ASSIGNMENT-3

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SUBJECT: AP-2
CLASS- IOT-610/B

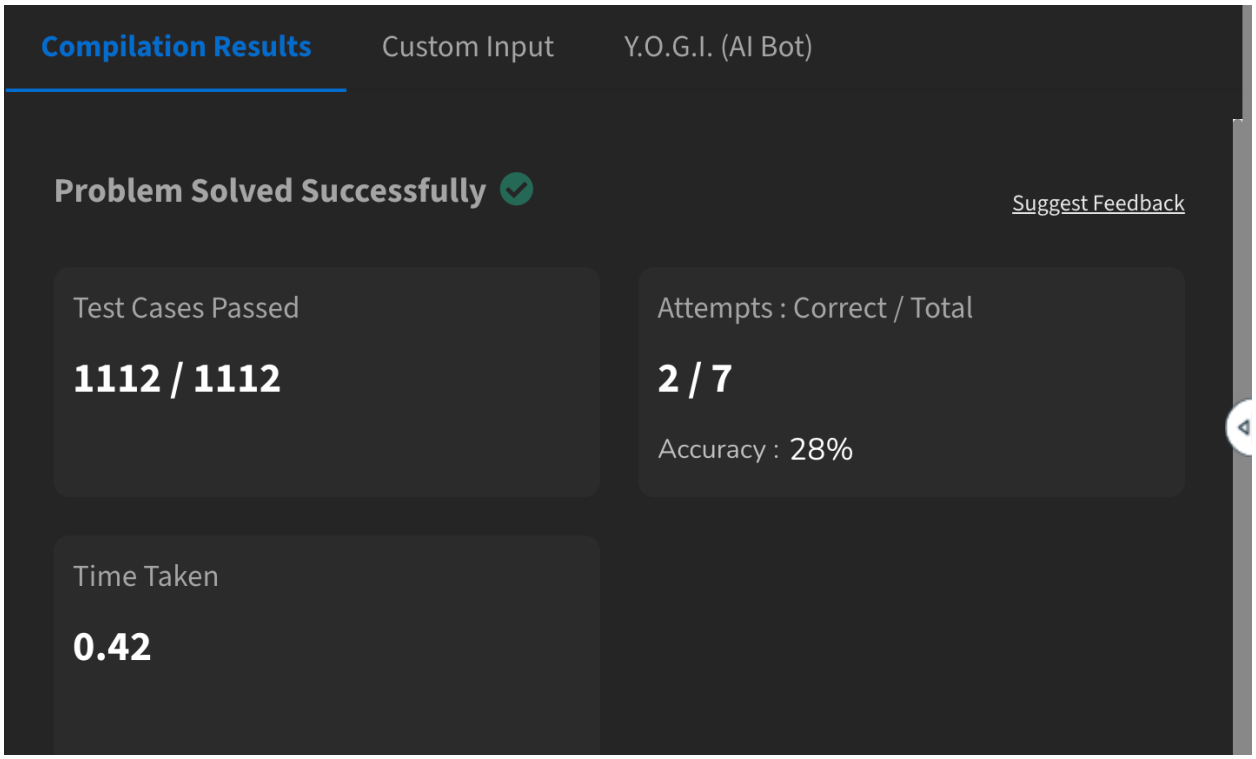
1. **Print Linked List: https://www.geeksforgeeks.org/problems/print-linked-list-elements/0**

Python3 Start Timer

```python
#Your task is to complete this function
#Your function should print the data in one line only

'''
class Node:
    def __init__(self, x):
        self.data = x
        self.next = None
'''
class Solution:
    # Function to display the elements of a linked list in same line
    def printList(self, node):
        #code here
        while node:
            print(node.data,end=" ")
            node=node.next


# } Driver Code Ends
```



2. Remove duplicates from a sorted list: https://leetcode.com/problems/remove-duplicates-from-sorted-list/description/

```
class Solution {
 public:
  ListNode* deleteDuplicates(ListNode* head) {
    ListNode* curr = head;

    while (curr != nullptr) {
      while (curr->next && curr->val == curr->next->val)
        curr->next = curr->next->next;
      curr = curr->next;
    }

    return head;
  }
};
```

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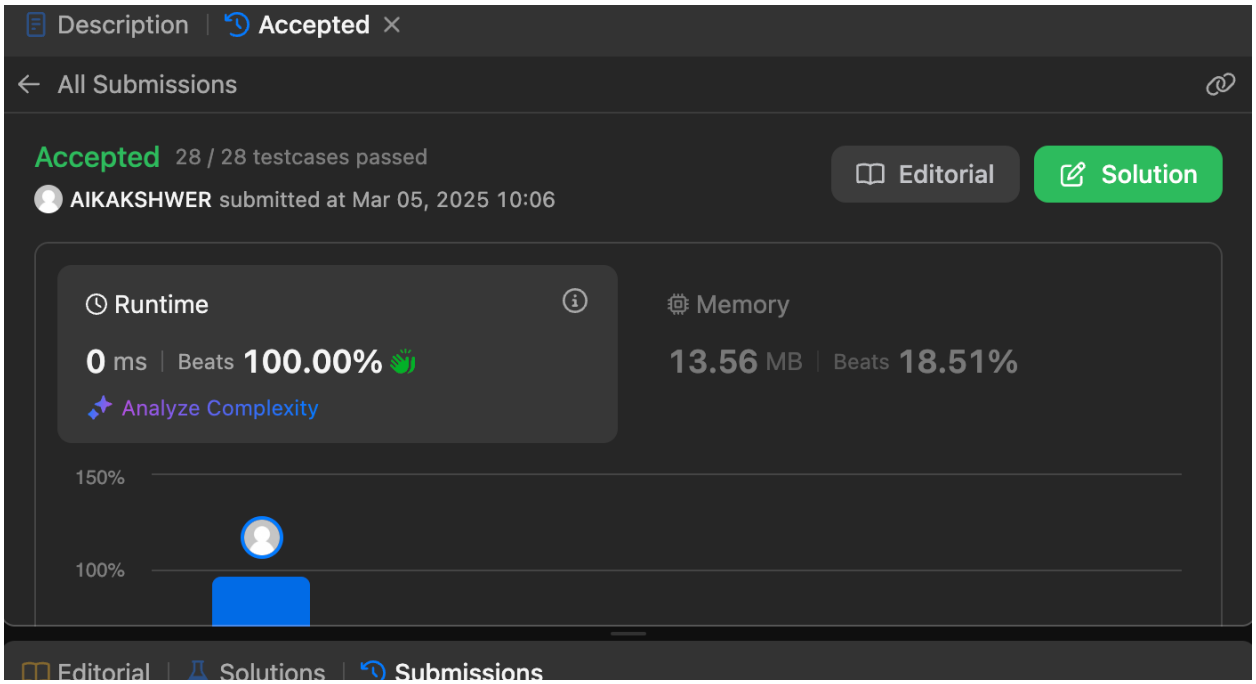
	Status	Language	Runtime	Memory	Notes
1	Accepted Feb 21, 2025	C++	0 ms	16.3 MB	

3. **Reverse a linked list: https://leetcode.com/problems/reverse-linked-list/description/**

```
class Solution {
 public:
  ListNode* reverseList(ListNode* head) {
    ListNode* prev = nullptr;

    while (head != nullptr) {
      ListNode* next = head->next;
      head->next = prev;
      prev = head;
      head = next;
    }

    return prev;
  }
};
```

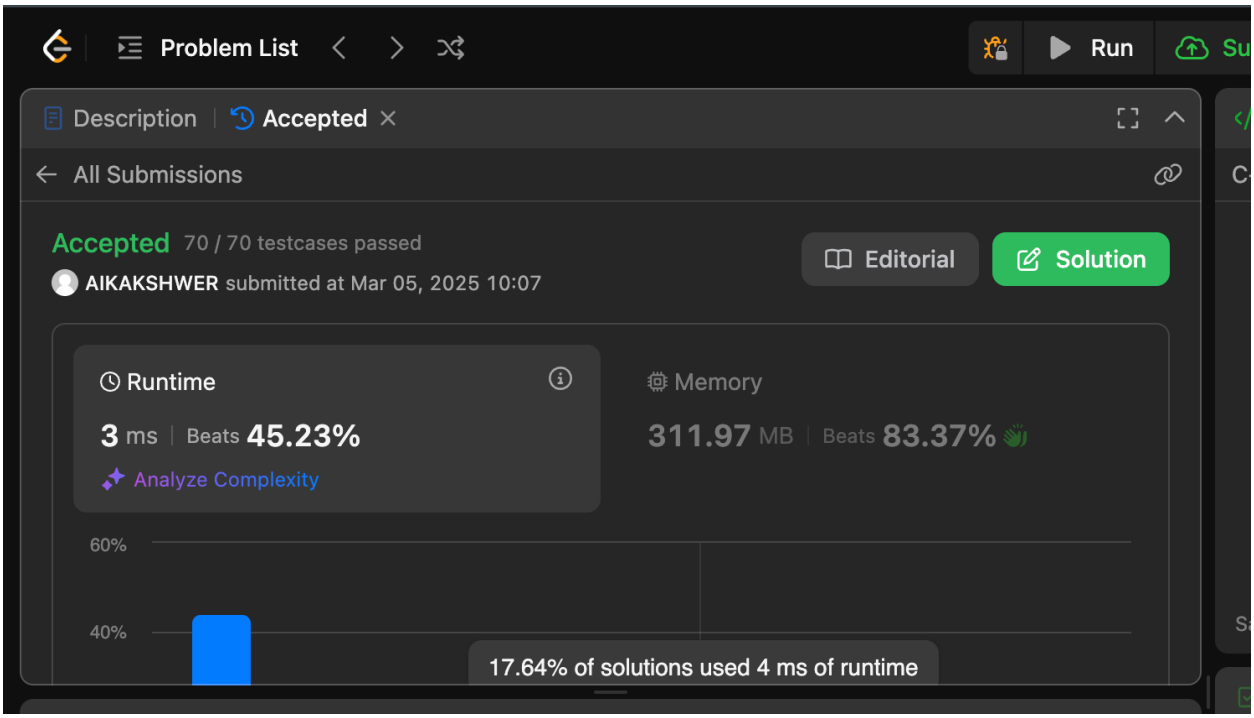


4. Delete middle node of a list: https://leetcode.com/problems/delete-the-middle-node-of-a-linked-list/description/

```
class Solution {
public:
 ListNode* deleteMiddle(ListNode* head) {
   ListNode dummy(0, head);
   ListNode* slow = &dummy;
   ListNode* fast = &dummy;

   while (fast->next != nullptr && fast->next->next != nullptr) {
     slow = slow->next;
     fast = fast->next->next;
   }

   // Delete the middle node.
   slow->next = slow->next->next;
   return dummy.next;
 }
};
```



5. **Merge two sorted linked lists: https://leetcode.com/problems/merge-two-sorted-lists/description/**

```
class Solution {
 public:
  ListNode* mergeTwoLists(ListNode* list1, ListNode* list2) {
    if (!list1 || !list2)
      return list1 ? list1 : list2;
    if (list1->val > list2->val)
      swap(list1, list2);
    list1->next = mergeTwoLists(list1->next, list2);
    return list1;
  }
};
```

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	Status	Language	Runtime	Memory	Notes
1	Accepted Feb 18, 2025	C++	0 ms	19.4 MB	

6. Detect a cycle in a linked list: https://leetcode.com/problems/linked-list-cycle/description/

```
class Solution {
 public:
  bool hasCycle(ListNode* head) {
    ListNode* slow = head;
    ListNode* fast = head;

    while (fast != nullptr && fast->next != nullptr) {
      slow = slow->next;
      fast = fast->next->next;
      if (slow == fast)
        return true;
    }

    return false;
  }
};
```

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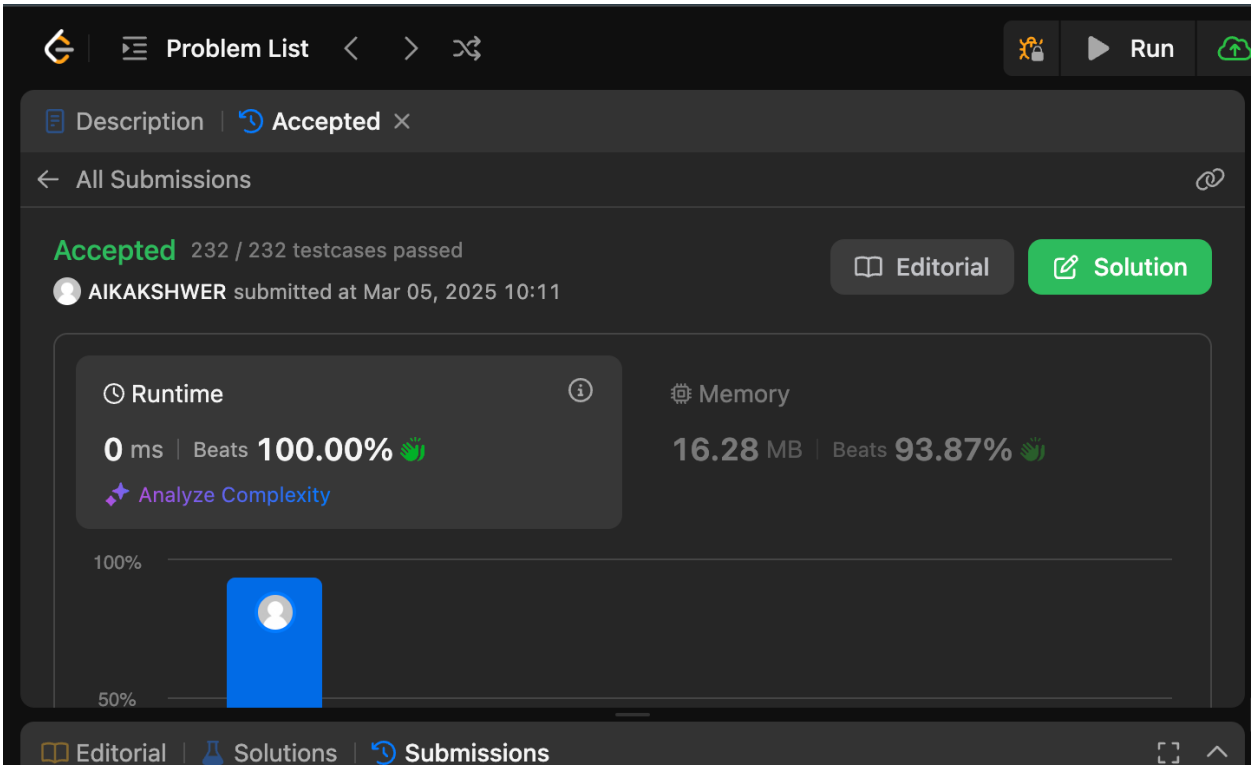
	Status	Language	Runtime	Memory	Notes
1	Accepted Feb 26, 2025	C++	10 ms	11.9 MB	

7. Rotate a list: https://leetcode.com/problems/rotate-list/description/

```
class Solution {
 public:
  ListNode* rotateRight(ListNode* head, int k) {
    if (!head || !head->next || k == 0)
      return head;

    ListNode* tail;
    int length = 1;
    for (tail = head; tail->next; tail = tail->next)
      ++length;
    tail->next = head;  // Circle the list.

    const int t = length - k % length;
    for (int i = 0; i < t; ++i)
      tail = tail->next;
    ListNode* newHead = tail->next;
    tail->next = nullptr;
```

```
    return newHead;
  }
};
```

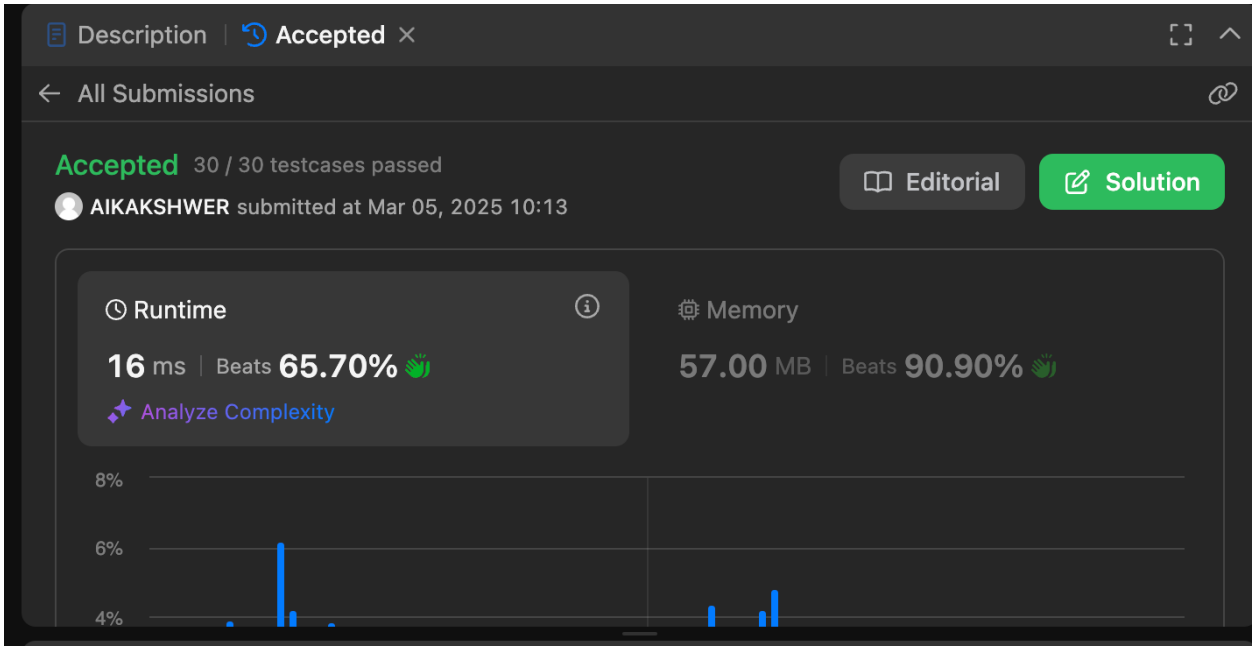


8. Sort List: https://leetcode.com/problems/sort-list/description/

```
class Solution {
public:
 ListNode* sortList(ListNode* head) {
   const int length = getLength(head);
   ListNode dummy(0, head);

   for (int k = 1; k < length; k *= 2) {
     ListNode* curr = dummy.next;
     ListNode* tail = &dummy;
```

```
      while (curr != nullptr) {
        ListNode* l = curr;
        ListNode* r = split(l, k);
        curr = split(r, k);
        auto [mergedHead, mergedTail] = merge(l, r);
        tail->next = mergedHead;
        tail = mergedTail;
      }
    }

    return dummy.next;
  }

private:
  int getLength(ListNode* head) {
    int length = 0;
    for (ListNode* curr = head; curr; curr = curr->next)
      ++length;
    return length;
  }

  ListNode* split(ListNode* head, int k) {
    while (--k && head)
      head = head->next;
    ListNode* rest = head ? head->next : nullptr;
    if (head != nullptr)
      head->next = nullptr;
    return rest;
  }

  pair<ListNode*, ListNode*> merge(ListNode* l1, ListNode* l2) {
    ListNode dummy(0);
    ListNode* tail = &dummy;

    while (l1 && l2) {
      if (l1->val > l2->val)
        swap(l1, l2);
      tail->next = l1;
      l1 = l1->next;
      tail = tail->next;
    }
    tail->next = l1 ? l1 : l2;
    while (tail->next != nullptr)
```

```
      tail = tail->next;

    return {dummy.next, tail};
  }
};
```



9. Merge k sorted lists: https://leetcode.com/problems/merge-k-sorted-lists/description/

```
class Solution {
 public:
  ListNode* mergeKLists(vector<ListNode*>& lists) {
    ListNode dummy(0);
    ListNode* curr = &dummy;
    auto compare = [](ListNode* a, ListNode* b) { return a->val > b->val; };
    priority_queue<ListNode*, vector<ListNode*>, decltype(compare)> minHeap(
        compare);
```

```
    for (ListNode* list : lists)
      if (list != nullptr)
        minHeap.push(list);

    while (!minHeap.empty()) {
      ListNode* minNode = minHeap.top();
      minHeap.pop();
      if (minNode->next)
        minHeap.push(minNode->next);
      curr->next = minNode;
      curr = curr->next;
    }

    return dummy.next;
  }
};
```