Assignment 3

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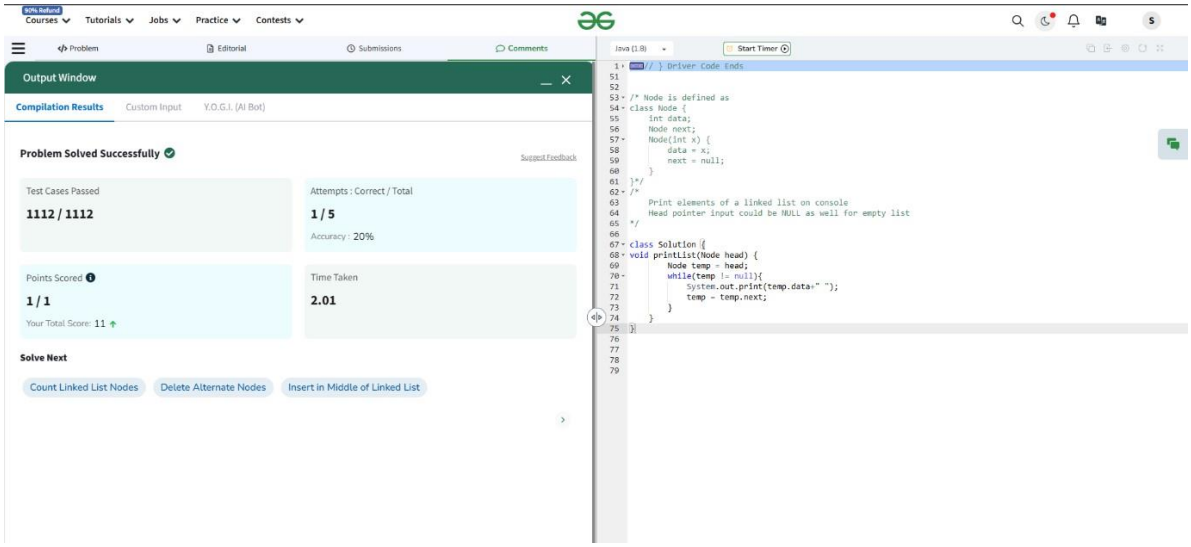
Branch: B.E CSE **Section/Group: 22BCS-610/B**
Semester: 6th **Date of Performance:27/02.25**
Subject Name: Advanced Programming **Subject Code: 22CSP-351**

1. **Aim: Print Linked List**
2. **Code:**

```
class Solution {
  void printList(Node head) {
      Node temp = head;
      while (temp != null) {
         System.out.print(temp.data + " ");
         temp = temp.next;
      }
      System.out.println();
   }
}
```

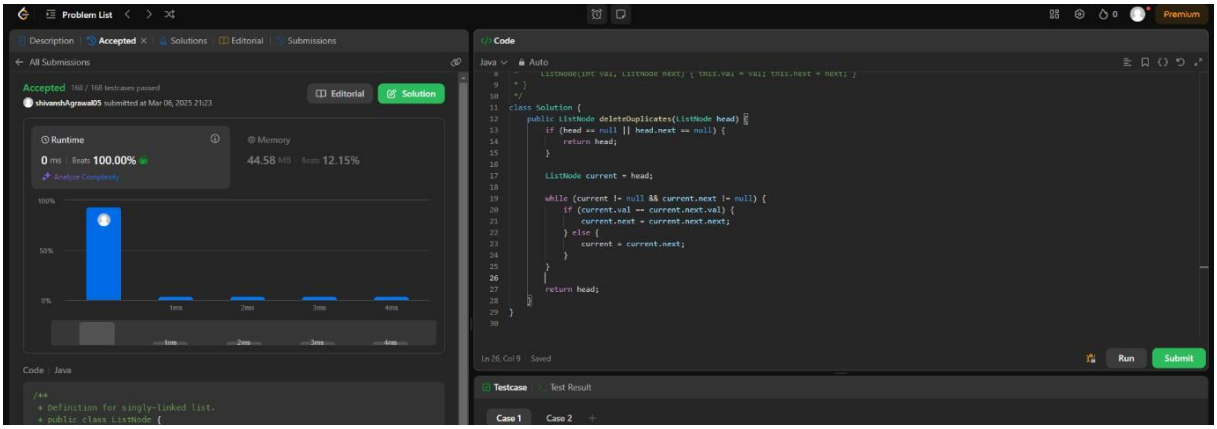
3. **Output:**



1. **Aim: Remove duplicates from a sorted list**
2. **Code:**

```
class Solution {
    public ListNode deleteDuplicates(ListNode head) {
        if (head == null || head.next == null) {
            return head;
        }
        ListNode current = head;

        while (current != null && current.next != null) {
            if (current.val == current.next.val) {
                current.next = current.next.next;
            } else {
                current = current.next;
            }
        }

        return head;
    }
    }
```

3. **Output:**

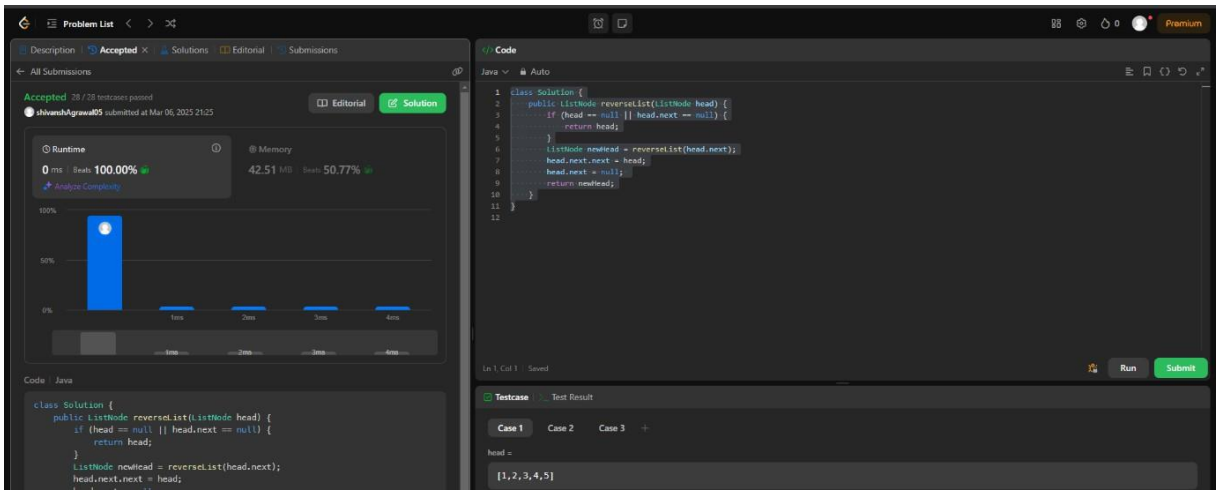


1. **Aim: Reverse a linked list**
2. **Code:**

```
class Solution {
    public ListNode reverseList(ListNode head) {
        if (head == null || head.next == null) {
            return head;
        }
        ListNode newHead = reverseList(head.next);
        head.next.next = head;
```

```
        head.next = null;
        return newHead;
    }
}
```

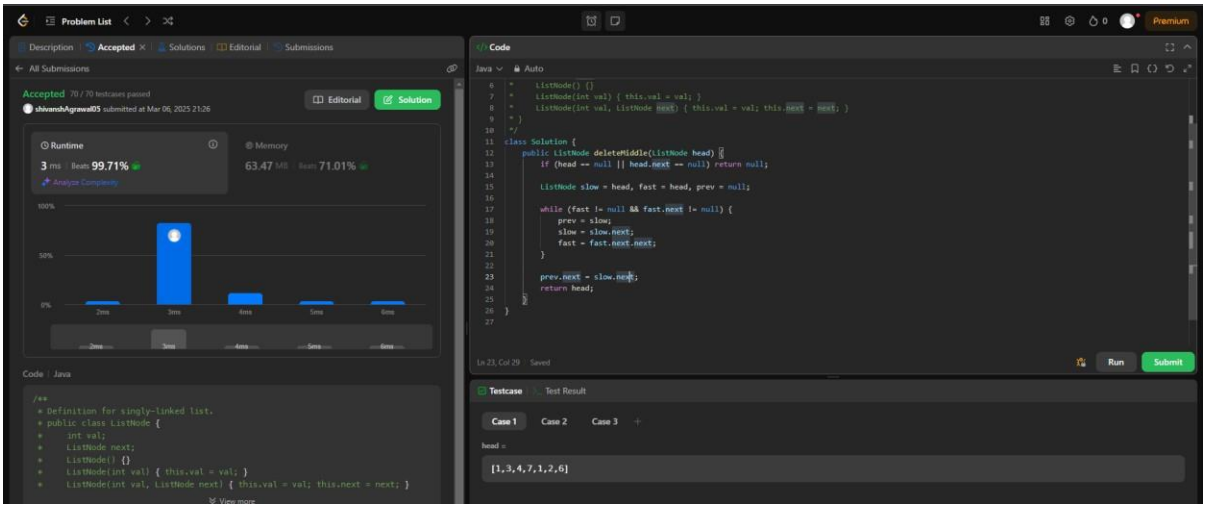
3. **Output:**



1. **Aim: Delete middle node of a list**
2. **Code:**

```
class Solution {
    public ListNode deleteMiddle(ListNode head) {
        if (head == null || head.next == null) return null;

        ListNode slow = head, fast = head, prev = null;

        while (fast != null && fast.next != null) {
            prev = slow;
            slow = slow.next;
            fast = fast.next.next;
        }

        prev.next = slow.next;
        return head;
    }
}
```

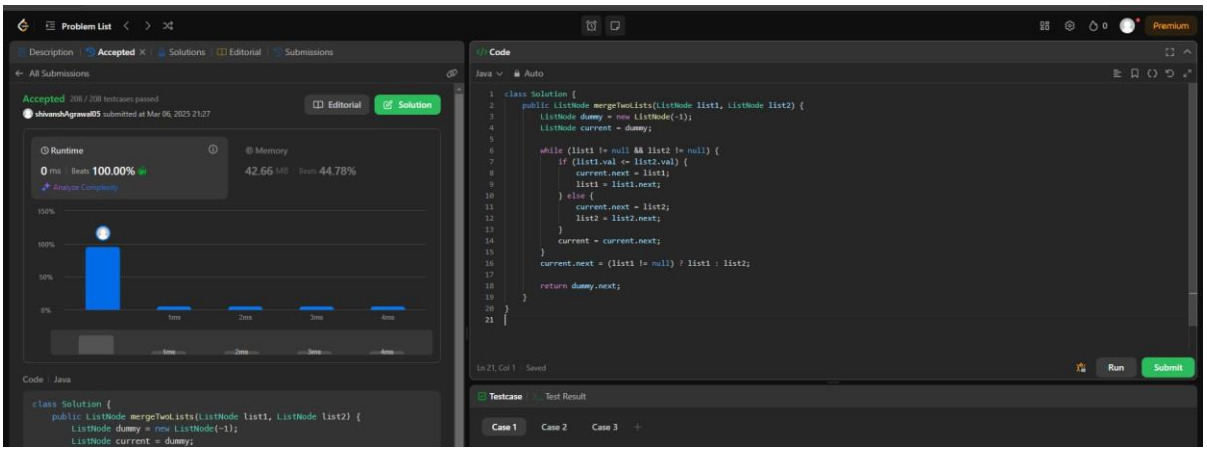
3. **Output:**



1. **Aim: Merge two sorted linked lists:**
2. **Code:**

```
class Solution {
    public ListNode mergeTwoLists(ListNode list1, ListNode list2) {
        ListNode dummy = new ListNode(-1);
        ListNode current = dummy;

        while (list1 != null && list2 != null) {
            if (list1.val <= list2.val) {
                current.next = list1;
                list1 = list1.next;
            } else {
                current.next = list2;
                list2 = list2.next;
            }
            current = current.next;
        }
        current.next = (list1 != null) ? list1 : list2;

        return dummy.next;
    }
}
```

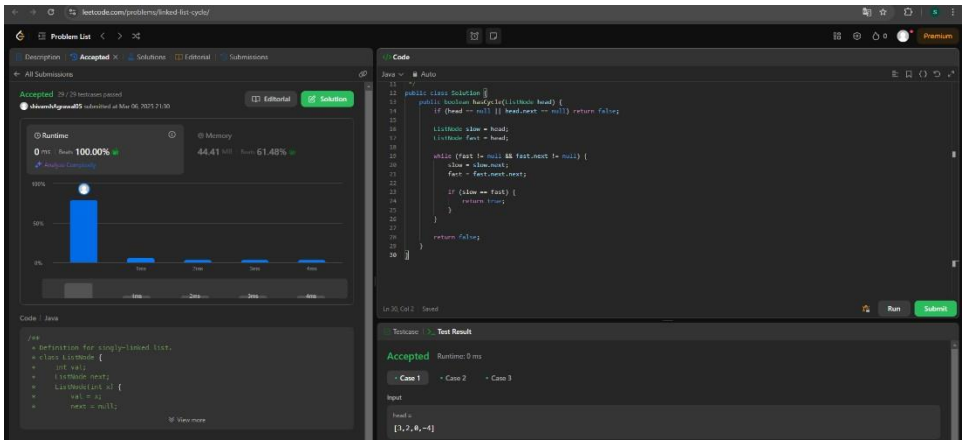
3. Output:



1. **Aim: Detect a cycle in a linked list**
2. **Code:**

```
public class Solution {
    public boolean hasCycle(ListNode head) {
        if (head == null || head.next == null) return false;

        ListNode slow = head;
        ListNode fast = head;

        while (fast != null && fast.next != null) {
            slow = slow.next;
            fast = fast.next.next;

            if (slow == fast) {
                return true;
            }
        }

        return false;
    }
}
```

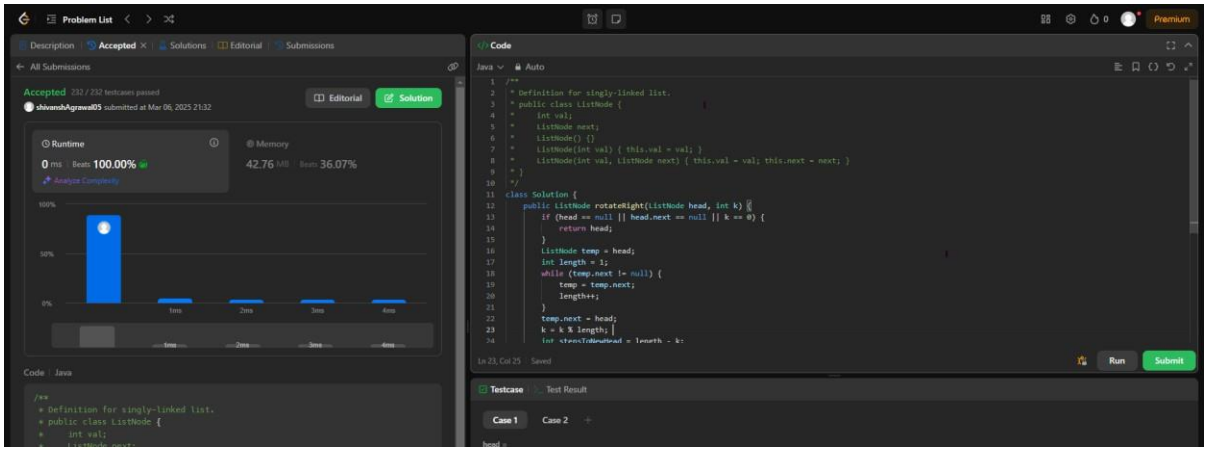
3. Output:



1. **Aim: Rotate a list**
2. **Code:**

```
class Solution {
    public ListNode rotateRight(ListNode head, int k) {
        if (head == null || head.next == null || k == 0) {
            return head;
        }
        ListNode temp = head;
        int length = 1;
        while (temp.next != null) {
            temp = temp.next;
            length++;
        }
        temp.next = head;
        k = k % length;
        int stepsToNewHead = length - k;
        ListNode newTail = head;

        for (int i = 1; i < stepsToNewHead; i++) {
            newTail = newTail.next;
        }
        head = newTail.next;
        newTail.next = null;

        return head;
    }
     }
```

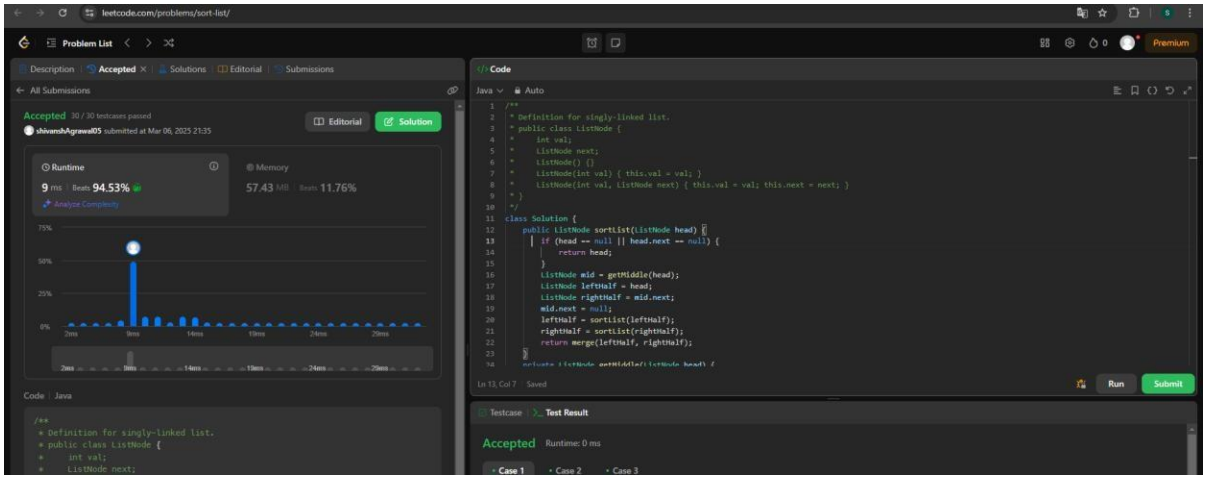
3. **Output:**



1. **Aim: Sort List**
2. **Code:**

```
class Solution {
    public ListNode sortList(ListNode head) {
        if (head == null || head.next == null) {
            return head;
        }
        ListNode mid = getMiddle(head);
        ListNode leftHalf = head;
        ListNode rightHalf = mid.next;
        mid.next = null;
        leftHalf = sortList(leftHalf);
        rightHalf = sortList(rightHalf);
        return merge(leftHalf, rightHalf);
    }
    private ListNode getMiddle(ListNode head) {
        ListNode slow = head, fast = head.next;
        while (fast != null && fast.next != null) {
            slow = slow.next;
            fast = fast.next.next;
        }
        return slow;
    }
    private ListNode merge(ListNode l1, ListNode l2) {
        ListNode dummy = new ListNode(0);
        ListNode tail = dummy;

        while (l1 != null && l2 != null) {
            if (l1.val < l2.val) {
                tail.next = l1;
                l1 = l1.next;
            } else {
                tail.next = l2;
                l2 = l2.next;
            }
            tail = tail.next;
        }
        if (l1 != null) tail.next = l1;
        if (l2 != null) tail.next = l2;

        return dummy.next;
    }
}
```

3. **Output:**



1. **Aim: Merge k sorted list**
2. **Code:**

```
import java.util.PriorityQueue;

class Solution {
    public ListNode mergeKLists(ListNode[] lists) {
        if (lists == null || lists.length == 0) {
            return null;
        }
        PriorityQueue<ListNode> minHeap = new PriorityQueue<>((a, b) -> a.val - b.val);
        for (ListNode list : lists) {
            if (list != null) {
                minHeap.add(list);
            }
        }
        ListNode dummy = new ListNode(0);
        ListNode tail = dummy;
        while (!minHeap.isEmpty()) {
            ListNode smallest = minHeap.poll();
            tail.next = smallest;
            tail = tail.next;

            if (smallest.next != null) {
                minHeap.add(smallest.next);
            }
        }
```

```
        return dummy.next;
    }
}
```

3. **Output:**