ASSIGNMENT-4

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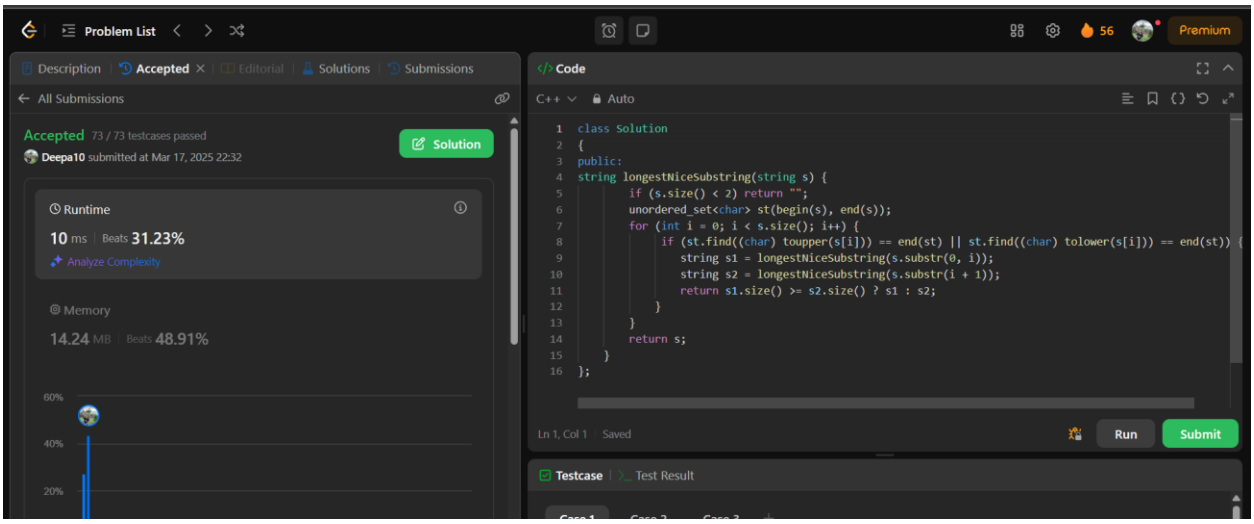
Branch: CSE **Section/Group:** 22BCS_IOT-609/B
Semester: 6th **Subject Code:** 22CSP-351
Subject Name: Advanced Programming Lab-II

1. **Problem Statement :**
   Longest Nice Substring
   https://leetcode.com/problems/longest-nice-substring/description/

   Code:

```
class Solution {
    public String longestNiceSubstring(String s) {
        if (s.length() < 2) return "";
        char[] arr = s.toCharArray();
        Set<Character> set = new HashSet<>();
        for (char c: arr) set.add(c);
        for (int i = 0; i < arr.length; i++) {
            char c = arr[i];
            if (set.contains(Character.toUpperCase(c)) &&
set.contains(Character.toLowerCase(c))) continue;
            String sub1 = longestNiceSubstring(s.substring(0, i));
            String sub2 = longestNiceSubstring(s.substring(i+1));
            return sub1.length() >= sub2.length() ? sub1 : sub2;
        }
        return s;
    }
}
```

OUTPUT:



2. **Problem Statement:**

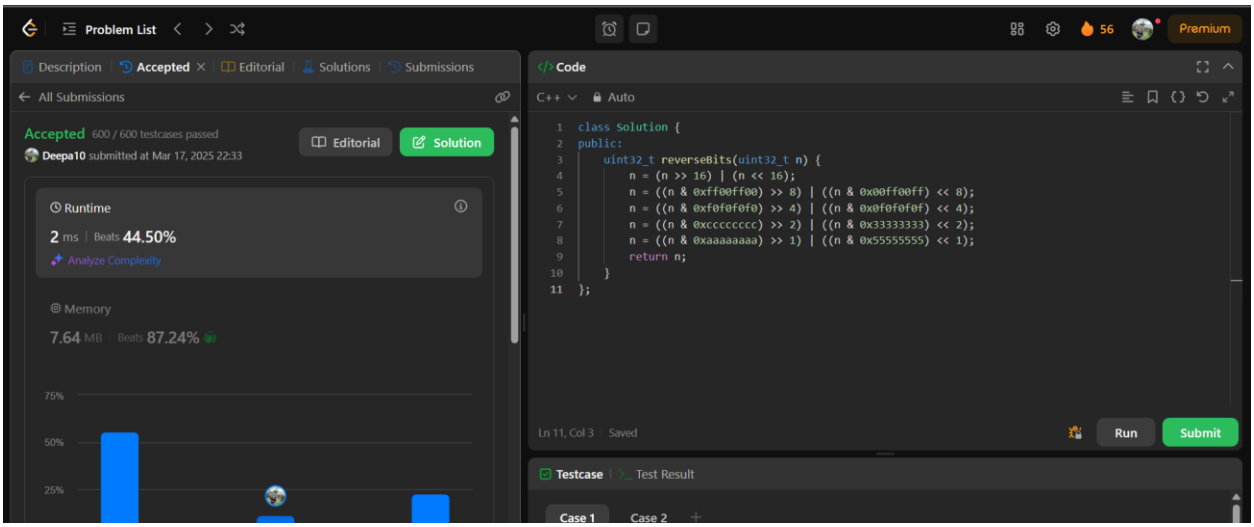
Reverse Bits

https://leetcode.com/problems/reverse-bits/description/

Code:

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

OUTPUT:



3. **Problem Statement:**

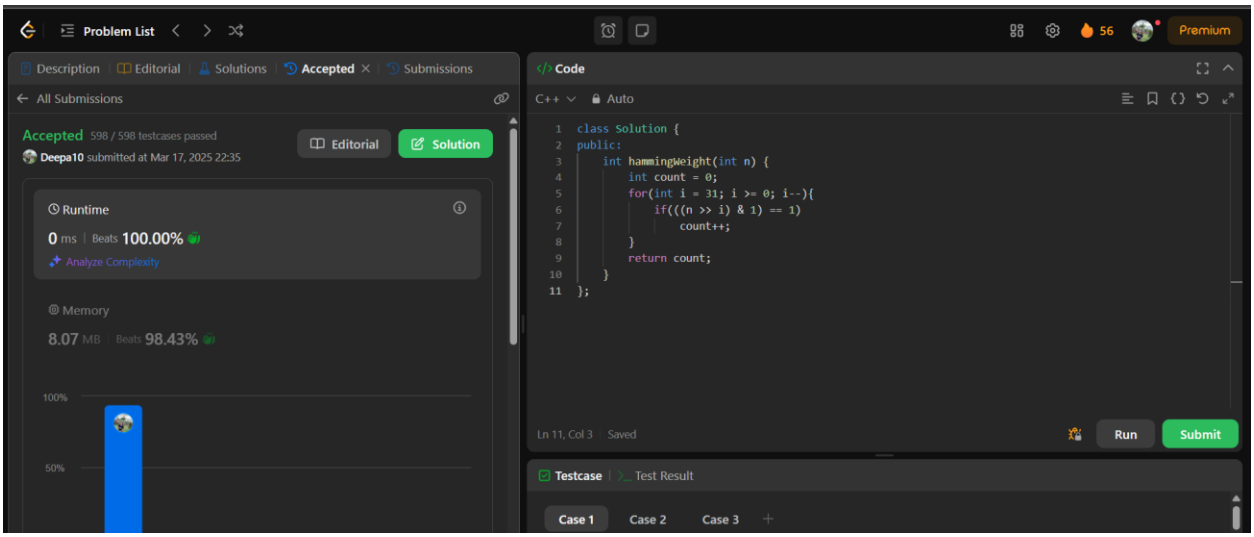
Number of 1 Bits

https://leetcode.com/problems/number-of-1-bits/description/

CODE:

```
class Solution {
public:
    int hammingWeight(int n) {
        int count = 0;
        while (n != 0) {
            count += n & 1;
            n >>= 1;
        }
        return count;
    }
};
```

OUTPUT:



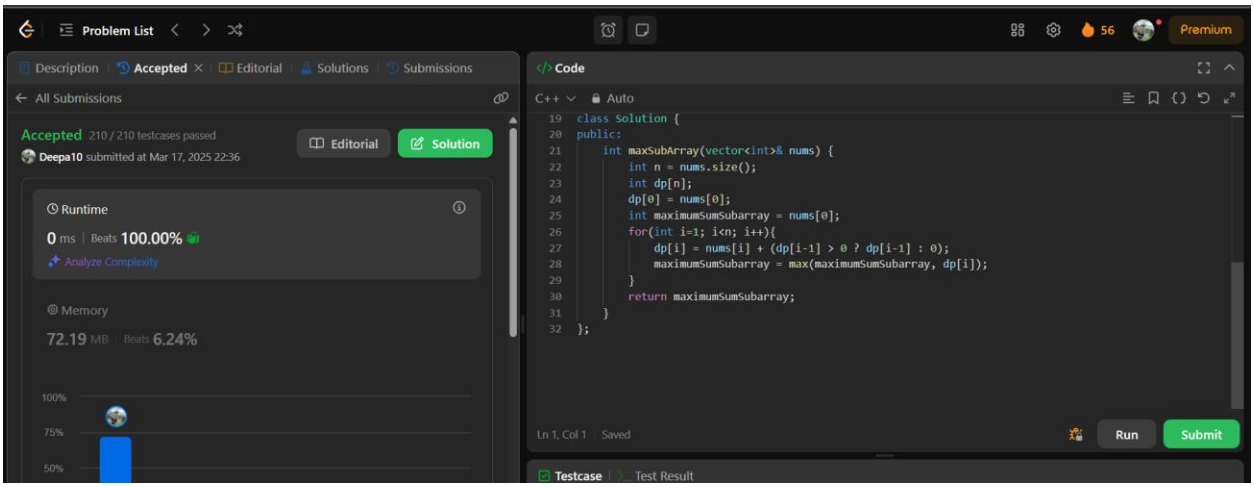
4. **Problem Statement:**
Maximum Subarray
https://leetcode.com/problems/maximum-subarray/description/

CODE:

```
class Solution {
public:
    int maxSubArray(vector<int>& nums) {
        int sum=0;
        int maxi=nums[0];

        for (int i=0;i<nums.size();i++){
            sum=sum+nums[i];
            maxi=max(maxi,sum);

            if (sum<0)
            {
                sum=0;
            }
```

```
        }
        return maxi;

    }
};
```

OUTPUT:



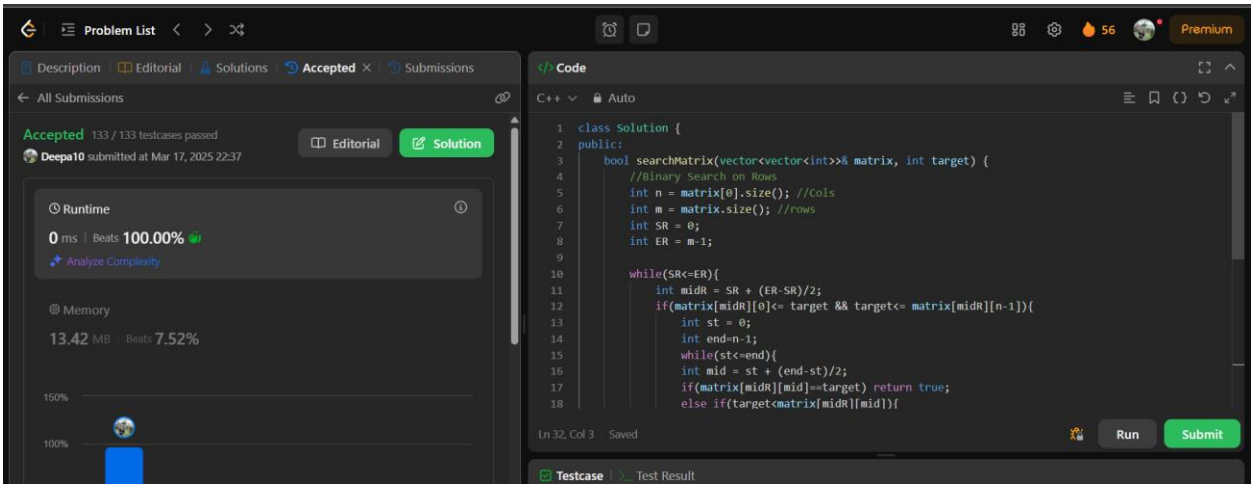
5. **Problem Statement:**
   Search a 2D Matrix II
   https://leetcode.com/problems/search-a-2d-matrix-ii/description/

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;
        while (row < rows && col >= 0) {
            if (matrix[row][col] == target) return true;
            else if (matrix[row][col] > target) col--;
```

```
            else row++;
        }
        return false;
    }
};
```

OUTPUT:



6. **Problem Statement:**

Super Pow

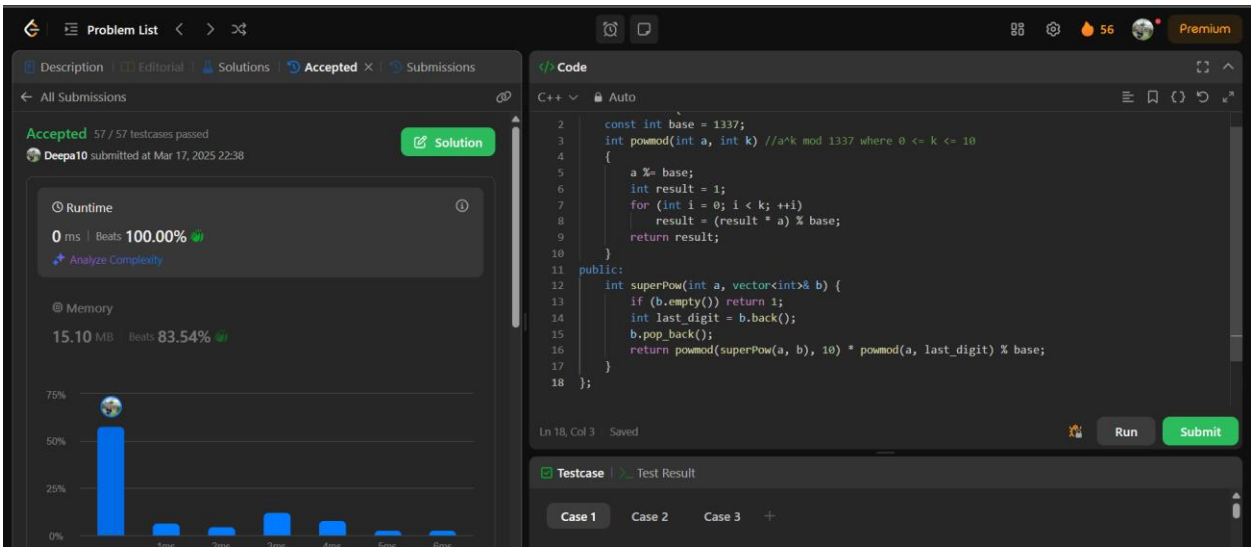
https://leetcode.com/problems/super-pow/description/

CODE:

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

    int powMod(int a, int b) {
        int result = 1;
        a %= MOD;
        for (int i = 0; i < b; i++) {
            result = (result * a) % MOD;
```

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

OUTPUT:



7. **Problem Statement:**

Beautiful Array

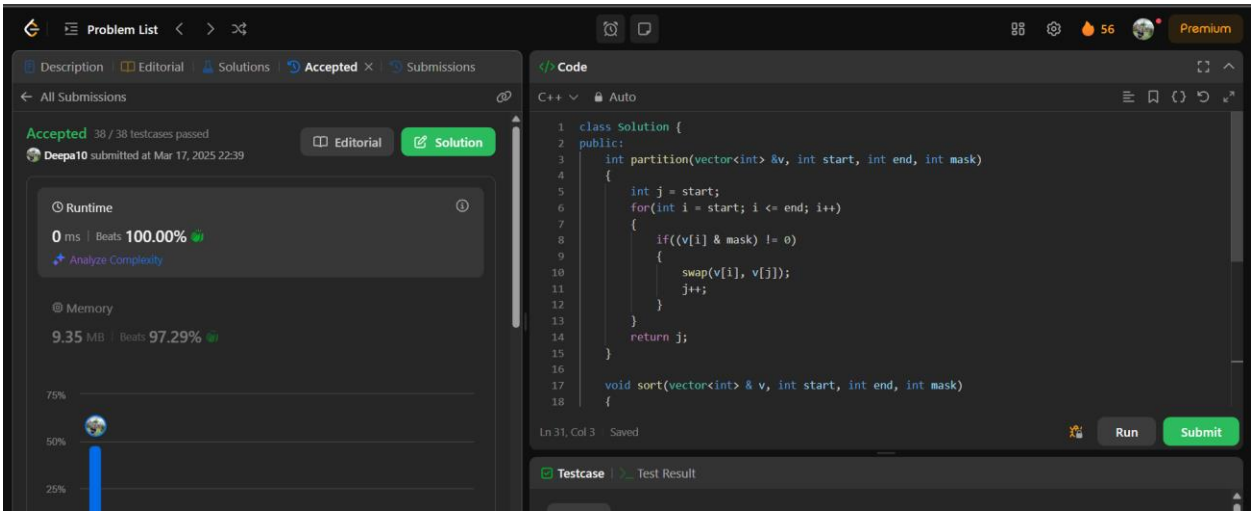
https://leetcode.com/problems/beautiful-array/description/

CODE:

```
class Solution {
public:
    vector<int> beautifulArray(int n) {
        if (n == 1) return {1};
```

```
        vector<int> oddPart = beautifulArray((n + 1) / 2);
        vector<int> evenPart = beautifulArray(n / 2);
        vector<int> result;
        for (int num : oddPart) result.push_back(2 * num - 1);
        for (int num : evenPart) result.push_back(2 * num);
        return result;
    }
};
```

OUTPUT:



8. Problem Statement:

The Skyline Problem

https://leetcode.com/problems/the-skyline-problem/description/

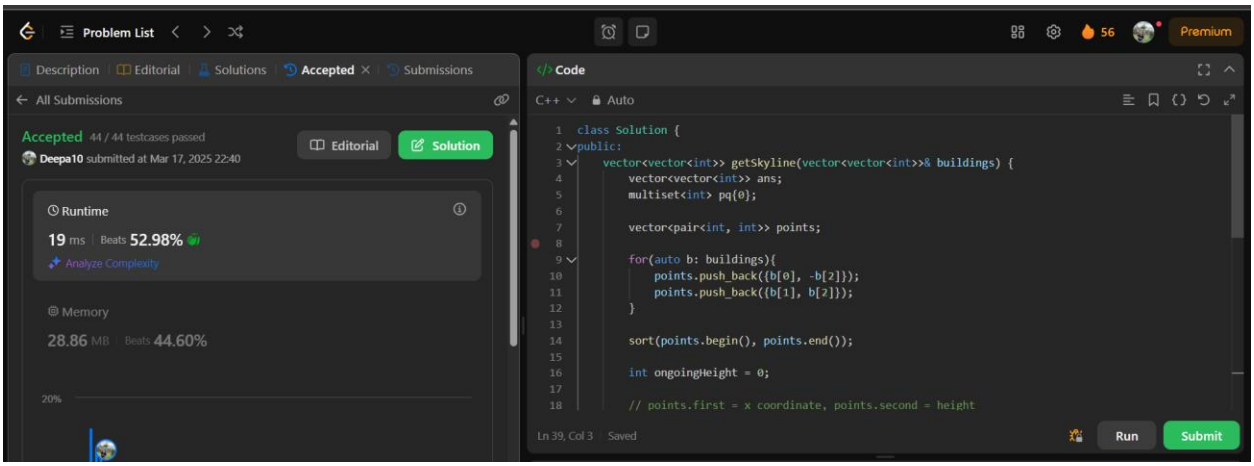
CODE:

```
class Solution {
public:
    vector<vector<int>> getSkyline(vector<vector<int>>& buildings) {
        vector<pair<int, int>> events;
        vector<vector<int>> result;
```

```
    for (auto& b : buildings) {
        events.emplace_back(b[0], -b[2]);
        events.emplace_back(b[1], b[2]);
    }

    sort(events.begin(), events.end(), [](pair<int, int>& a, pair<int, int>&
b) {
        if (a.first != b.first) return a.first < b.first;
        return a.second < b.second;
    });

    multiset<int> heights = {0};
    int prevHeight = 0;

    for (auto& e : events) {
        int x = e.first, h = e.second;

        if (h < 0) {
            heights.insert(-h);
        } else {
            heights.erase(heights.find(h));
        }

        int currHeight = *heights.rbegin();

        if (currHeight != prevHeight) {
            result.push_back({x, currHeight});
            prevHeight = currHeight;
        }
    }

    return result;
```

```
    }
};
```

OUTPUT:



9. **Problem Statement:**

Reverse Pairs

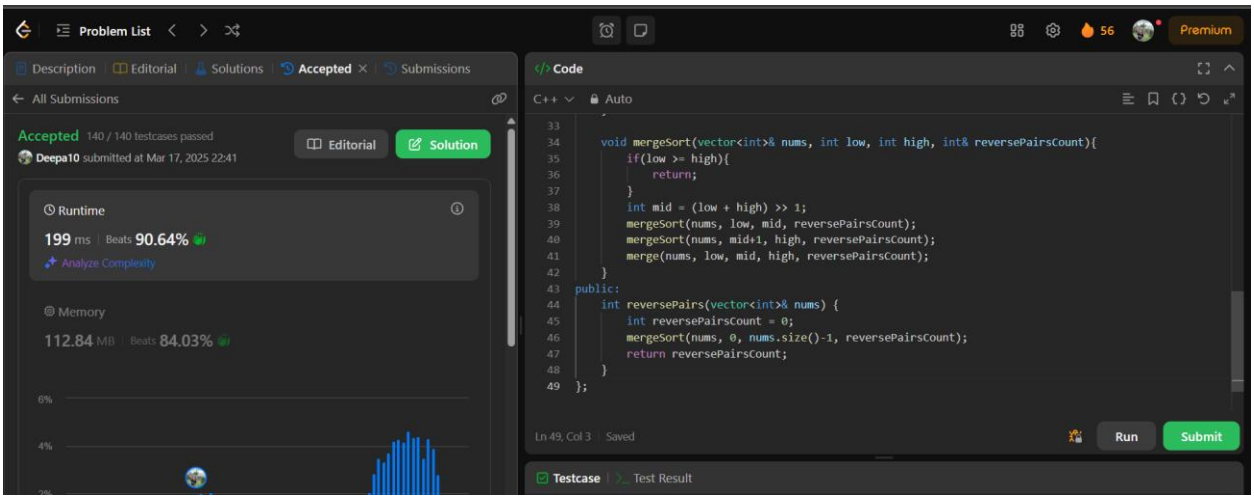
https://leetcode.com/problems/reverse-pairs/description/

CODE:

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

private:
    int mergeSort(vector<int>& nums, int left, int right) {
        if (left >= right) return 0;

        int mid = left + (right - left) / 2;
        int count = mergeSort(nums, left, mid) + mergeSort(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));
        }

        merge(nums, left, mid, right);
        return count;
    }

    void merge(vector<int>& nums, int left, int mid, int right) {
        vector<int> temp;
        int i = left, j = mid + 1;

        while (i <= mid && j <= right) {
            if (nums[i] <= nums[j]) temp.push_back(nums[i++]);
            else temp.push_back(nums[j++]);
        }

        while (i <= mid) temp.push_back(nums[i++]);
        while (j <= right) temp.push_back(nums[j++]);

        for (int k = 0; k < temp.size(); k++) {
            nums[left + k] = temp[k];
        }
    }
};
```

OUTPUT:



10. Problem Statement

Longest Increasing Subsequence II:

https://leetcode.com/problems/longest-increasing-subsequence-ii/description/

CODE:

```
class SegmentTree {
    vector<int> tree;
    int size;

public:
    SegmentTree(int n) : size(n) {
        tree.resize(4 * n, 0);
    }

    void update(int index, int value, int node = 1, int start = 0, int end = -1)
{
        if (end == -1) end = size - 1;
        if (start == end) {
            tree[node] = value;
```

```
            return;
        }
        int mid = (start + end) / 2;
        if (index <= mid) update(index, value, 2 * node, start, mid);
        else update(index, value, 2 * node + 1, mid + 1, end);
        tree[node] = max(tree[2 * node], tree[2 * node + 1]);
    }

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

class Solution {
public:
    int lengthOfLIS(vector<int>& nums, int k) {
        int maxVal = *max_element(nums.begin(), nums.end());
        SegmentTree segTree(maxVal + 1);
        int maxLength = 0;

        for (int num : nums) {
            int bestPrev = segTree.query(max(0, num - k), num - 1);
            int currLength = bestPrev + 1;
            segTree.update(num, currLength);
            maxLength = max(maxLength, currLength);
        }
```

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

OUTPUT: