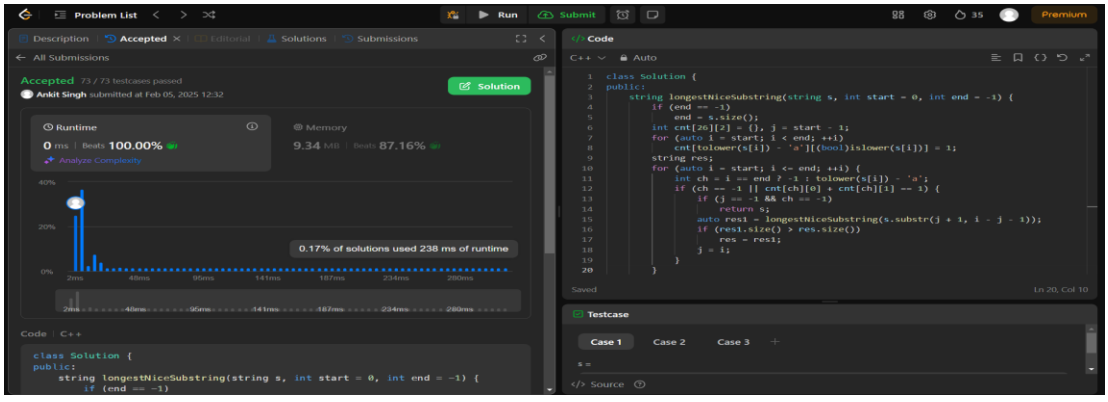
# ASSIGNMENT -1 (ADVANCED PROGRAMMING)

1. **Problem 1:** Longest Nice Substring
2. **Implementation/Code:**

```
class Solution {
public:
    string longestNiceSubstring(string s, int start = 0, int end = -1) {
        if (end == -1)
            end = s.size();
        int cnt[26][2] = {}, j = start - 1;
        for (auto i = start; i < end; ++i)
            cnt[tolower(s[i]) - 'a'][(bool)islower(s[i])] = 1;
        string res;
        for (auto i = start; i <= end; ++i) {
            int ch = i == end ? -1 : tolower(s[i]) - 'a';
            if (ch == -1 || cnt[ch][0] + cnt[ch][1] == 1) {
                if (j == -1 && ch == -1)
                    return s;
                auto res1 = longestNiceSubstring(s.substr(j + 1, i - j - 1));
                if (res1.size() > res.size())
                    res = res1;
                j = i;
            }
        }
        return res;
    }
};
```

**Output:**



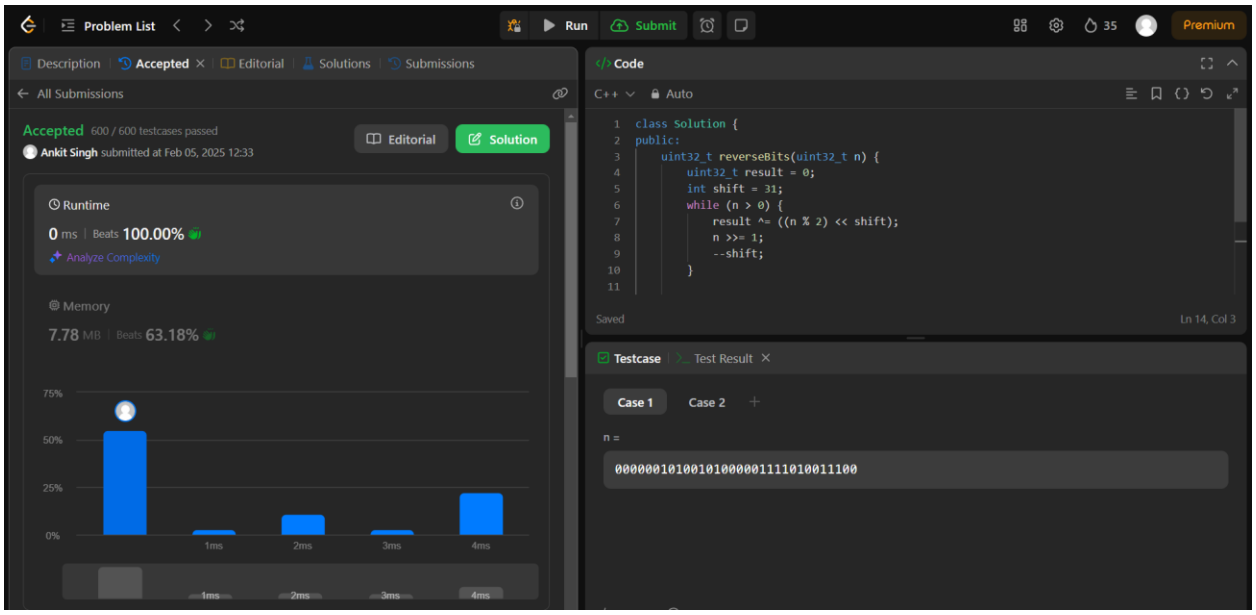
1. **Problem 2:** Reverse Bits

2. **Implementation/Code:**

```cpp
class Solution {
public:
    uint32_t reverseBits(uint32_t n) {
        uint32_t result = 0;
        int shift = 31;
        while (n > 0) {
            result ^= ((n % 2) << shift);
            n >>= 1;
            --shift;
        }

        return result;
    }
};
```

3. **Output:**

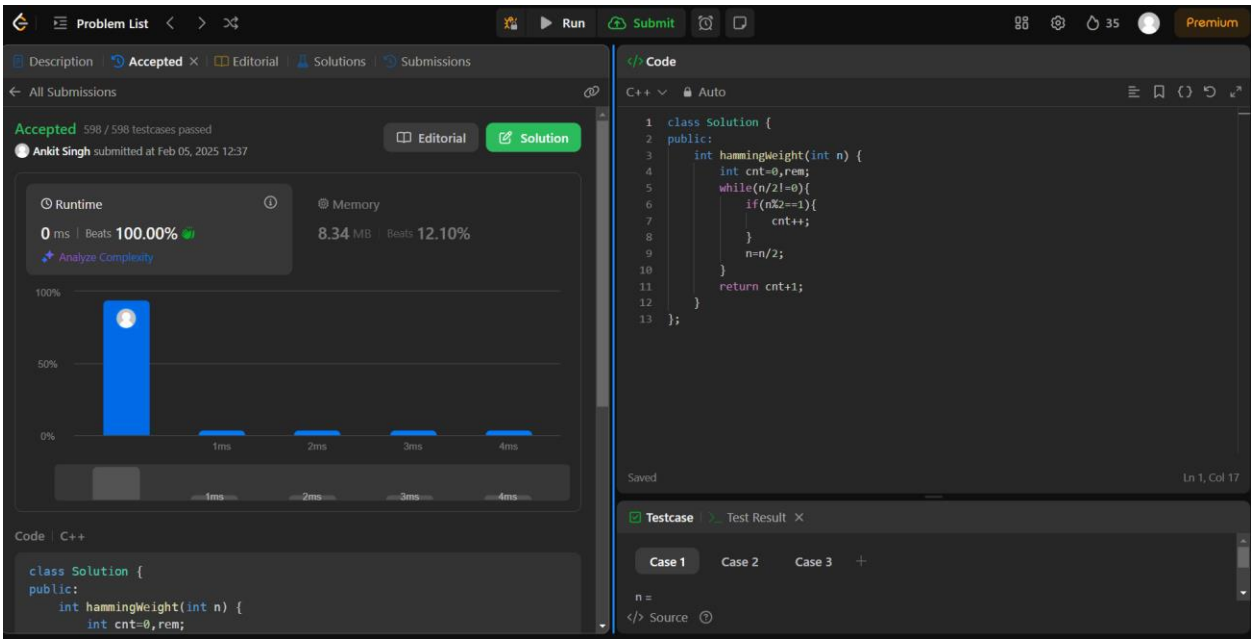


1. **Problem 3:** Number of 1 bits

2. **Implementation/code:**

```cpp
class Solution {
public:
    int hammingWeight(int n) {
        int cnt=0,rem;
        while(n/2!=0){
            if(n%2==1){
                cnt++;
            }
            n=n/2;
        }
        return cnt+1;
    }
};
```

3. **Output:**

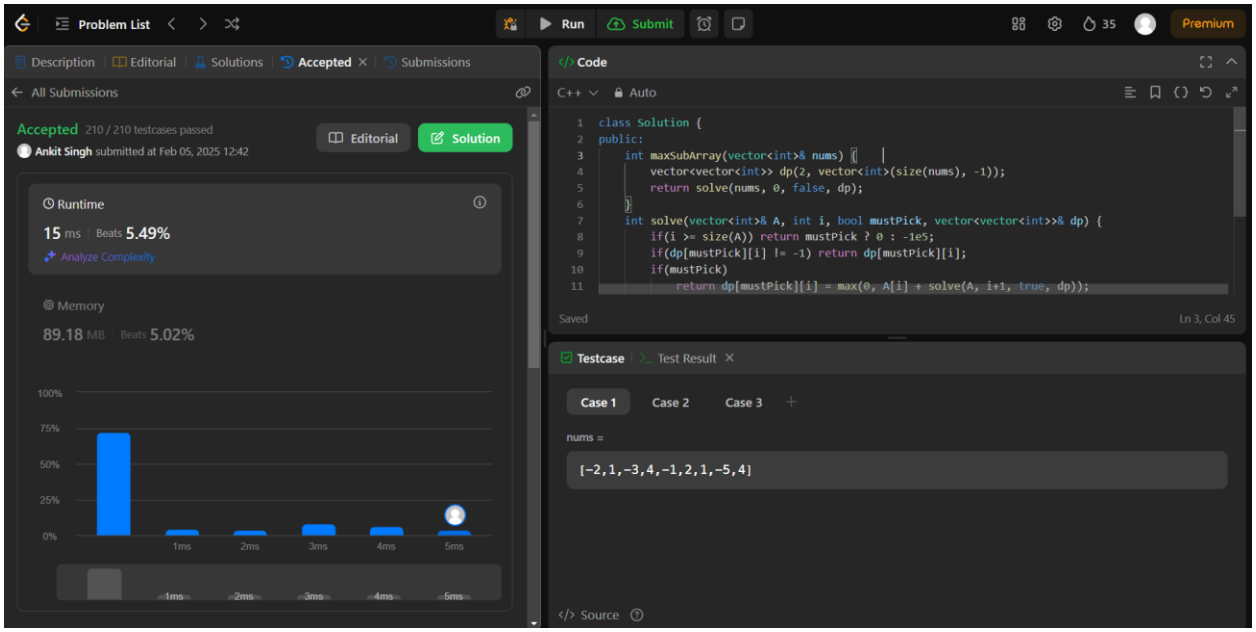


1. **Problem 4: Maximum Sub array**

2. **Implementation/code:**

```
class Solution {
public:
    int maxSubArray(vector<int>& nums) {
        vector<vector<int>> dp(2, vector<int>(size(nums), -1));
        return solve(nums, 0, false, dp);
    }
    int solve(vector<int>& A, int i, bool mustPick, vector<vector<int>>& dp) {
        if(i >= size(A)) return mustPick ? 0 : -1e5;
        if(dp[mustPick][i] != -1) return dp[mustPick][i];
        if(mustPick)
            return dp[mustPick][i] = max(0, A[i] + solve(A, i+1, true, dp));
        return dp[mustPick][i] = max(solve(A, i+1, false, dp), A[i] + solve(A, i+1,
true, dp));
    }
};
```

3. **Output:**

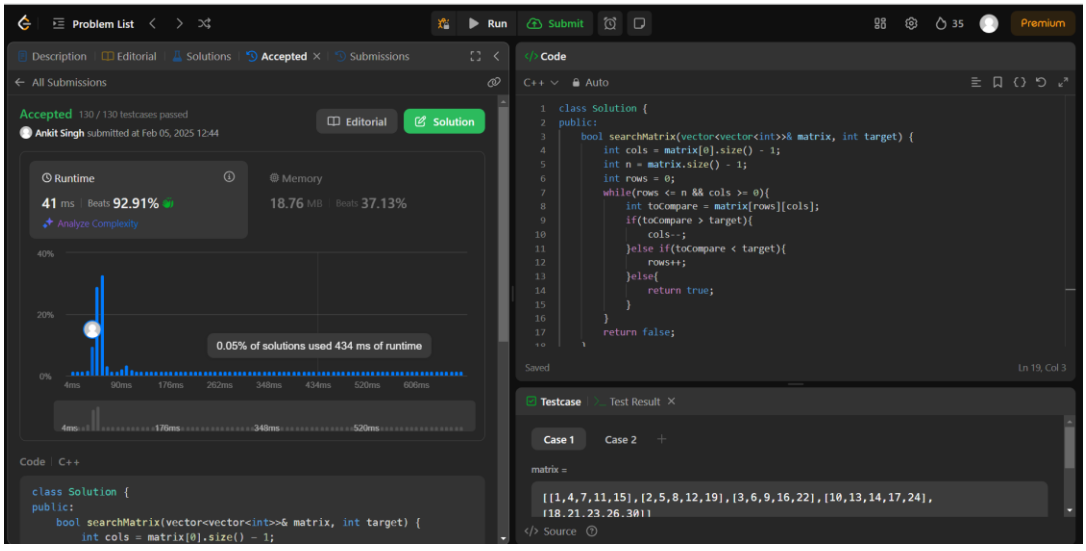


1. **Problem 5: Search a 2D Matrix II**

2. **Implementation/Code:**

```
class Solution {
public:
    bool searchMatrix(vector<vector<int>>& matrix, int target) {
        int cols = matrix[0].size() - 1;
        int n = matrix.size() - 1;
        int rows = 0;
        while(rows <= n && cols >= 0){
            int toCompare = matrix[rows][cols];
            if(toCompare > target){
                cols--;
            }else if(toCompare < target){
                rows++;
            }else{
                return true;
            }
        }
        return false;
    }
};
```

3. **Output:**

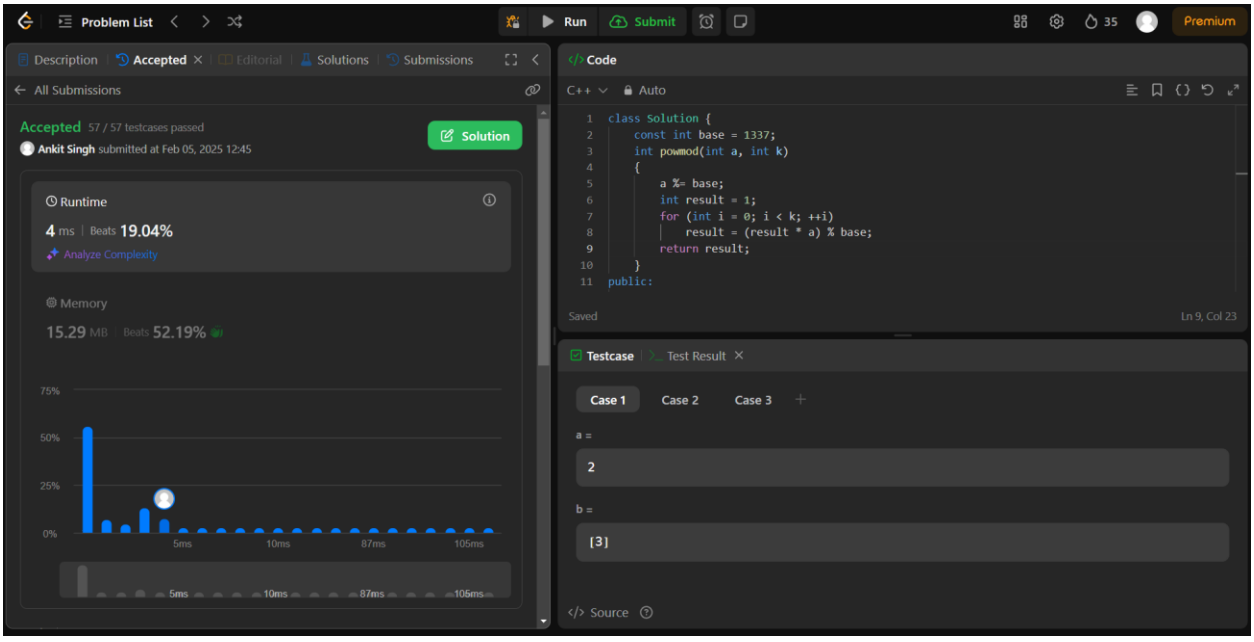


1. **Problem 6: Super Pow**

2. **Implementation/Code:**

```
class Solution {
    const int base = 1337;
    int powmod(int a, int k)
    {
        a %= base;
        int result = 1;
        for (int i = 0; i < k; ++i)
            result = (result * a) % base;
        return result;
    }
public:
    int superPow(int a, vector<int>& b) {
        if (b.empty()) return 1;
        int last_digit = b.back();
        b.pop_back();
        return powmod(superPow(a, b), 10) * powmod(a, last_digit) % base;
    }
};
```

3. **Output:**

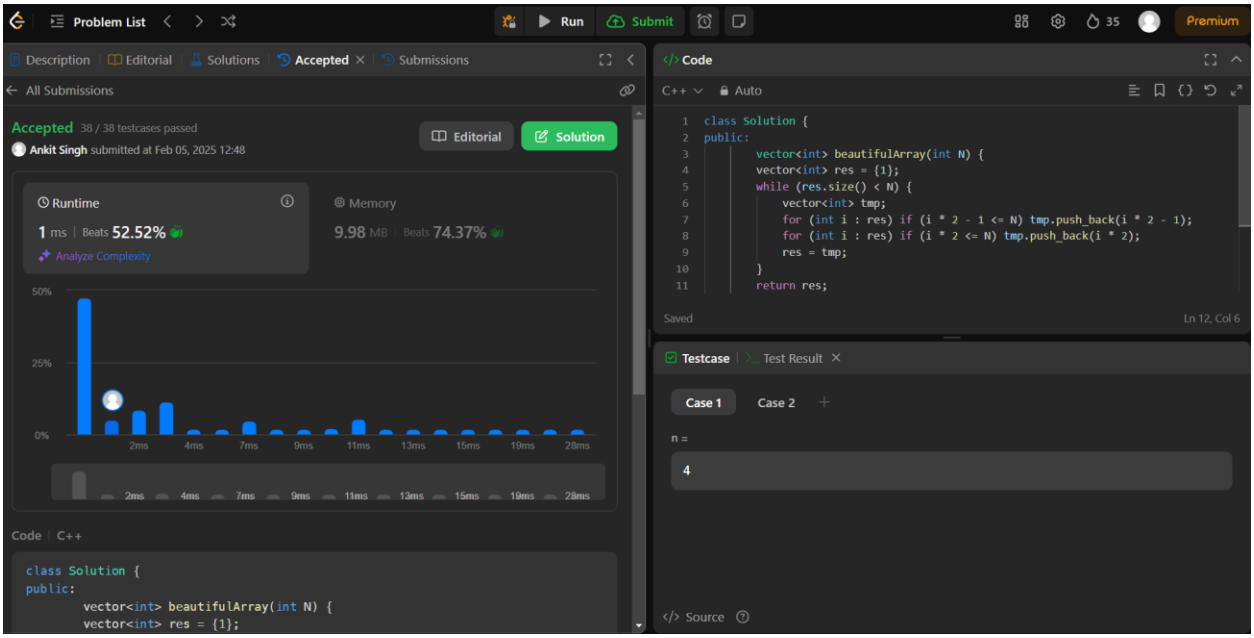


1. **Problem 7: Beautiful Array**

2. **Implementation/code:**

```
vector<int> beautifulArray(int N) {
    vector<int> res = {1};
    while (res.size() < N) {
        vector<int> tmp;
        for (int i : res) if (i * 2 - 1 <= N) tmp.push_back(i * 2 - 1);
        for (int i : res) if (i * 2 <= N) tmp.push_back(i * 2);
        res = tmp;
    }
    return res;
}
```

3. **Output:**



1. **Problem 8: The Skyline Problem.**

2. **Implementation/code:**

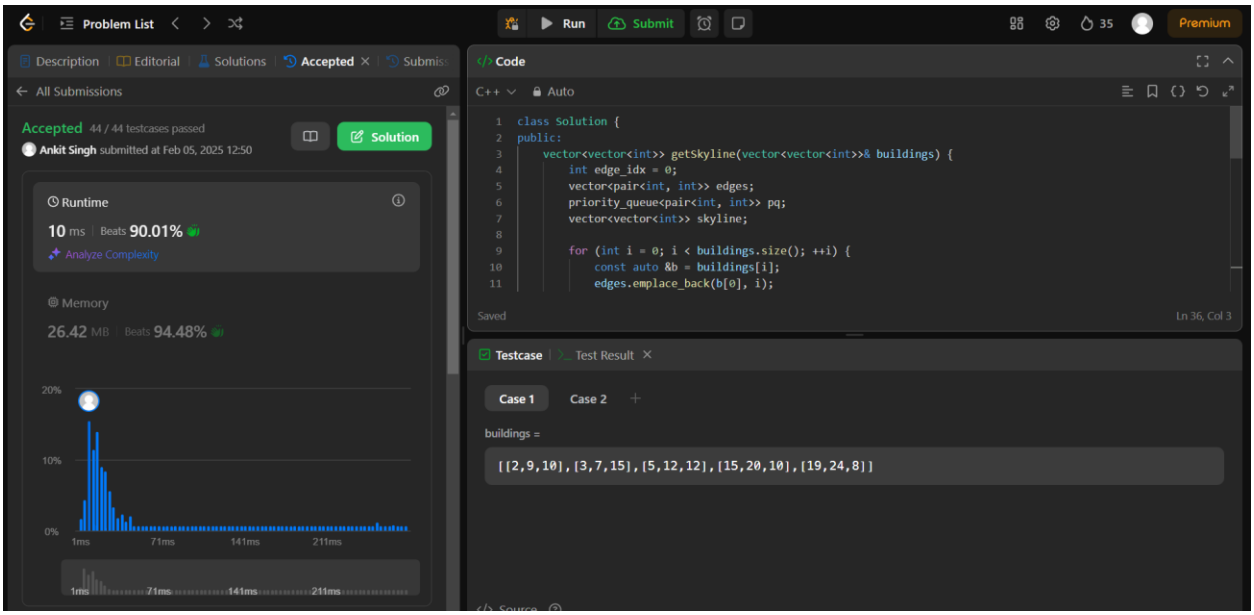
```
class Solution {
public:
    vector<vector<int>> getSkyline(vector<vector<int>>& buildings) {
        int edge_idx = 0;
        vector<pair<int, int>> edges;
        priority_queue<pair<int, int>> pq;
        vector<vector<int>> skyline;

        for (int i = 0; i < buildings.size(); ++i) {
            const auto &b = buildings[i];
            edges.emplace_back(b[0], i);
            edges.emplace_back(b[1], i);
        }

        std::sort(edges.begin(), edges.end());

        while (edge_idx < edges.size()) {
            int curr_height;
            const auto &[curr_x, _] = edges[edge_idx];
            while (edge_idx < edges.size() &&
                    curr_x == edges[edge_idx].first) {
                const auto &[_, building_idx] = edges[edge_idx];
                const auto &b = buildings[building_idx];
                if (b[0] == curr_x)
                    pq.emplace(b[2], b[1]);
                ++edge_idx;
            }
            while (!pq.empty() && pq.top().second <= curr_x)
                pq.pop();
            curr_height = pq.empty() ? 0 : pq.top().first;
            if (skyline.empty() || skyline.back()[1] != curr_height)
                skyline.push_back({curr_x, curr_height});
        }
        return skyline;
    }
};
```

3. **Output:**




1. **Problem 9: Reverse Pairs**

2. **Implementation/code:**

```
class Solution {
public:

    void merge(vector<int>& nums, int low, int mid, int high, int&
reversePairsCount){

        int j = mid+1;
        for(int i=low; i<=mid; i++){
            while(j<=high && nums[i] > 2*(long long)nums[j]){
                j++;
            }
            reversePairsCount += j-(mid+1);
        }

        int size = high-low+1;
        vector<int> temp(size, 0);
```

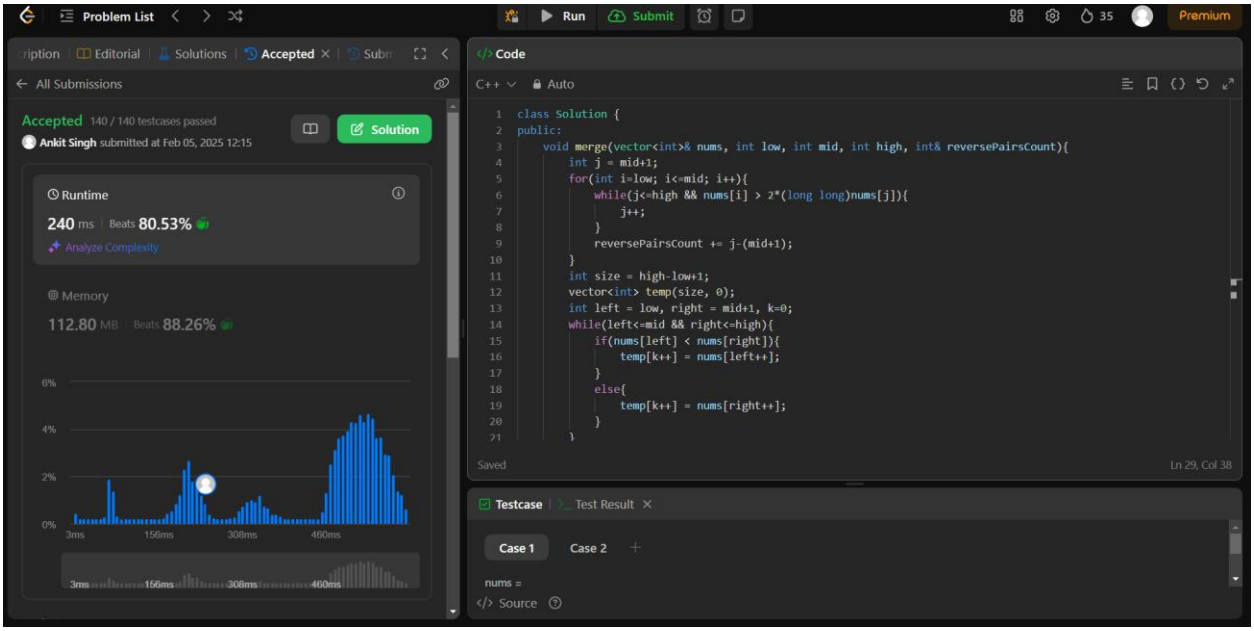
```
        int left = low, right = mid+1, k=0;
        while(left<=mid && right<=high){
            if(nums[left] < nums[right]){
                temp[k++] = nums[left++];
            }
            else{
                temp[k++] = nums[right++];
            }
        }
        while(left<=mid){
            temp[k++] = nums[left++];
        }
        while(right<=high){
            temp[k++] = nums[right++];
        }
        int m=0;
        for(int i=low; i<=high; i++){
            nums[i] = temp[m++];
        }
    }

    void mergeSort(vector<int>& nums, int low, int high, int& reversePairsCount){
        if(low >= high){
            return;
        }

        int mid = (low + high) >> 1;
        mergeSort(nums, low, mid, reversePairsCount);
        mergeSort(nums, mid+1, high, reversePairsCount);
        merge(nums, low, mid, high, reversePairsCount);
    }

public:
    int reversePairs(vector<int>& nums) {
        int reversePairsCount = 0;
        mergeSort(nums, 0, nums.size()-1, reversePairsCount);
        return reversePairsCount;
    }
};
```

3. **Output:**




1. **Problem 10: Longest Increasing SubSequence**
2. **Code:**

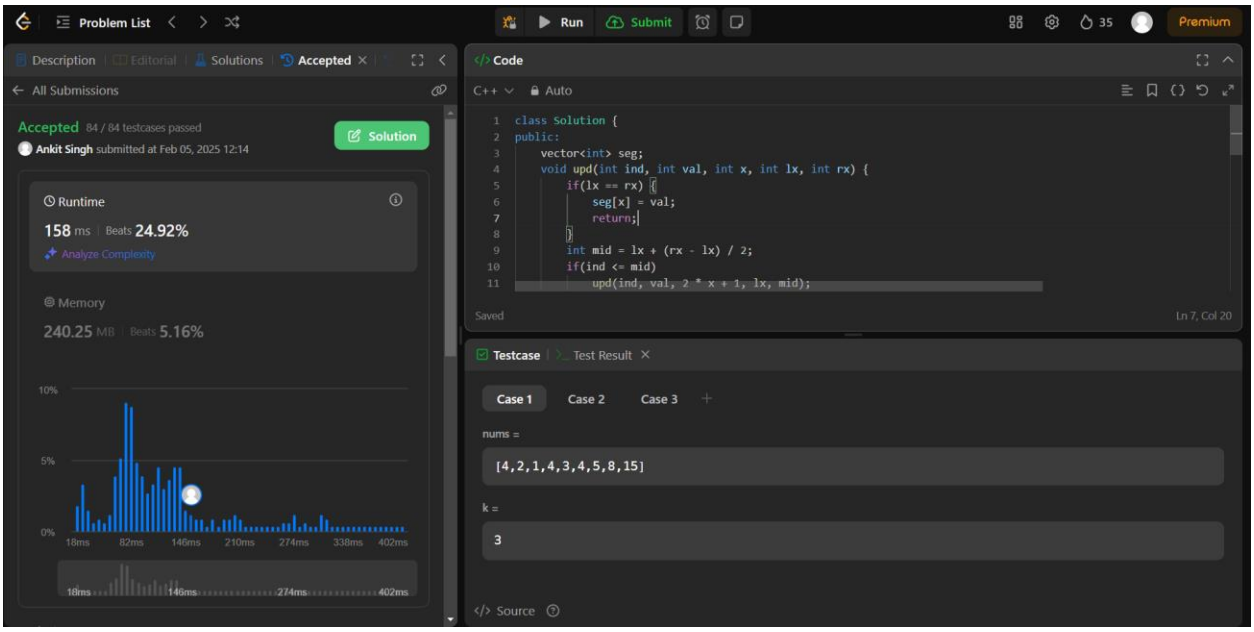
```
class Solution {
public:
    vector<int> seg;
    void upd(int ind, int val, int x, int lx, int rx) {
        if(lx == rx) {
            seg[x] = val;
            return;
        }
        int mid = lx + (rx - lx) / 2;
        if(ind <= mid)
            upd(ind, val, 2 * x + 1, lx, mid);
        else
            upd(ind, val, 2 * x + 2, mid + 1, rx);
        seg[x] = max(seg[2 * x + 1], seg[2 * x + 2]);
    }
    int query(int l, int r, int x, int lx, int rx) {
        if(lx > r or rx < l) return 0;
        if(lx >= l and rx <= r) return seg[x];
```

```
        int mid = lx + (rx - lx) / 2;
        return max(query(l, r, 2 * x + 1, lx, mid), query(l, r, 2 * x + 2, mid + 1,
rx));
    }

    int lengthOfLIS(vector<int>& nums, int k) {
        int x = 1;
        while(x <= 200000) x *= 2;
        seg.resize(2 * x, 0);

        int res = 1;
        for(int i = 0; i < nums.size(); ++i) {
            int left = max(1, nums[i] - k), right = nums[i] - 1;
            int q = query(left, right, 0, 0, x - 1);
            res = max(res, q + 1);
            upd(nums[i], q + 1, 0, 0, x - 1);
        }
        return res;
    }
};
```

## 3. Output:



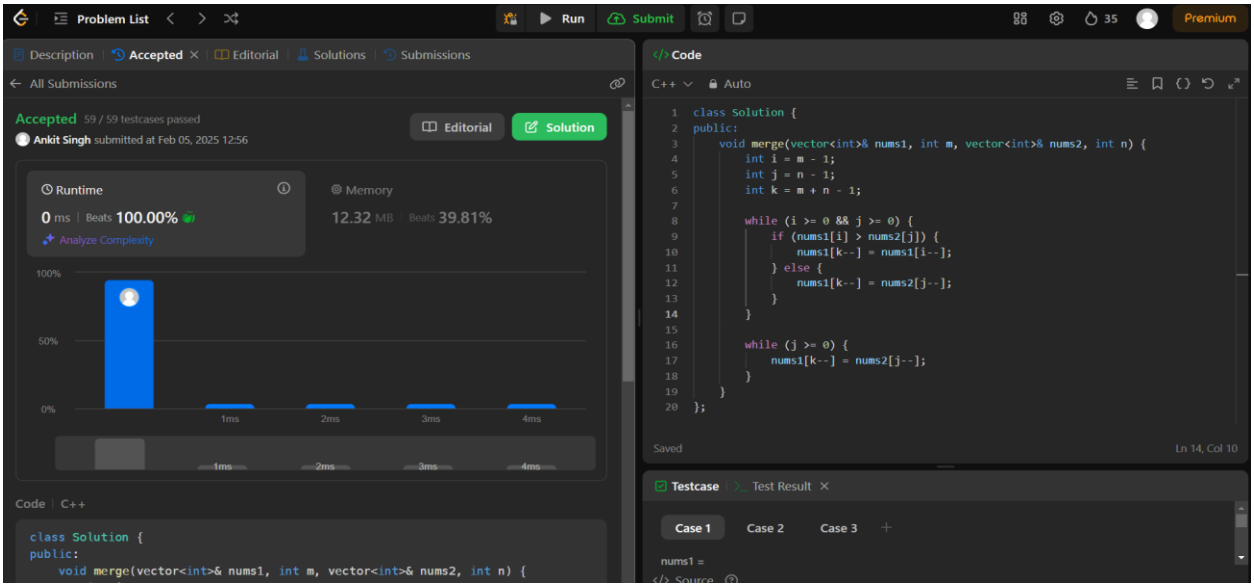
1. **Problem 11: Merge Sorted Array**
2. **Code:**

```cpp
class Solution {
public:
    void merge(vector<int>& nums1, int m, vector<int>& nums2, int n) {
        int i = m - 1;
        int j = n - 1;
        int k = m + n - 1;

        while (i >= 0 && j >= 0) {
            if (nums1[i] > nums2[j]) {
                nums1[k--] = nums1[i--];
            } else {
                nums1[k--] = nums2[j--];
            }
        }

        while (j >= 0) {
            nums1[k--] = nums2[j--];
        }
    }
};
```

3. **Output:**



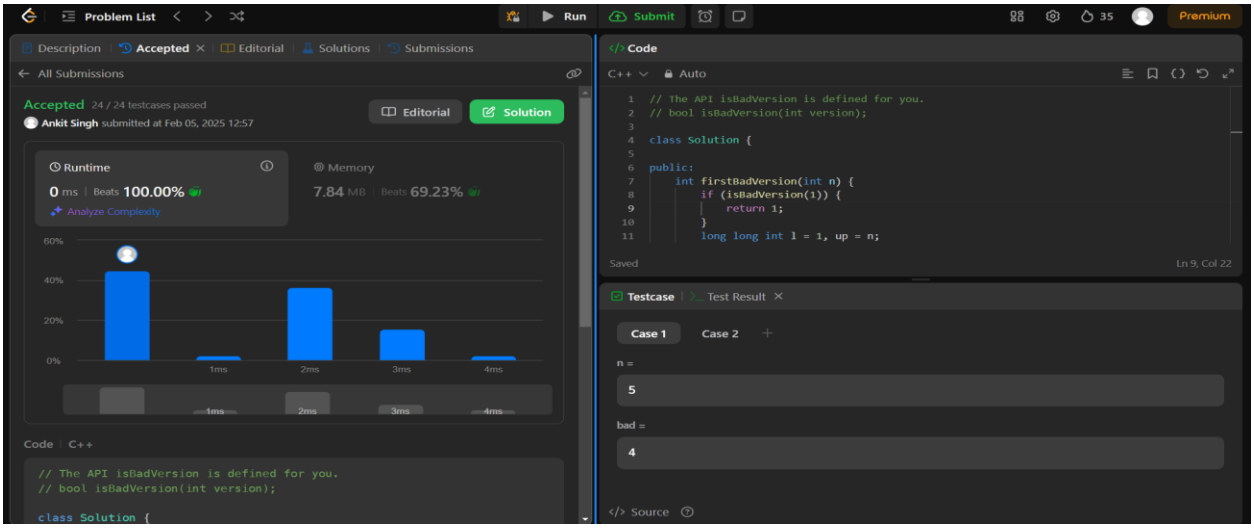
1. **Problem 12: First Bad Version**
2. **Code:**

```cpp
// The API isBadVersion is defined for you.
// bool isBadVersion(int version);

class Solution {

public:
    int firstBadVersion(int n) {
        if (isBadVersion(1)) {
            return 1;
        }
        long long int l = 1, up = n;
        long long int mid = (l + up) / 2;
        while (l < up) {
            if (isBadVersion(mid)) {
                up = mid;
            } else {
                l = mid + 1;
            }
            mid = (l + up) / 2;
        }
        return mid;
    }
};
```

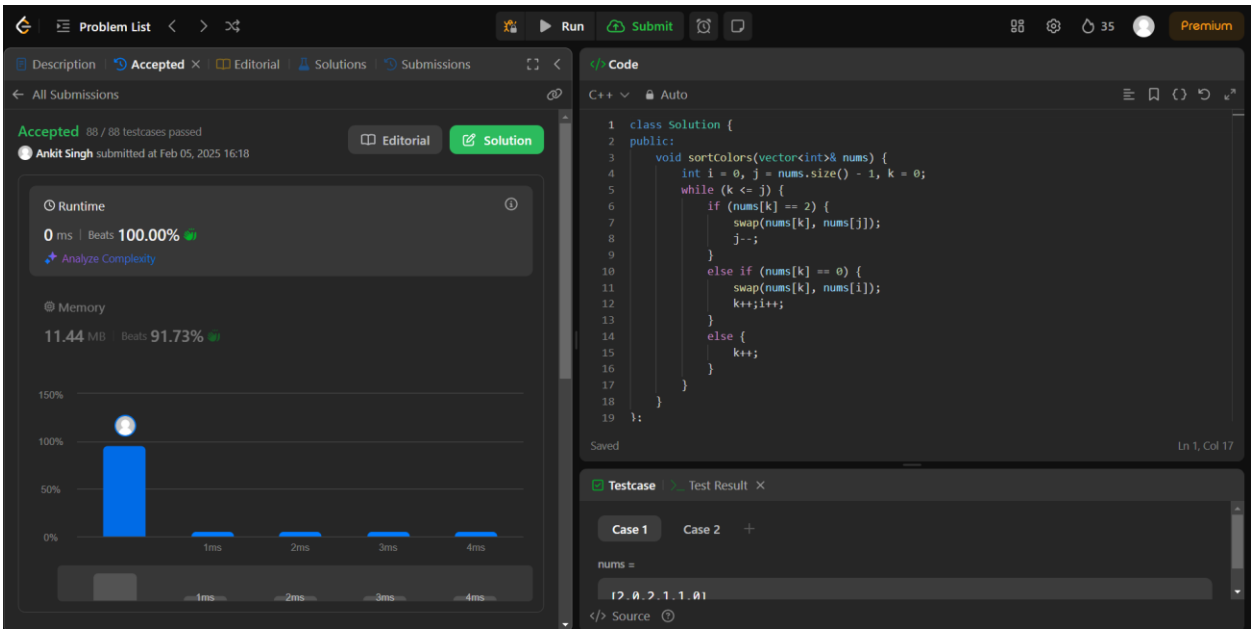
3. **Output:**



1. **Problem 13: Sort Colors**
2. **Code:**

```cpp
class Solution {
public:
    void sortColors(vector<int>& nums) {
        int i = 0, j = nums.size() - 1, k = 0;
        while (k <= j) {
            if (nums[k] == 2) {
                swap(nums[k], nums[j]);
                j--;
            }
            else if (nums[k] == 0) {
                swap(nums[k], nums[i]);
                k++;i++;
            }
            else {
                k++;
            }
        }
    }
};
```

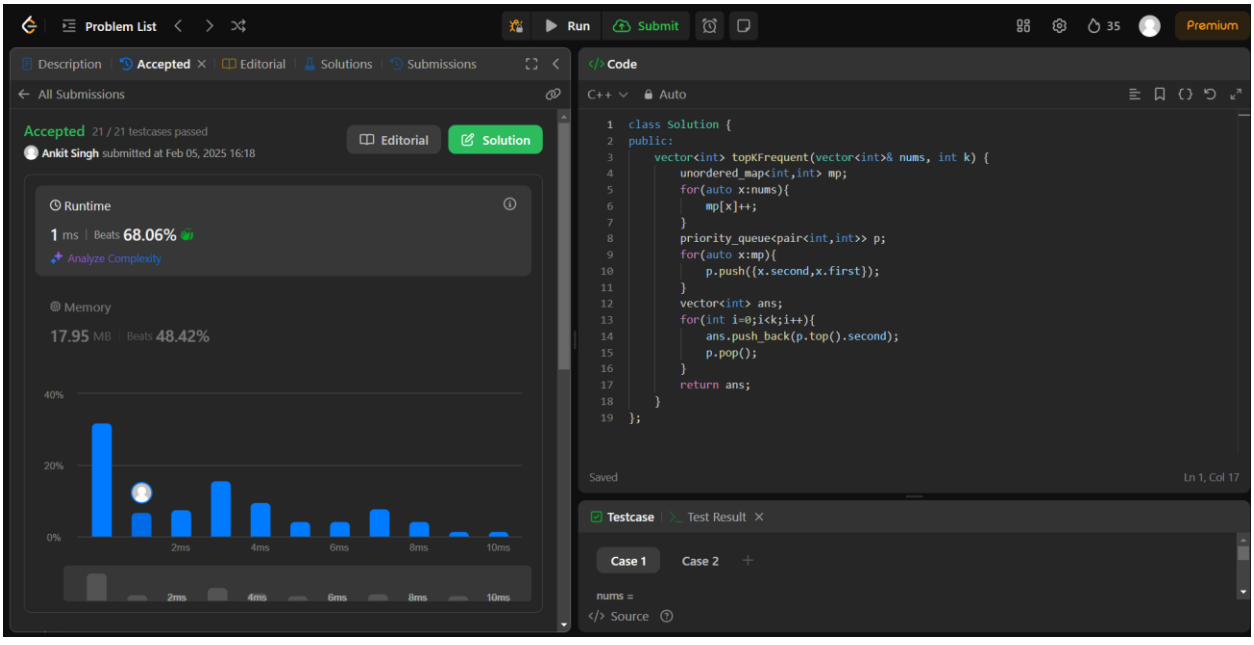
3. **Output:**



1. **Problem 14: Top K frequent Elements**
2. **Code:**

```cpp
class Solution {
public:
    vector<int> topKFrequent(vector<int>& nums, int k) {
        unordered_map<int,int> mp;
        for(auto x:nums){
            mp[x]++;
        }
        priority_queue<pair<int,int>> p;
        for(auto x:mp){
            p.push({x.second,x.first});
        }
        vector<int> ans;
        for(int i=0;i<k;i++){
            ans.push_back(p.top().second);
            p.pop();
        }
        return ans;
    }
};
```

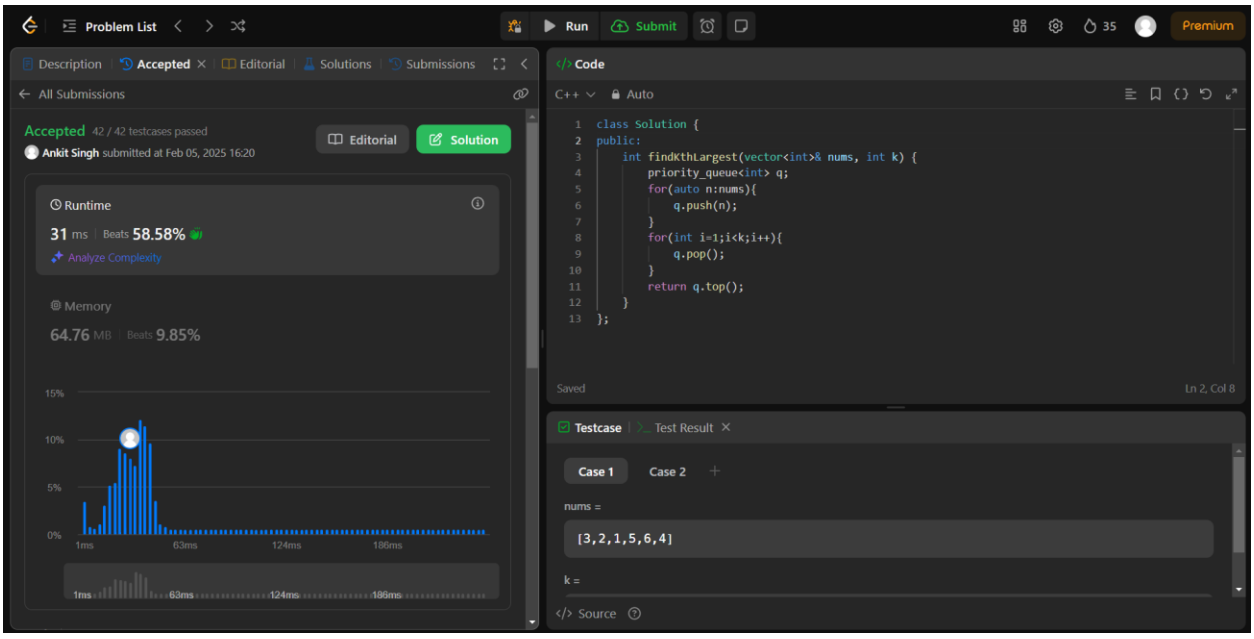
3. **Output:**



1. **Problem 15:**
2. **Code:**

```cpp
class Solution {
public:
    int findKthLargest(vector<int>& nums, int k) {
        priority_queue<int> q;
        for(auto n:nums){
            q.push(n);
        }
        for(int i=1;i<k;i++){
            q.pop();
        }
        return q.top();
    }
};
```

3. **Output:**



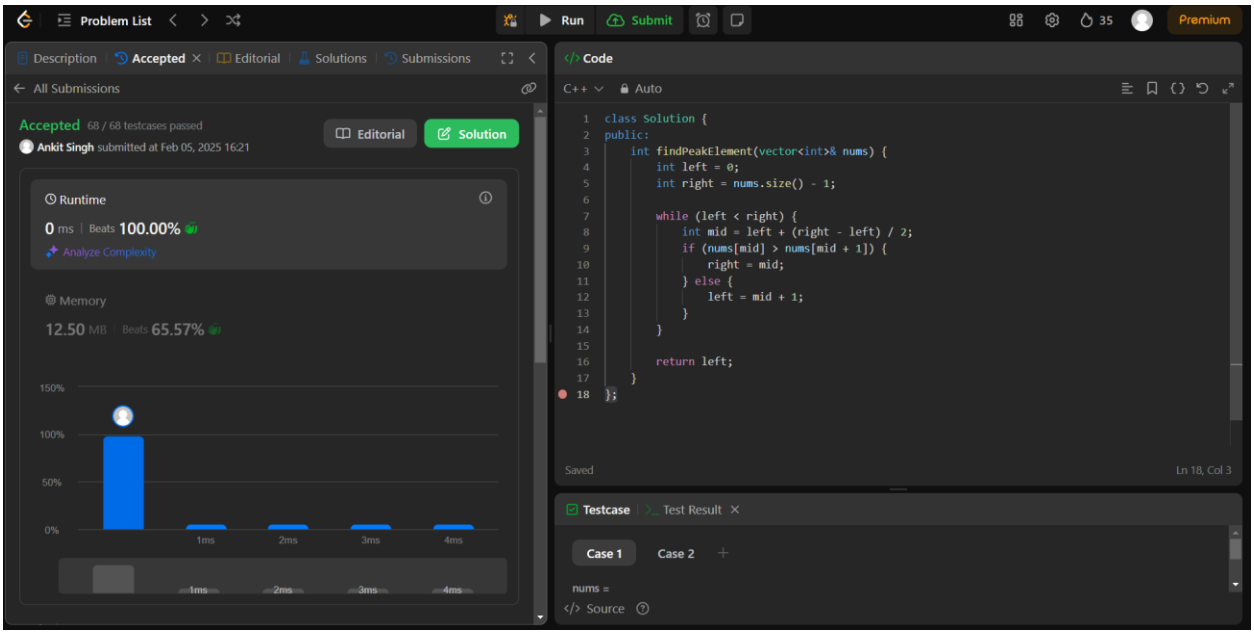
1. **Problem 16: Find Peak Element**
2. **Code:**

```cpp
class Solution {
public:
    int findPeakElement(vector<int>& nums) {
        int left = 0;
        int right = nums.size() - 1;

        while (left < right) {
            int mid = left + (right - left) / 2;
            if (nums[mid] > nums[mid + 1]) {
                right = mid;
            } else {
                left = mid + 1;
            }
        }

        return left;
    }
};
```

3. **Output:**

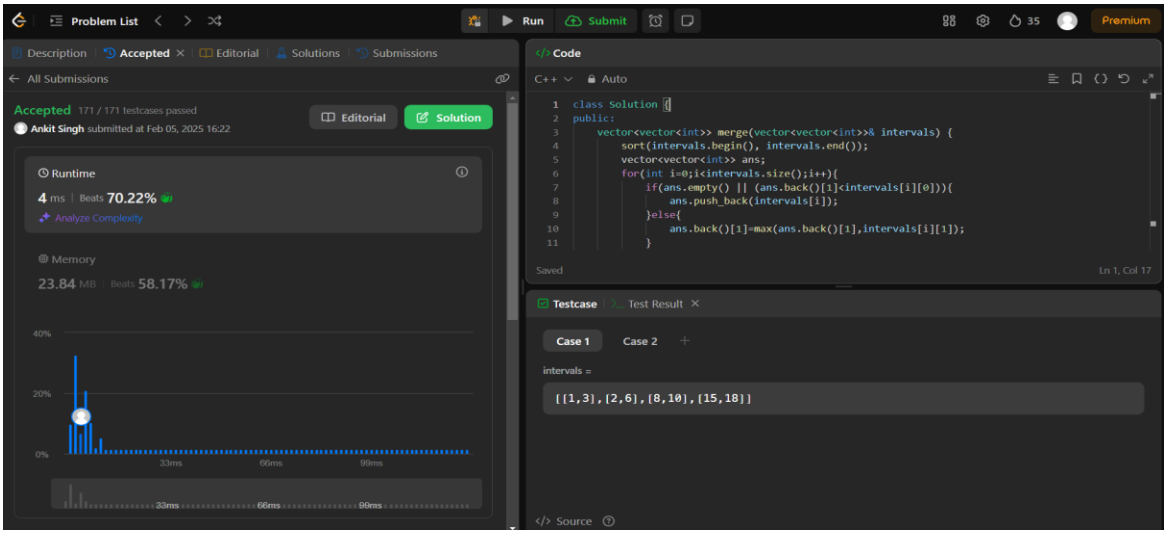


1. **Problem 17: Merge Intervals**
2. **Code:**

```cpp
class Solution {
public:
    vector<vector<int>> merge(vector<vector<int>>& intervals) {
        sort(intervals.begin(), intervals.end());
        vector<vector<int>> ans;
        for(int i=0;i<intervals.size();i++){
            if(ans.empty() || (ans.back()[1]<intervals[i][0])){
                ans.push_back(intervals[i]);
            }else{
                ans.back()[1]=max(ans.back()[1],intervals[i][1]);
            }
        }
        return ans;
        /**sort(intervals.begin(), intervals.end());
        for(int i=1;i<intervals.size();i++){
            if(intervals[i-1][1]>=intervals[i][0]){
                intervals[i-1][1]=max(intervals[i][1],intervals[i-1][1]) ;
                intervals.erase(intervals.begin()+i);
                i--;
            }

        }
        return intervals;**/
    }
};
```

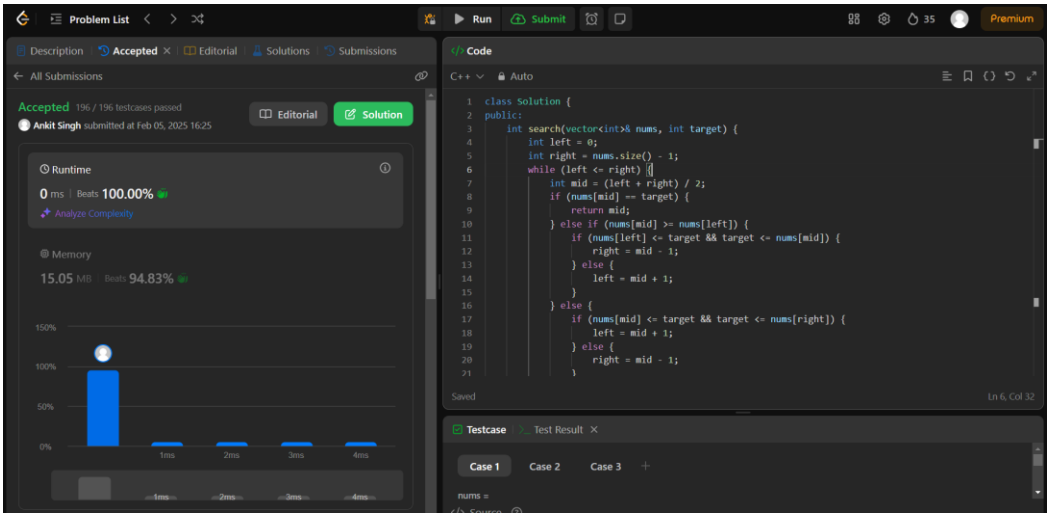
3. **Output:**



1. **Problem 18: Search in rotated Sorted Array**
2. **Code:**

```cpp
class Solution {
public:
    int search(vector<int>& nums, int target) {
        int left = 0;
        int right = nums.size() - 1;
        while (left <= right) {
            int mid = (left + right) / 2;
            if (nums[mid] == target) {
                return mid;
            } else if (nums[mid] >= nums[left]) {
                if (nums[left] <= target && target <= nums[mid]) {
                    right = mid - 1;
                } else {
                    left = mid + 1;
                }
            } else {
                if (nums[mid] <= target && target <= nums[right]) {
                    left = mid + 1;
                } else {
                    right = mid - 1;
                }
            }
        }
        return -1;
    }
};
```

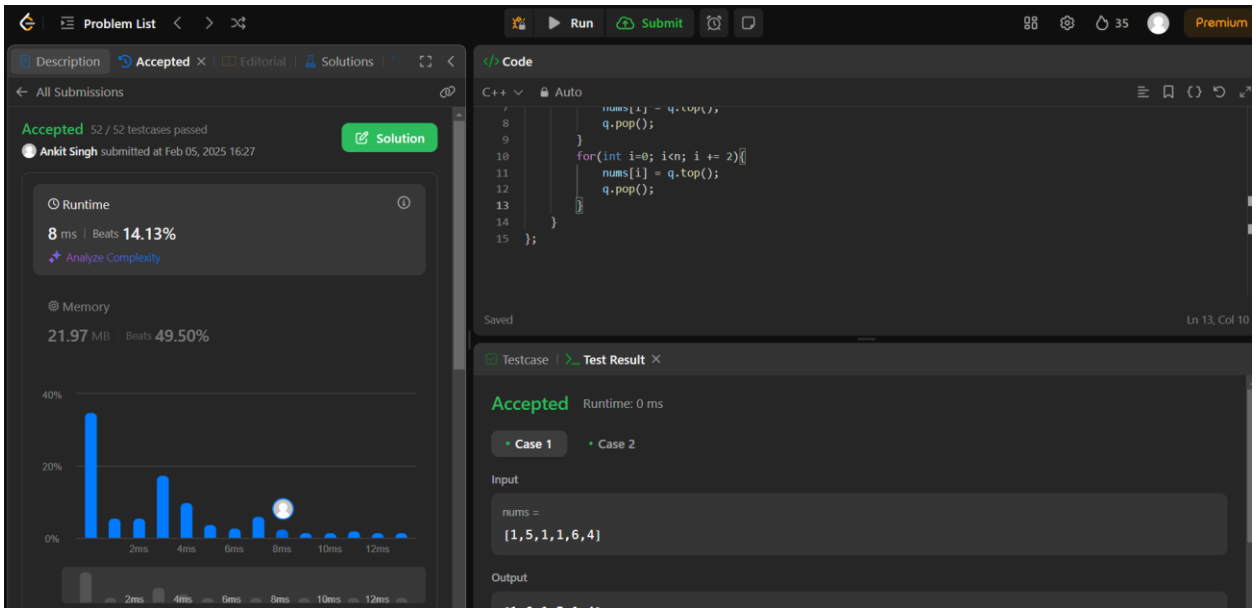
3. **Output:**



1. **Problem 19: Wiggle Sort**
2. **Code:**

```
class Solution {
public:
    void wiggleSort(vector<int>& nums) {
        int n= nums.size();
        priority_queue<int> q(nums.begin(), nums.end());
        for(int i=1; i<n; i += 2){
            nums[i] = q.top();
            q.pop();
        }
        for(int i=0; i<n; i += 2){
            nums[i] = q.top();
            q.pop();
        }
    }
};
```

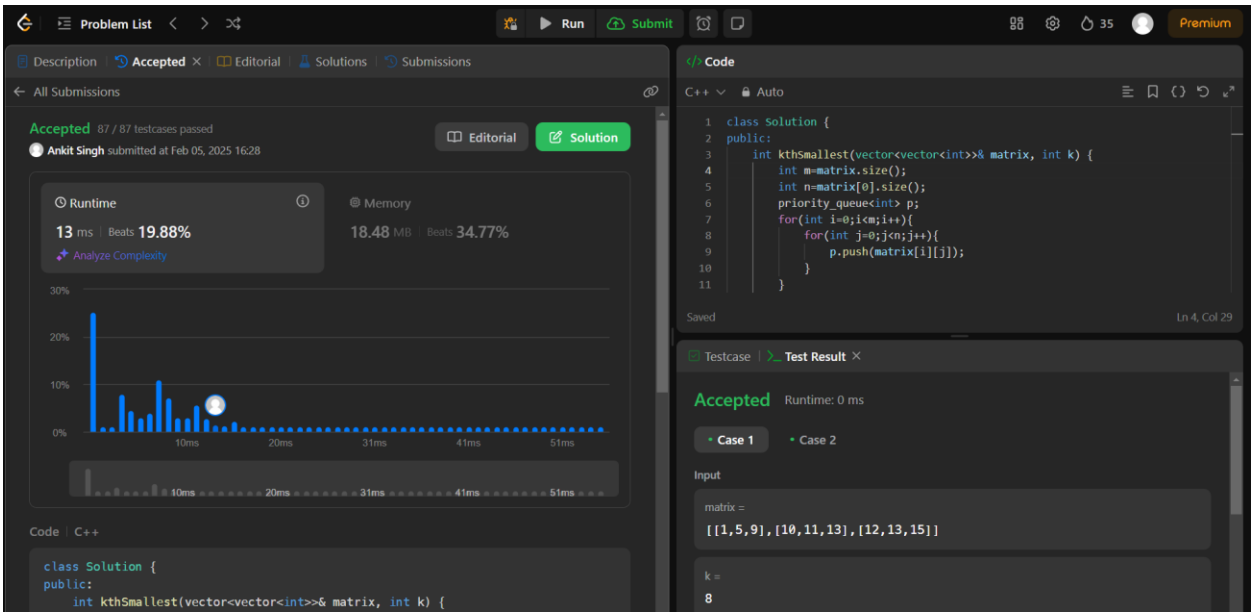
3. **Output:**



1. **Problem 20: Kth Smallest Element**
2. **Code:**

```
class Solution {
public:
    int kthSmallest(vector<vector<int>>& matrix, int k) {
        int m=matrix.size();
        int n=matrix[0].size();
        priority_queue<int> p;
        for(int i=0;i<m;i++){
            for(int j=0;j<n;j++){
                p.push(matrix[i][j]);
            }
        }
        int po=m*n-k;
        for(int i=0;i<po;i++){
            p.pop();
        }
        return p.top();
    }
};
```

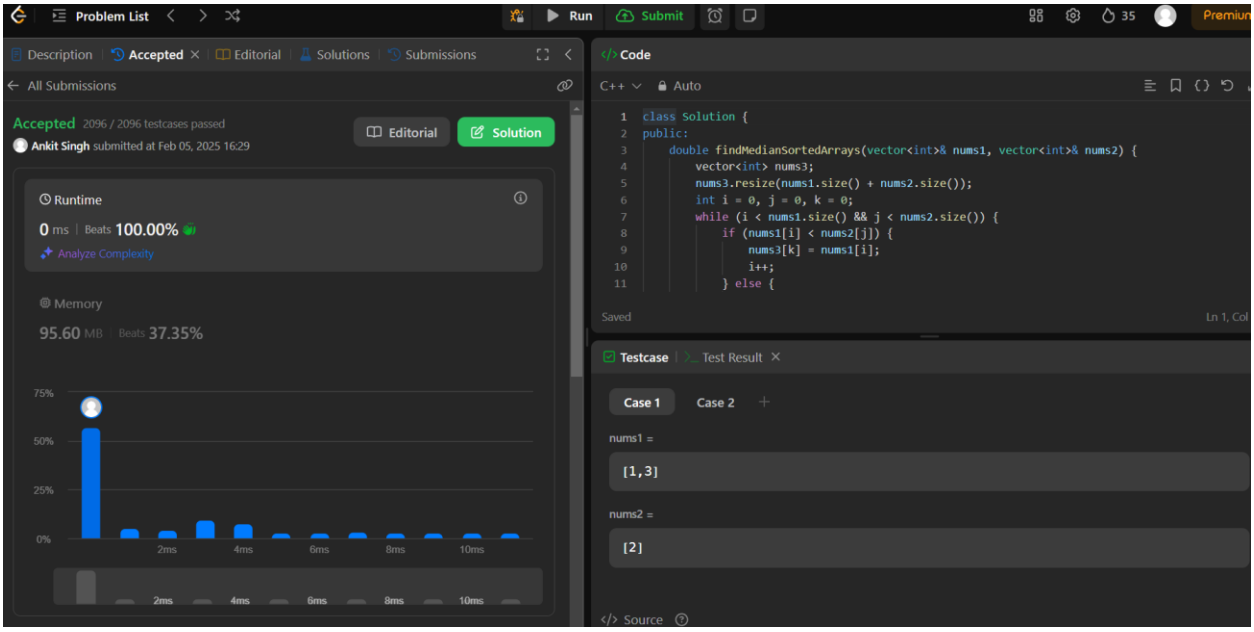
3. **Output:**



1. **Problem 21: Median of Two Sorted Arrays.**
2. **Code:**

```
class Solution {
public:
    double findMedianSortedArrays(vector<int>& nums1, vector<int>& nums2) {
        vector<int> nums3;
        nums3.resize(nums1.size() + nums2.size());
        int i = 0, j = 0, k = 0;
        while (i < nums1.size() && j < nums2.size()) {
            if (nums1[i] < nums2[j]) {
                nums3[k] = nums1[i];
                i++;
            } else {
                nums3[k] = nums2[j];
                j++;
            }
            k++;
        }
        while (i < nums1.size()) {
            nums3[k] = nums1[i];
            i++;
            k++;
        }
        while (j < nums2.size()) {
            nums3[k] = nums2[j];
            j++;
            k++;
        }
        int n = nums3.size();
        if (n % 2 == 1) {
            return static_cast<double>(nums3[n / 2]);
        } else {
            return (static_cast<double>(nums3[n / 2 - 1]) +
static_cast<double>(nums3[n / 2])) / 2.0;
        }
    }
};
```

## 3. Output:


Problem List
Run
Submit
Description
Accepted
Editorial
Solutions
Submissions
All Submissions
Accepted 2096 / 2096 testcases passed
Ankit Singh submitted at Feb 05, 2025 16:29
Editorial
Solution
Runtime
0 ms | Beats 100.00%
Analyze Complexity
Memory
95.60 MB | Beats 37.35%
75%
50%
25%
0%
2ms
4ms
6ms
8ms
10ms
Code
C++
Auto
class Solution {
public:
double findMedianSortedArrays(vector<int>& nums1, vector<int>& nums2) {
vector<int> nums3;
nums3.resize(nums1.size() + nums2.size());
int i = 0, j = 0, k = 0;
while (i < nums1.size() && j < nums2.size()) {
if (nums1[i] < nums2[j]) {
nums3[k] = nums1[i];
i++;
} else {
Saved
Testcase
Test Result
Case 1
Case 2
nums1 =
[1,3]
nums2 =
[2]
Source