

ALL Towers

2...



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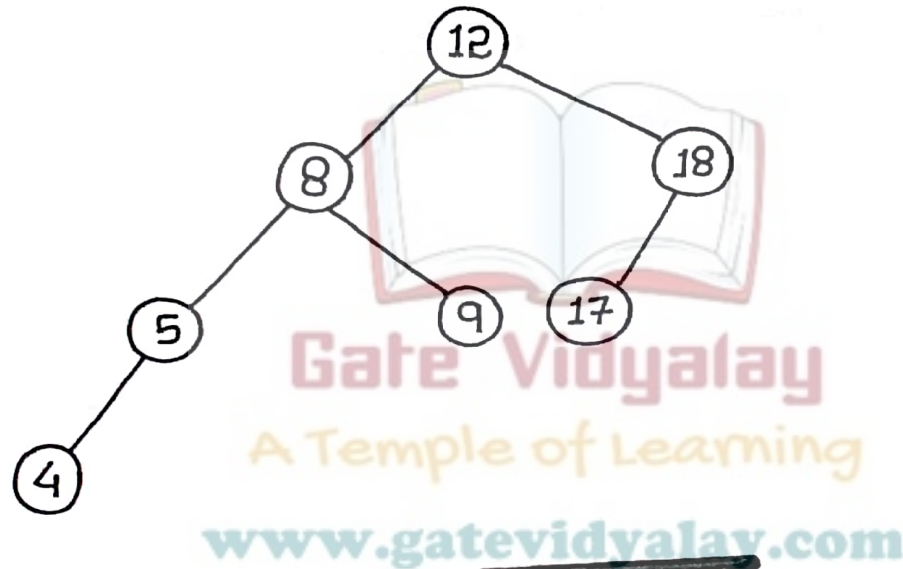
Definitions-

AVL trees are self-balancing Binary Search Trees where the difference between heights of left and right subtrees cannot be more than one for all nodes.

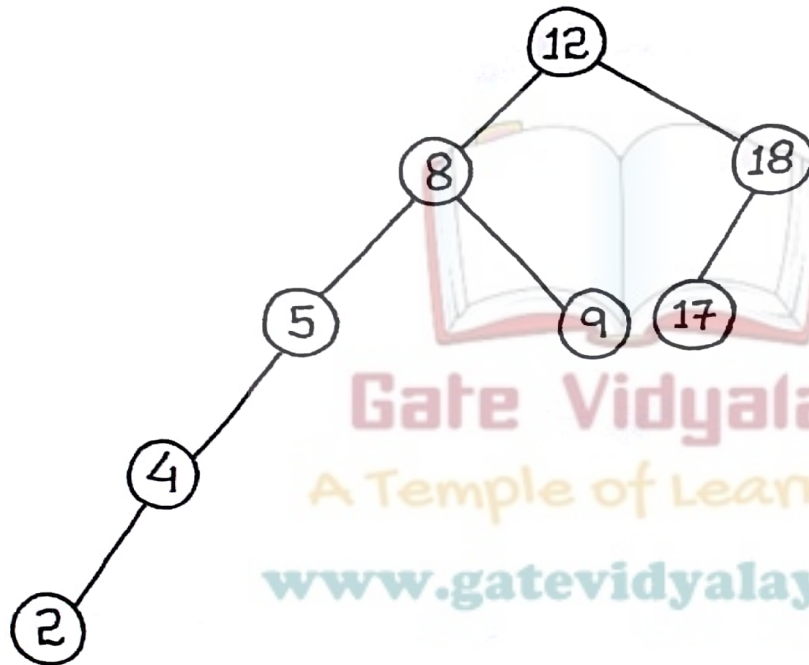
OR

AVL trees are Binary Search Trees in which the heights of the left and right subtrees of every node differs by at most one.

Example of AVL Tree -



Example of not an AVL Tree-



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Balance Factor-

Balance Factor for any node is defined as -

$$\text{Balance Factor} = \text{Height of Left subtree} - \text{Height of Right subtree}$$

For a node to be balanced, the value of balance factor has to be either 0 or 1 or -1.

How balancing is done in AVL Trees?

In AVL Tree, after performing every operation like insertion and deletion, we check the balance factor of every node in the tree.

If every node satisfies the balance factor condition, then the operation is concluded otherwise we must make it balanced.

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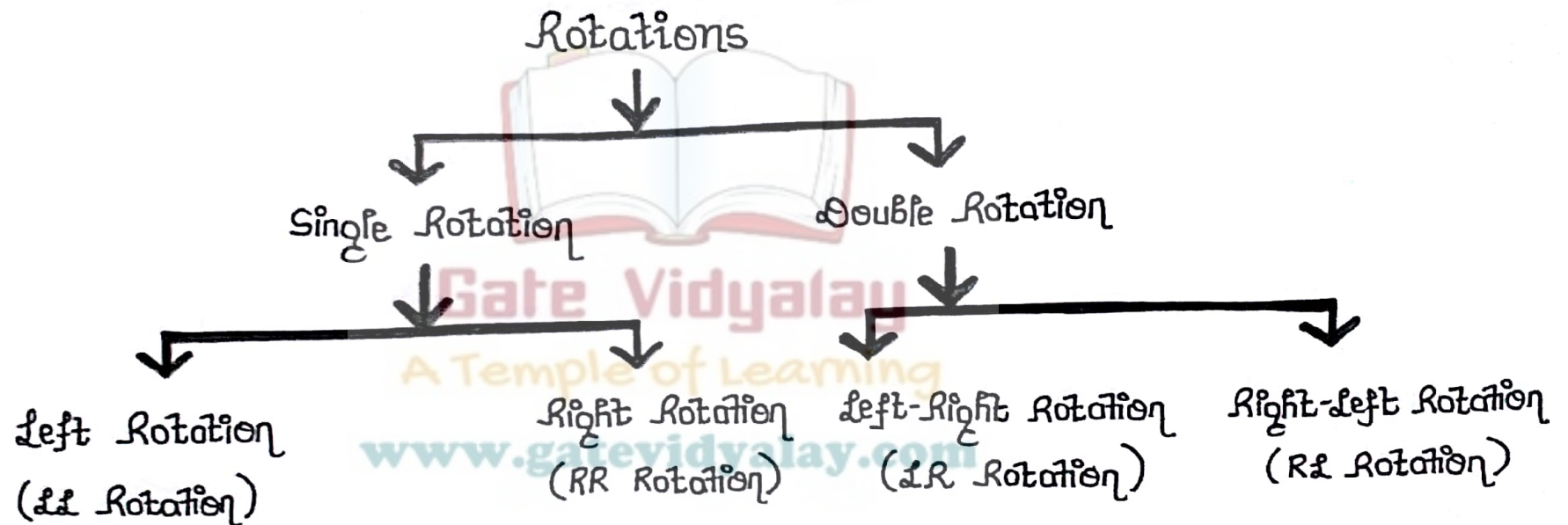
We use rotation operations to make the tree balanced when the tree becomes unbalanced due to any operation.

Thus,

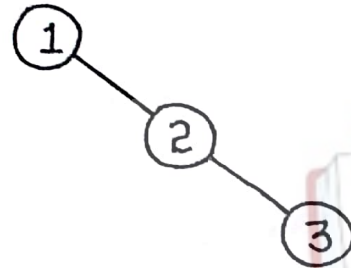
Rotation is the process of moving the nodes to make tree balanced.

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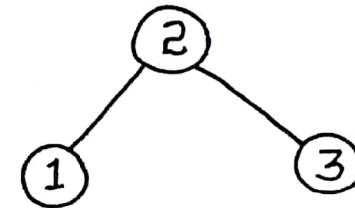
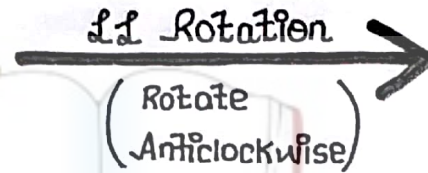
Kinds of Rotations-



Case-I:

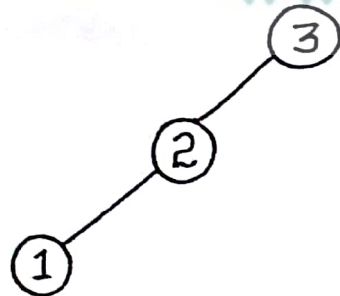


(Insertion order : 1, 2, 3)
Tree is Imbalanced

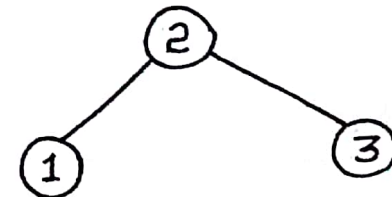
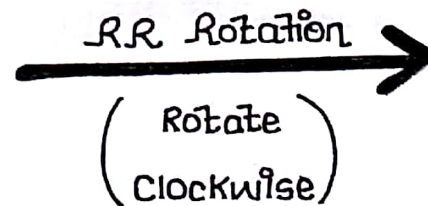


Tree is Balanced

Case-II:

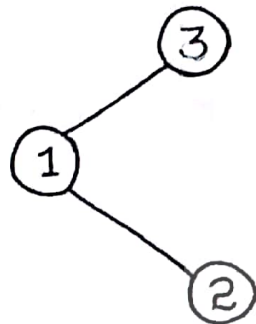


(Insertion order : 3, 2, 1)
Tree is Imbalanced



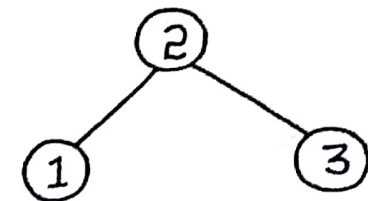
Tree is Balanced

Case-III:



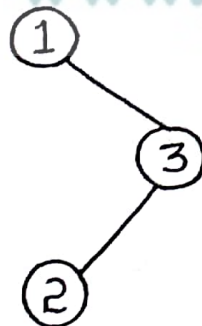
(Insertion Order : 3, 1, 2)
Tree is Imbalanced

LL Rotation + RR Rotation
(LR Rotation)



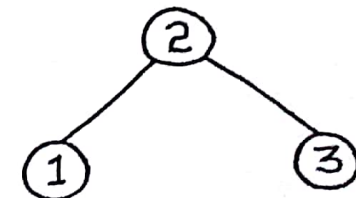
Tree is balanced

Case-IV:



(Insertion Order : 1, 3, 2)
Tree is Imbalanced

RR Rotation + LL Rotation
(RL Rotation)



Tree is balanced

Operations on AVL Trees-

The following operations are performed on AVL trees -

- i) Search
- ii) Insertion
- iii) Deletion


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