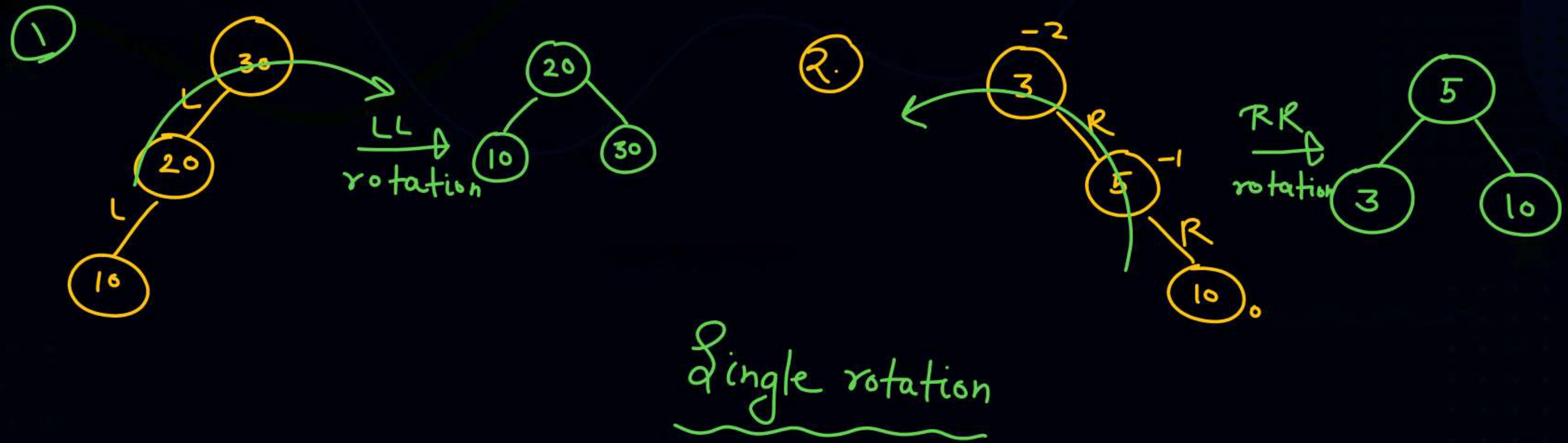
CS & IT ENGINEERING

Data Structure

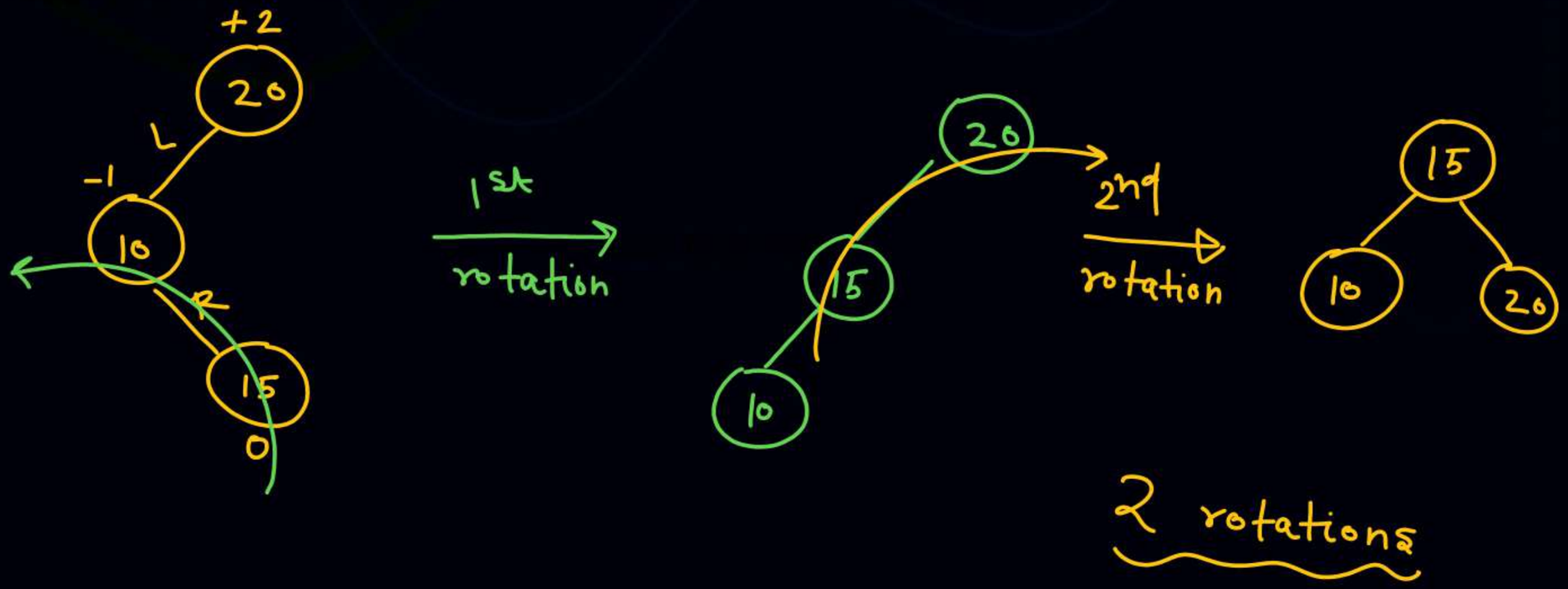
Tree
Chapter- 5
Lec- 07

By- Pankaj Sharma sir

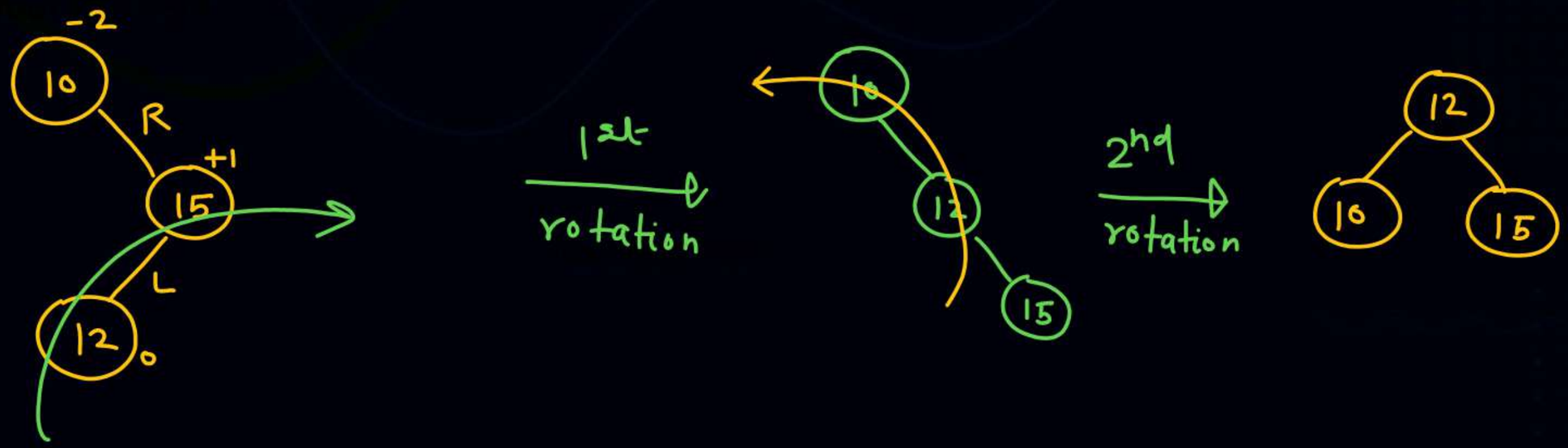
Tree-VII



Single rotation



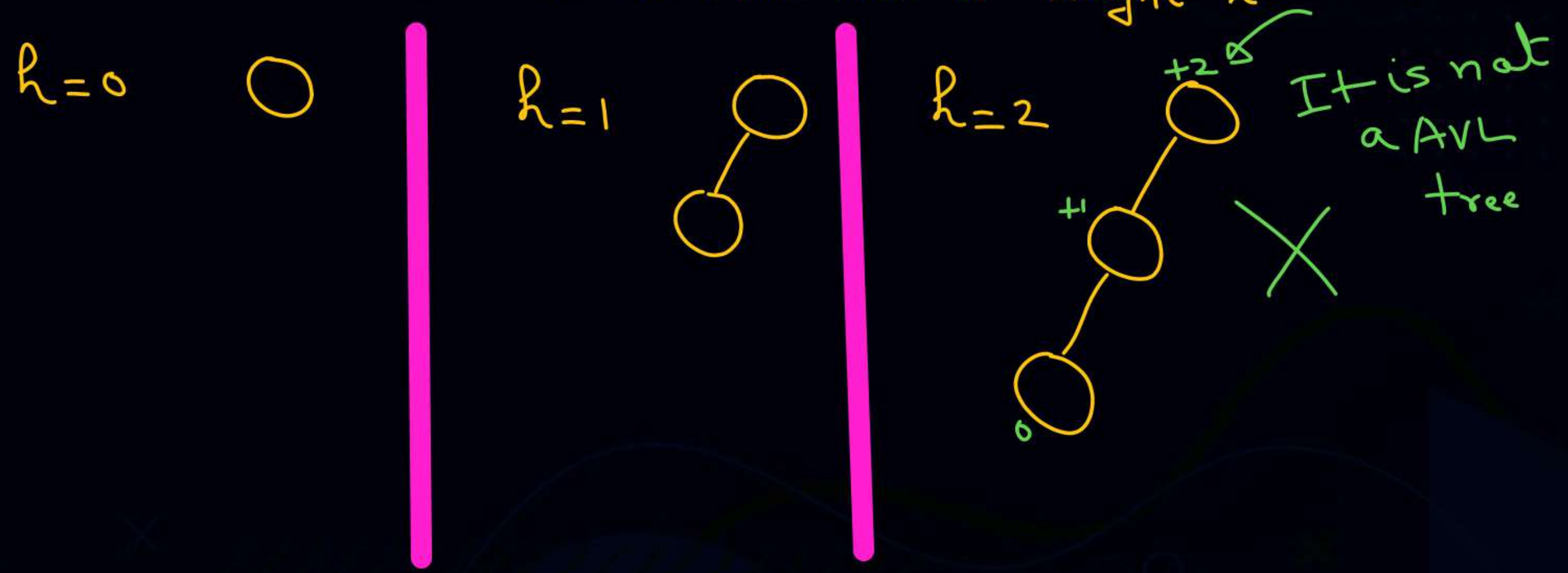
2 rotations


-2
10
R
+1
15
L
12
0
1st
rotation
10
12
15
2nd
rotation
12
10
15

1. Maximum no. of nodes in an AVL tree of height h

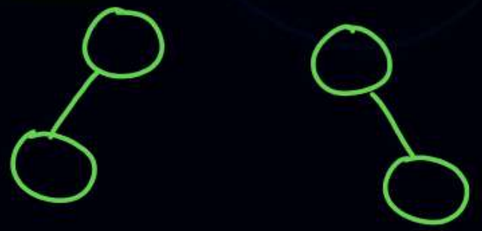
$$= 2^{h+1} - 1$$

Minimum no. of nodes in an AVL tree of height h

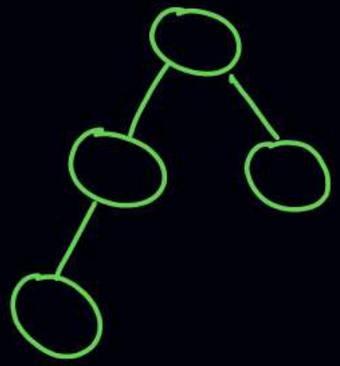


h = 0

h = 1



h = 2

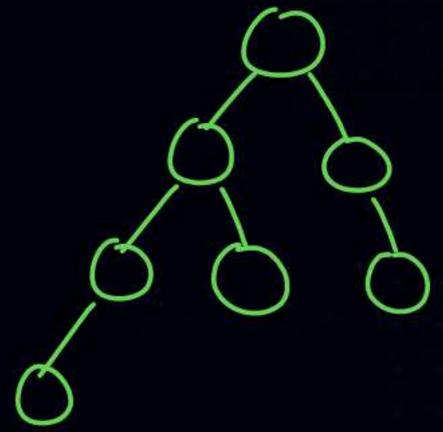


h = 0 1

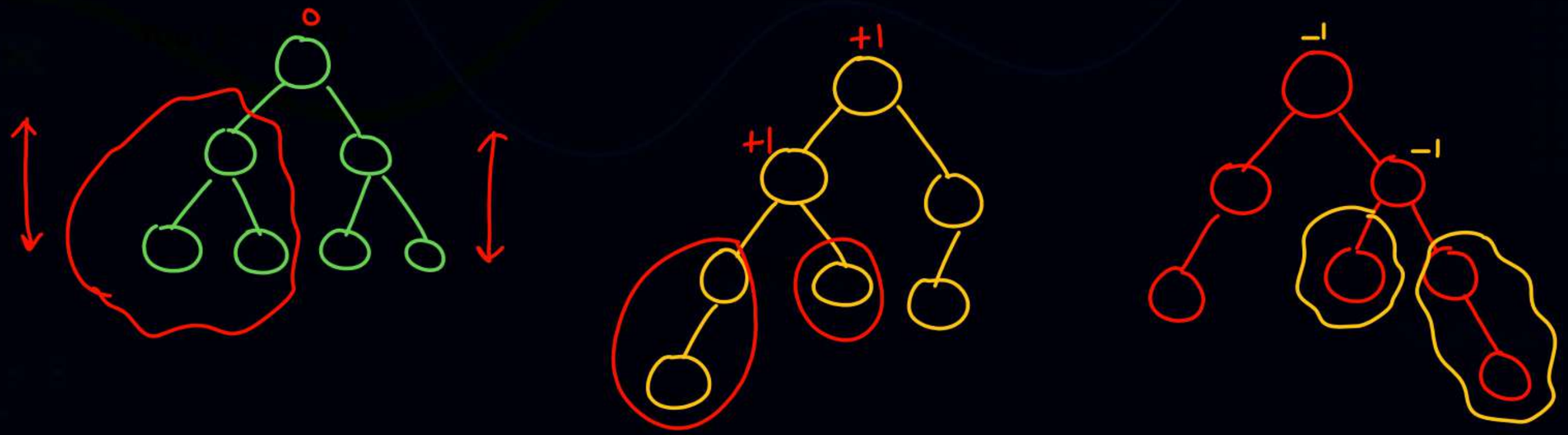
h = 1 2

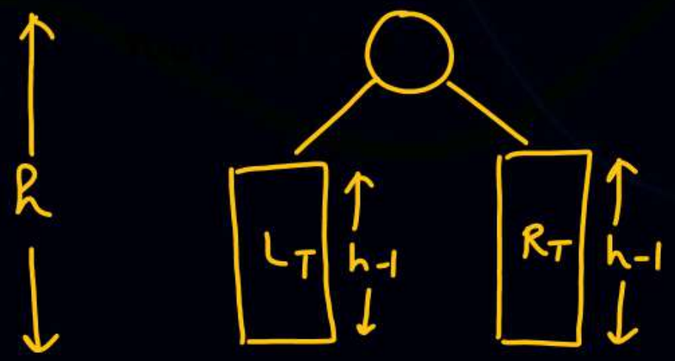
h = 2 4

h = 3 7

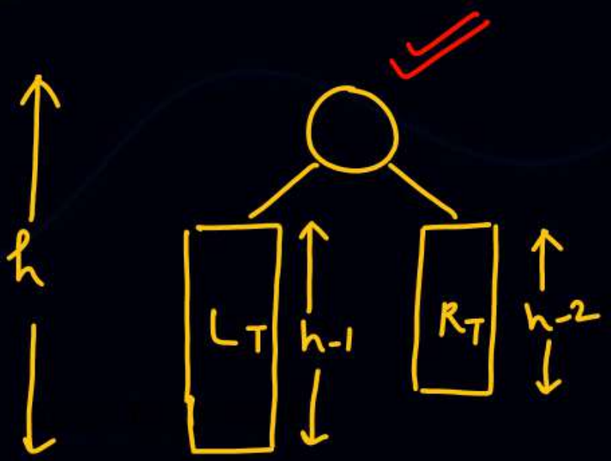


+1 0 -1

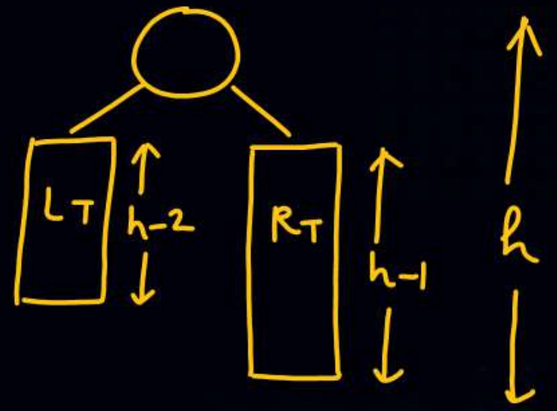




Case I

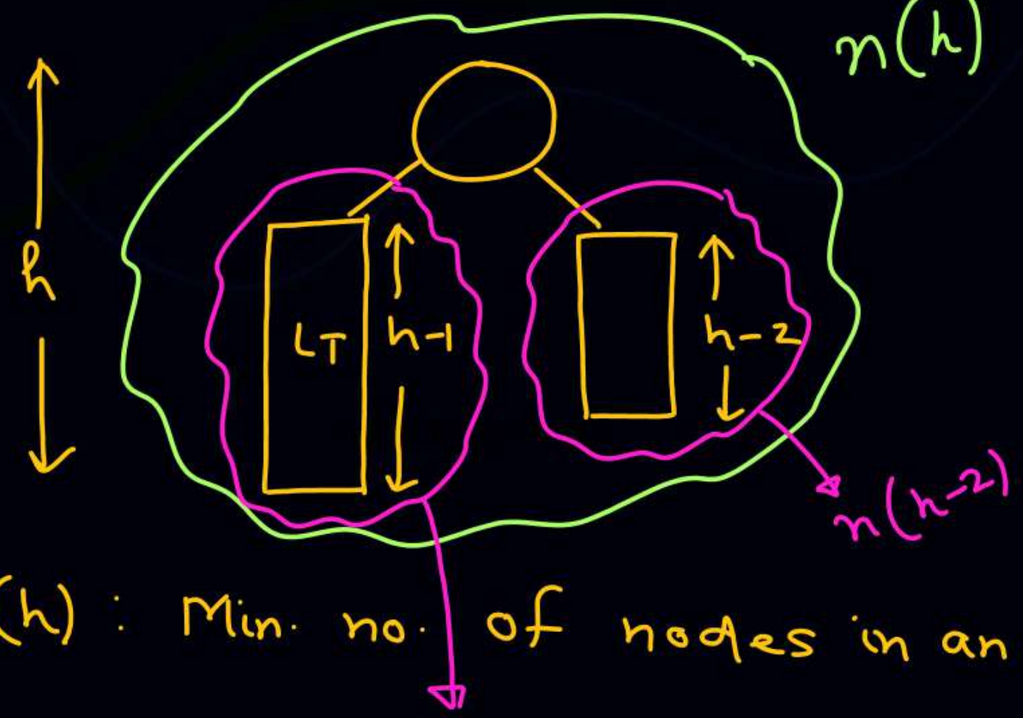


Case II



Case III

h height



let $n(h)$: Min. no. of nodes in an AVL tree of height h

$$n(h) = 1 + n(h-1) + n(h-2)$$

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$n(0) = 1$

$n(1) = 2$

$n(2) = 1 + n(1) + n(0)$

$= 1 + 2 + 1 = 4$

$n(3) = 1 + n(2) + n(1)$

$= 1 + 4 + 2 = 7$

Fibb. Series

h	0	1	2	3	4	5	6
n(h)	1	2	4	7	12	20	33

Q Min no. of nodes in an AVL tree of height 8?

	1,	2,	4,	7,	12,	20,	33,	54,	88
h	0	1	2	3	4	5	6	7	8

88

Q A binary tree is having condition that the diff. b/w no. of nodes in L_T & no. of nodes in R_T is atmost 1 for each node. Min. no. of nodes in such a binary tree of height 5 is _____

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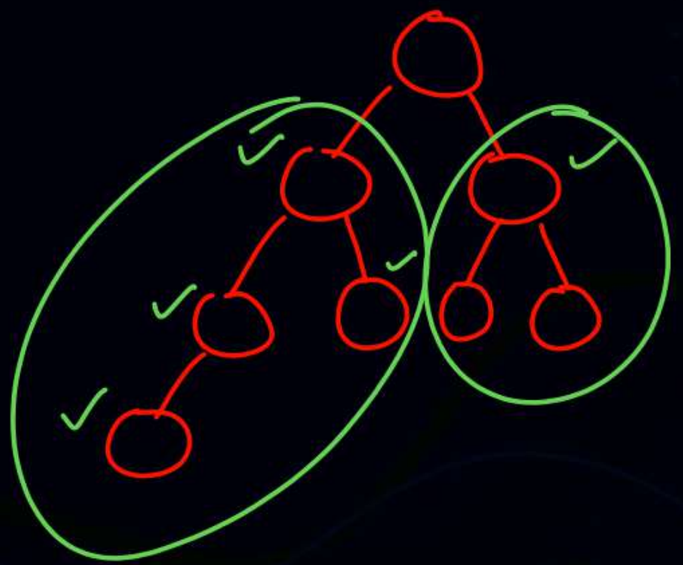
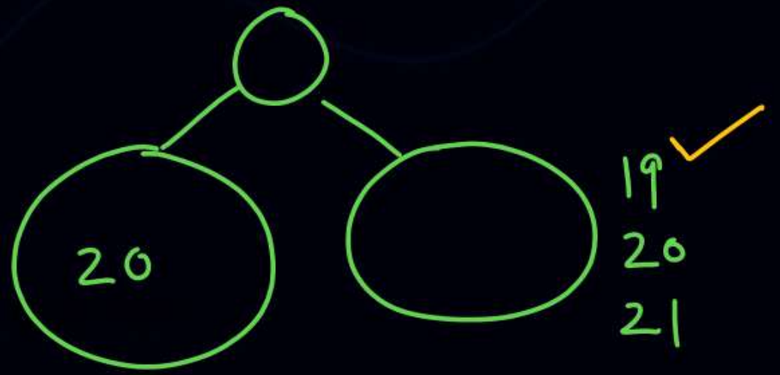
$h = 2 \Rightarrow 4$

$h = 3 \Rightarrow 8$




20
19
20
21

5 min

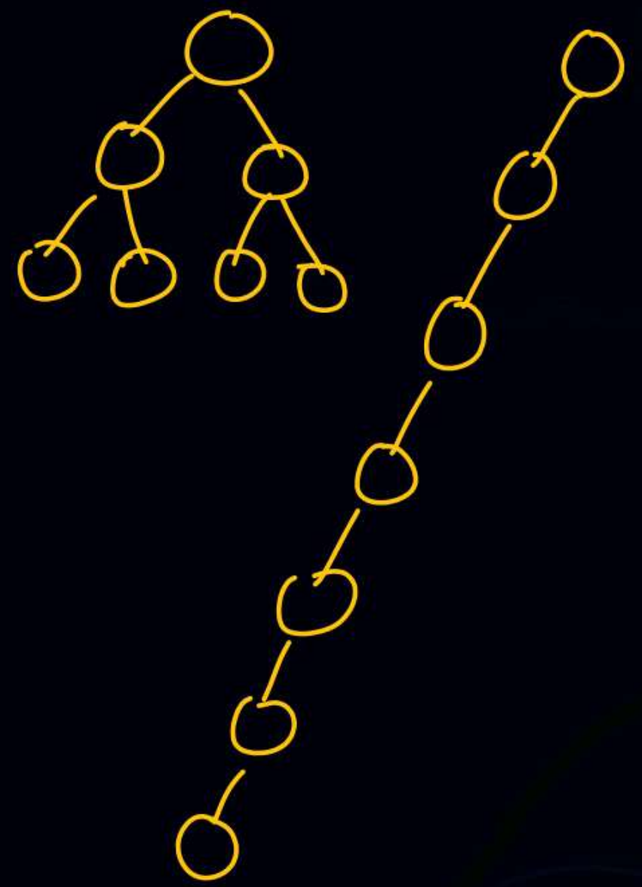
$n(0) = 1$
$n(1) = 2$
$n(2) = 2^2$
$n(3) = 2^3$

$n(h)$: Min. no. of nodes ___ h

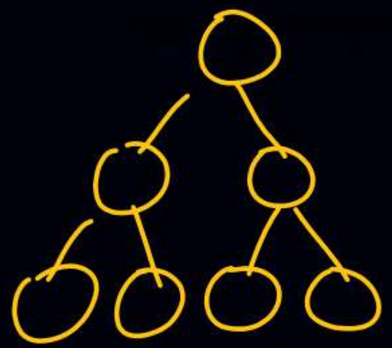
$n(h) = 1 + n(h-1) + n(h-1) - 1$

$\boxed{n(h) = 2n(h-1)}$

7 node → Maximum height



7 node → Min. height



What is the max. height possible for an AVL tree with 7 nodes.

Min no.

h	n(h)
0	1
1	2
2	4
3 ←	7
4	12
5	

Max. height of an AVL tree with 10 nodes?

100

h	0	1	2	3	4	5
n(h)	1	2	4	7	12	20

7 to 11 nodes → height 3

Heap

Expression tree

Algo

HULK

AVL tree

PS Sir

Easy

doubt?


THANK YOU GW
SOLDIERS !