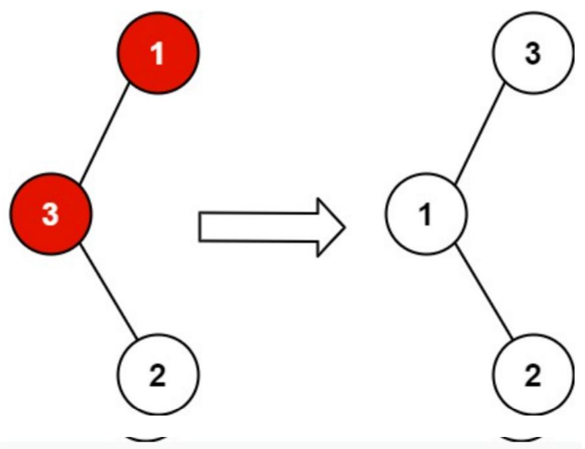
99. Recover Binary Search Tree

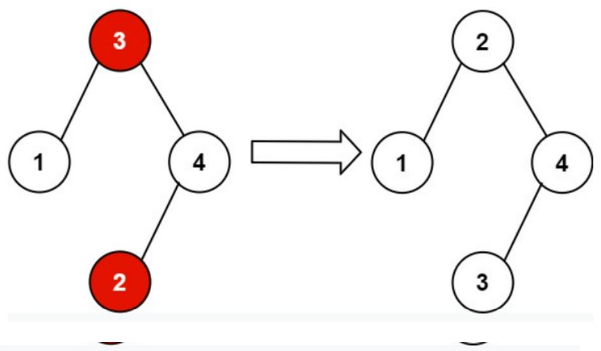
03 April 2022 05:41 PM

You are given the `root` of a binary search tree (BST), where the values of **exactly** two nodes of the tree were swapped by mistake. *Recover the tree without changing its structure.*

Example 1:



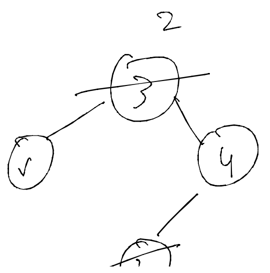
```
Input: root = [1,3,null,null,2]
Output: [3,1,null,null,2]
Explanation: 3 cannot be a left child of 1 because 3 >
1. Swapping 1 and 3 makes the BST valid.
```

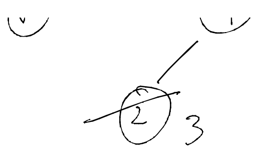


```
Input: root = [3,1,4,null,null,2]
Output: [2,1,4,null,null,3]
Explanation: 2 cannot be in the right subtree of 3
because 2 < 3. Swapping 2 and 3 makes the BST valid.
```

Recover BST

→ Two nodes swapped





Brute force

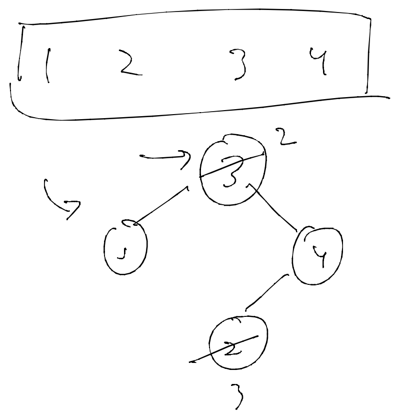
Inorder Traversal

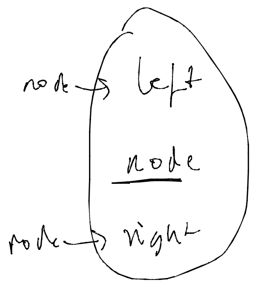
$\downarrow$

Sort

$\downarrow$

Correct Inorder





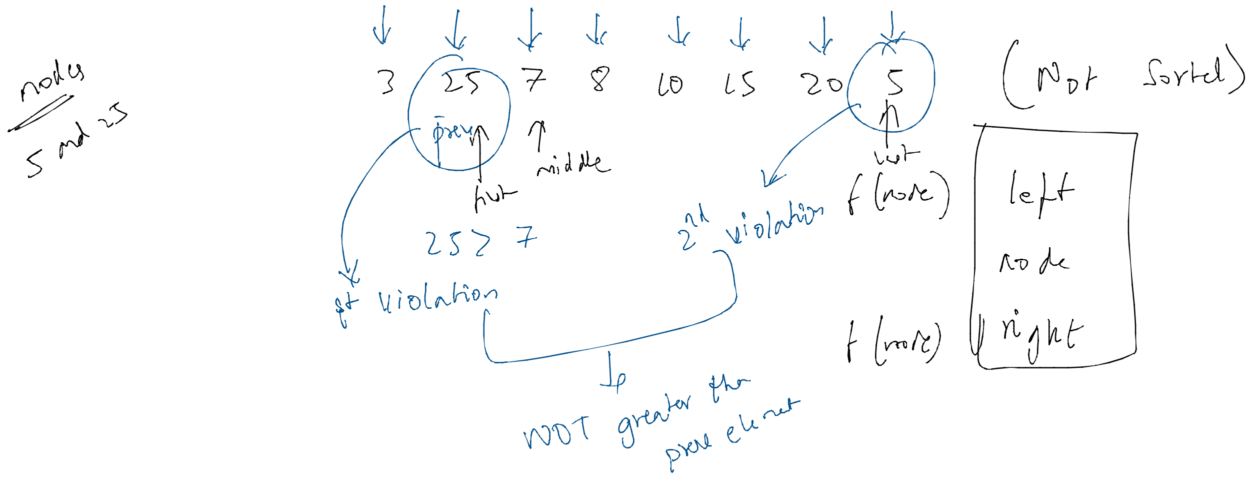
T.C $\Rightarrow O(N) + N\log N$

S.C $\Rightarrow O(N)$

2) Better Solution :

Swap can have 2 cases

1. Swapped nodes are not adjacent



You have stored two violation and then swap it.

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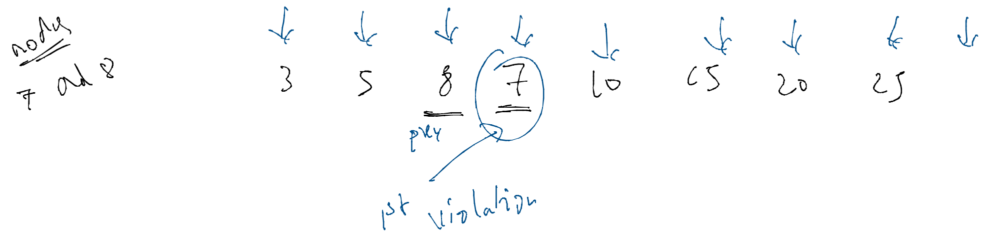
if there is not second violation ↓ swap(first, last) just storing.

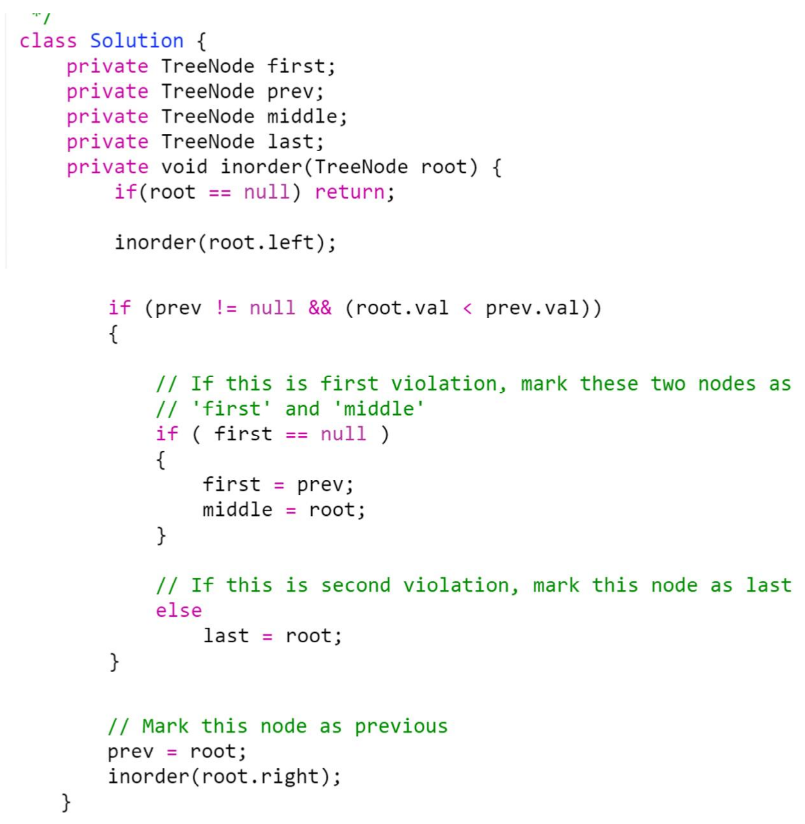
2. Swapped nodes are adjacent



no second violation, so it's a adjacent pair so just swap them.

$T.C \Rightarrow O(N)$

$S.C \Rightarrow O(1)$



```
*/
class Solution {
    private TreeNode first;
    private TreeNode prev;
    private TreeNode middle;
    private TreeNode last;
    private void inorder(TreeNode root) {
        if(root == null) return;

        inorder(root.left);


       if (prev != null && (root.val < prev.val))
       {

           // If this is first violation, mark these two nodes as
           // 'first' and 'middle'
           if ( first == null )
           {
               first = prev;
               middle = root;
           }

           // If this is second violation, mark this node as last
           else
               last = root;
       }

       // Mark this node as previous
       prev = root;
       inorder(root.right);
    }
```

```java
public void recoverTree(TreeNode root) {
    first = middle = last = null;
    prev = new TreeNode(Integer.MIN_VALUE);
    inorder(root);
    if(first!=null && last!=null) {
        int t = first.val;
        first.val = last.val;
        last.val = t;
    }
    else if(first!=null && middle!=null)  {
        int t = first.val;
        first.val = middle.val;
        middle.val = t;
    }
}
```