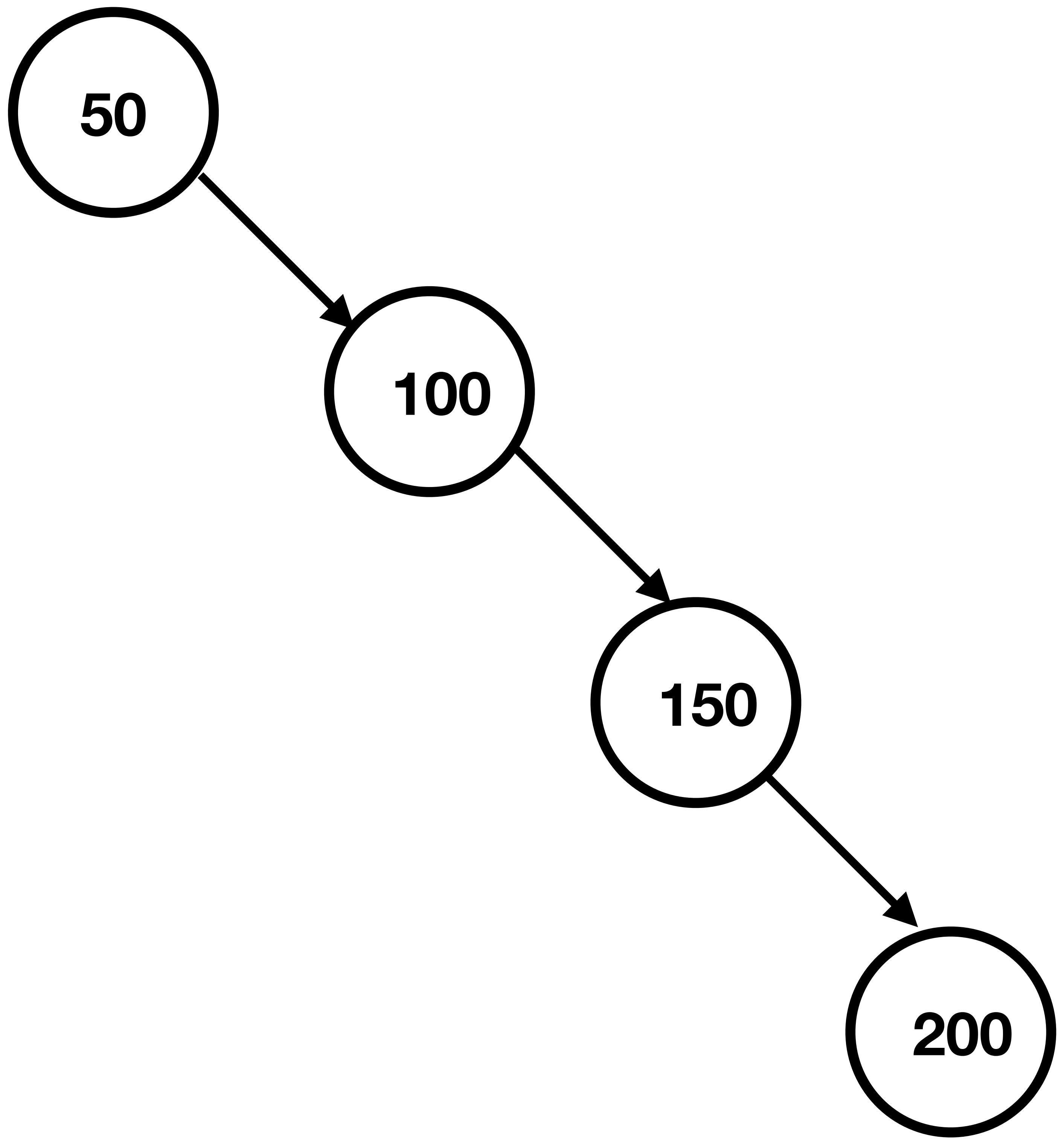
AVL Trees

AVL Trees

Insert 50, 100, 150, 200 into a Binary Search Tree



AVL Trees

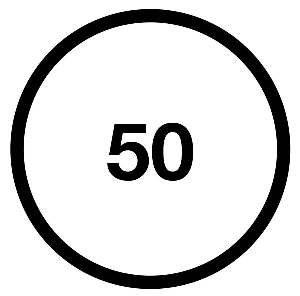
- A “balanced” binary search tree
- AVL trees are balanced in the sense that for any node the height of the left subtree and the height of the right subtree differ by at most 1.
- To keep track of the balance a balance value (tall left, equal, tall right) can be attached to each node or each node can maintain its height.

AVL Trees

- The find functions for AVL trees work exactly like the find functions for binary search trees
- Insert and remove follow the same procedure as that used by binary search trees except after a node is inserted or deleted the tree might have to be rebalanced.
- Rebalancing takes place along the search path
- Inserts require rebalancing at most one node in the search path
- Removes could require rebalancing at every node in the search path

AVL Trees

Insert 50, 100, 150, 200 into a AVL Tree



AVL Trees

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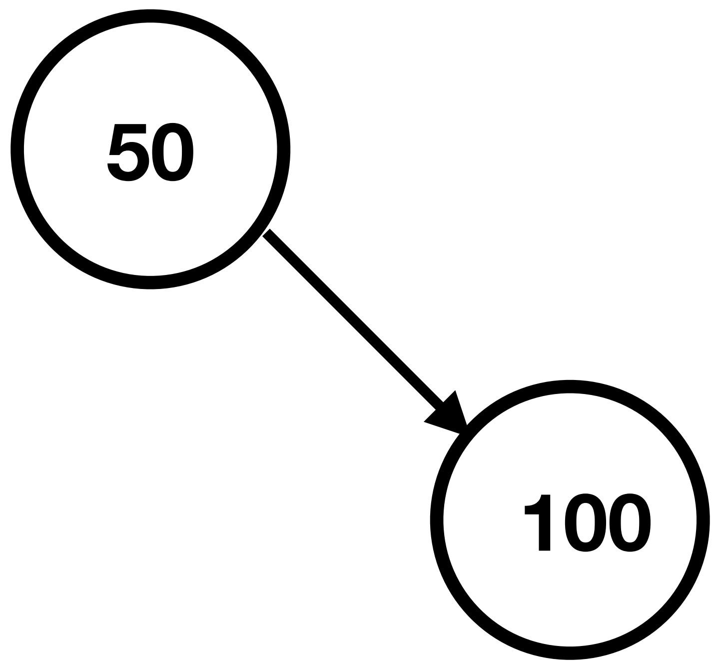
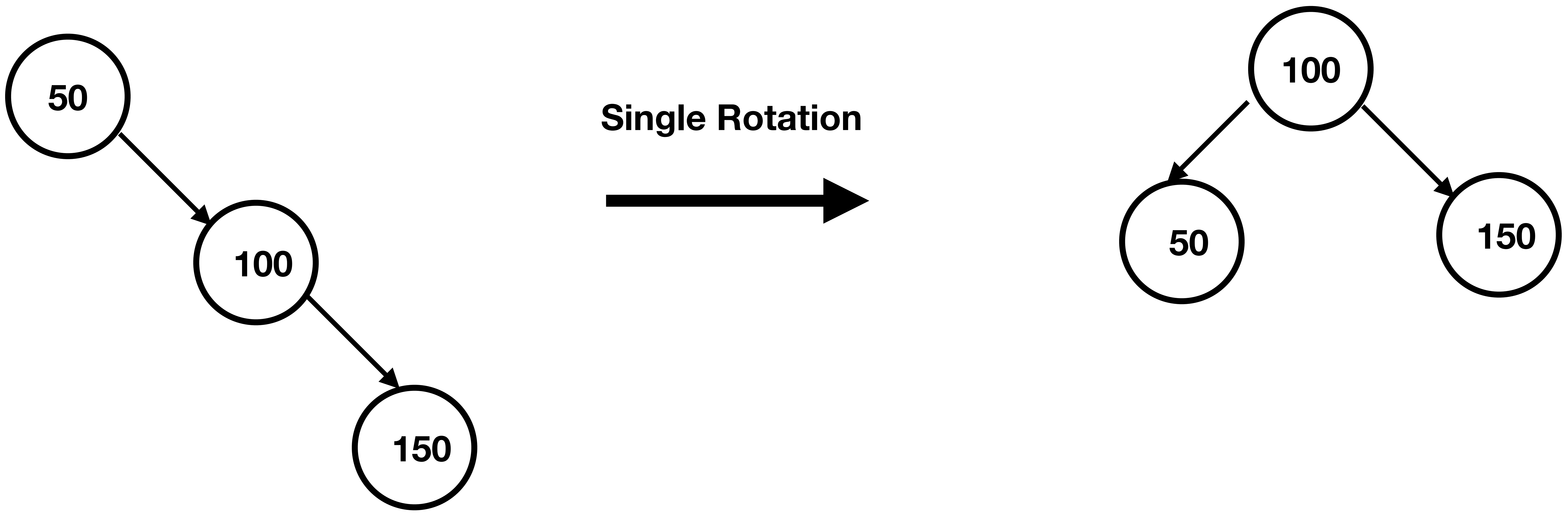


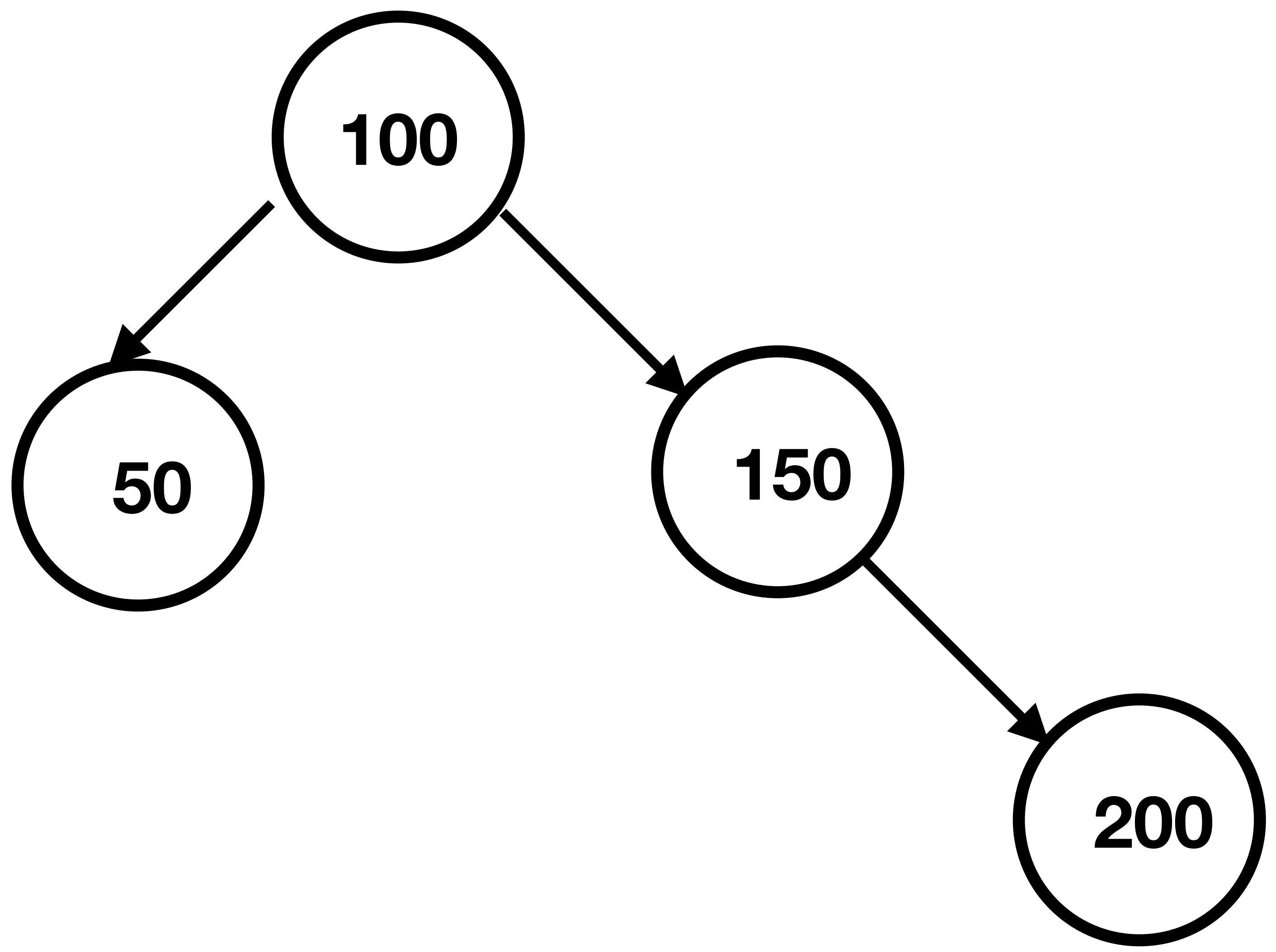
AVL Trees

Insert 50, 100, 150, 200 into a AVL Tree

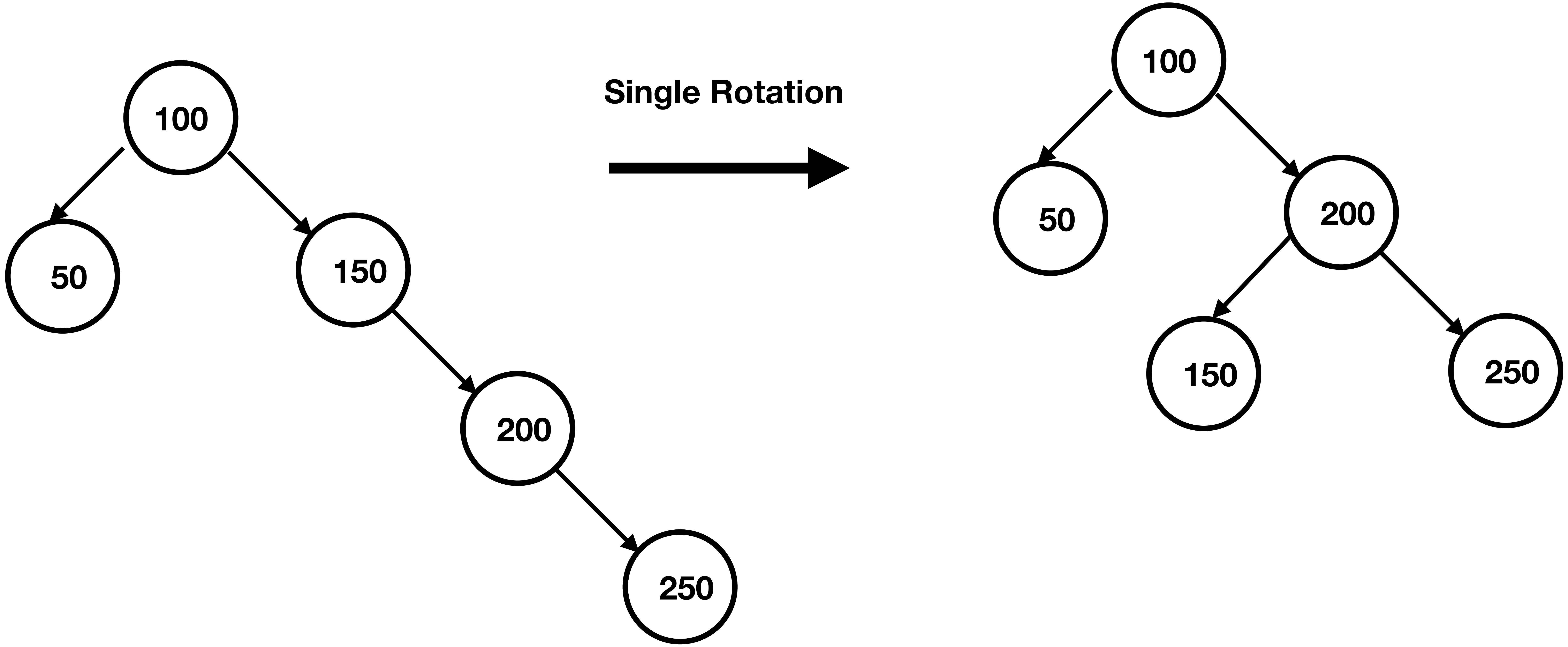


AVL Trees

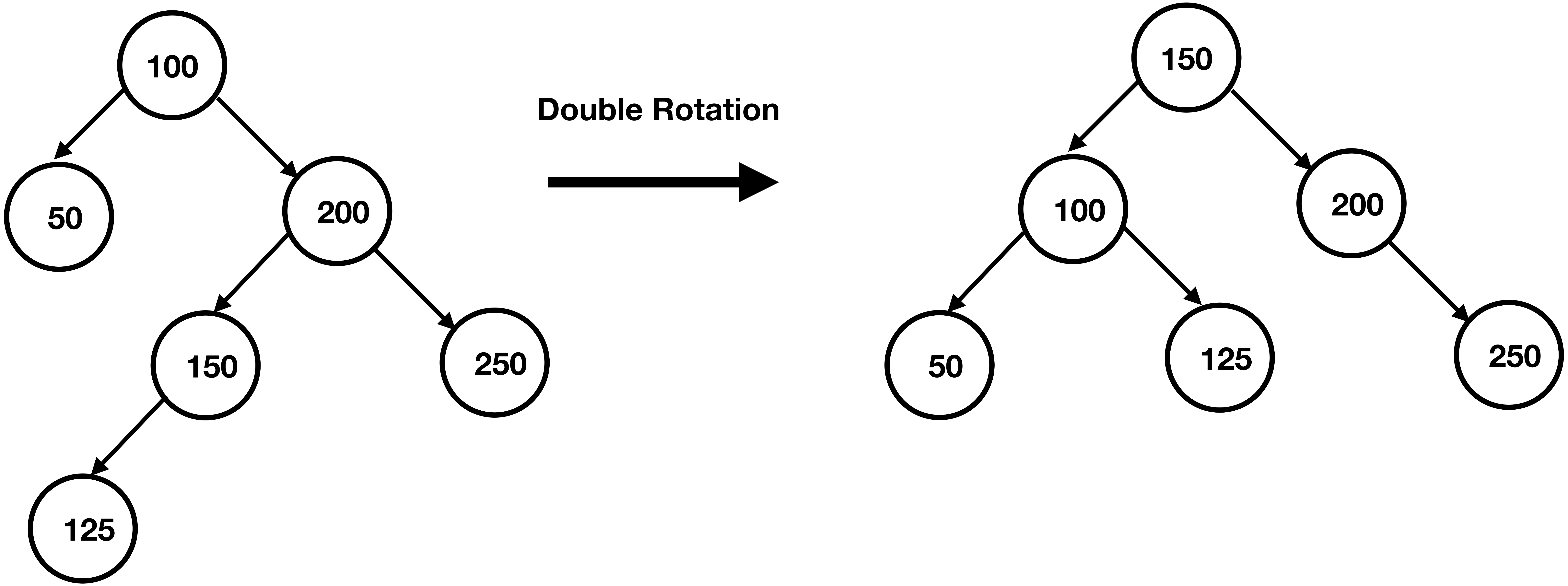
Insert 50, 100, 150, 200 into a AVL Tree



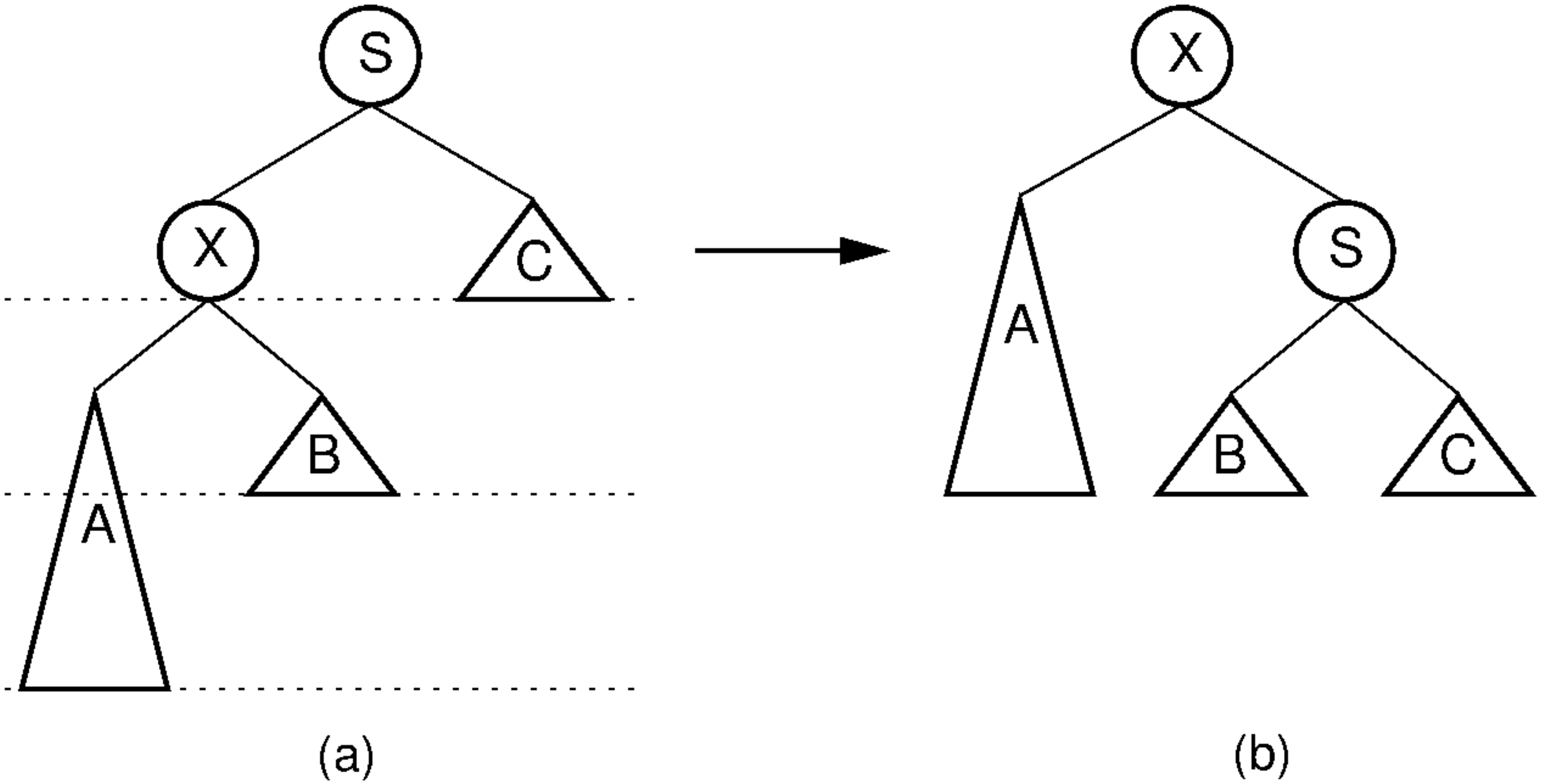
AVL Trees
Insert 250



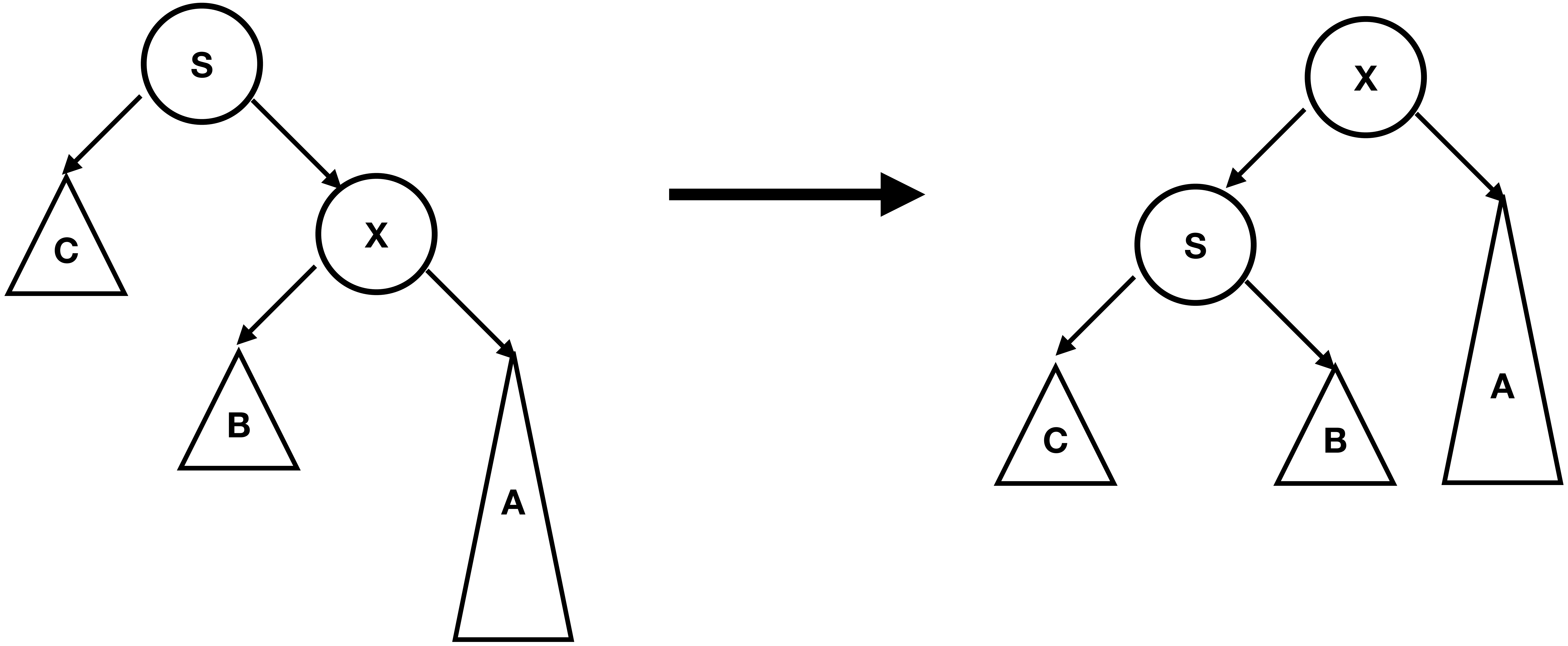
AVL Trees
Insert 125



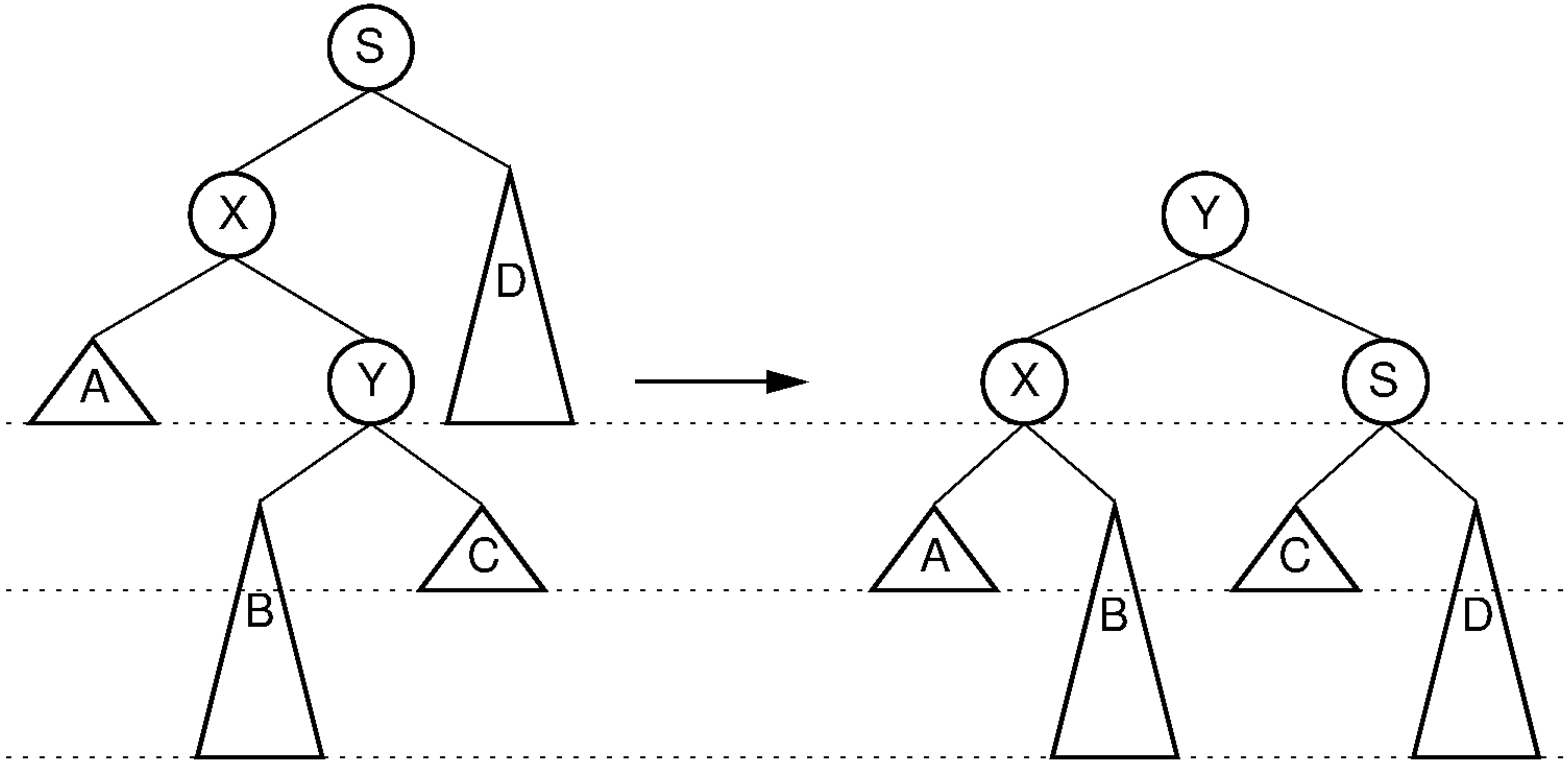
AVL Single Rotation
Insertion Done to the Left of S
height(X) == height(C) + 2
height(A) == height(B) + 1



AVL Single Rotation
Insertion Done to the Right of S
height(C) + 2 == height(X)
height(B) + 1 == height(A)



AVL Tree Double Rotation
Insertion Done to the Left of S
height(X) == height(D) + 2
height(A) + 1 == height(Y)



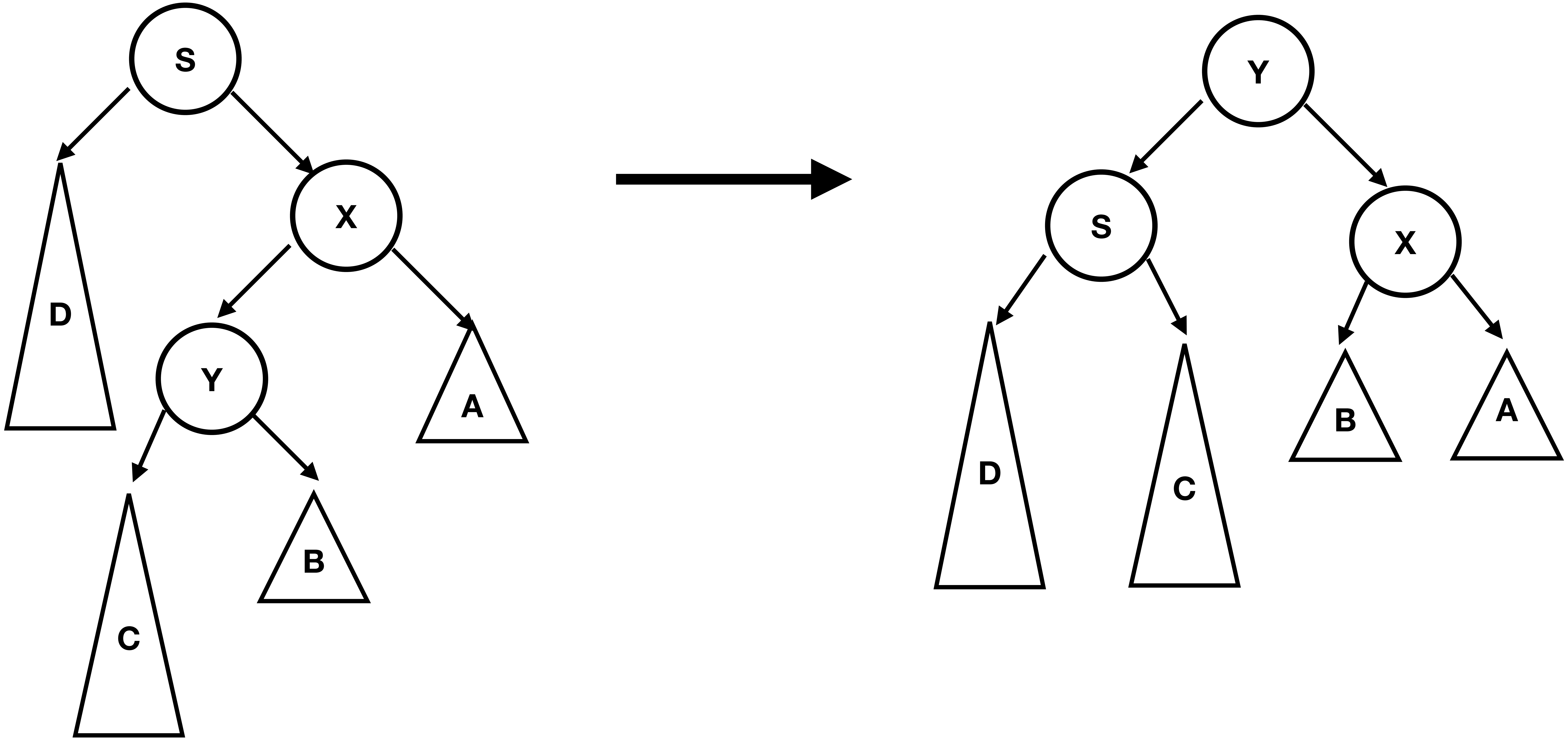
(a) (b)

AVL Double Rotation

Insertion Done to the Right of S

height(D)+ 2 == height(X)

height(Y) == height(A) + 1



AVL Trees
Review Question

- Insert the following values into an AVL tree
- 100, 50, 5, 75, 2, 80, 12, 90, 200, 150, 300, 125, 110, 95, 130, 3, 25, 97