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Problem 1

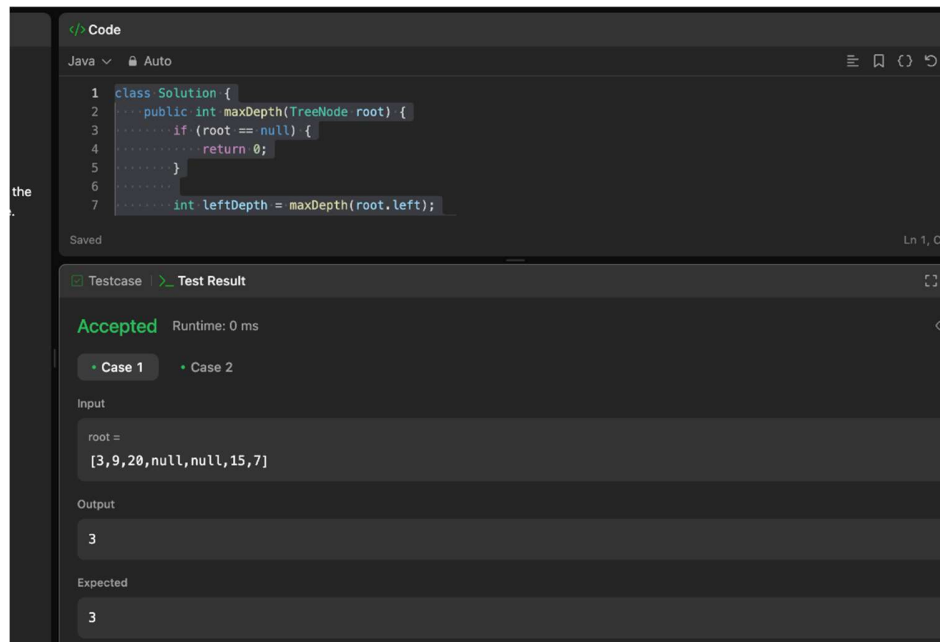
Aim:

Maximum Depth of Binary Tree

Code:

```
class Solution {  
    public int maxDepth(TreeNode root) {  
        if (root == null) {  
            return 0;  
        }  
  
        int leftDepth = maxDepth(root.left);  
        int rightDepth = maxDepth(root.right);  
  
        return Math.max(leftDepth, rightDepth) + 1;  
    }  
}
```

Output:



The screenshot displays a code editor with the following Java code:

```
1 class Solution {  
2     public int maxDepth(TreeNode root) {  
3         if (root == null) {  
4             return 0;  
5         }  
6         int leftDepth = maxDepth(root.left);  
7     }  
}
```

Below the code editor, the test result is shown as 'Accepted' with a runtime of 0 ms. The test case is 'Case 1'. The input is 'root = [3,9,20,null,null,15,7]' and the output is '3'.

Problem 2

Aim:

Validate Binary Search Tree

Code:

```
class Solution {
    public boolean isValidBST(TreeNode root) {
        return isValidBST(root, Long.MIN_VALUE, Long.MAX_VALUE);
    }

    private boolean isValidBST(TreeNode node, long min, long max) {
        if (node == null) {
            return true;
        }

        if (node.val <= min || node.val >= max) {
            return false;
        }

        return isValidBST(node.left, min, node.val) && isValidBST(node.right, node.val, max);
    }
}
```

Output:

The screenshot displays a code editor with the following content:

```
1 class Solution {
2     public boolean isValidBST(TreeNode root) {
3         return isValidBST(root, Long.MIN_VALUE, Long.MAX_VALUE);
4     }
5 }
```

Below the code editor, the test results are shown:

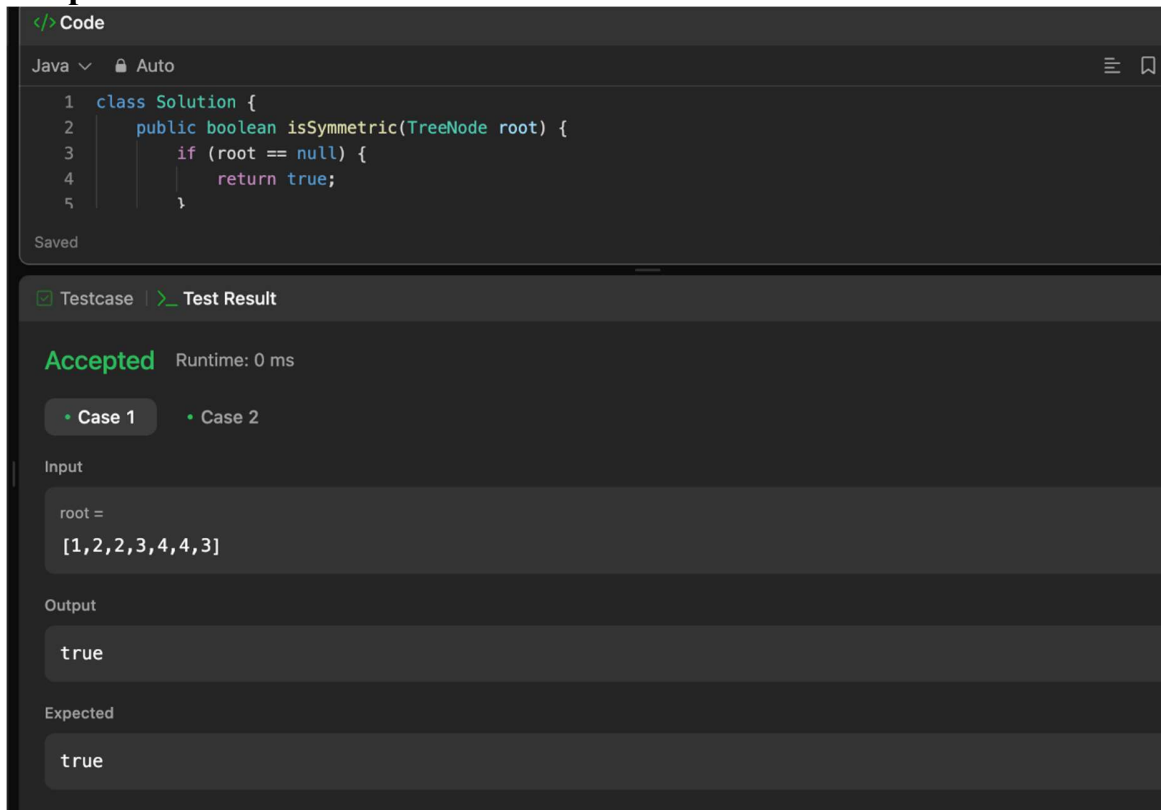
- Testcase** | **Test Result**
- Accepted** Runtime: 0 ms
- Case 1** • Case 2
- Input**
root =
[2,1,3]
- Output**
true
- Expected**
true

Problem 3

Aim: Symmetric Tree

```
Code : class Solution {  
    public boolean isSymmetric(TreeNode root) {  
        if (root == null) {  
            return true;  
        }  
        return isMirror(root.left, root.right);  
    }  
  
    private boolean isMirror(TreeNode t1, TreeNode t2) {  
        if (t1 == null && t2 == null) {  
            return true;  
        }  
        if (t1 == null || t2 == null) {  
            return false;  
        }  
  
        return (t1.val == t2.val)  
            && isMirror(t1.left, t2.right)  
            && isMirror(t1.right, t2.left);  
    }  
}
```

Output:



The screenshot displays a code editor with the following content:

```
</> Code  
Java ▾ 🔒 Auto  
1 class Solution {  
2     public boolean isSymmetric(TreeNode root) {  
3         if (root == null) {  
4             return true;  
5         }  
  
        private boolean isMirror(TreeNode t1, TreeNode t2) {  
            if (t1 == null && t2 == null) {  
                return true;  
            }  
            if (t1 == null || t2 == null) {  
                return false;  
            }  
  
            return (t1.val == t2.val)  
                && isMirror(t1.left, t2.right)  
                && isMirror(t1.right, t2.left);  
        }  
    }  
}
```

Below the code editor, the test result is shown:

- Testcase | **Test Result**
- Accepted** Runtime: 0 ms
- Case 1 • Case 2
- Input: root = [1,2,2,3,4,4,3]
- Output: true
- Expected: true

Problem 4

Aim: Binary Tree Level Order Traversal

Code:

```
import java.util.*;

class Solution {
    public List<List<Integer>> levelOrder(TreeNode root) {
        List<List<Integer>> result = new ArrayList<>();
        if (root == null) {
            return result;
        }

        Queue<TreeNode> queue = new LinkedList<>();
        queue.offer(root);

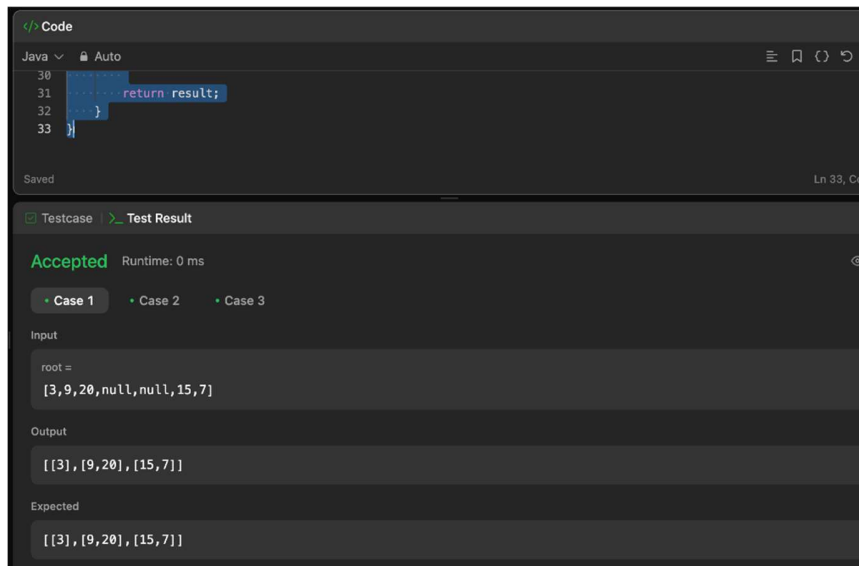
        while (!queue.isEmpty()) {
            int levelSize = queue.size();
            List<Integer> currentLevel = new ArrayList<>();

            for (int i = 0; i < levelSize; i++) {
                TreeNode currentNode = queue.poll();
                currentLevel.add(currentNode.val);

                if (currentNode.left != null) {
                    queue.offer(currentNode.left);
                }
                if (currentNode.right != null) {
                    queue.offer(currentNode.right);
                }
            }
            result.add(currentLevel);
        }

        return result;
    }
}
```

Output:



The screenshot shows an IDE with a Java file. The code is as follows:

```
30  
31     return result;  
32 }  
33 }
```

Below the code editor, the 'Test Result' tab is active, showing 'Accepted' with a runtime of 0 ms. There are three test cases: Case 1, Case 2, and Case 3. Case 1 is selected, showing the following details:

Input: root = [3,9,20,null,null,15,7]

Output: [[3], [9,20], [15,7]]

Expected: [[3], [9,20], [15,7]]

Problem 5

Aim:

Convert Sorted Array to Binary Search Tree

Code:

```
class Solution {  
    public TreeNode sortedArrayToBST(int[] nums) {  
        if (nums == null || nums.length == 0) {  
            return null;  
        }  
        return helper(nums, 0, nums.length - 1);  
    }  
  
    private TreeNode helper(int[] nums, int left, int right) {  
        if (left > right) {  
            return null;  
        }  
  
        int mid = left + (right - left) / 2;  
        TreeNode root = new TreeNode(nums[mid]);  
        root.left = helper(nums, left, mid - 1);  
        root.right = helper(nums, mid + 1, right);  
  
        return root;  
    }  
}
```

Output:

The screenshot shows an IDE with a Java file. The code is a helper function for a binary tree search. It has a base case where if left is greater than right, it returns null. Then it calculates the mid index and creates a new TreeNode at that index. The left child is then recursively set by calling the helper function with the left half of the array.

```
10     if (left > right) {
11         return null;
12     }
13
14     int mid = left + (right - left) / 2;
15     TreeNode root = new TreeNode(nums[mid]);
16     root.left = helper(nums, left, mid - 1);
```

Below the code editor, there is a 'Testcase' tab and a 'Test Result' tab. The 'Test Result' tab shows 'Accepted' with a runtime of 0 ms. There are two test cases: 'Case 1' and 'Case 2'. 'Case 1' is selected. The input for Case 1 is 'nums = [-10,-3,0,5,9]'. The output is '[0,-10,5,null,-3,null,9]'. The expected output is '[0,-3,9,-10,null,5]'.

Problem 6

Aim:

Binary Tree Inorder Traversal

Code:

```
import java.util.*;
```

```
class Solution {
    public List<Integer> inorderTraversal(TreeNode root) {
        List<Integer> result = new ArrayList<>();
        Stack<TreeNode> stack = new Stack<>();
        TreeNode current = root;

        while (current != null || !stack.isEmpty()) {
            while (current != null) {
                stack.push(current);
                current = current.left;
            }

            current = stack.pop();
            result.add(current.val);
            current = current.right;
        }

        return result;
    }
}
```

Output:

```
</> Code
Java ▾ Auto
17         current = current.right;
18     }
19
20     return result;
21 }
22 }
```

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Testcase Test Result

Accepted Runtime: 0 ms

• Case 1 • Case 2 • Case 3 • Case 4

Input

root =
[1,null,2,3]

Output

[1,3,2]

Expected

[1,3,2]

Problem 7

Aim:

Construct Binary Tree from Inorder and Postorder Traversal

Code:

```
import java.util.*;
class Solution {
    public TreeNode buildTree(int[] inorder, int[] postorder) {
        if (inorder == null || postorder == null || inorder.length != postorder.length) {
            return null;
        }
        Map<Integer, Integer> inorderMap = new HashMap<>();
        for (int i = 0; i < inorder.length; i++) {
            inorderMap.put(inorder[i], i);
        }
        return buildTreeHelper(inorder, 0, inorder.length - 1, postorder, 0, postorder.length - 1,
            inorderMap);
    }
    private TreeNode buildTreeHelper(int[] inorder, int inStart, int inEnd, int[] postorder, int postStart, int
        postEnd, Map<Integer, Integer> inorderMap) {
        if (inStart > inEnd || postStart > postEnd) {
            return null;
        }
        int rootVal = postorder[postEnd];
        TreeNode root = new TreeNode(rootVal);
        int rootIndex = inorderMap.get(rootVal);
        int leftSize = rootIndex - inStart;
```

```

root.left = buildTreeHelper(inorder, inStart, rootIndex - 1, postorder, postStart, postStart + leftSize - 1,
inorderMap);
    root.right = buildTreeHelper(inorder, rootIndex + 1, inEnd, postorder, postStart + leftSize, postEnd
- 1, inorderMap);
    return root;
}
}

```

The screenshot shows a code editor with the following Java code snippet:

```

26 root.right = buildTreeHelper(inorder, rootIndex + 1, inEnd, postorder, postStart + leftSize, postEnd - 1,
inorderMap);
27

```

Below the code editor, the 'Test Result' tab is active, showing 'Accepted' with a runtime of 0 ms. The test case is 'Case 1'. The input is:

```

inorder =
[9, 3, 15, 20, 7]

postorder =
[9, 15, 7, 20, 3]

```

The output is:

```

[3, 9, 20, null, null, 15, 7]

```

The expected output is:

```

[3, 9, 20, null, null, 15, 7]

```

Output:

Problem 8

Aim:

Kth Smallest element in a BST

Code:

```
import java.util.*;
```

```
class Solution {
```

```

    public TreeNode buildTree(int[] inorder, int[] postorder) {
        if (inorder == null || postorder == null || inorder.length != postorder.length) {
            return null;
        }
        Map<Integer, Integer> inorderMap = new HashMap<>();
        for (int i = 0; i < inorder.length; i++) {
            inorderMap.put(inorder[i], i);
        }
        return buildTreeHelper(inorder, 0, inorder.length - 1, postorder, 0, postorder.length - 1,
inorderMap);
    }

```

```

    private TreeNode buildTreeHelper(int[] inorder, int inStart, int inEnd, int[] postorder, int
postStart, int postEnd, Map<Integer, Integer> inorderMap) {
        if (inStart > inEnd || postStart > postEnd) {
            return null;
        }

```

```

        int rootVal = postorder[postEnd];

```



```

    TreeNode root = new TreeNode(rootVal);
    int rootIndex = inorderMap.get(rootVal);
    int leftSize = rootIndex - inStart;

    root.left = buildTreeHelper(inorder, inStart, rootIndex - 1, postorder, postStart, postStart +
leftSize - 1, inorderMap);
    root.right = buildTreeHelper(inorder, rootIndex + 1, inEnd, postorder, postStart + leftSize,
postEnd - 1, inorderMap);

    return root;
}

public int kthSmallest(TreeNode root, int k) {
    Stack<TreeNode> stack = new Stack<>();
    TreeNode current = root;
    int count = 0;

    while (current != null || !stack.isEmpty()) {
        while (current != null) {
            stack.push(current);
            current = current.left;
        }

        current = stack.pop();
        count++;
        if (count == k) {
            return current.val;
        }

        current = current.right;
    }

    return -1; // Should not reach here if k is valid
}
}

```

Output:

```
52 }
53 }
```

Testcase | Test Result

Accepted Runtime: 0 ms

• Case 1 • Case 2

Input

root =
[3,1,4,null,2]

k =
1

Output

1

Expected

1

Problem 9

Aim:

Populating Next Right Pointers in Each Node

Code:

```
class Solution {
    public Node connect(Node root) {
        if (root == null) {
            return null;
        }
    }
}
```

```

Node leftmost = root;

while (leftmost.left != null) {
    Node current = leftmost;

    while (current != null) {
        // Connect left child to right child
        current.left.next = current.right;

        // Connect right child to the left child of next node
        if (current.next != null) {
            current.right.next = current.next.left;
        }

        // Move to the next node in the current level
        current = current.next;
    }

    // Move to the next level
    leftmost = leftmost.left;
}

return root;
}
}

```

Output:

☒ Testcase
 ☒ Test Result
 

Accepted
 runtime: 0 ms
 

- Case 1
- Case 2

Input

root =
 [1,2,3,4,5,6,7]
 

Output

[1,#,2,3,#,4,5,6,7,#]

Expected

[1 # 2 3 # 4 5 6 7 #]