

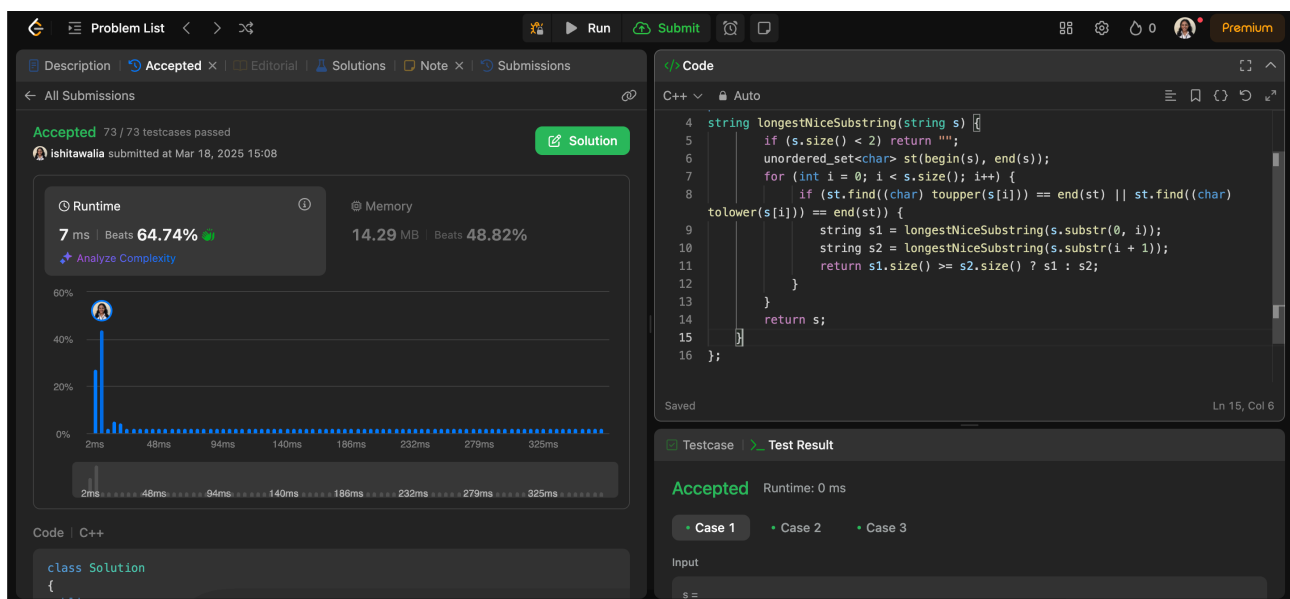
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UID : 22BCS14916  
Subject : Advance Programming Lab

Date of Submission : 18/03/2025  
Subject Code : 22CSP - 351  
Submitted to : Er. Pratima Sonali

### ASSIGNMENT - 3

#### Question 1

```
class Solution
{
public:
string longestNiceSubstring(string s) {
    if (s.size() < 2) return "";
    unordered_set<char> st(begin(s), end(s));
    for (int i = 0; i < s.size(); i++) {
        if (st.find((char) toupper(s[i])) == end(st) || st.find((char) tolower(s[i])) == end(st)) {
            string s1 = longestNiceSubstring(s.substr(0, i));
            string s2 = longestNiceSubstring(s.substr(i + 1));
            return s1.size() >= s2.size() ? s1 : s2;
        }
    }
    return s;
}
};
```



#### Question 2

```
class Solution {
public:
uint32_t reverseBits(uint32_t n) {
    uint32_t ans = 0;
    for (int i = 0; i < 32; i++) {
        ans <<= 1;
        ans |= (n & 1);
        n >>= 1;
    }
    return ans;
}
};
```

Problem List
Run
Premium

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Description Accepted Editorial Solutions Note Submissions

All Submissions

**Accepted** 600 / 600 testcases passed

Ishitawalla submitted at Mar 18, 2025 15:11

Editorial
Solution

**Runtime**

0 ms | Beats 100.00%

Analyze Complexity

**Memory**

7.86 MB | Beats 28.61%

Time Interval	Percentage
0ms - 1ms	~65%
1ms - 2ms	~2%
2ms - 3ms	~10%
3ms - 4ms	~2%
4ms - 5ms	~18%

```

1 class Solution {
2 public:
3     uint32_t reverseBits(uint32_t n) {
4         uint32_t ans = 0;
5         for (int i = 0; i < 32; i++) {
6             ans <<= 1;
7             ans |= (n & 1);
8             n >>= 1;
9         }
10        return ans;
11    }
12 };
13 
```

Saved

Ln 13, Col 1

Code C++

```

class Solution {
public:

```

Testcase Test Result

**Accepted** Runtime: 0 ms

- Case 1
- Case 2

Input

n =

## Question 4

```
class Solution {
public:
    int maxSubArray(vector<int>& nums) {
        int curMax = 0, maxTillNow = INT_MIN;
        for(auto c : nums)
            curMax = max(c, curMax + c),
            maxTillNow = max(maxTillNow, curMax);
        return maxTillNow;
    }
};
```

The screenshot shows the LeetCode interface for the problem '53. Maximum Subarray'. The problem is marked as 'Solved' and 'Medium'. The description states: 'Given an integer array `nums`, find the `subarray` with the largest sum, and return *its* sum.' Three examples are provided: Example 1 with input `[-2,1,-3,4,-1,2,1,-5,4]` and output 6; Example 2 with input `[1]` and output 1; Example 3 with input `[5,4,-1,7,8]` and output 23. The right sidebar shows the submission status as 'Accepted' with 210/210 testcases passed, submitted by 'ishitawalia' on Mar 18, 2025. Performance metrics show 0 ms runtime (100.00% beats) and 71.83 MB memory (18.41% beats). A bar chart shows the user's performance relative to others. The test case section shows Case 1 with input `nums = [-2,1,-3,4,-1,2,1,-5,4]`.

## Question 5

```
class Solution {
public:
    bool searchMatrix(vector<vector<int>>& matrix, int target) {

        int row = 0;
        int col = matrix[0].size() - 1;

        while (row < matrix.size() && col >= 0) {
            if (matrix[row][col] == target) {
                return true;
            } else if (matrix[row][col] > target) {
                col--;
            } else {
                row++;
            }
        }
        return false;
    }
};
```

Problem List < > > Run Submit

Description Editorial Solutions Accepted x Note x Submissions

All Submissions

Accepted 130 / 130 testcases passed

ishitawalia submitted at Mar 18, 2025 15:18

Editorial Solution

Runtime 42 ms | Beats 90.92%

Memory 18.69 MB | Beats 67.35%

Analyze Complexity

40%

20%

0%

4ms 8ms 173ms 258ms 343ms 428ms 513ms 598ms

Code C++

```
class Solution {
public:
```

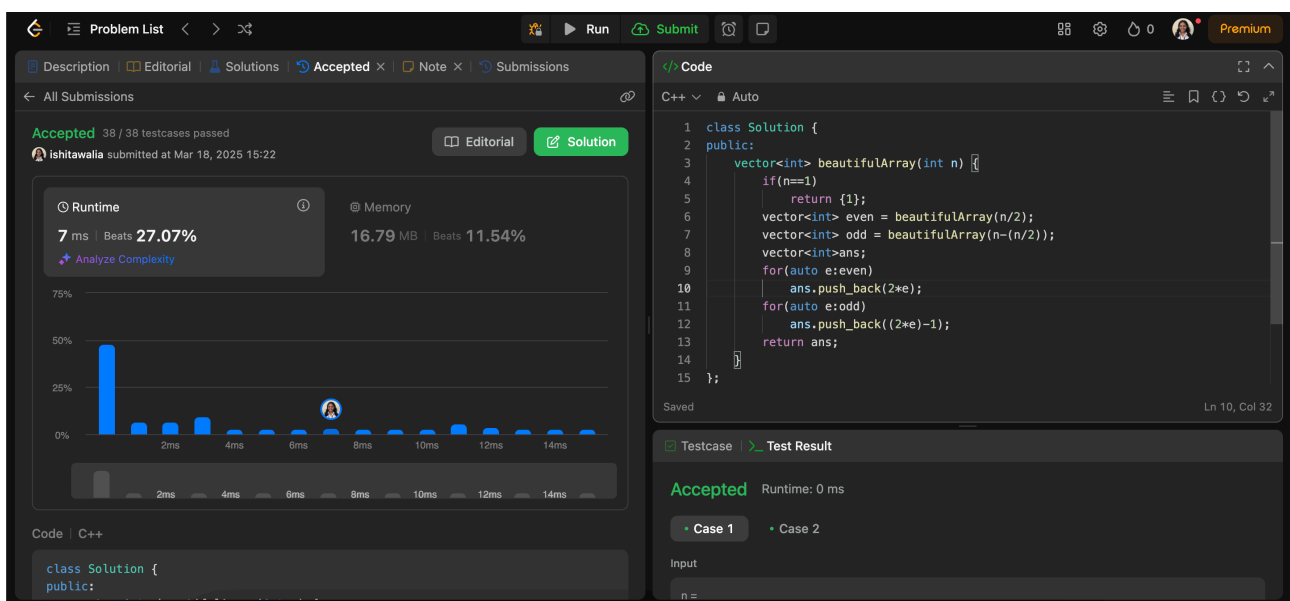
Code C++ Auto

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```
};
```

## Question 7

```
class Solution {
public:
    vector<int> beautifulArray(int n) {
        if(n==1)
            return {1};
        vector<int> even = beautifulArray(n/2);
        vector<int> odd = beautifulArray(n-(n/2));
        vector<int> ans;
        for(auto e:even)
            ans.push_back(2*e);
        for(auto e:odd)
            ans.push_back((2*e)-1);
        return ans;
    }
};
```



## Question 8

```
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);
        }

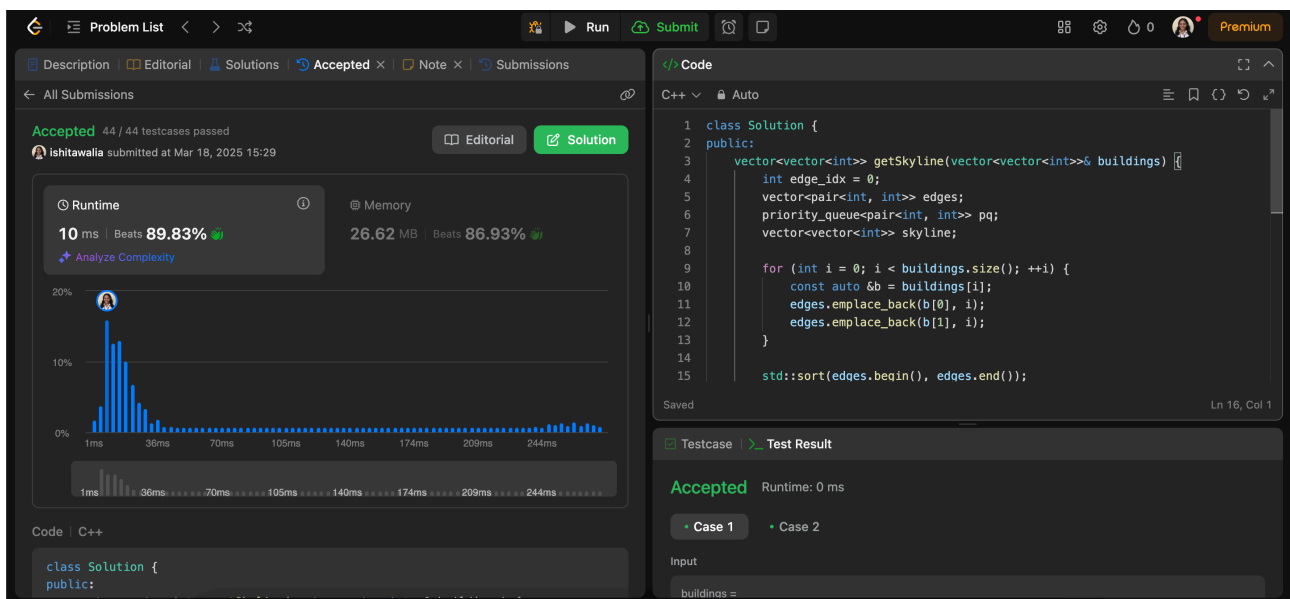
        std::sort(edges.begin(), edges.end());

        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;
}
};

```



## Question 9

```

class Solution {
private:
    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++];
            }
        }
    }
}

```

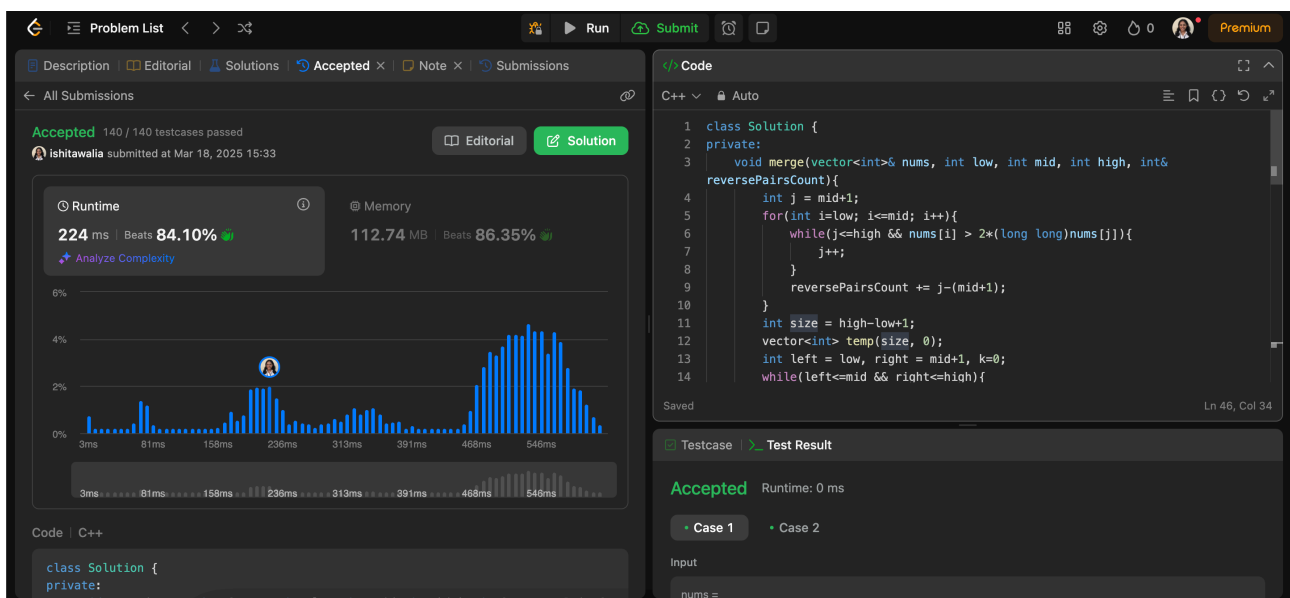
```

        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;
}
};

```



## Question 10

```

class Solution {
public:
    vector<int> seg;
    //Segment tree to return maximum in a range
    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); // check for the element in the range of [nums[i] - k,
nums[i] - 1] with the maximum value
        res = max(res, q + 1);
        upd(nums[i], q + 1, 0, 0, x - 1); //update current value
    }
    return res;
}
};

```

**Accepted** 84 / 84 testcases passed  
 ishitawalia submitted at Mar 18, 2025 15:34

**Runtime** 153 ms | Beats 26.13%  
**Memory** 240.04 MB | Beats 5.35%

**Code**

```

26 while(x <= 200000) x *= 2;
27 seg.resize(2 * x, 0);
28
29 int res = 1;
30 for(int i = 0; i < nums.size(); ++i) {
31     int left = max(1, nums[i] - k), right = nums[i] - 1;
32     int q = query(left, right, 0, 0, x - 1); // check for the element
in the range of [nums[i] - k, nums[i] - 1] with the maximum value
33     res = max(res, q + 1);
34     upd(nums[i], q + 1, 0, 0, x - 1); //update current value
35 }
36 return res;
37 }
38 };

```

**Testcase** **Test Result**

**Accepted** Runtime: 4 ms

Case 1 Case 2 Case 3

Input

nums =