

# AVL TREE

## INSERTION

Example:

Insert 3, 2, 1, 4, 5, 6, 7,  
16, 15, 14

Step 1: Insert 3



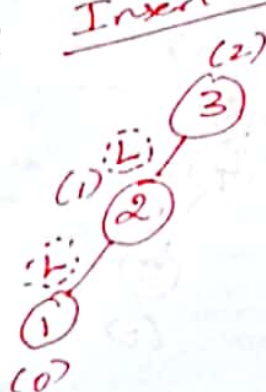
Balanced

Step 2: Insert 2



Balanced

Step 3: Insert 1



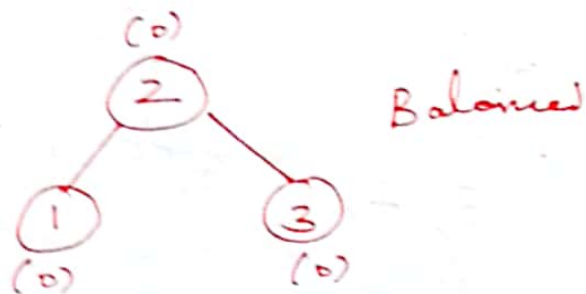
Imbalance

Imbalance node A is 3, closest ancestor to inserted to node 1.

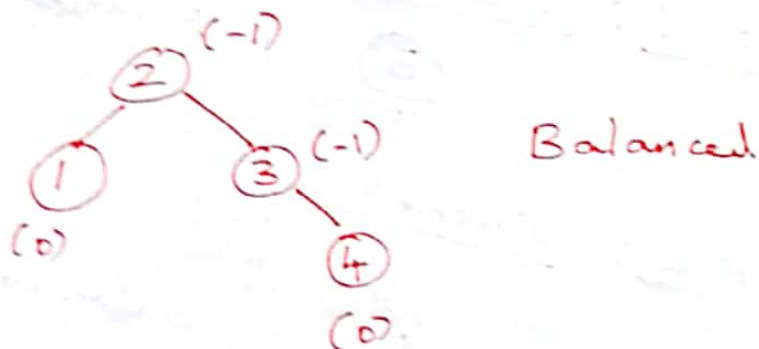
Node 1 is inserted to Left ~~subtree~~  
Subtree (L) of left child of L.

$\therefore$  LL Imbalance

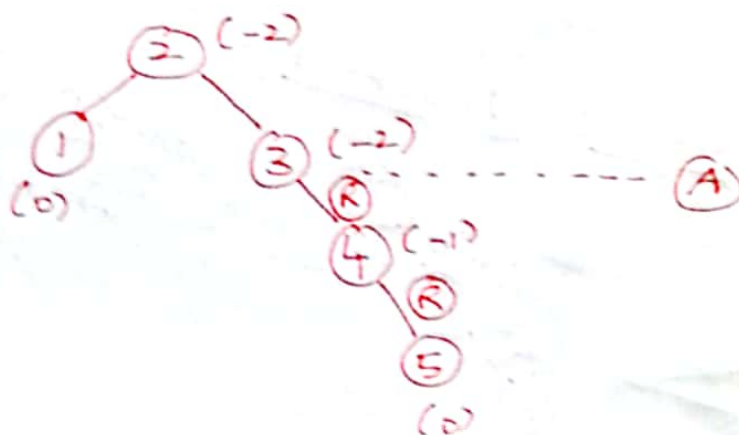
Doing LL Rotation,



Step 4: Insert 4



Step 5: Insert 5

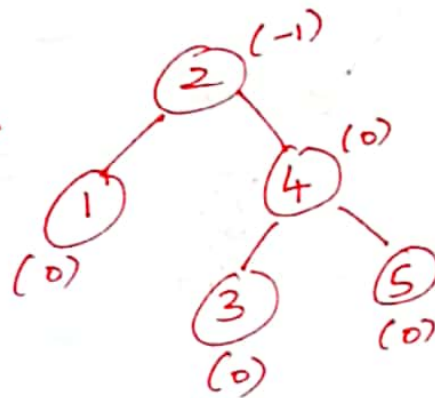


The closest ancestor node to the inserted node 5 with bf -2 is 2, called as A.

Node 5 is inserted to Right subtree (R) of Right child (R) of 3.

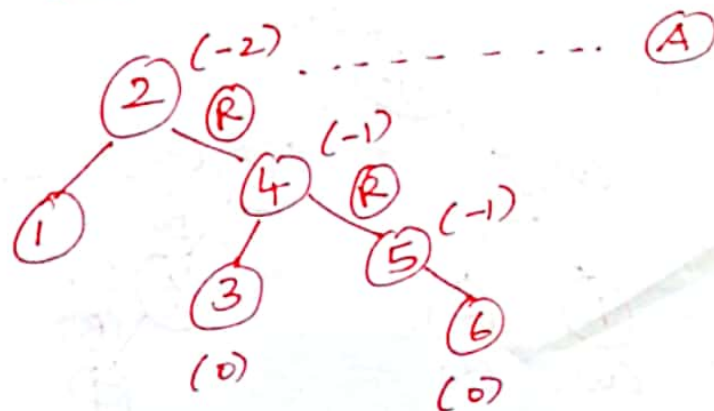
$\therefore$  RR Imbalance.

Doing RR Rotation,



Balanced.

Step 6 : Insert 6

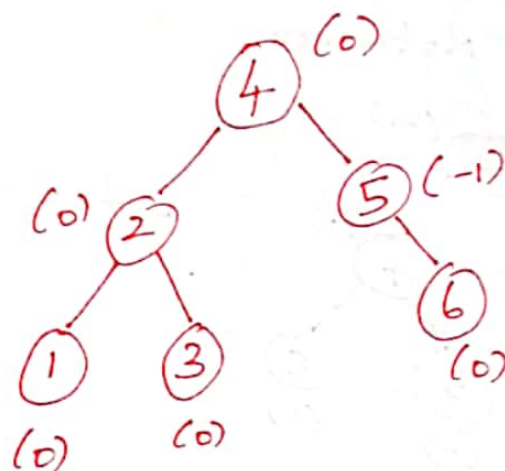


The closest ancestor node to inserted node 6 is 2 with ~~Imbalance~~ Balance factor -2. Hence 2 is called node A.

Node 6 is inserted to Right Subtree (R)  
 of Right child (R) of A.

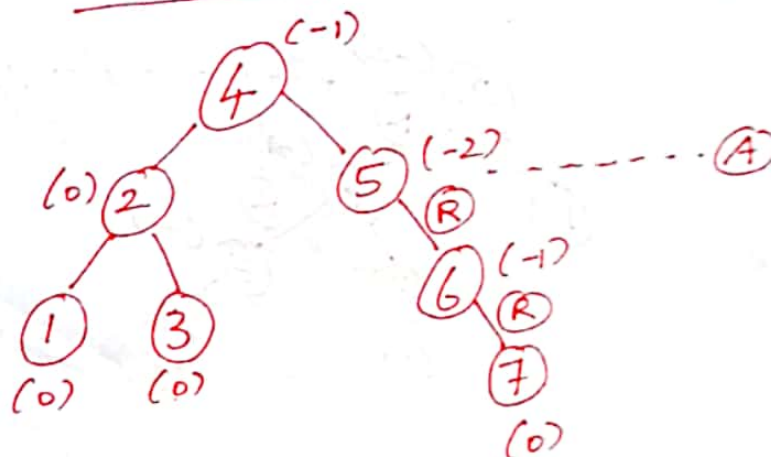
$\therefore$  RR Imbalance.

Doing RR Rotation,



Balanced

Step 7: Insert 7

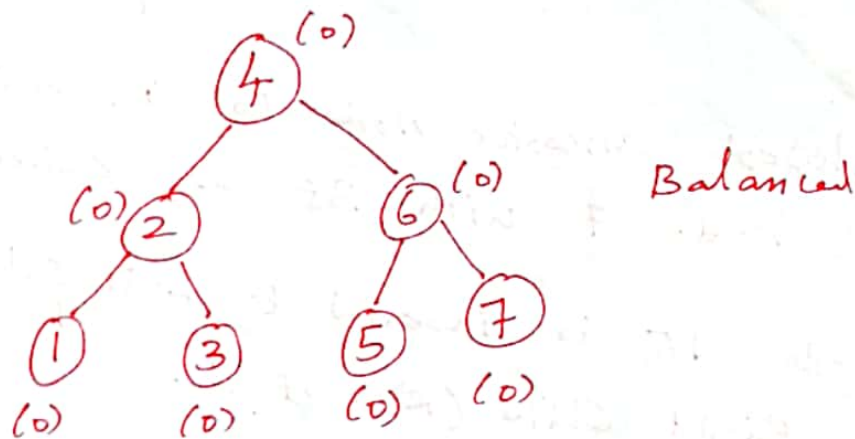


The closest ~~node~~ ancestor to inserted node 7 with Lf -2 is node 5 called as A.

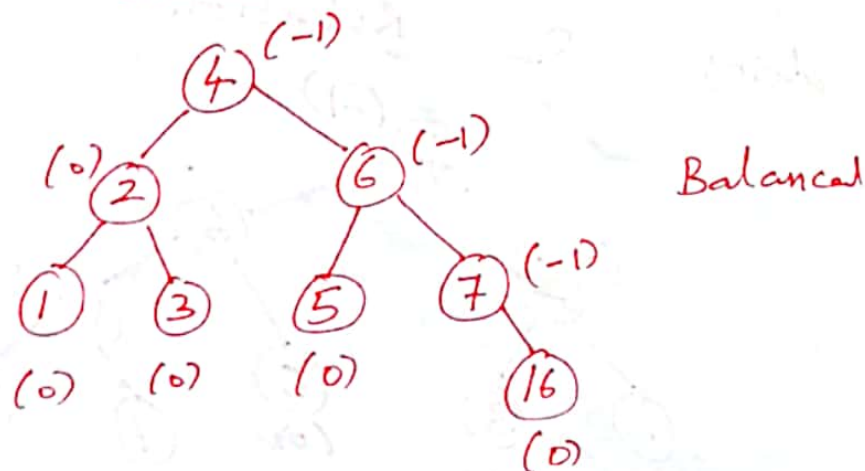
Node 7 is inserted to Right Subtree(R) of Right child(R) of A.

∴ RR Imbalance

Doing RR Rotation



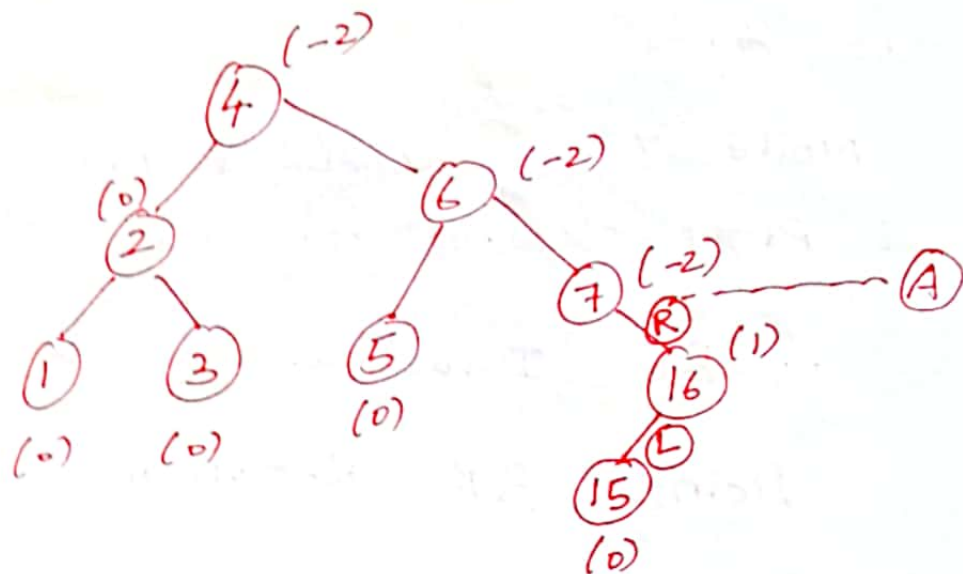
Step 8 : Insert 16



No rotation.



Step 7: Insert 15.

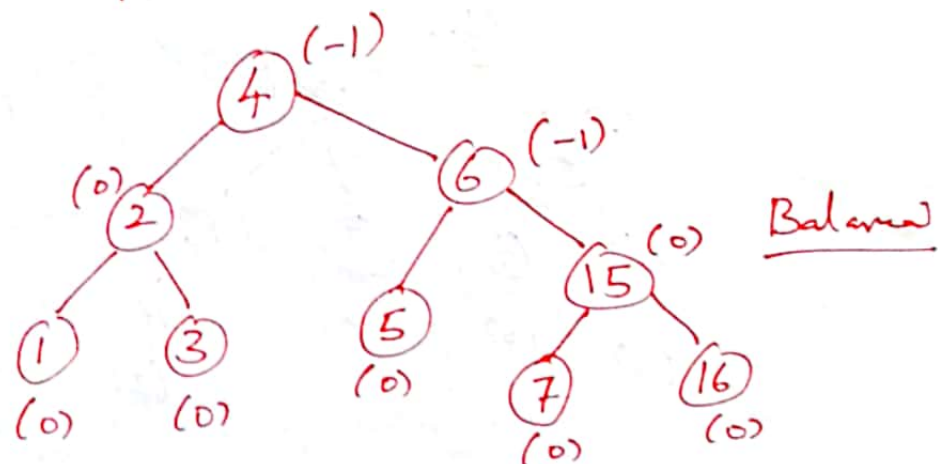


Closest ancestor node to inserted node 15 is node 7 with BF -2, called as A.

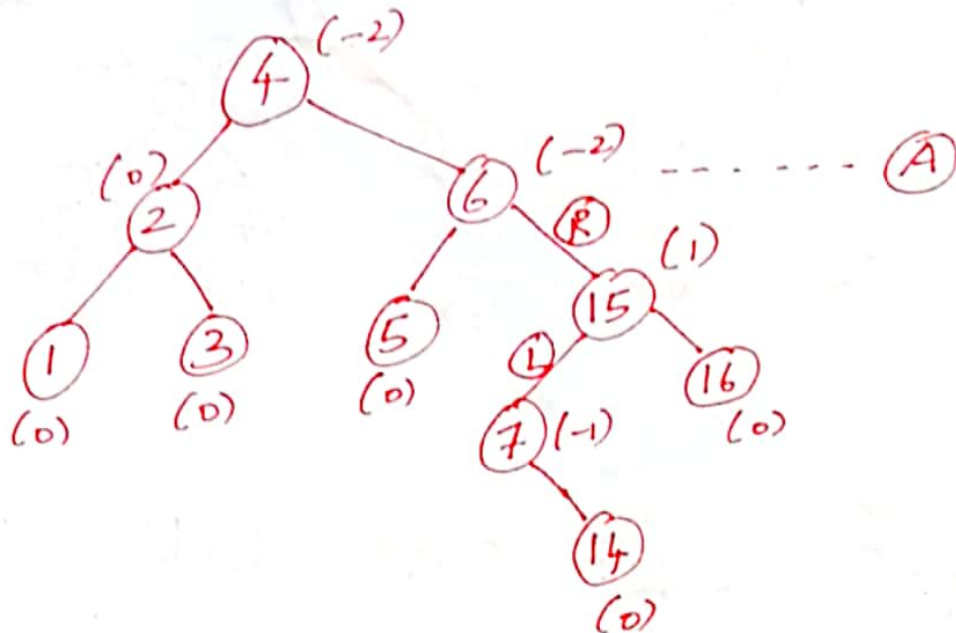
Node 15 is inserted to Left Subtree (L) of Right Child (R) of A.

∴ RL Imbalance

doing RL Rotation



Step 10: Insert 14

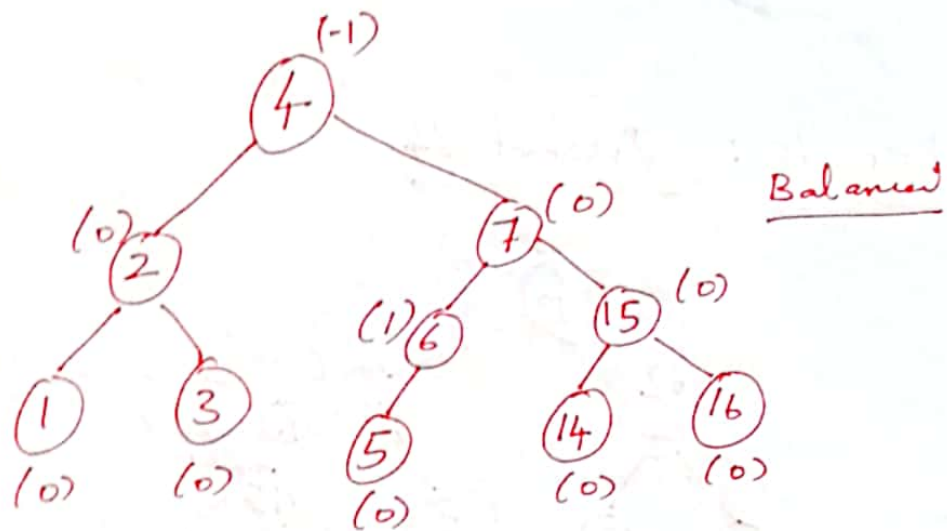


The Closest ancestor node to the inserted node 14 is node 6 called A.

The node 14 is inserted to the Left subtree (L) of Right child (R) of node A.

∴ RL Imbalance.

Doing RL Rotation.

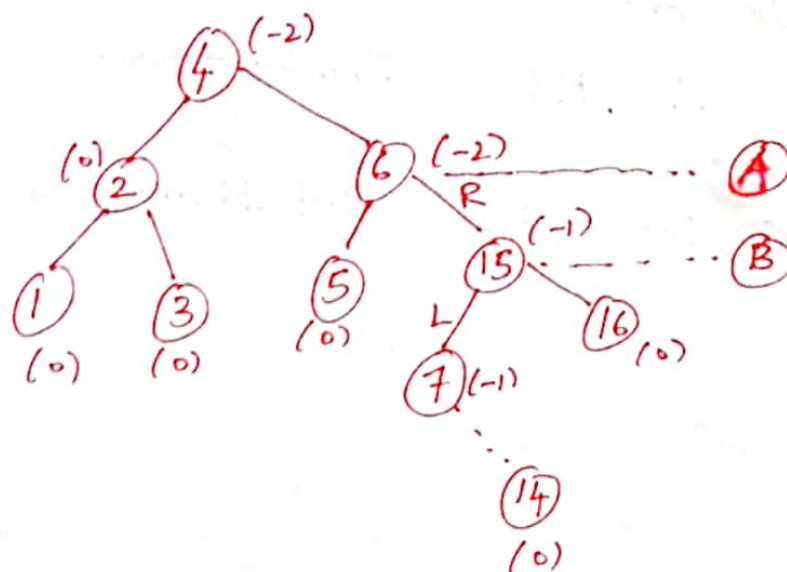


RL & LR are double rotations

RL = LL followed by RR

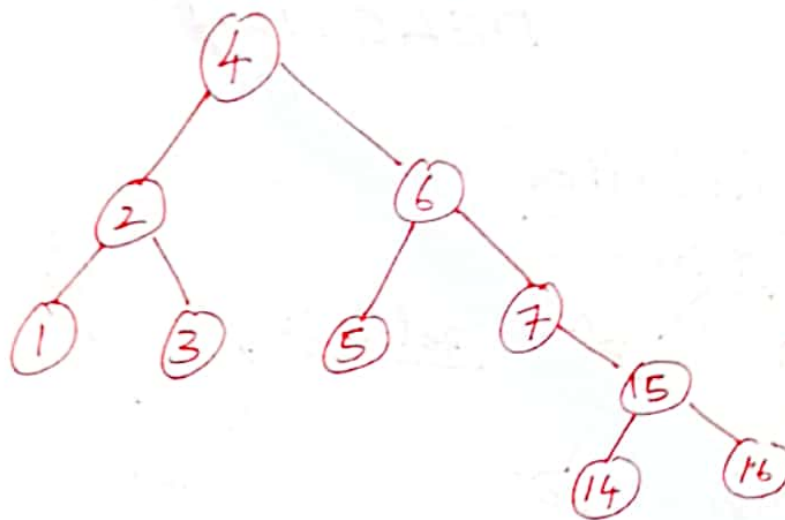
LR = RR followed by LL

Example





Do LL over B



Do RR over A

