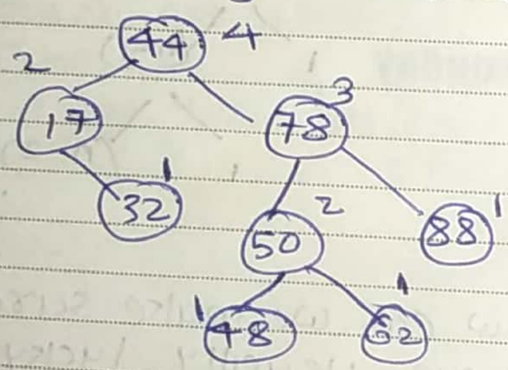
27 Monday

AVL Trees.

BST has worst case time $O(n^2)$, [Avg. $O(n \log n)$]
∴ we modify that to AVL Tree.

° AVL trees are balanced
° It is BST such that heights of children of v can differ by at most 1.



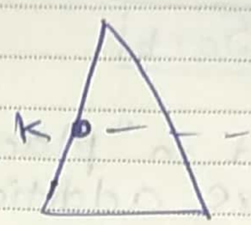
If $n(h)$ is min. no. of nodes in AVL tree of height h, $h < 2 \log n(h)$

Thus height is $O(\log n)$

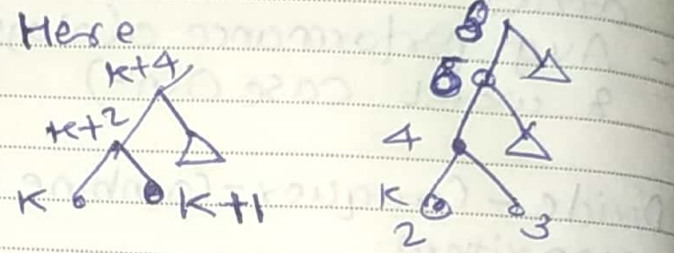
Consider an AVL tree on n nodes. Consider a leaf closet to the root. Suppose leaf is at level k

Note:

28 Tuesday



Here



∴ Relation is $2k-1$

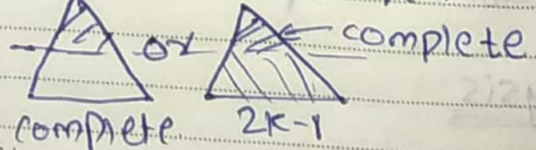
Height of the tree is at most $(2k-1)$.

Tree has atleast 2^{k-1} nodes

$$\boxed{2^{k-1} \leq n <= 2^{2k-1}}$$

∴ height of tree is at most $2k-1$ it has at most 2^{2k-1} nodes

~~∴ Heigt is at most 2k-1 at least k-1.~~

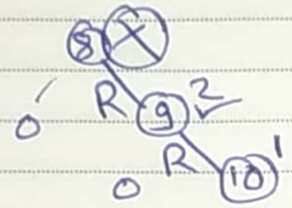


Note:

JANUARY FEBRUARY

* Inertion in AVL Tree
Difference in height of Childern can be -1, 0, +1

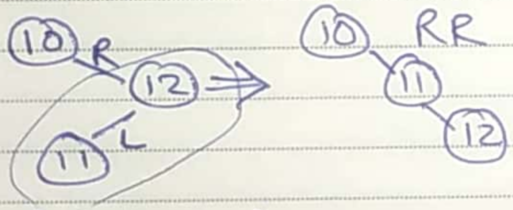
e.g. 8, 9, 10



∴ This is not AVL.

Then rotate Anticlockwise

For RR → Anticlockwise
LL → clockwise
RL →

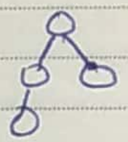


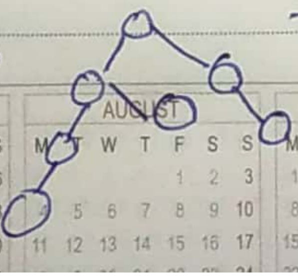
LR ⇒ LL ⇒ clockwise

Maximum height of AVL with n nodes

0 → O 1 Nodes

1 → O–O 2 Nodes

2 →  4 nodes

3 →  7 Nodes

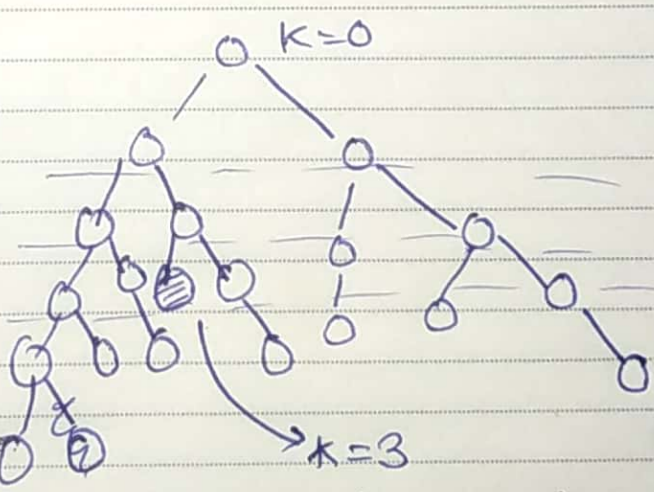
∴ Relation is
$n(h) = n(h-1) + n(h-2) + 1$

← This & above this must have 2 children.

← if this leaf

Insertion | Deletion of element take $O(\log n)$ time.

Example how $\underline{2k-1}$



∴ max. height is
$2k-1 = 5$

or min. height = 3