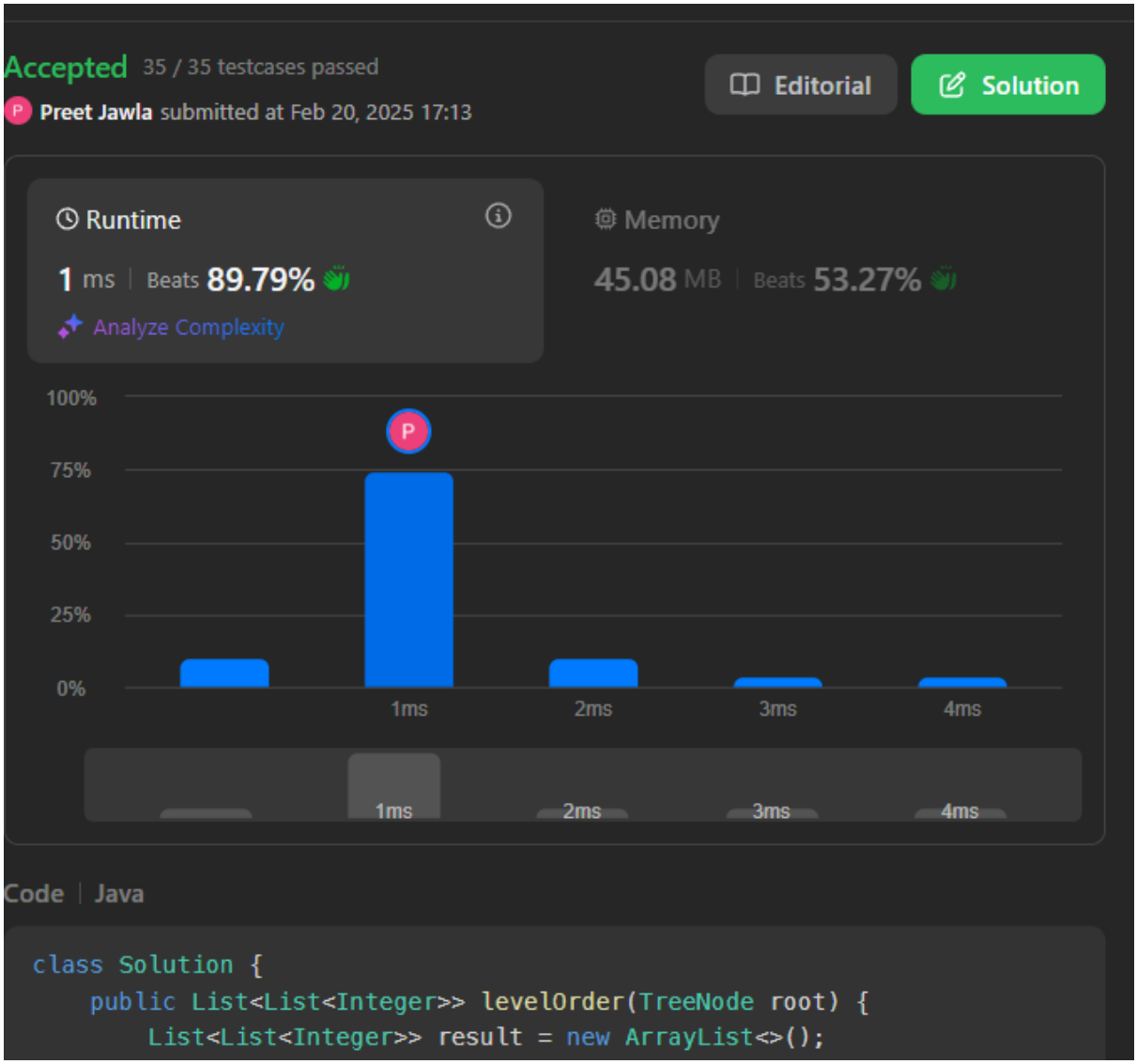
1. https://leetcode.com/problems/binary-tree-level-order-traversal/description/

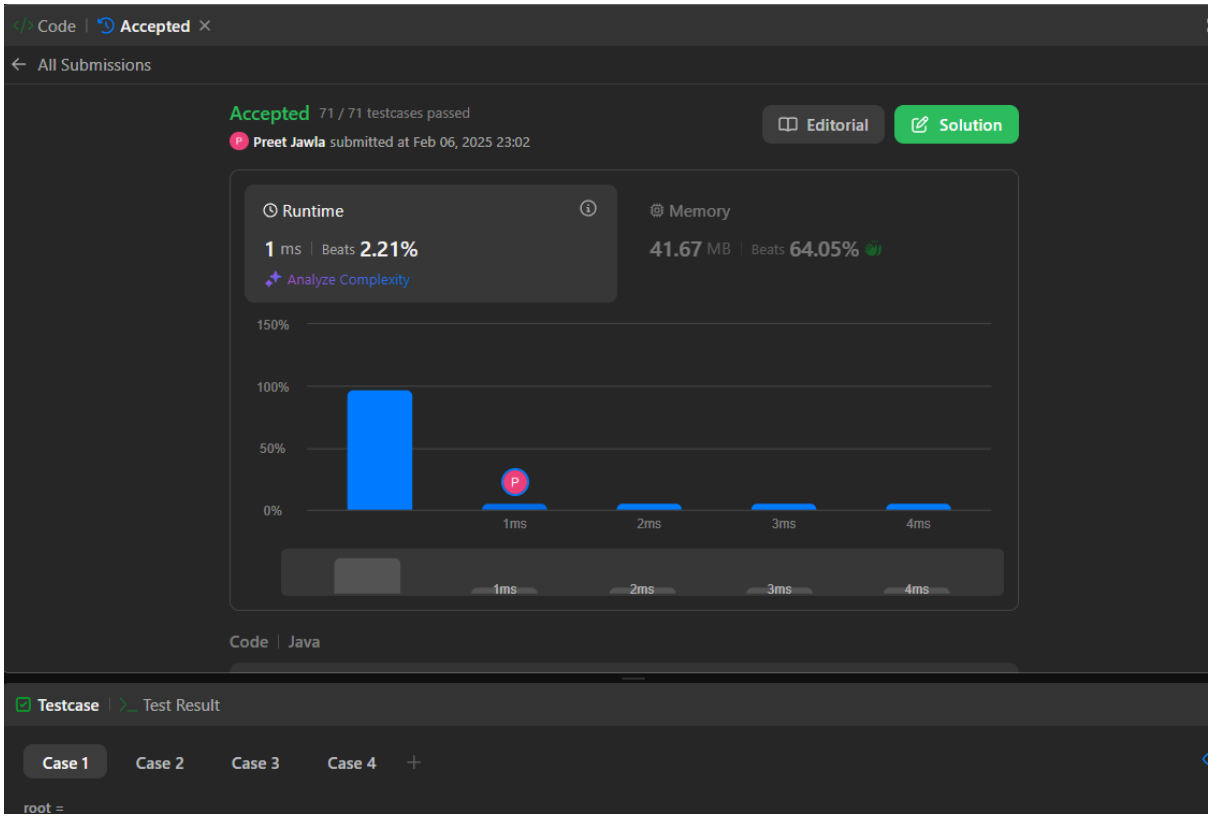
```
class Solution {
    public List<List<Integer>> levelOrder(TreeNode root) {
        List<List<Integer>> result = new ArrayList<>();
        if (root == null) return result;

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

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

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

                if (node.left != null) queue.add(node.left);
                if (node.right != null) queue.add(node.right);
            }

            result.add(level);
        }

        return result;
    }
}
```



2. https://leetcode.com/problems/binary-tree-inorder-traversal/description/ (Iterative)

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

        while (curr != null || !stack.isEmpty()) {
            while (curr != null) {
                stack.push(curr);
```

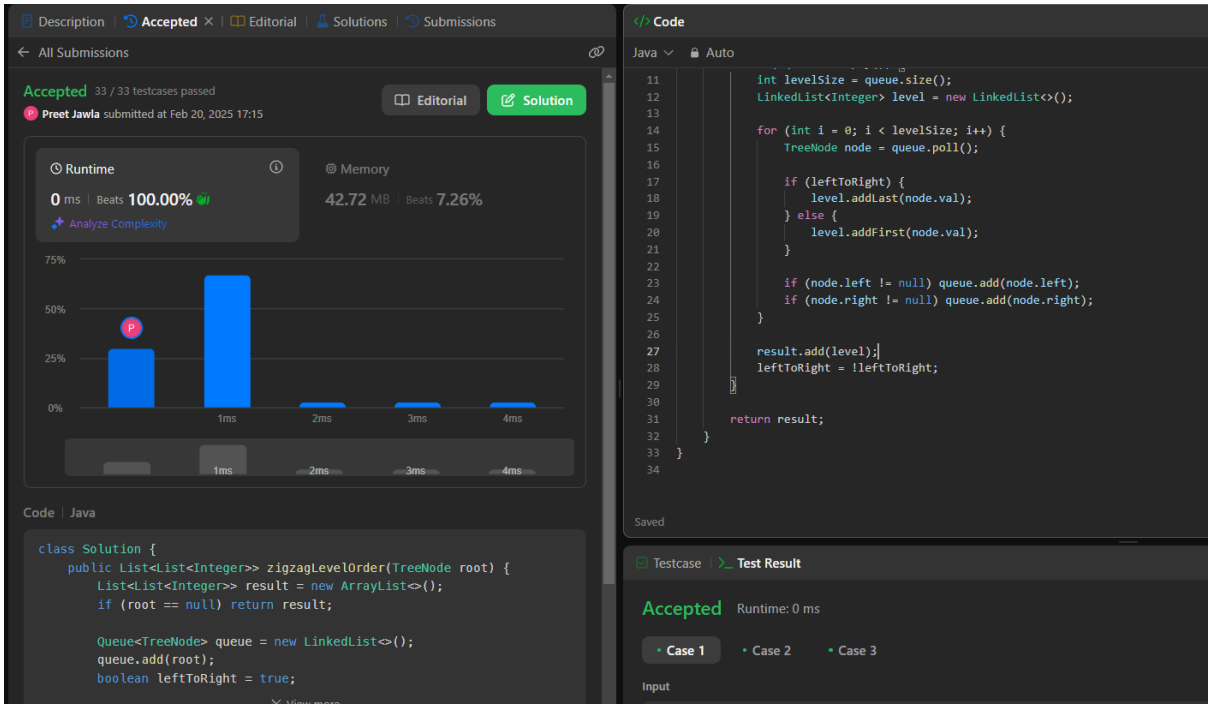
```
            curr = curr.left;
        }
        curr = stack.pop();
        result.add(curr.val);
        curr = curr.right;
    }

    return result;
  }
}
```



3. https://leetcode.com/problems/binary-tree-zigzag-level-order-traversal/description/

```
class Solution {
    public List<List<Integer>> zigzagLevelOrder(TreeNode root) {
        List<List<Integer>> result = new ArrayList<>();
```

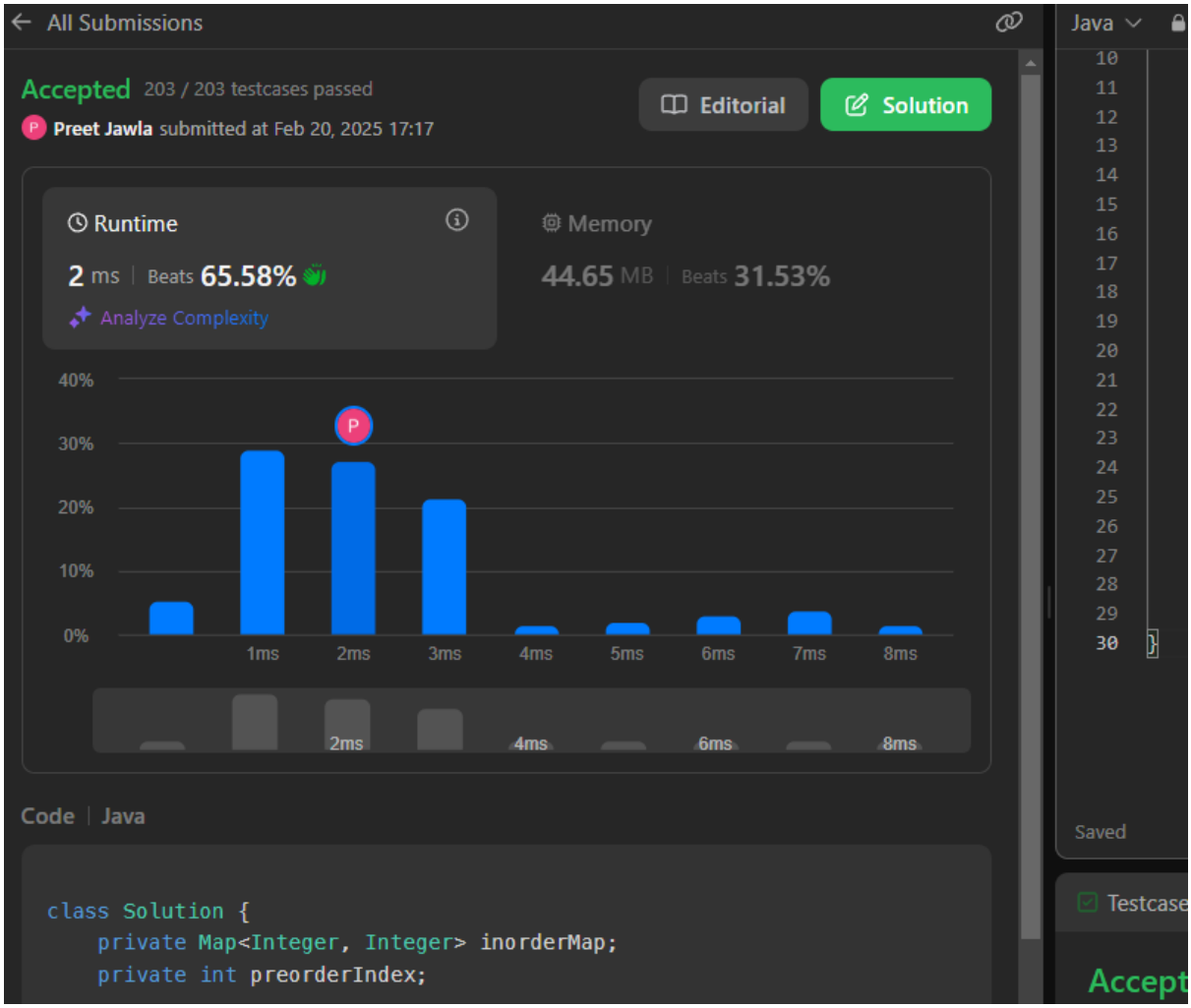
```
        if (root == null) return result;

        Queue<TreeNode> queue = new LinkedList<>();
        queue.add(root);
        boolean leftToRight = true;

        while (!queue.isEmpty()) {
            int levelSize = queue.size();
            LinkedList<Integer> level = new LinkedList<>();

            for (int i = 0; i < levelSize; i++) {
                TreeNode node = queue.poll();

                if (leftToRight) {
                    level.addLast(node.val);
                } else {
                    level.addFirst(node.val);
                }

                if (node.left != null) queue.add(node.left);
                if (node.right != null) queue.add(node.right);
            }

            result.add(level);
            leftToRight = !leftToRight;
        }

        return result;
    }
}
```



4. https://leetcode.com/problems/construct-binary-tree-from-preorder-and-inorder-traversal/description/

```
class Solution {
    private Map<Integer, Integer> inorderMap;
    private int preorderIndex;

    public TreeNode buildTree(int[] preorder, int[] inorder) {
        inorderMap = new HashMap<>();
        preorderIndex = 0;

        for (int i = 0; i < inorder.length; i++) {
            inorderMap.put(inorder[i], i);
        }

        return constructTree(preorder, 0, inorder.length - 1);
    }
```

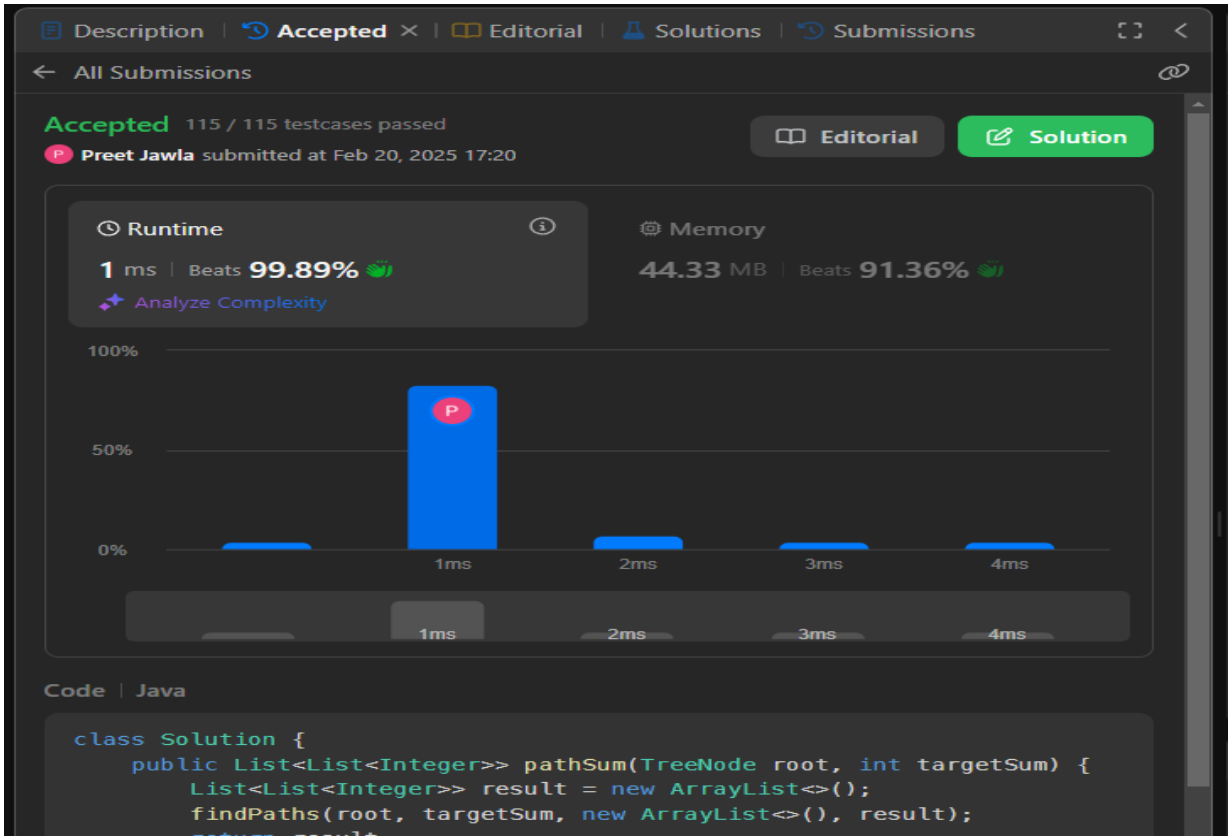
```
    private TreeNode constructTree(int[] preorder, int left, int right) {
        if (left > right) return null;

        int rootValue = preorder[preorderIndex++];
        TreeNode root = new TreeNode(rootValue);

        int inorderIndex = inorderMap.get(rootValue);

        root.left = constructTree(preorder, left, inorderIndex - 1);
        root.right = constructTree(preorder, inorderIndex + 1, right);

        return root;
    }
}
```



5. https://leetcode.com/problems/path-sum-ii/description/

```
import java.util.*;

class TreeNode {
    int val;
    TreeNode left, right;
    TreeNode(int x) { val = x; }
}

class Solution {
    public List<List<Integer>> pathSum(TreeNode root, int targetSum) {
        List<List<Integer>> result = new ArrayList<>();
        findPaths(root, targetSum, new ArrayList<>(), result);
        return result;
    }

    private void findPaths(TreeNode node, int targetSum, List<Integer> path, List<List<Integer>> result)
{
        if (node == null) return;

        path.add(node.val);
        targetSum -= node.val;

        // If it's a leaf node and the sum matches, add the path to result
        if (node.left == null && node.right == null && targetSum == 0) {
            result.add(new ArrayList<>(path));
        } else {
            // Recur for left and right subtrees
            findPaths(node.left, targetSum, path, result);
            findPaths(node.right, targetSum, path, result);
        }
```

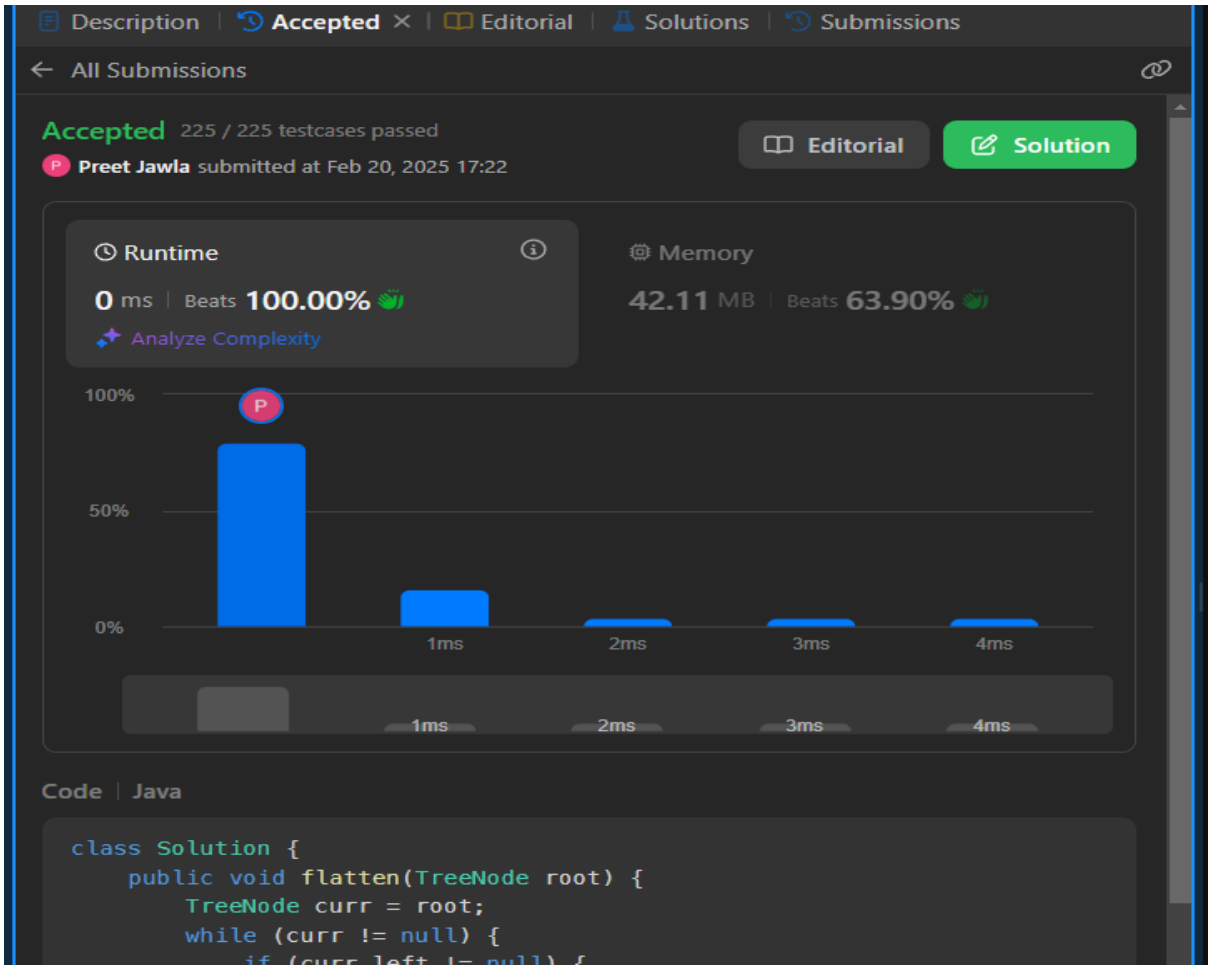
```
        // Backtrack: Remove the last added node before returning to the parent
        path.remove(path.size() - 1);
    }
}
```



6. https://leetcode.com/problems/flatten-binary-tree-to-linked-list/description/

```
class Solution {
    public void flatten(TreeNode root) {
        TreeNode curr = root;
        while (curr != null) {
            if (curr.left != null) {
                TreeNode prev = curr.left;
                while (prev.right != null) {
                    prev = prev.right;
                }
                prev.right = curr.right;
                curr.right = curr.left;
```

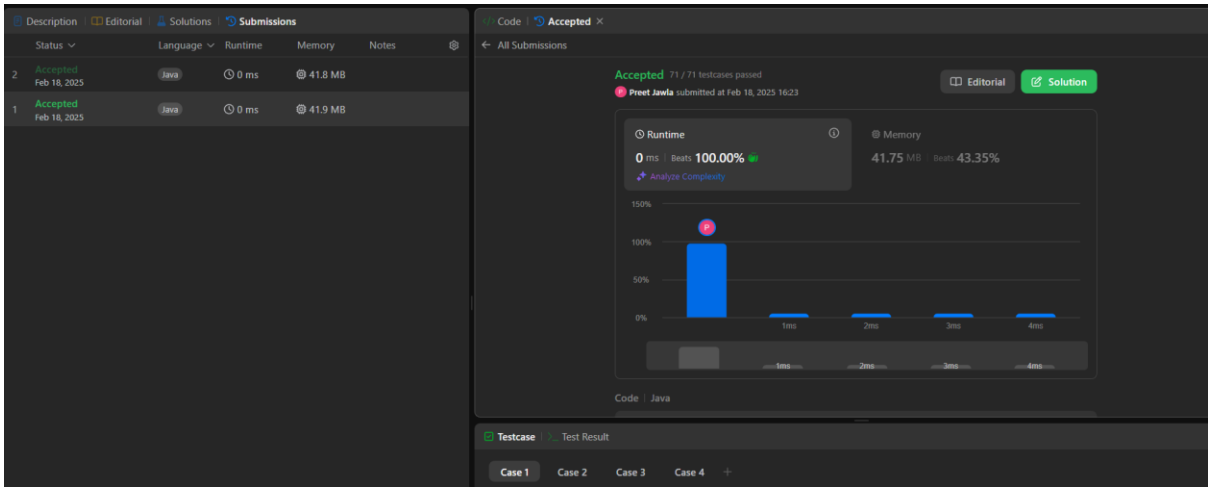
```
            curr.left = null;
        }
        curr = curr.right;
    }
  }
}
```



7. https://leetcode.com/problems/binary-tree-preorder-traversal/description/ (iterative)

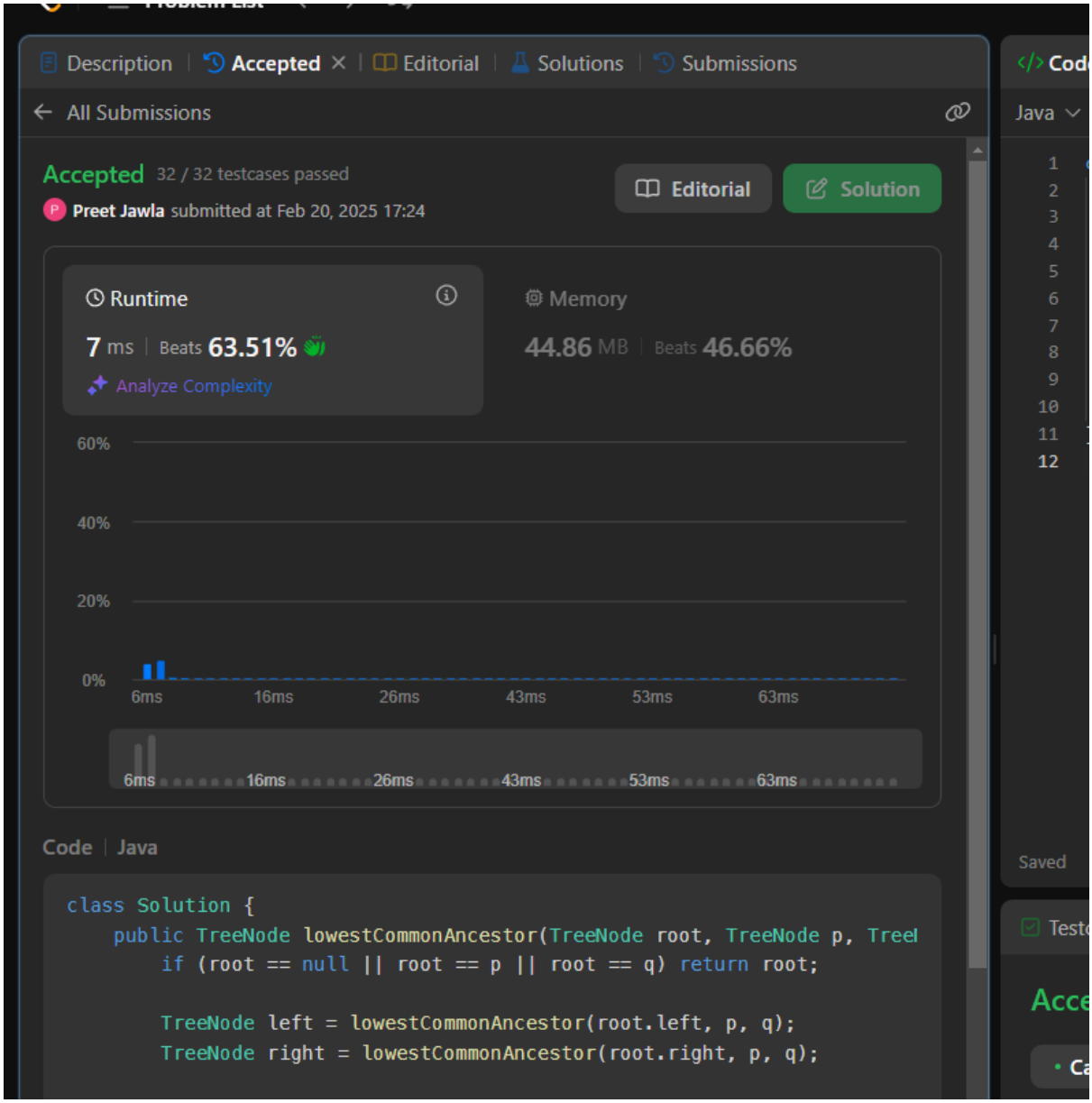
```
8.  class Solution {
9.      public List<Integer> preorderTraversal(TreeNode root) {
10.         List<Integer> result = new ArrayList<>();
11.         preOrder(root, result);
12.         return result;
13.     }
```

```
14.     private void preOrder(TreeNode node, List<Integer> result){
15.         if(node == null) return;
16.         result.add(node.val);
17.         preOrder(node.left, result);
18.         preOrder(node.right, result);
19.     }
20.
21. }
```



22. https://leetcode.com/problems/lowest-common-ancestor-of-a-binary-tree/description/

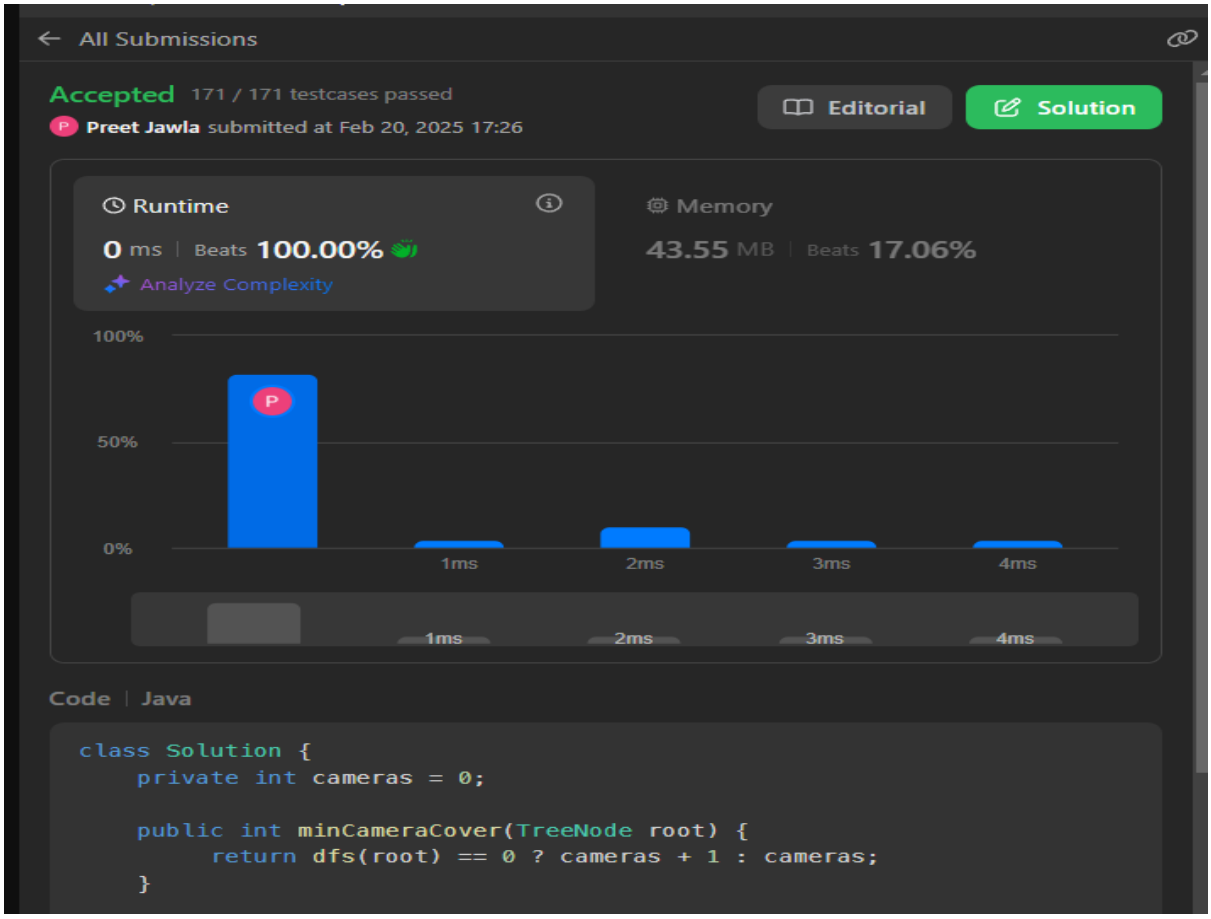
```
class Solution {
    public TreeNode lowestCommonAncestor(TreeNode root, TreeNode p, TreeNode q) {
        if (root == null || root == p || root == q) return root;

        TreeNode left = lowestCommonAncestor(root.left, p, q);
        TreeNode right = lowestCommonAncestor(root.right, p, q);

        if (left != null && right != null) return root;
        return left != null ? left : right;
    }
}
```



23. https://leetcode.com/problems/binary-tree-cameras/description/

```
class Solution {
    private int cameras = 0;

    public int minCameraCover(TreeNode root) {
        return dfs(root) == 0 ? cameras + 1 : cameras;
    }

    private int dfs(TreeNode node) {
        if (node == null) return 2;
```

```
        int left = dfs(node.left);
        int right = dfs(node.right);

        if (left == 0 || right == 0) {
            cameras++;
            return 1;
        }

        if (left == 1 || right == 1) {
            return 2;
        }
        return 0;
    }
}
```



24. https://leetcode.com/problems/vertical-order-traversal-of-a-binary-tree/description/

```
25. class Solution {
26.     public List<List<Integer>> verticalTraversal(TreeNode root) {
27.         TreeMap<Integer, List<int[]>> map = new TreeMap<>();
28.
29.         Queue<Tuple> queue = new LinkedList<>();
30.         queue.offer(new Tuple(root, 0, 0));
31.
32.         while (!queue.isEmpty()) {
33.             Tuple t = queue.poll();
34.             TreeNode node = t.node;
35.             int row = t.row, col = t.col;
36.
37.              map.putIfAbsent(col, new ArrayList<>());
38.             map.get(col).add(new int[]{row, node.val});
39.
40.              if (node.left != null) queue.offer(new Tuple(node.left, row + 1, col - 1));
41.             if (node.right != null) queue.offer(new Tuple(node.right, row + 1, col + 1));
42.         }
43.
44.         List<List<Integer>> result = new ArrayList<>();
45.
46.         for (List<int[]> nodes : map.values()) {
47.             nodes.sort((a, b) -> a[0] == b[0] ? a[1] - b[1] : a[0] - b[0]); // Sort by row, then value
48.             List<Integer> colList = new ArrayList<>();
49.             for (int[] node : nodes) colList.add(node[1]); // Extract values
50.             result.add(colList);
51.         }
52.
53.         return result;
```

```
54.     }
55.
56.     private static class Tuple {
57.         TreeNode node;
58.         int row, col;
59.         Tuple(TreeNode node, int row, int col) {
60.             this.node = node;
61.             this.row = row;
62.             this.col = col;
63.         }
64.     }
65. }
```