Experiment 6

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Subject Name: AP Lab-2
Subject Code: 22CSP-351

1. Aim: Symmetric Tree

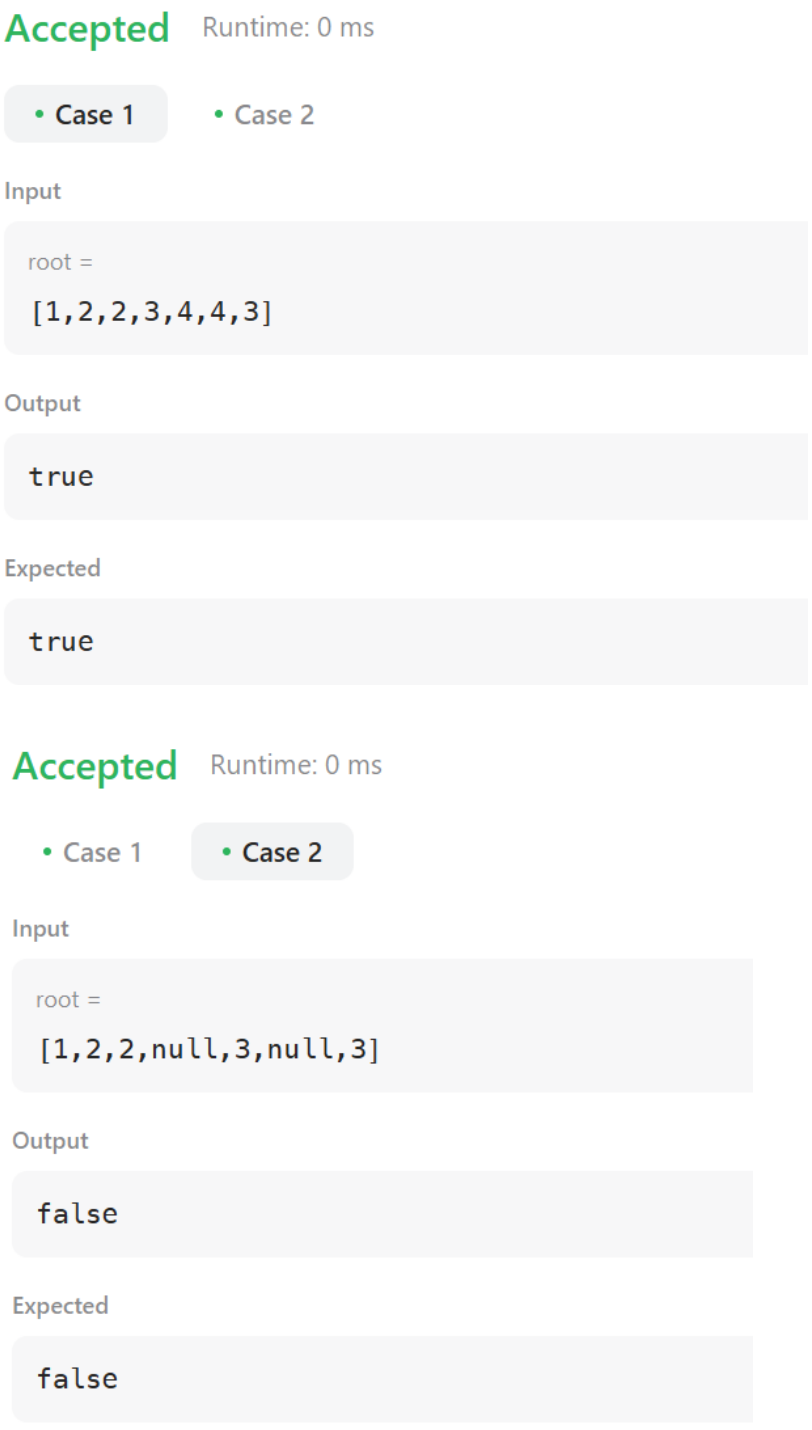
2. Objective:

Given the root of a binary tree, *check whether it is a mirror of itself* (i.e., symmetric around its center).

3. Implementation/Code:

```
bool help(TreeNode* r1 , TreeNode* r2){

        if(r1 == NULL and r2 == NULL){
            return true;
        }
        if(r1 == NULL and r2 != NULL){
            return false;
        }
        if(r1 != NULL and r2 == NULL){
            return false;
        }
        if(r1->val != r2->val){
            return false;
        }

        bool one = help(r1->left,r2->right);
        bool two = help(r1->right,r2->left);

        bool ans = one & two;

        return ans;
    }
    bool isSymmetric(TreeNode* root) {

        return help(root->left,root->right);

    }
```

4. Output


Accepted
Runtime: 0 ms
• Case 1
• Case 2
Input
root =
[1,2,2,3,4,4,3]
Output
true
Expected
true
Accepted
Runtime: 0 ms
• Case 1
• Case 2
Input
root =
[1,2,2,null,3,null,3]
Output
false
Expected
false

5. Learning Outcome:

i. We Learn About the use of Reccursion.
ii. We Learn About the use of ListNode.
iii. We Learn About the use of Base Cases.
iv. We learn About the Calling function in recc..

Question 2

1. **Aim**:- **Kth Smallest Element in a BST**

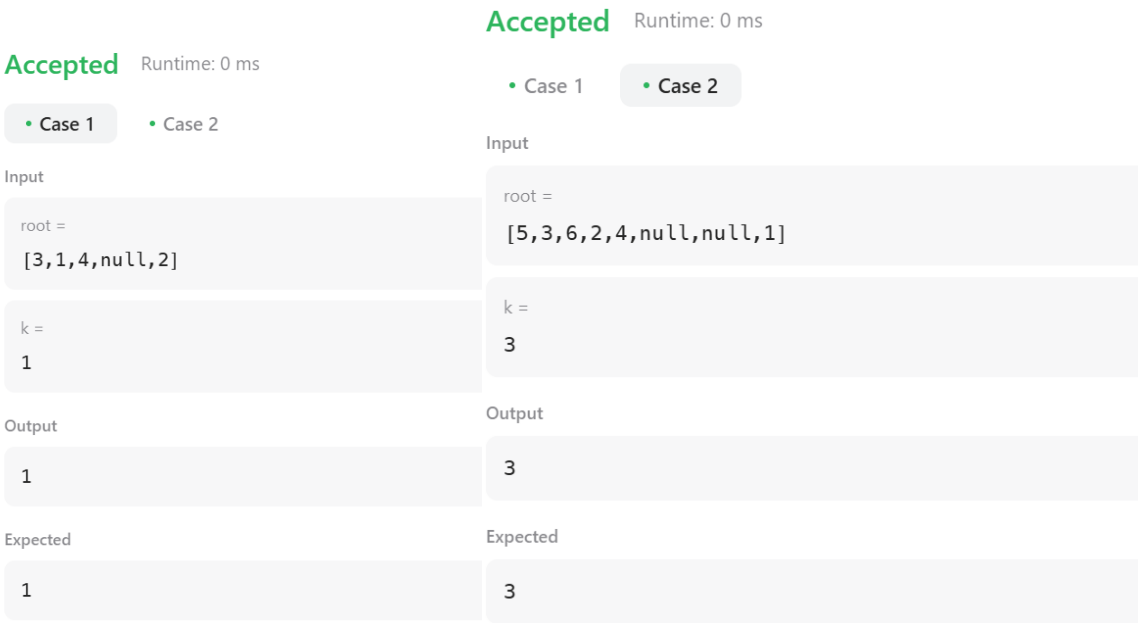
2. **Objective**:-

Given the root of a binary search tree, and an integer k, return *the* k^{th} *smallest value (**1-indexed**) of all the values of the nodes in the tree*.

3. **Implementation/Code:-**

```
void help(TreeNode* root,vector<int>&ans){

    if(root == NULL){
       return;
    }
    help(root->left,ans);
    ans.push_back(root->val);
    help(root->right,ans);
}
int kthSmallest(TreeNode* root, int k) {
    vector<int>ans;
    help(root,ans);

    return ans[k-1];
}
```

4. Output:-



5. **Learning Outcome:**
   1. We Learn about the inorder traversal
   2. We Learn about the function calls
   3. We learned about recursion.

Question 3

6. **Aim**:- **Convert Sorted Array to Binary Search Tree**

7. **Objective**:-

Given an integer array nums where the elements are sorted in **ascending order**, convert *it to a **height-balanced** binary search tree*.

8. Implementation/Code:-

```
TreeNode*help(int s , int e , vector<int>&nums){

        if(s> e){
            return NULL;
        }

        int mid = (s+e)/2;
        TreeNode*newnode =  new  TreeNode(nums[mid]);

        newnode->left = help(s,mid-1,nums);
        newnode->right = help(mid+1,e,nums);
        return newnode;
    }
    TreeNode* sortedArrayToBST(vector<int>& nums) {
        int s =0;
        int e = nums.size()-1;
        return help(s, e, nums);
    }
```

9. Output:-

10.Learning Outcome:

- We learn about to create a new node.
- We learn about function calls.
- We learn about the to push middle value.
- We learn to make a tree from recc.