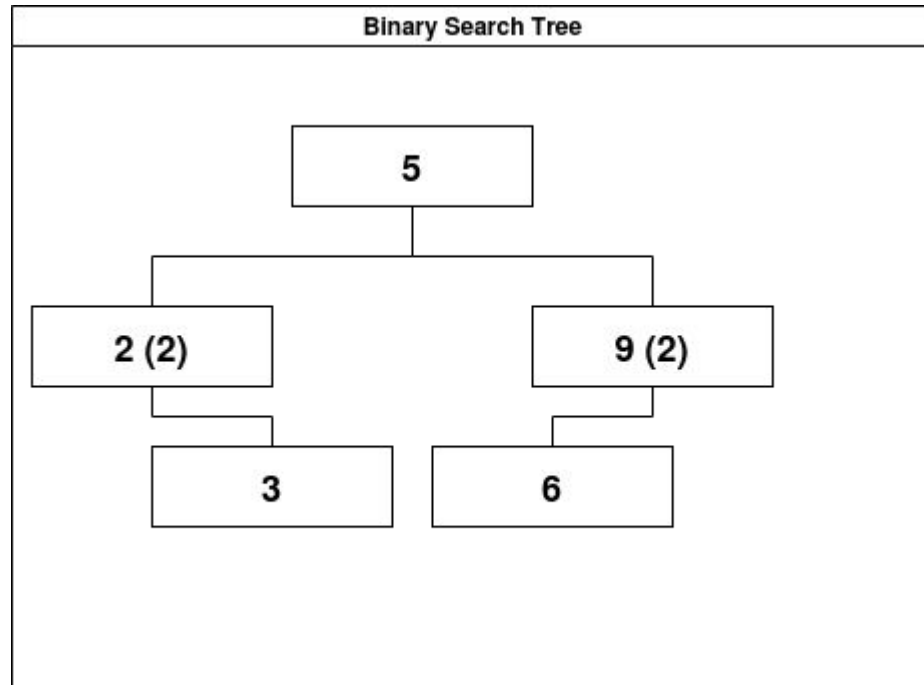
Binary search Tree Construction

- Data points: 5, 2, 3, 2, 9, 6, 9



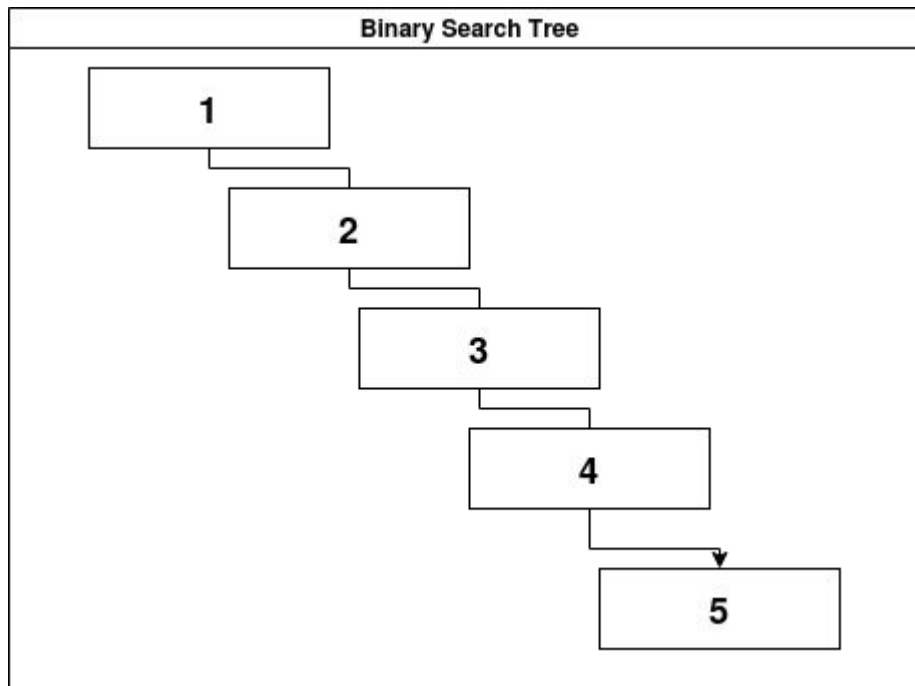
Binary search Tree Construction

- Data points: 5, 2, 3, 2, 9, 6, 9



Binary search Tree Construction

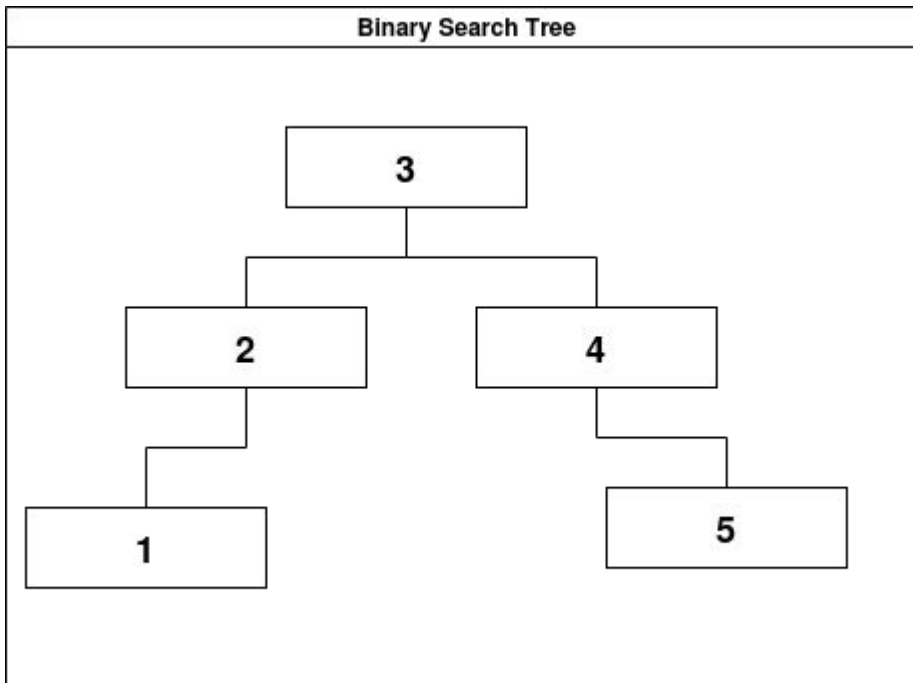
- Consider the following data:
1, 2, 3, 4, 5



Similar to linear search!

Binary search Tree Construction

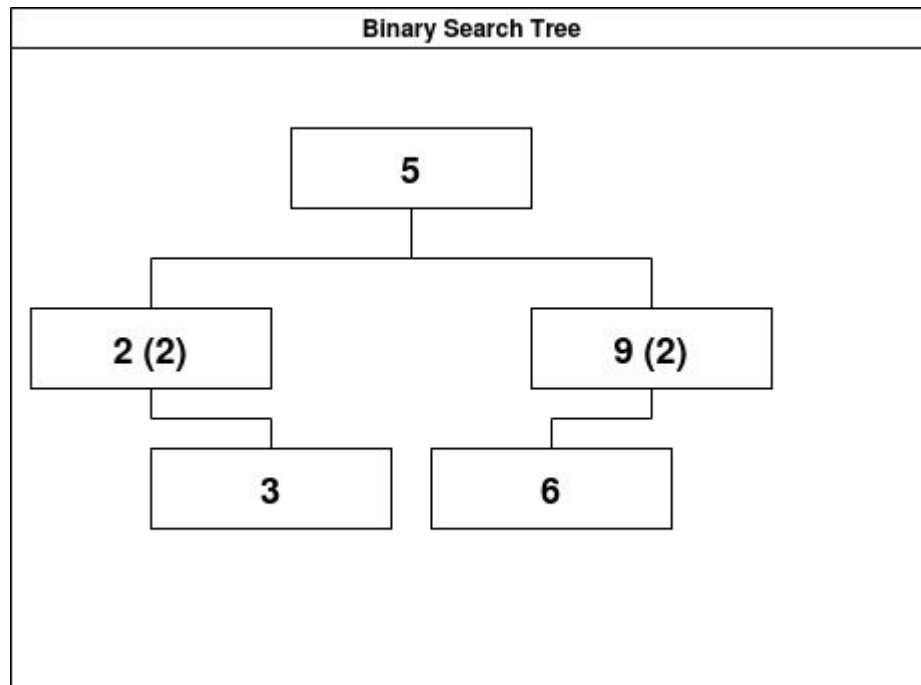
- Consider the following data:
1, 2, **3**, 4, 5



**Solution: Take medians
and build balanced tree**

Range Search using BST

- Query -
 - Select * from table where position_in_X > 2 and position_in_X < 5



K-D Tree

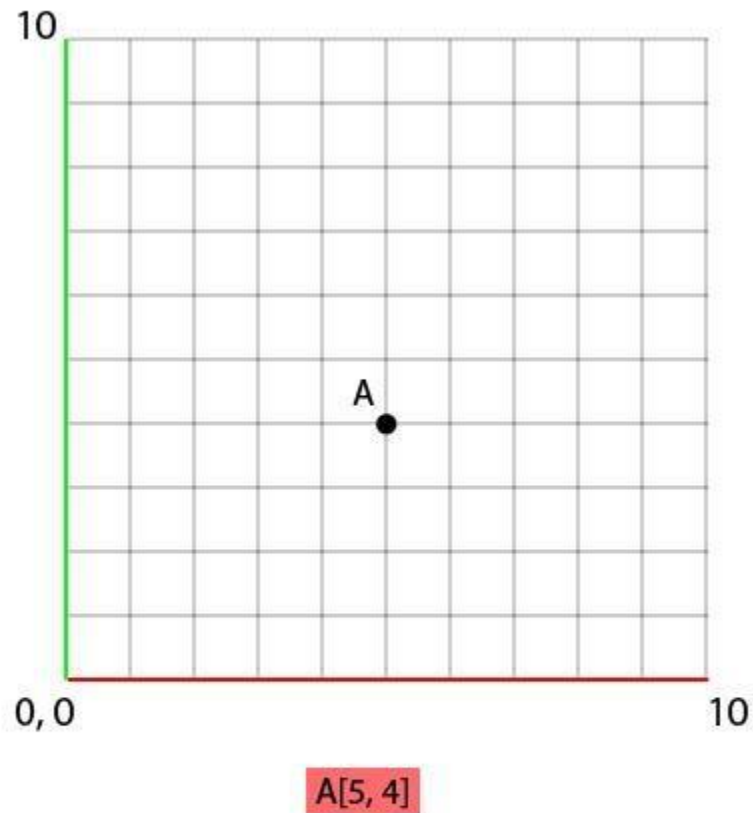
- What if -

Object	Position in X (A)	Position in Y (B)
A	5	4
B	2	9
C	3	5
D	2	2
E	9	2
F	6	1
G	9	9

K-D Tree

- And Range Query -
 - Select * from table where position_in_X > 2 and position_in_Y < 5

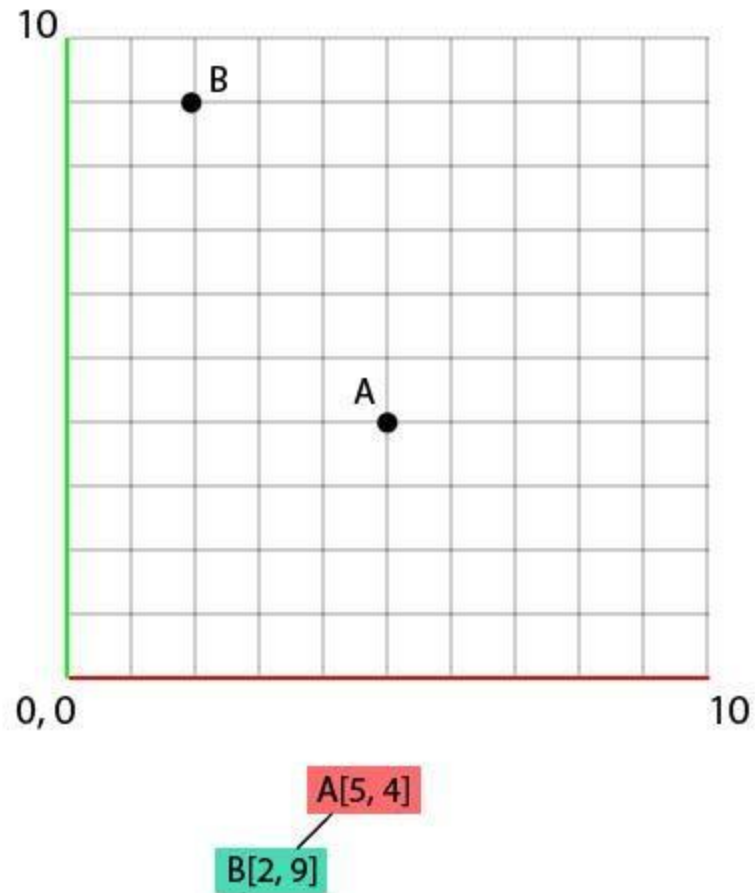
K-D Tree Construction



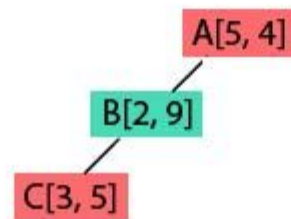
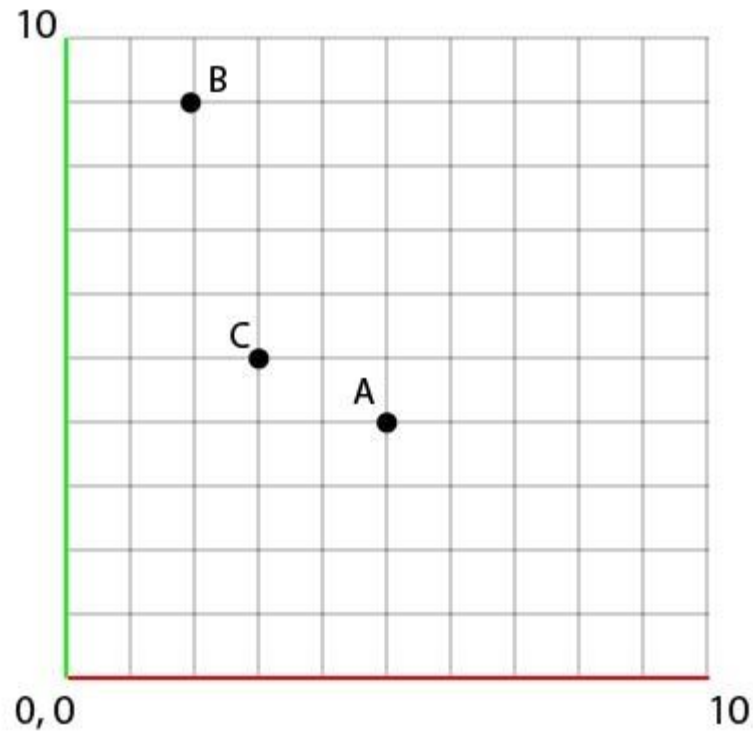
K-D Tree Construction

- To set B, we'll compare his x value with the x value of A, like so :
 - $B.x < A.x \Rightarrow 2 < 5$

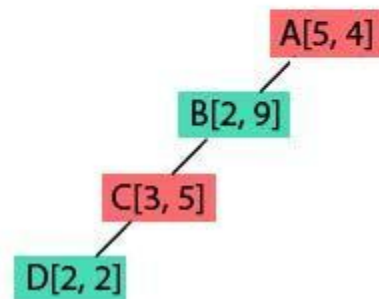
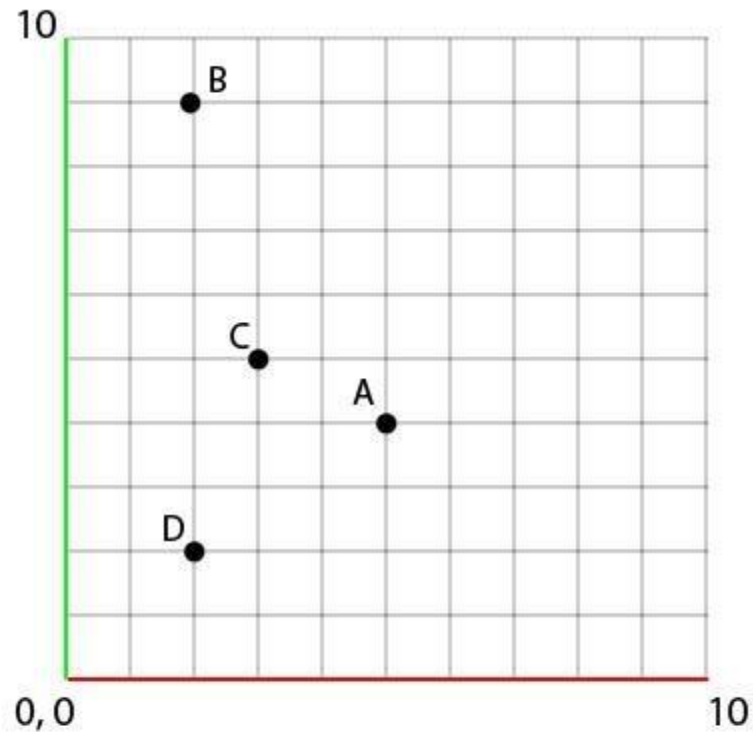
K-D Tree Construction



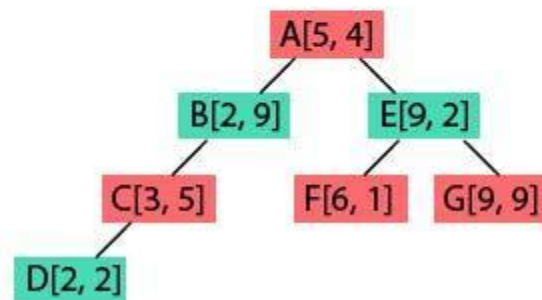
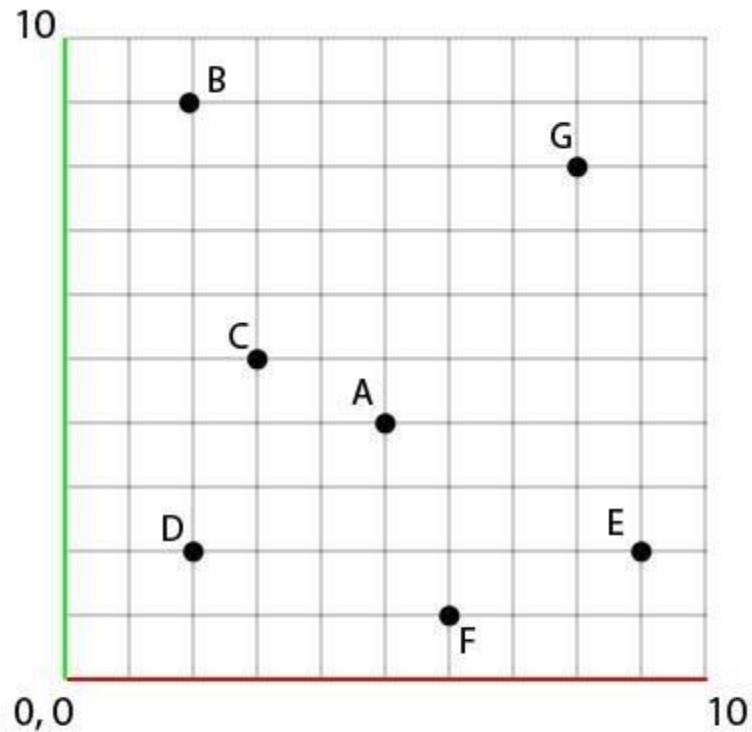
K-D Tree Construction



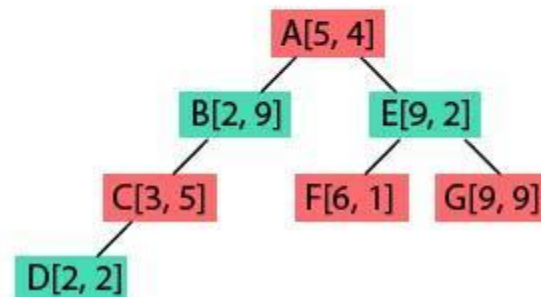
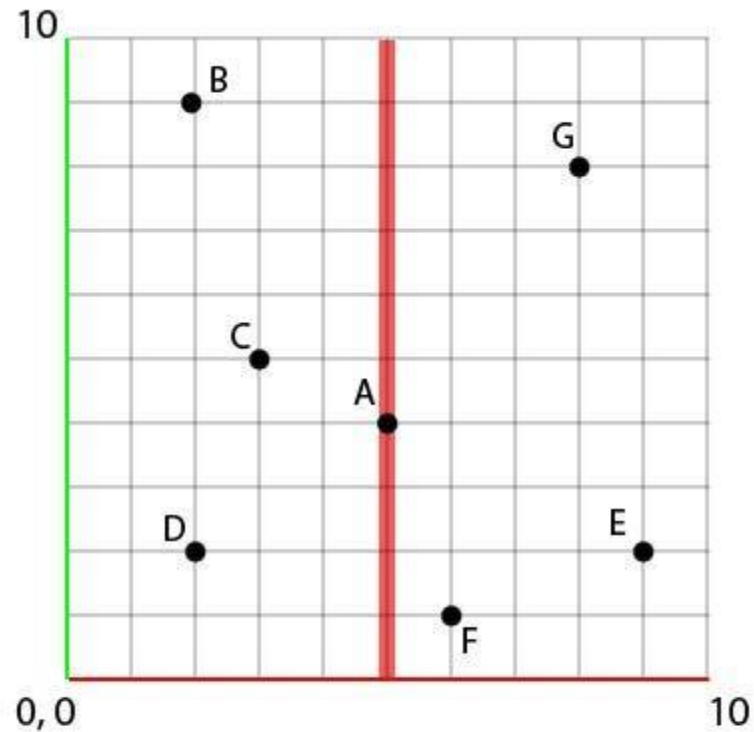
K-D Tree Construction



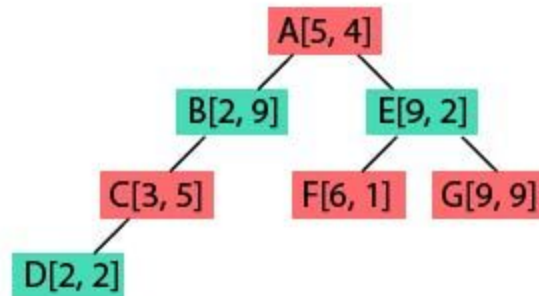
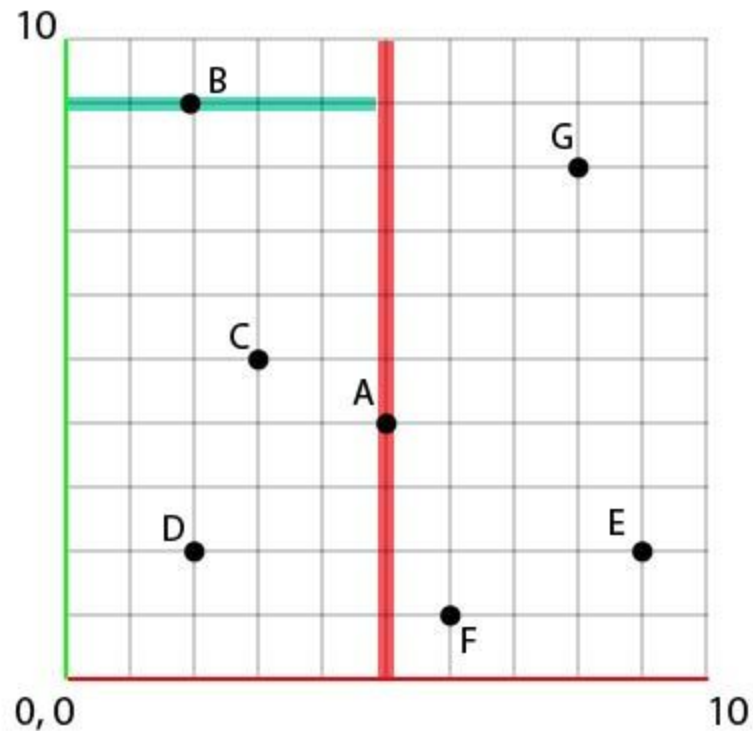
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