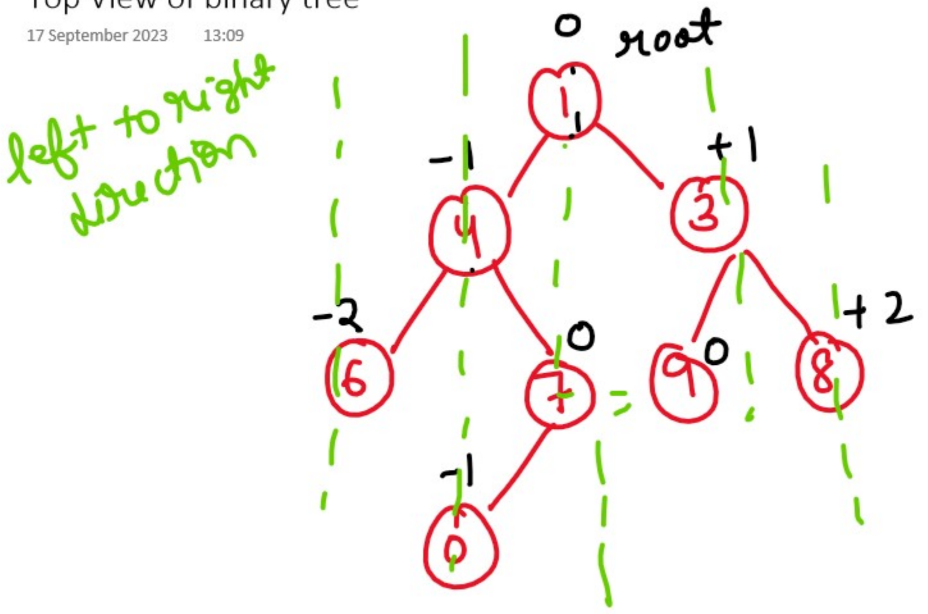
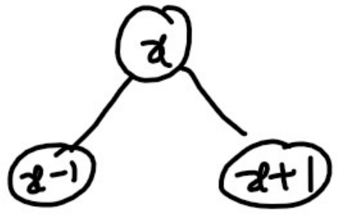
Top View of binary tree

17 September 2023 13:09



Horizontal distance (hd)



Top view - 6, 4, 1, 3, 8

= 6,4,1,3, 8

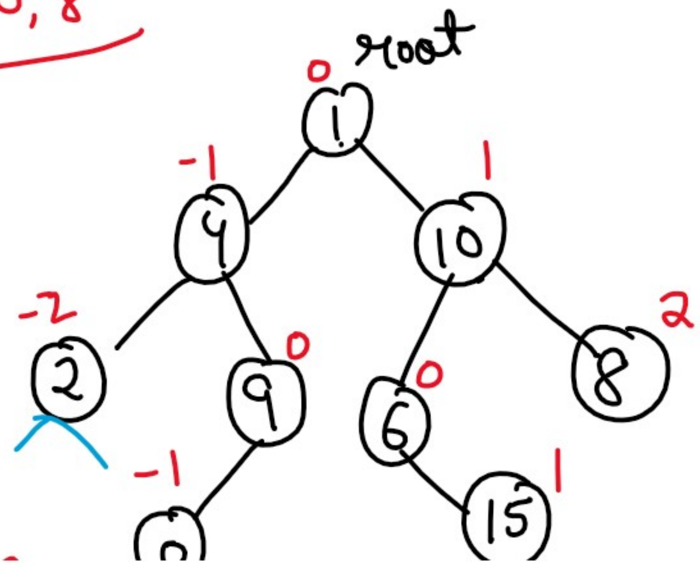
level order traversal + horizontal distance

Map (?) TreeMap map.

hd		nodes values
-2	→	6
-1	→	4
0	→	1
1	→	3
2	→	8

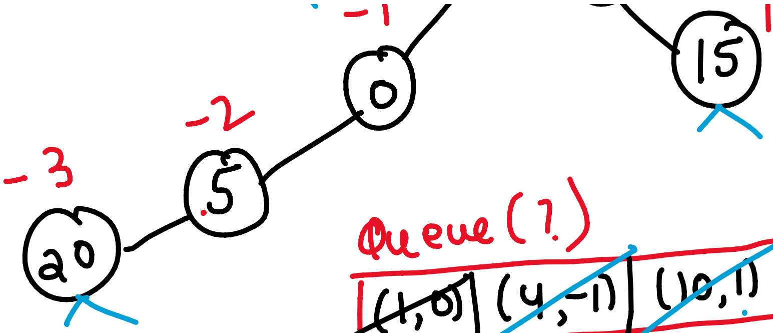
Keys will be in sorted order.

2,4,1,10,8



Map

hd	→	values
-3	→	20
-2	→	2
-1	→	4
0	→	1
1	→	10
2	→	8



1 → 10
2 → 8

Queue (7.)

~~(1,0)~~	~~(4,-1)~~	~~(10,1)~~	~~(2,-2)~~	~~(9,0)~~

~~(6,0)~~, ~~(8,2)~~, ~~(0,-1)~~, ~~(15,1)~~

~~(5,-2)~~, ~~(20,-3)~~

Pair:- (Node, hd)

O(log N)

TreeMap

map

Time:- O(N log N)

Space:- O(N)

Maximum path sum in a binary tree

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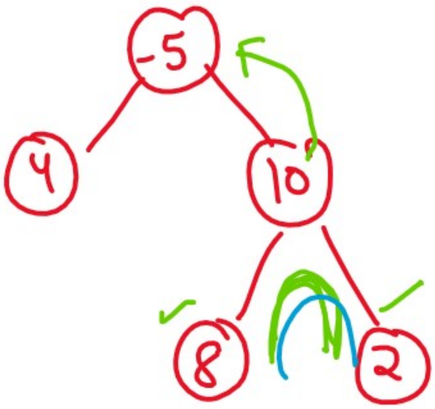


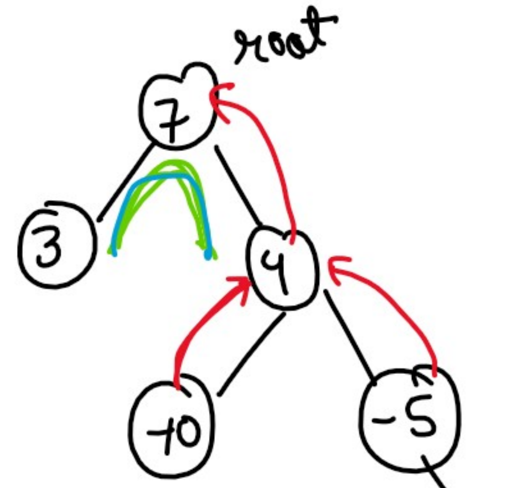
traversal ?

left, right, root}

ans = 20

Path ?

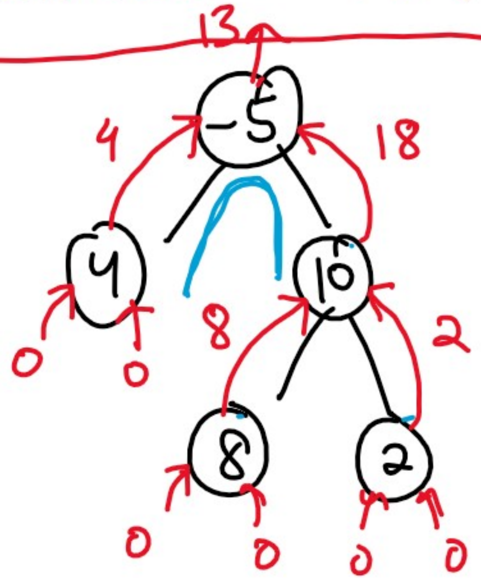
root.val + leftSum + rightSum



ans = 14

return root.val + max(leftSum, rightSum);

currSum = root.val + leftSum + rightSum

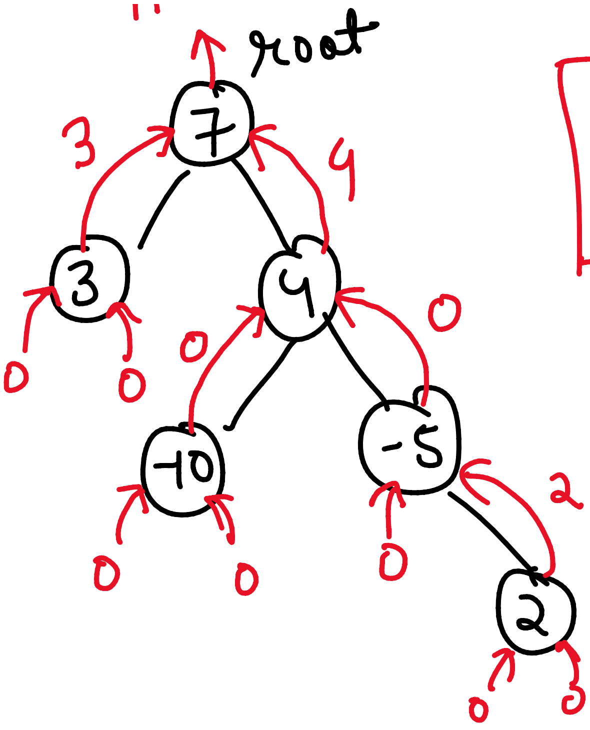


left, right, root

currSum = ~~4~~ ~~8~~ ~~2~~ ~~20~~ 17

maxSum = ~~INT_MIN~~ ~~4~~ ~~8~~ 20

O(N)



Time : O(N)

space : O(Height)

14

~~4~~

~~2~~ -~~3~~

currSum = ~~0~~ ~~3~~ -~~10~~

maxSum = ~~INT_MIN~~

~~3~~ ~~4~~ 14

All nodes at distance K in a binary tree

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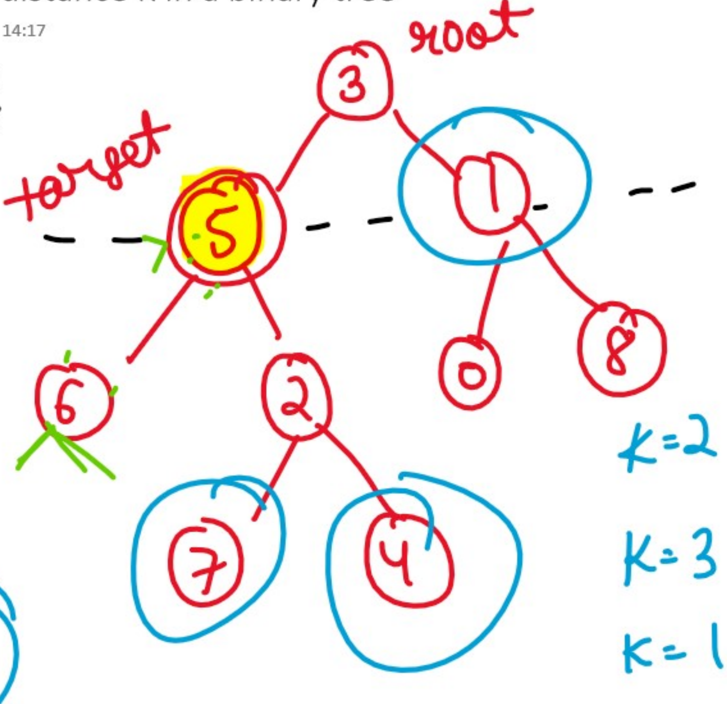
iterative

K=2



(parent)

map

5 →	3
1 →	3
6 →	5
2 →	5
7 →	2
4 →	2
0 →	1
8 →	1

K=2 [7,4,1]

K=3 [0,8]

K=1 [6,2,3]

[7,4,1]

Queue(Node)

~~5~~	~~6~~	~~2~~	~~3~~	~~7~~	~~4~~	1

1 2

visited

5,6,2,3
7,4,1

set

Time → O(N)
Space → O(N)

Burn tree

BST (Binary search trees)

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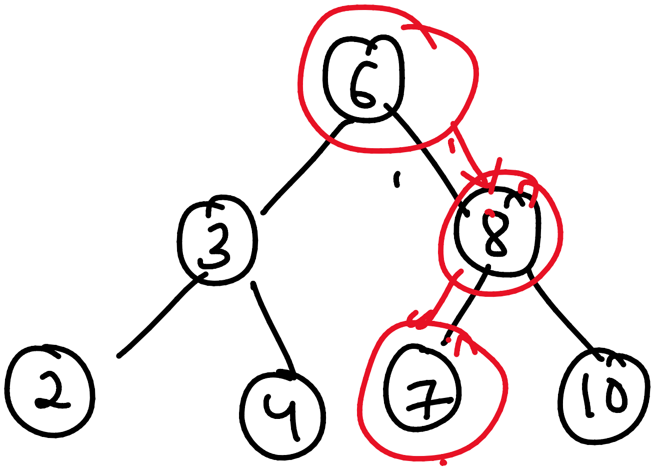
values on left of root should be smaller and values on right of root should be greater & each subtree should also be BST.



valid BST

searching ?

7 target

$O(N)$

$O(\log N) = O(\text{Height})$

Insert node in a BST

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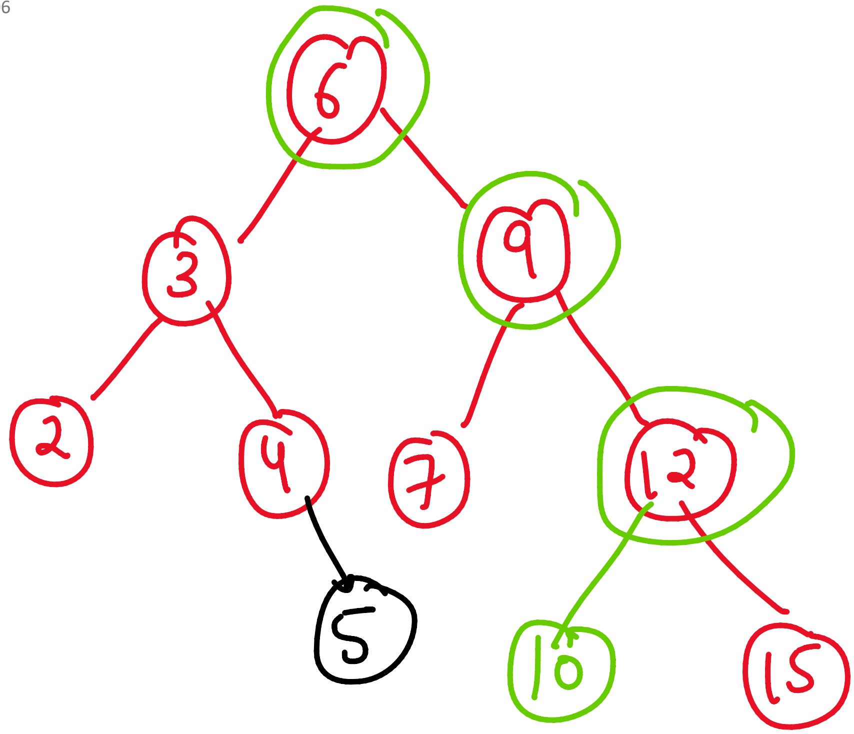

Insert = 5

10

Delete a node in BST

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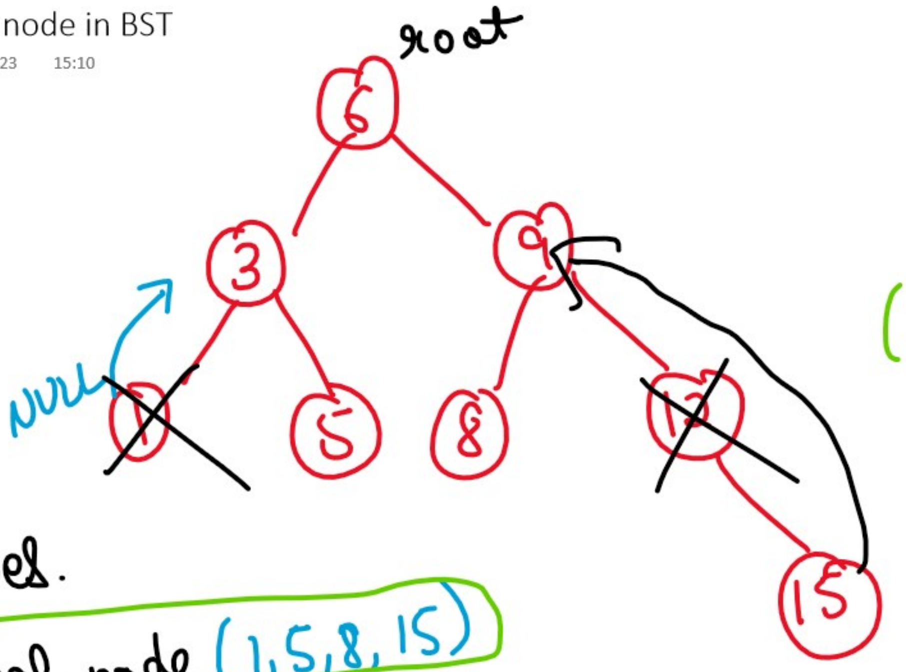


Delete :- 1
(3 → left will be NULL)

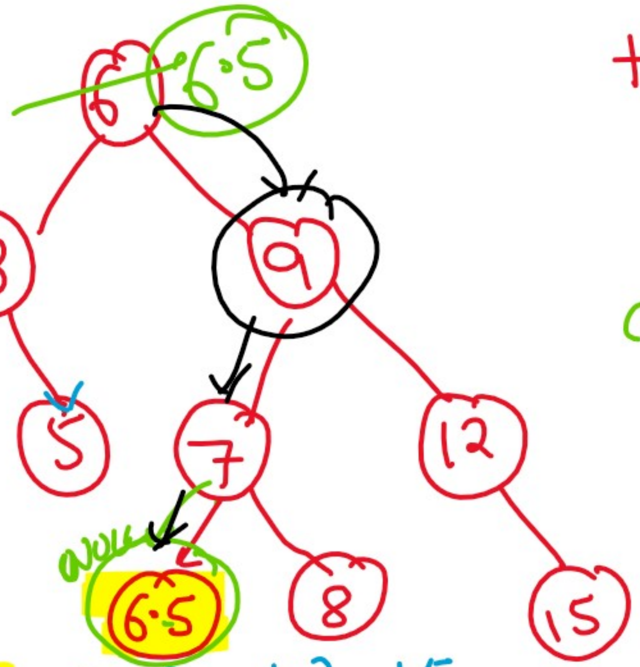
Delete :- 12
(return non-null node)

3 types.

① Leaf node (1, 5, 8, 15)

② one child (12)

③ two children (3, 6, 9)



target = 6
(8, 5)

candidate = 7

Inorder :-

2 3 5 6 8 9 12 15

replaceNode = 6.5

Inorder of BST is always sorted.

Kth smallest element in a BST

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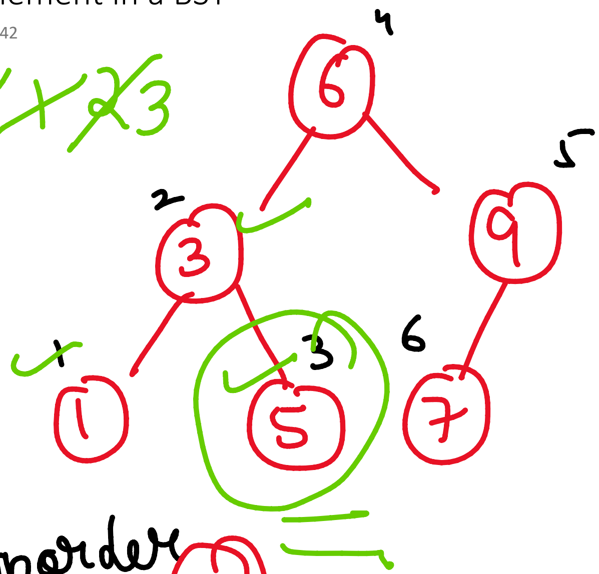
Count = ~~0~~ ~~1~~ ~~2~~ 3



k = 3

ans = 5

X

Inorder

valus	1	3	5	6	7	9
index	0	1	2	3	4	5

ans

ans : 5

Time = O(N)

Space = ~~O(N)~~ O(1)

Validate BST

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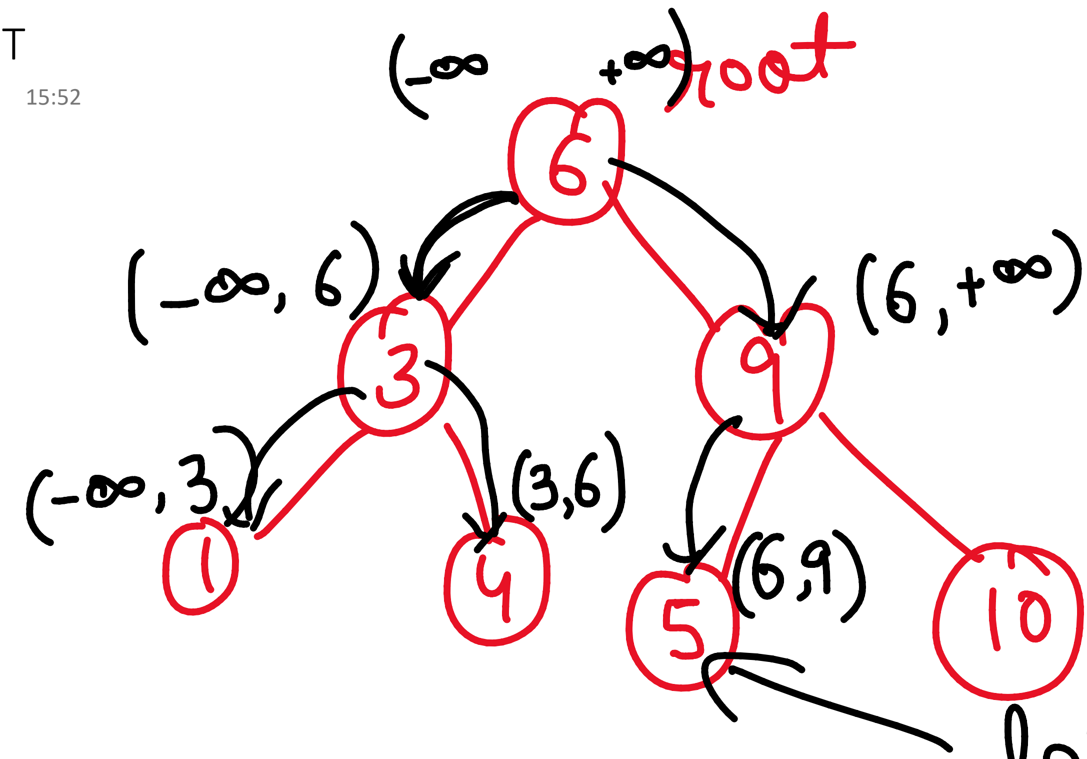

false

Inorder → 1, 3, 4, 6, 7, 9, 10 →