ASSIGNMENT: 04

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Section/Group: IOT- 606-B
Semester: 6th
Date of Submission: 17/03/2025
Subject Name: AP LAB-II
Subject Code: 22CSP-351

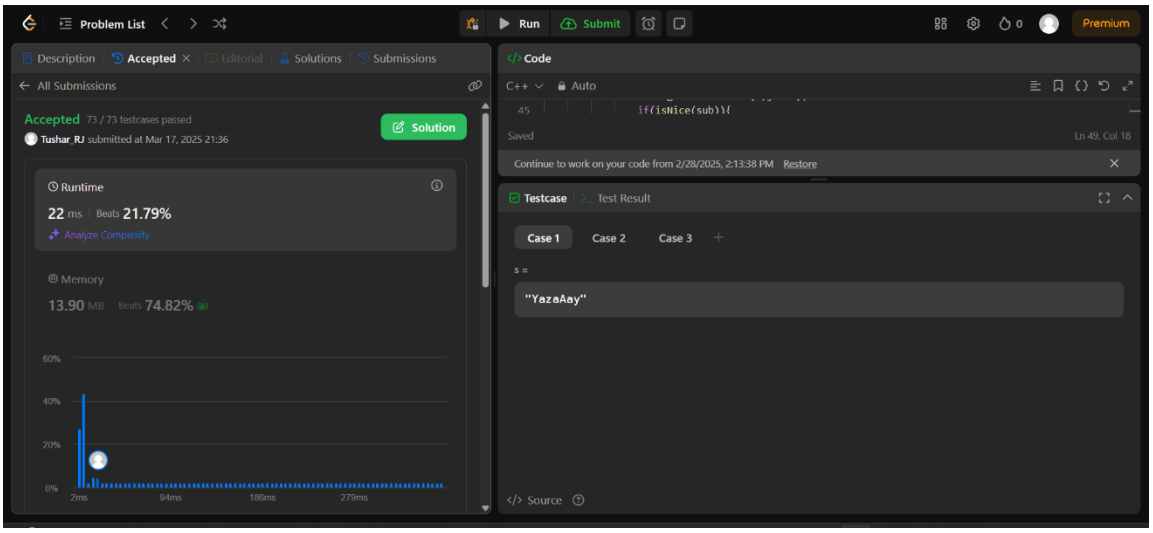
Problems:

1. **Longest Nice Substring**
2. **Code:**

```
class Solution {
private:
    bool isNice(string& str){
        for(char c:str){
            if(islower(c)&&str.find(toupper(c))==string::npos){
                return false;
            }
            if(isupper(c)&&str.find(tolower(c))==string::npos){
                return false;
            }
        }
        return true;
    }
public:
    string longestNiceSubstring(string s) {
        string ans="";
        int n=s.length();
        for(int i=0;i<n;i++){
            for(int j=i;j<n;j++){
                string sub=s.substr(i,j-i+1);
                if(isNice(sub)){
                    if(sub.length()>ans.length()){
                        ans=sub;
                    }
                }
            }
```

```
    }
        return ans;
    }
};
```

3. **Submission Screenshot:**

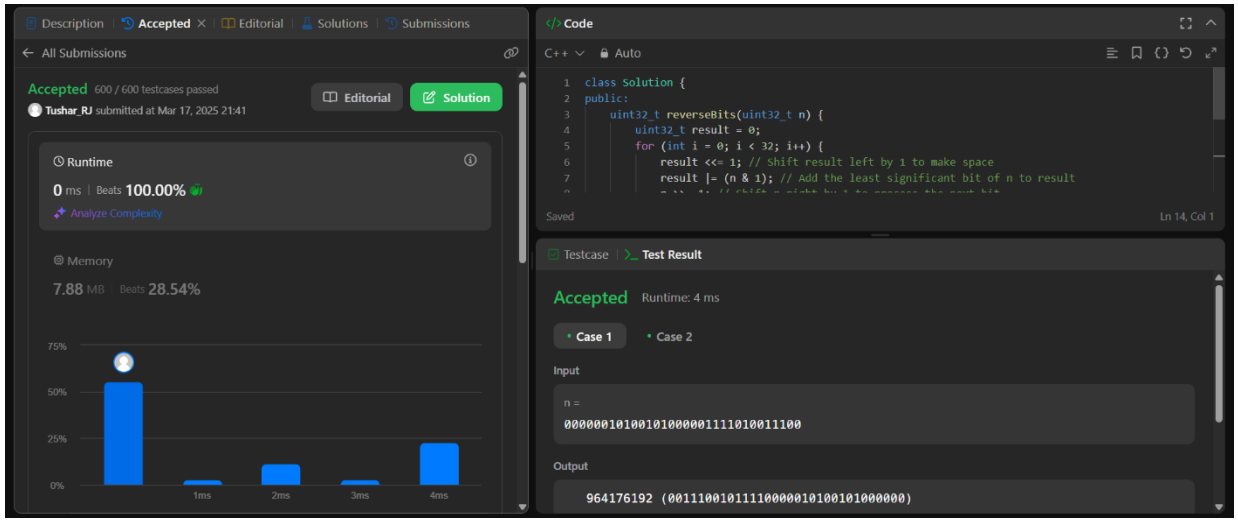


2. Reverse Bits:

1. Code:

```
class Solution {
public:
    uint32_t reverseBits(uint32_t n) {
        uint32_t result = 0;
        for (int i = 0; i < 32; i++) {
            result <<= 1; // Shift result left by 1 to make space
            result |= (n & 1); // Add the least significant bit of n to result
            n >>= 1; // Shift n right by 1 to process the next bit
        }
        return result;
    }
};
```

2. Submission Screenshot:

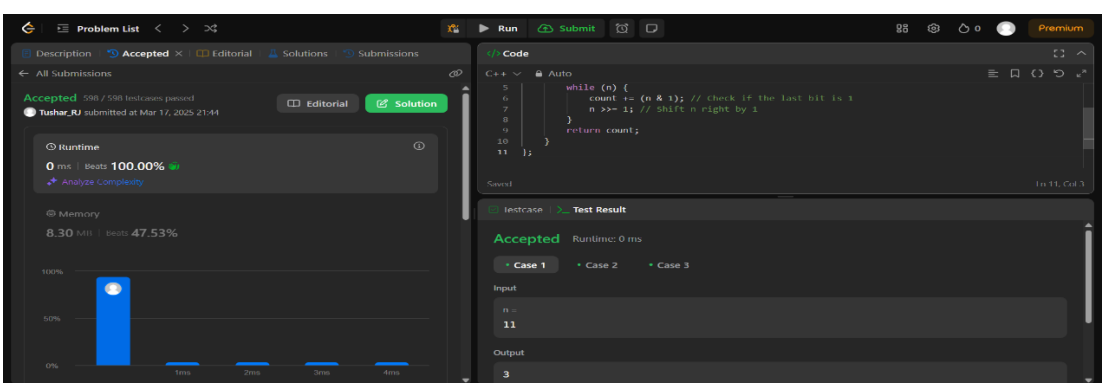


3. Number of 1 Bits:

i. Code:

```
class Solution {
public:
    int hammingWeight(uint32_t n) {
        int count = 0;
        while (n) {
            count += (n & 1); // Check if the last bit is 1
            n >>= 1; // Shift n right by 1
        }
        return count;
    }
};
```

ii. Submission Screenshot:

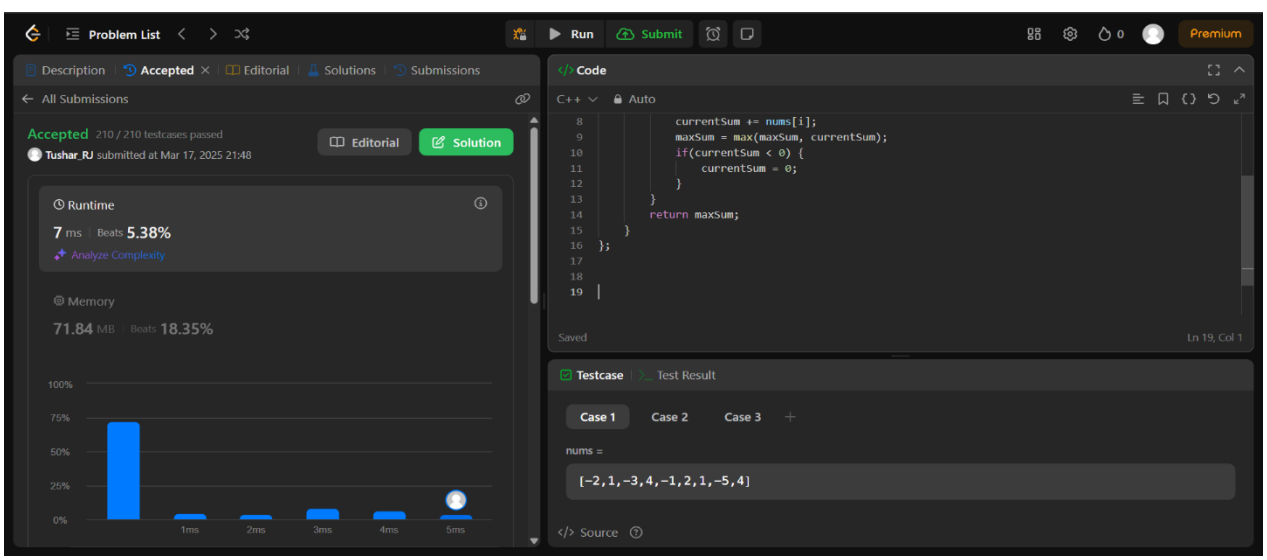


4. Maximum Subarray:

i. Code:

```
class Solution {
public:
    int maxSubArray(vector<int>& nums) {
        int maxSum = INT_MIN;
        int currentSum = 0;

        for(int i = 0; i < nums.size(); i++) {
            currentSum += nums[i];
            maxSum = max(maxSum, currentSum);
            if(currentSum < 0) {
                currentSum = 0;
            }
        }
        return maxSum;
    }
};
```

ii. Submission Screenshot:

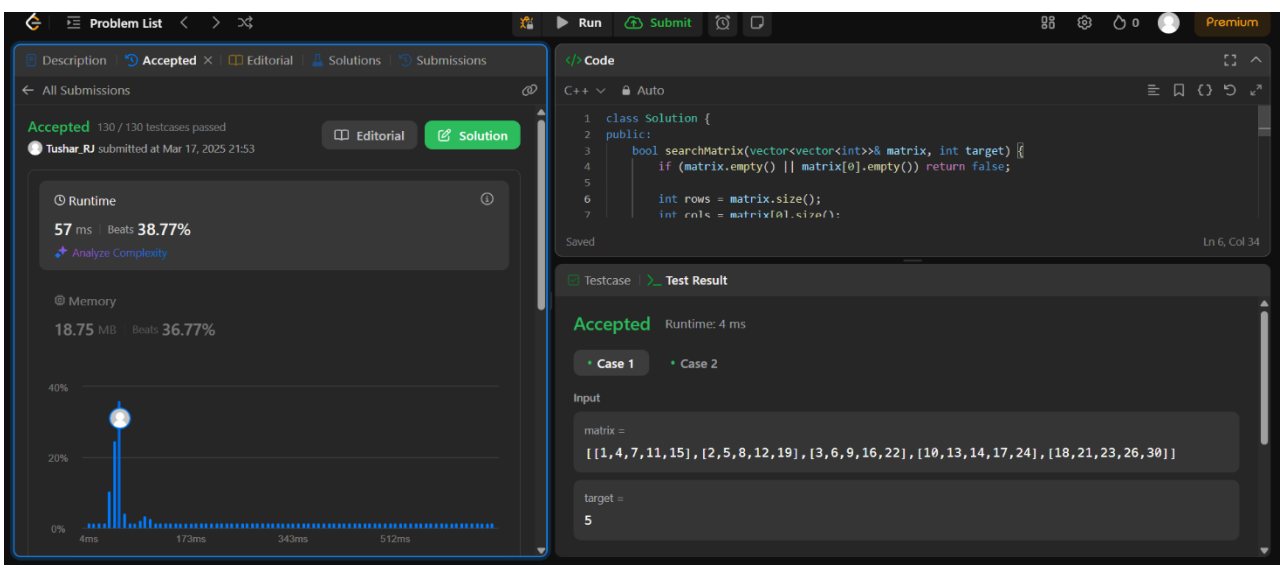


5. Search a 2D Matrix II:

i. Code:

```
class Solution {
public:
    bool searchMatrix(vector<vector<int>>& matrix, int target) {
        if (matrix.empty() || matrix[0].empty()) return false;

        int rows = matrix.size();
        int cols = matrix[0].size();
        int row = 0, col = cols - 1; // Start from the top-right corner

        while (row < rows && col >= 0) {
            if (matrix[row][col] == target) {
                return true; // Target found
            } else if (matrix[row][col] > target) {
                col--; // Move left
            } else {
                row++; // Move down
            }
        }
        return false; // Target not found
    }
};
```

ii. Submission Screenshot:

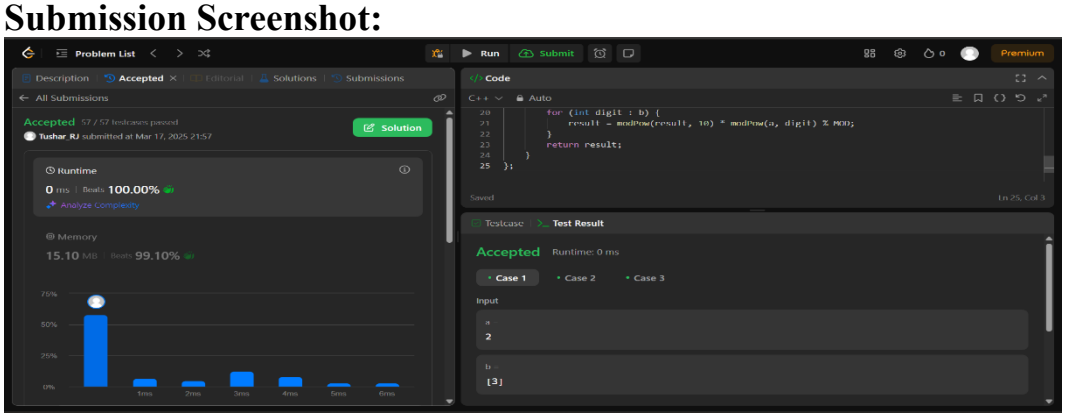


6. **Super Pow:**

   i. **Code:**

```
class Solution {
public:
    const int MOD = 1337;

    int modPow(int a, int b) {
        int result = 1;
        a %= MOD;
        while (b) {
            if (b % 2 == 1) {
                result = (result * a) % MOD;
            }
            a = (a * a) % MOD;
            b /= 2;
        }
        return result;
    }

    int superPow(int a, vector<int>& b) {
        int result = 1;
        for (int digit : b) {
            result = modPow(result, 10) * modPow(a, digit) % MOD;
        }
        return result;
    }
};
```

   ii. **Submission Screenshot:**

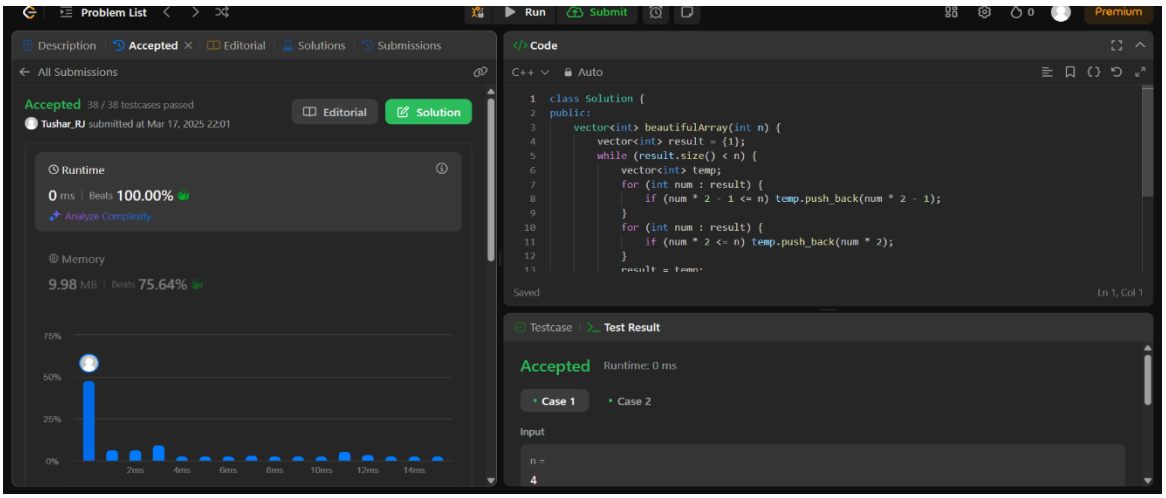


7. **Beautiful Array:**

Code:

```
class Solution {
public:
    vector<int> beautifulArray(int n) {
        vector<int> result = {1};
        while (result.size() < n) {
            vector<int> temp;
            for (int num : result) {
                if (num * 2 - 1 <= n) temp.push_back(num * 2 - 1);
            }
            for (int num : result) {
                if (num * 2 <= n) temp.push_back(num * 2);
            }
            result = temp;
        }
        return result;
    }
};
```

Submission Screenshot:



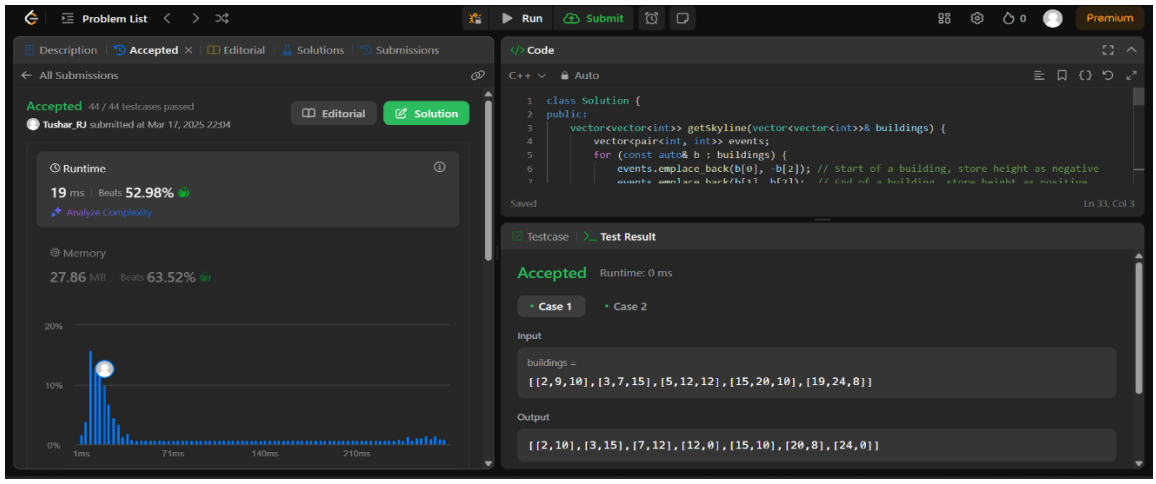
8. **The Skyline Problem:**

Code:

```
class Solution {
public:
    vector<vector<int>> getSkyline(vector<vector<int>>& buildings) {
        vector<pair<int, int>> events;
        for (const auto& b : buildings) {
            events.emplace_back(b[0], -b[2]); // Start of a building, store height as
negative
            events.emplace_back(b[1], b[2]);  // End of a building, store height as
positive
        }

        sort(events.begin(), events.end()); // Sort by x-coordinate, process starts
before ends

        multiset<int> heights = {0};
        vector<vector<int>> result;
        int prevMaxHeight = 0;

        for (const auto& e : events) {
            int x = e.first, h = e.second;
            if (h < 0) {
                heights.insert(-h); // Insert new height
            } else {
                heights.erase(heights.find(h)); // Remove height
            }

            int currentMaxHeight = *heights.rbegin();
            if (currentMaxHeight != prevMaxHeight) {
                result.push_back({x, currentMaxHeight});
                prevMaxHeight = currentMaxHeight;
```

```
}
        }

        return result;
    }
};
```

Submission Screenshot:



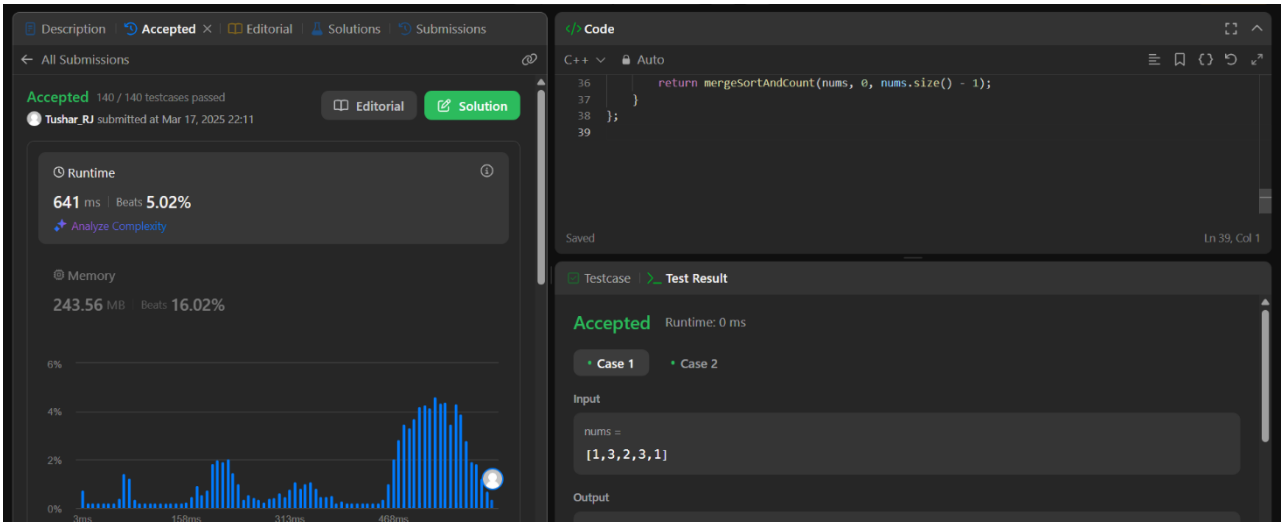
9. Reverse Pairs:

Code:

```
class Solution {
public:
    int reversePairs(vector<int>& nums) {
        function<int(vector<int>&, int, int)> mergeSortAndCount = [&](vector<int>& nums, int
left, int right) {
            if (left >= right) return 0;
            int mid = left + (right - left) / 2;
            int count = mergeSortAndCount(nums, left, mid) + mergeSortAndCount(nums, mid + 1,
right);

            int j = mid + 1;
            for (int i = left; i <= mid; i++) {
                while (j <= right && nums[i] > 2LL * nums[j]) {
                    j++;
                }
                count += (j - (mid + 1));
            }

            vector<int> temp;
```

```
int i = left, k = mid + 1;
        while (i <= mid && k <= right) {
            if (nums[i] <= nums[k]) {
                temp.push_back(nums[i++]);
            } else {
                temp.push_back(nums[k++]);
            }
        }
        while (i <= mid) temp.push_back(nums[i++]);
        while (k <= right) temp.push_back(nums[k++]);

        for (int i = left; i <= right; i++) {
            nums[i] = temp[i - left];
        }

        return count;
    };

    return mergeSortAndCount(nums, 0, nums.size() - 1);
  }
};
```

Submission Screenshot:



10.Longest Increasing Subsequence II:

Code:

```
class Solution {
public:
    int lengthOfLIS(vector<int>& nums, int k) {
        int n = nums.size();
        int maxVal = 100000;
        vector<int> tree(4 * maxVal);

        function<void(int, int, int, int, int)> update =
            [&](int node, int start, int end, int idx, int val) {
                if (start == end) {
                    tree[node] = val;
                    return;
                }
                int mid = (start + end) / 2;
                if (idx <= mid) {
                    update(2 * node, start, mid, idx, val);
                } else {
                    update(2 * node + 1, mid + 1, end, idx, val);
                }
                tree[node] = max(tree[2 * node], tree[2 * node + 1]);
            };

        function<int(int, int, int, int, int)> query =
            [&](int node, int start, int end, int left, int right) {
                if (right < start || end < left) {
                    return 0;
                }
                if (left <= start && end <= right) {
                    return tree[node];
                }
                int mid = (start + end) / 2;
                return max(query(2 * node, start, mid, left, right),
                           query(2 * node + 1, mid + 1, end, left, right));
            };

        int maxLength = 0;
        for (int num : nums) {
            int left = max(1, num - k);
            int currentLength = query(1, 1, maxVal, left, num - 1) + 1;
            update(1, 1, maxVal, num, currentLength);
            maxLength = max(maxLength, currentLength);
        }
```

```
        return maxLength;
    }
};
```

Submission screenshot: