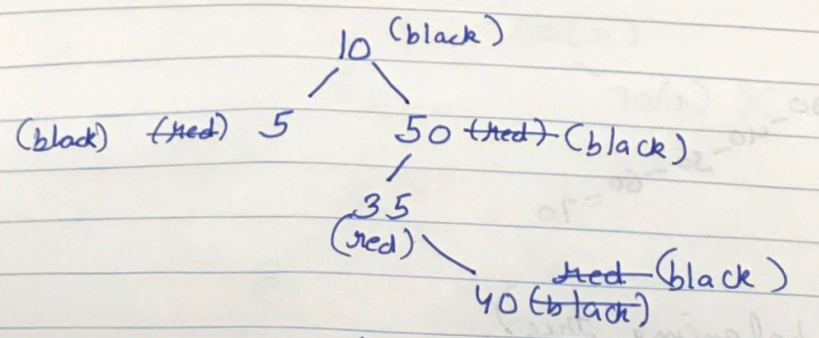
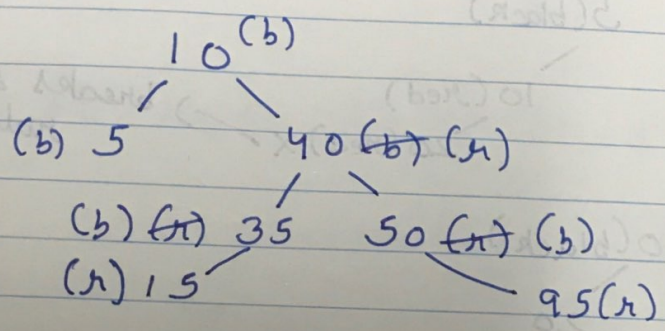
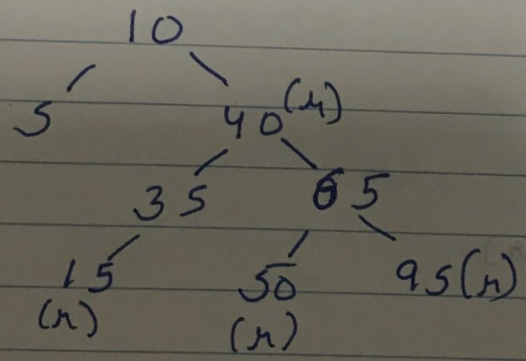
• Activity-1 RED-BLACK TREES

1. (10, 5, 50, 35, 40, 15, 95, 65, 20)







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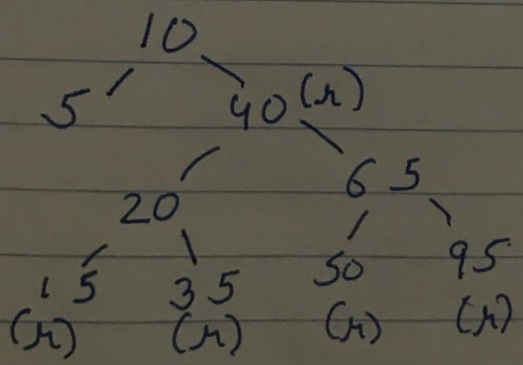
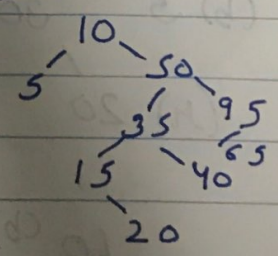


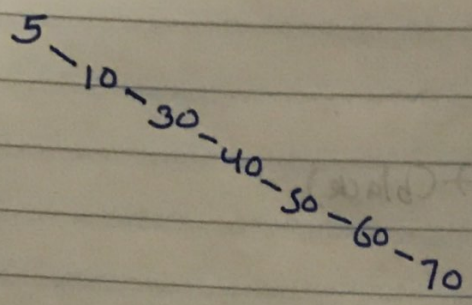
Self-balancing tree

BST

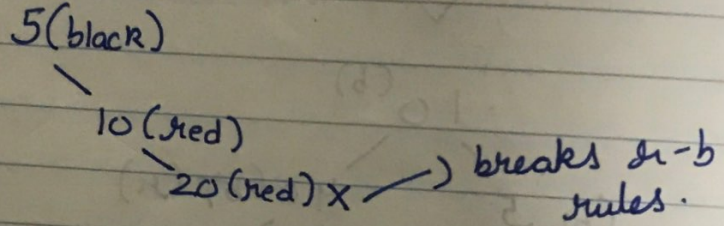


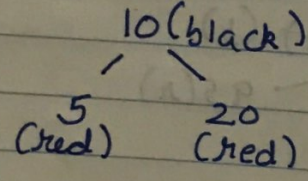
2. (5, 10, 20, 30, 40, 50, 60, 70)

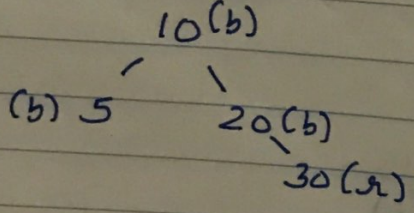
-> Normal bst.

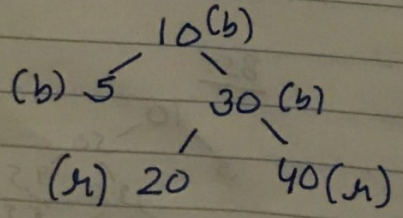


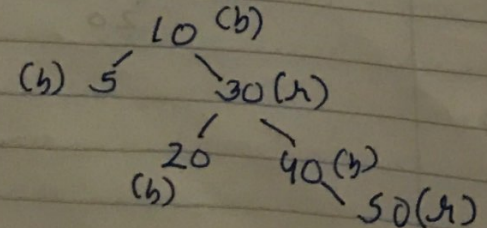
-> Red-black (self balancing tree)

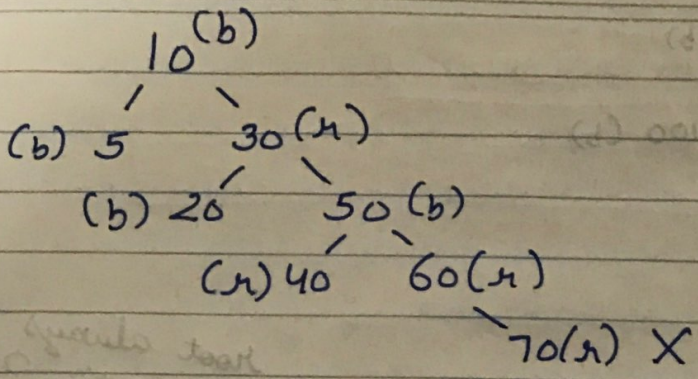


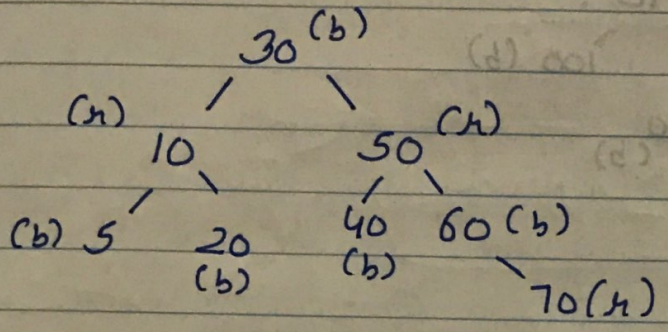




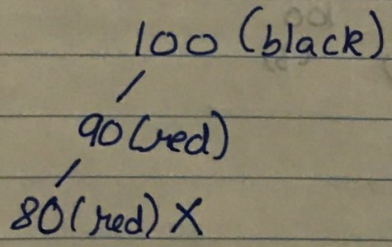


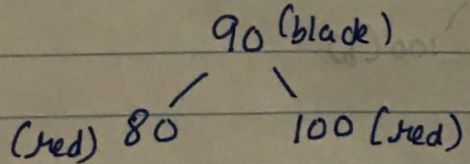


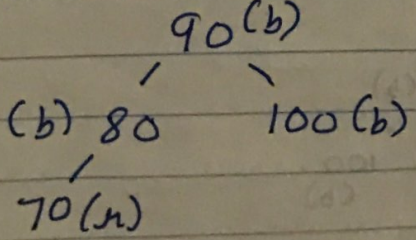


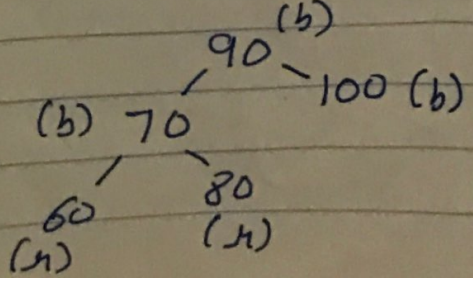


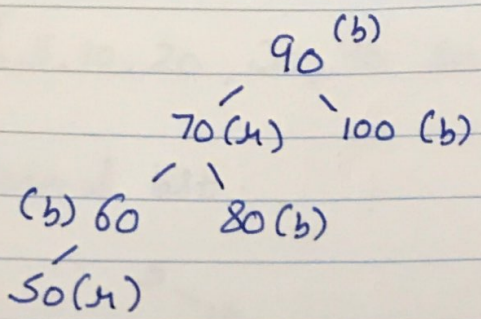
3. (100, 90, 80, 70, 60, 50, 40, 30, 20, 10, 5)



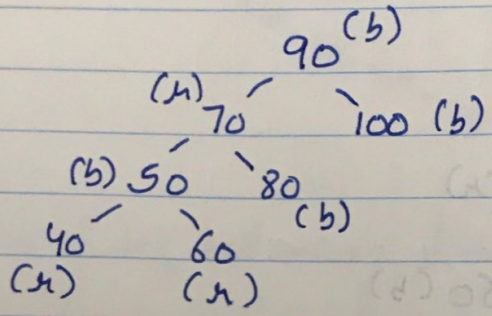


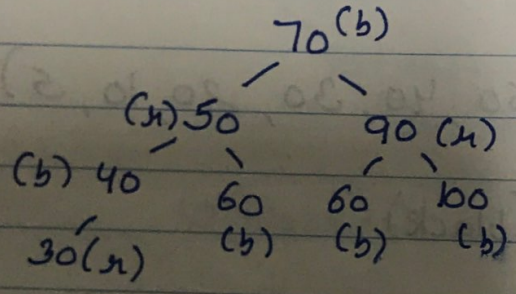


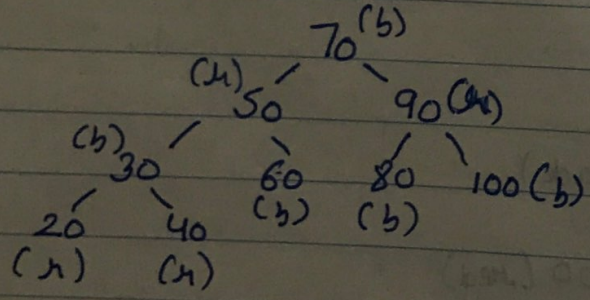


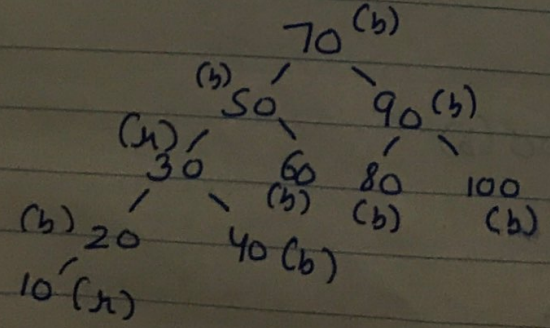


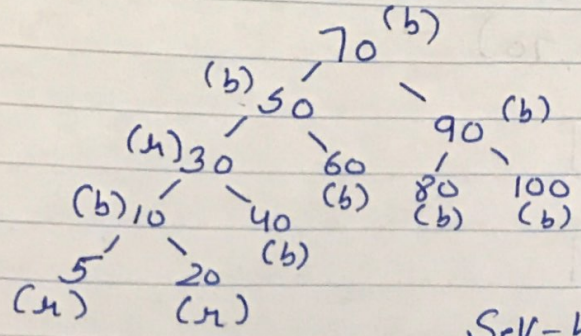
root always rotating?







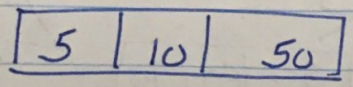


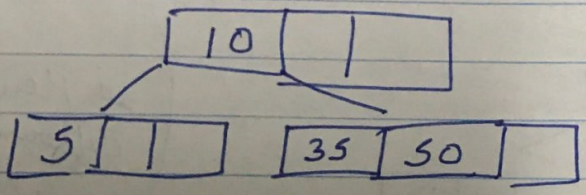


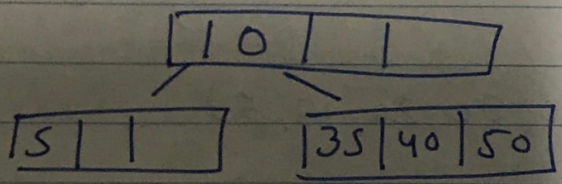
Self-balancing tree.

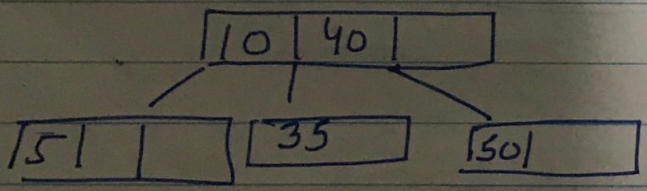
- Activity-2 : 2-3-4 Trees

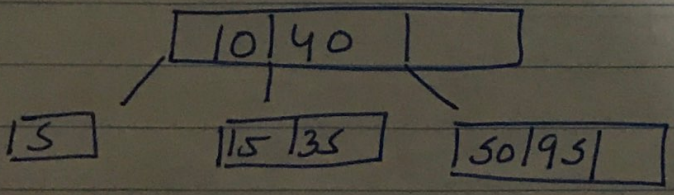
1) (10, 5, 50, 35, 40, 15, 95, 65, 20)

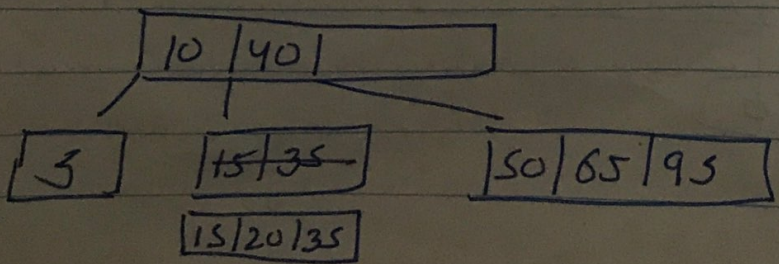






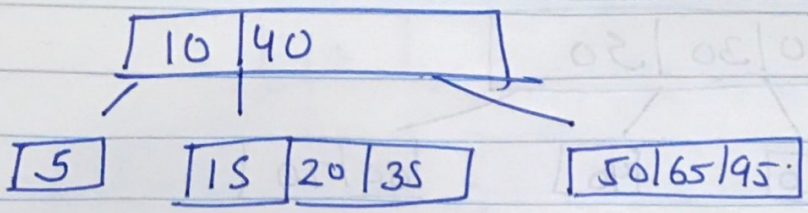






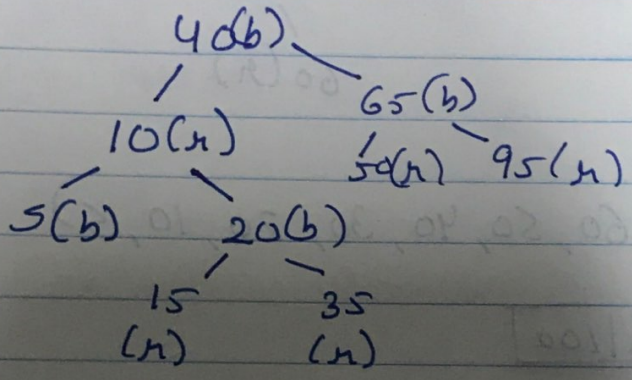
Demo app always inserts first in root node.

Whereas, algorithm in lectures, new keys are always added to the leaf.
(Top-down insertion.)

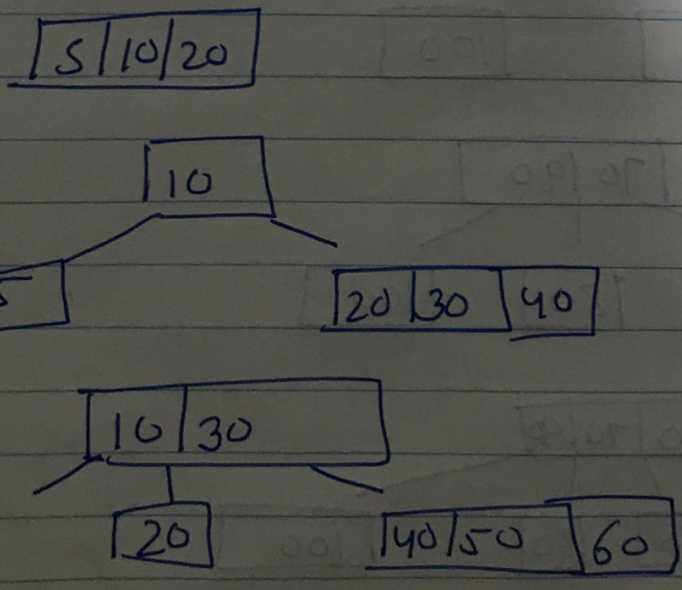


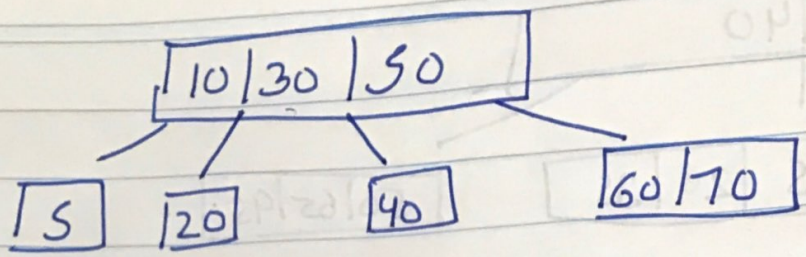
=> Converting to red-black tree.

A 1-Key node is a black node
A 2-Key node is a black node with a red child.
A 3-Key node is a black node with 2 red children.

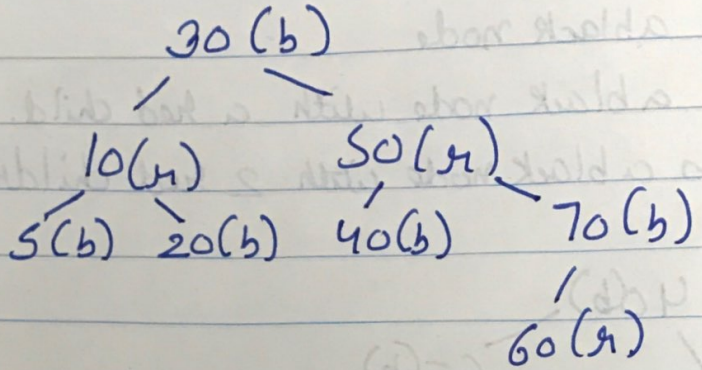


2) (5, 10, 20, 30, 40, 50, 60, 70)

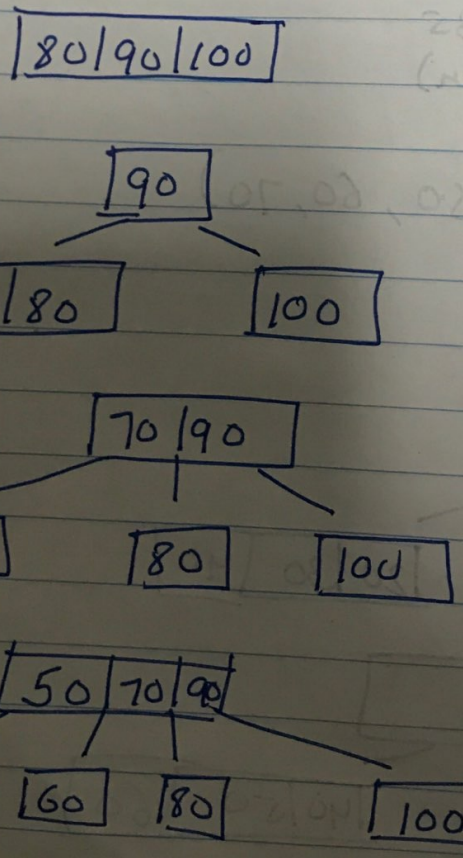


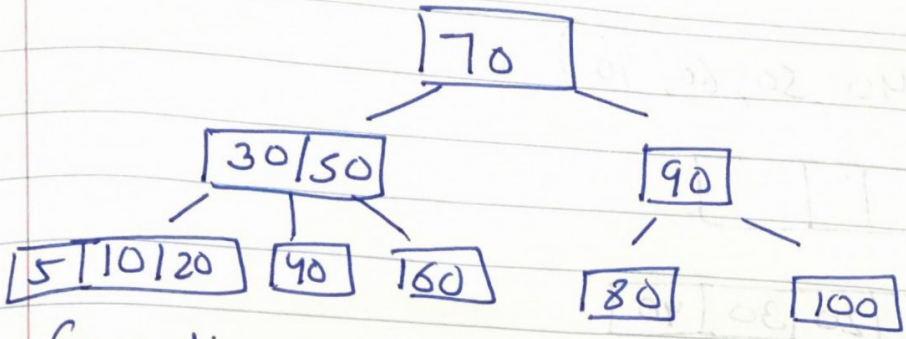


- Converting to red black tree

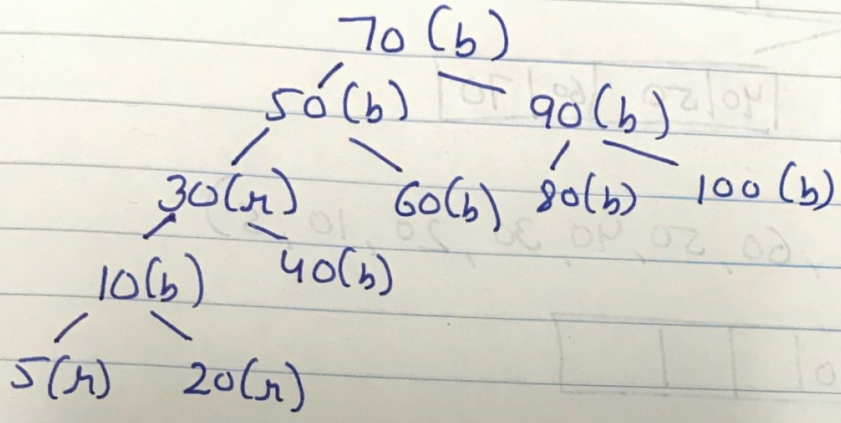


3) (100, 90, 80, 70, 60, 50, 40, 30, 20, 10, 5)





- Converting to red black tree

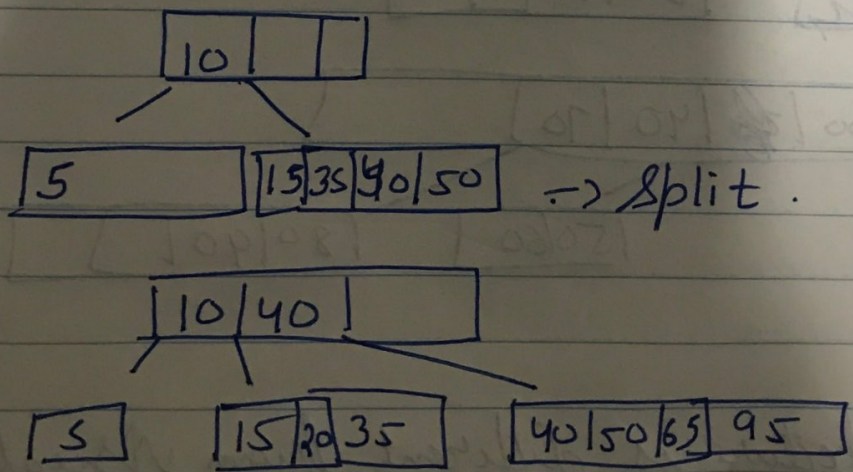


Rules :-
1 Key node is black.
2 key node is black with red child.
3 Key node is black with 2 red children.

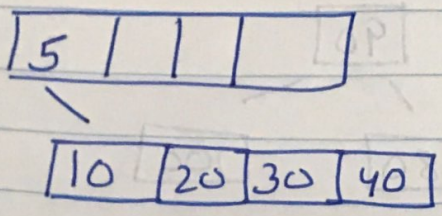
- ACTIVITY-3 B-TREES

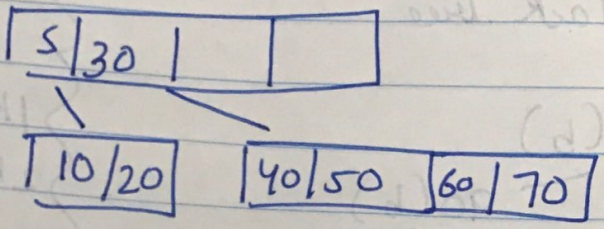
1) (10, 5, 50, 35, 40, 15, 95, 65, 20)

Sol.

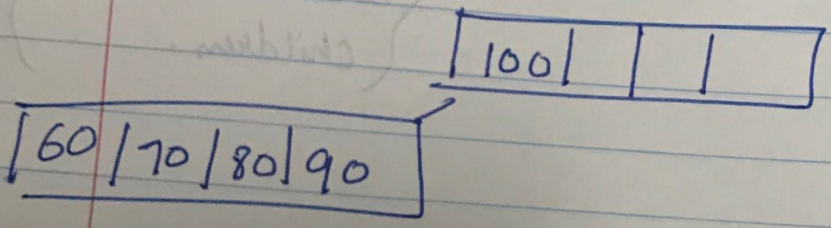


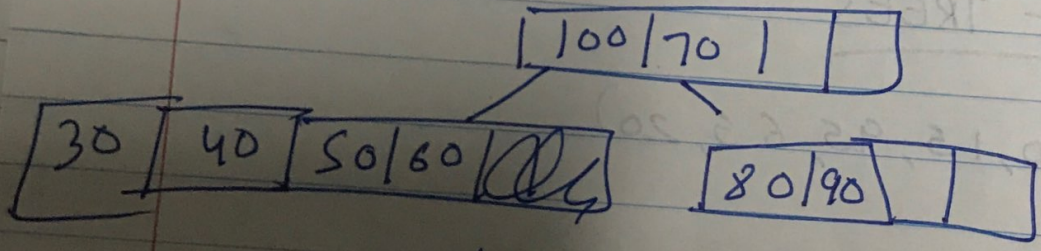
2. 2> (5, 10, 20, 30, 40, 50, 60, 70)

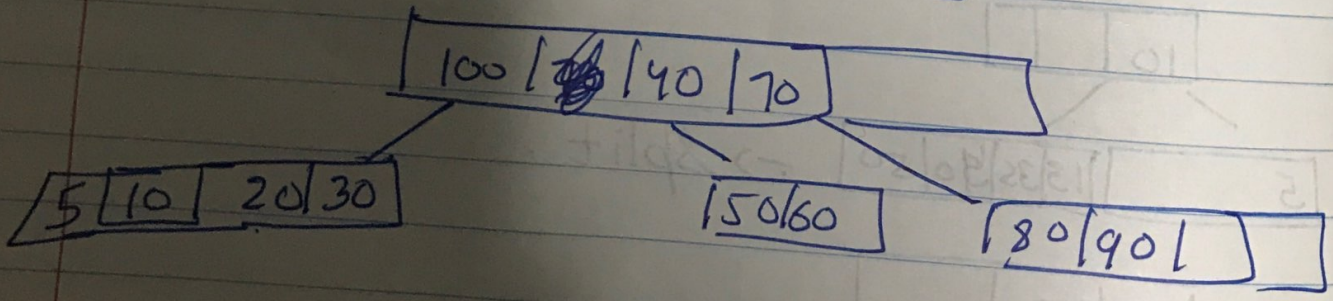




3> (100, 90, 80, 70, 60, 50, 40, 30, 20, 10, 5)







* Algorithm in lecture is different from visualgo as splits are performed from the bottom up and in demo app/website, it fills up root node first.