# Experiment-6

**Student Name:** Harsh Kumar
**UID:** 22BCS15183
**Branch:** BE-CSE
**Section/Group:** 640/B
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1. **Aim:** To Solve Problems of Tree on leetcode

2. **Objective:** To understand the algorithm and to implement the questions of tree on leetcode

**Tree Traversal Methods:**

Traversal is the process of visiting nodes in a tree.

1. **Depth-First Search (DFS)**

- Explores as deep as possible before backtracking.
- Preorder (Root → Left → Right): Used for copying a tree.
- Inorder (Left → Root → Right): Used in Binary Search Trees (BSTs) to retrieve sorted values.
- Postorder (Left → Right → Root): Used for deleting trees (deletes child nodes before the parent).

2. **Breadth-First Search (BFS)**

- Also called Level Order Traversal.
- Explores all nodes at one level before moving to the next.

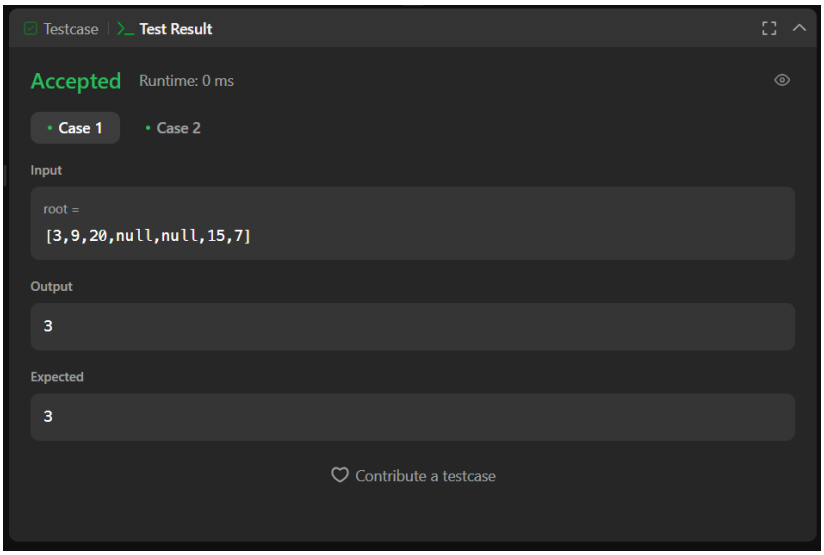
## 3. Implementation/Code:

- **104 Maximum Depth of Binary Tree:**

```
import java.util.*;
class Solution {
    public int maxDepth(TreeNode root) {
        if (root == null) return 0;
        Queue<TreeNode> queue = new LinkedList<>();
        queue.add(root);
        int depth = 0;
        while (!queue.isEmpty()) {
            int size = queue.size();
            depth++;
            for (int i = 0; i < size; i++) {
                TreeNode node = queue.poll();
                if (node.left != null) queue.add(node.left);
                if (node.right != null) queue.add(node.right);
```

```
            }
          }
          return depth;
        }
      }
```

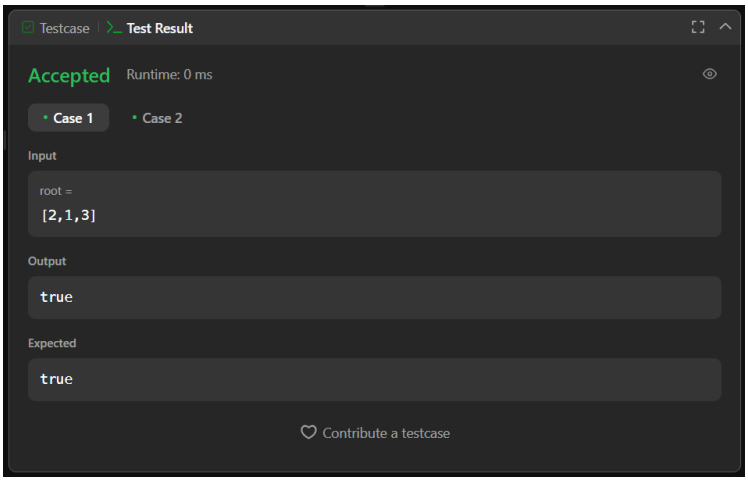
**104Output:**




- **98 Validate Binary Search Tree:**

```
import java.util.Stack;
class Solution {
    public boolean isValidBST(TreeNode root) {
        Stack<TreeNode> stack = new Stack<>();
        TreeNode current = root;
        TreeNode prev = null;
        while (!stack.isEmpty() || current != null) {
            while (current != null) {
                stack.push(current);
                current = current.left;
            }
            current = stack.pop();
            if (prev != null && current.val <= prev.val) {
                return false;
            }
            prev = current;
            current = current.right;
        }
        return true;
    }
}
```

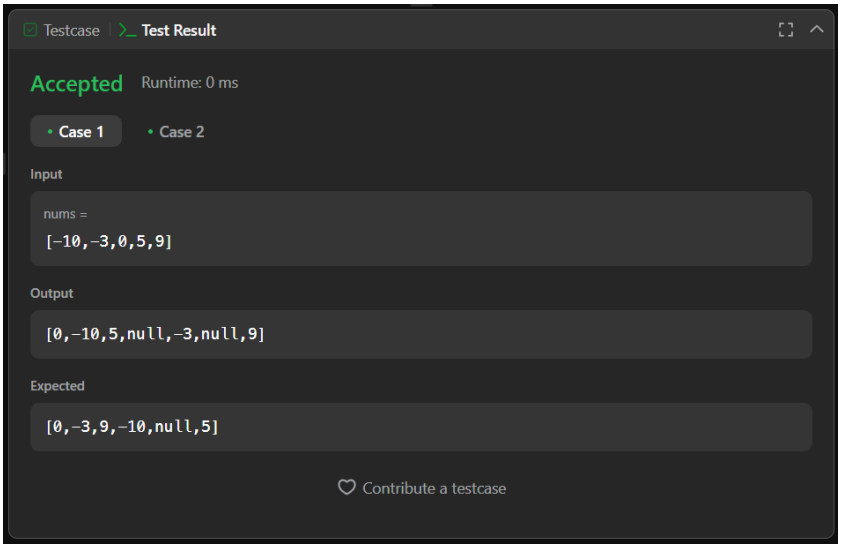
**98 Output:**




- **108 Convert Sorted Array to Binary Search Tree:**

```
class Solution {
    public TreeNode sortedArrayToBST(int[] nums) {
        return buildBST(nums, 0, nums.length - 1);
    }
    private TreeNode buildBST(int[] nums, int left, int right) {
        if (left > right) return null; // Base case
        int mid = (left + right) / 2;  // Find middle index
        TreeNode root = new TreeNode(nums[mid]); // Create root node
        root.left = buildBST(nums, left, mid - 1);  // Left Subtree
        root.right = buildBST(nums, mid + 1, right); // Right Subtree
        return root;
    }
}
```

**108 Output:**



## 4. Learning Outcome

- Understand the breaking down the sorted array into smaller parts to build a height-balanced BST.
- Understanding binary search tree beyond simple sorted arrays.
- How to validate if a binary tree is a BST by checking left and right subtrees recursively.