CU CHANDIGARH UNIVERSITY

DEPARTMENT OF
COMPUTER SCIENCE & ENGINEERING

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ASSIGNMENT-4

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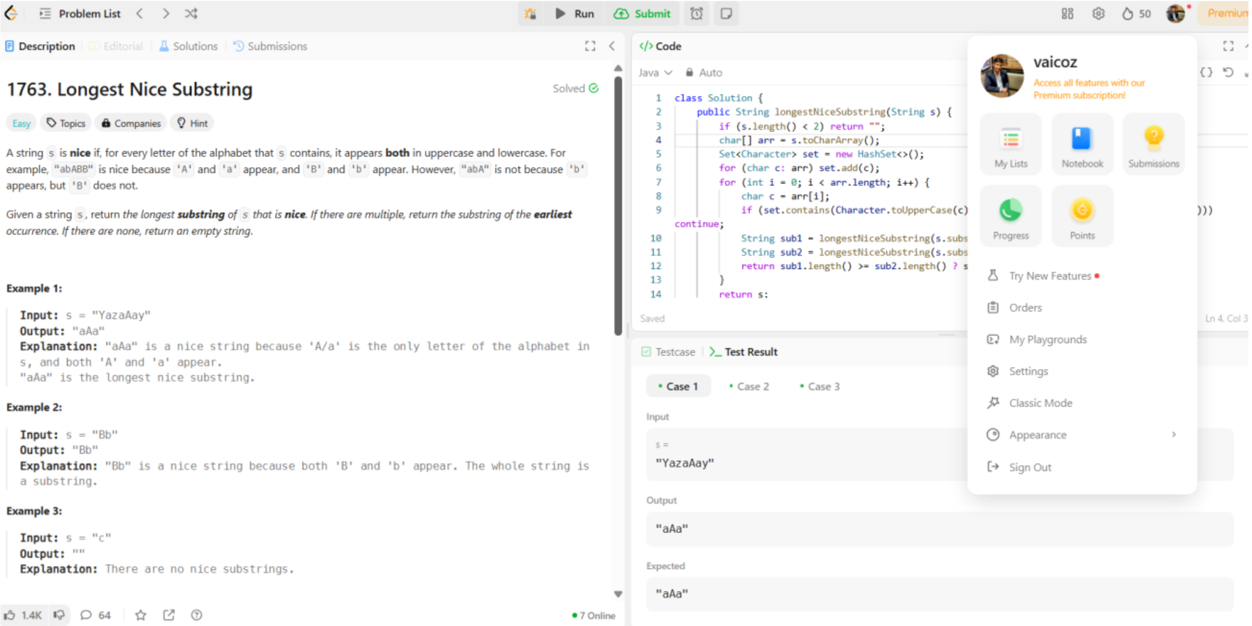
Semester: 6th	**Subject Code:** 22CSP-351
Subject Name: Advanced Programming Lab-II	

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:



1763. Longest Nice Substring

A string `s` is **nice** if, for every letter of the alphabet that `s` contains, it appears **both** in uppercase and lowercase. For example, `"abABB"` is nice because `'A'` and `'a'` appear, and `'B'` and `'b'` appear. However, `"abA"` is not because `'b'` appears, but `'B'` does not.

Given a string `s`, return *the longest **substring** of `s` that is **nice**. If there are multiple, return the substring of the **earliest** occurrence. If there are none, return an empty string.*

Example 1:

```
Input: s = "YazaAay"
Output: "aAa"
Explanation: "aAa" is a nice string because 'A/a' is the only letter of the alphabet in
s, and both 'A' and 'a' appear.
"aAa" is the longest nice substring.
```

Example 2:

```
Input: s = "Bb"
Output: "Bb"
Explanation: "Bb" is a nice string because both 'B' and 'b' appear. The whole string is
a substring.
```

Example 3:

```
Input: s = "c"
Output: ""
Explanation: There are no nice substrings.
```

```java
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)                              )))
continue;
            String sub1 = longestNiceSubstring(s.subs
            String sub2 = longestNiceSubstring(s.subs
            return sub1.length() >= sub2.length() ? s
        }
        return s:
```

Input

```
s =
"YazaAay"
```

Output

```
"aAa"
```

Expected

```
"aAa"
```

2. Problem Statement:

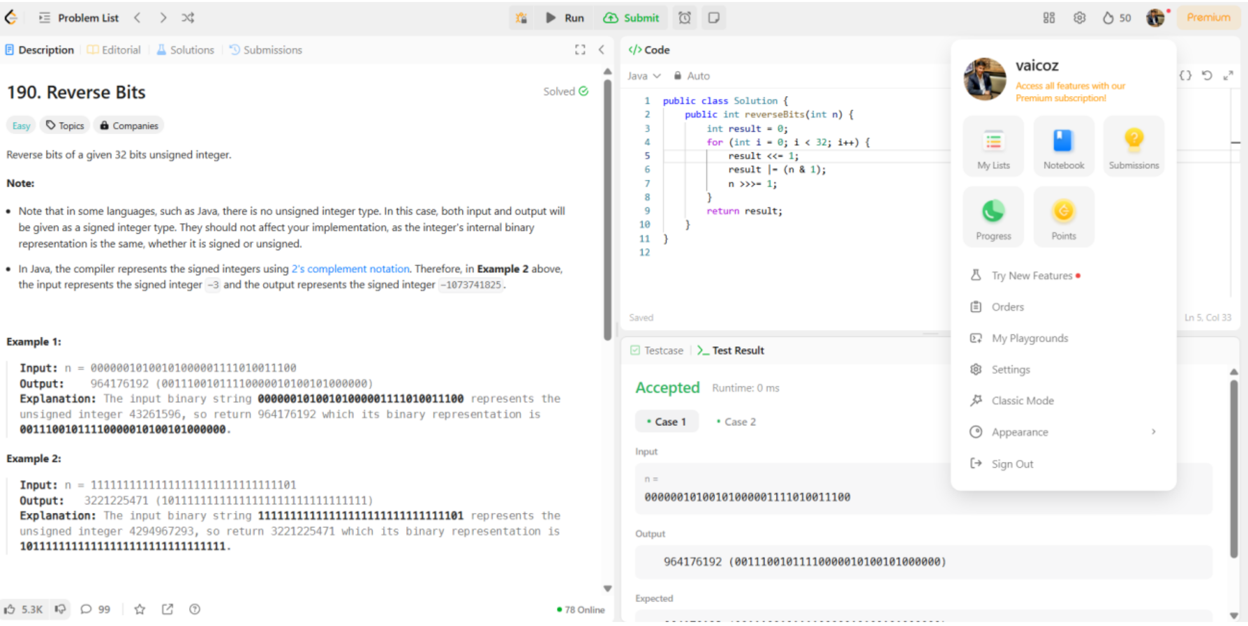
Reverse Bits

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:



190. Reverse Bits

Solved ✓

Reverse bits of a given 32 bits unsigned integer.

Note:

- Note that in some languages, such as Java, there is no unsigned integer type. In this case, both input and output will be given as a signed integer type. They should not affect your implementation, as the integer's internal binary representation is the same, whether it is signed or unsigned.
- In Java, the compiler represents the signed integers using 2's complement notation. Therefore, in **Example 2** above, the input represents the signed integer `-3` and the output represents the signed integer `-1073741825`.

Example 1:

```
Input: n = 00000010100101000001111010011100
Output:    964176192 (00111001011110000010100101000000)
Explanation: The input binary string 00000010100101000001111010011100 represents the
unsigned integer 43261596, so return 964176192 which its binary representation is
00111001011110000010100101000000.
```

Example 2:

```
Input: n = 11111111111111111111111111111101
Output:   3221225471 (10111111111111111111111111111111)
Explanation: The input binary string 11111111111111111111111111111101 represents the
unsigned integer 4294967293, so return 3221225471 which its binary representation is
10111111111111111111111111111111.
```

```
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;
    }
}
```

Accepted Runtime: 0 ms

Input

```
n =
00000010100101000001111010011100
```

Output

```
964176192 (00111001011110000010100101000000)
```

Expected

3. Problem Statement:

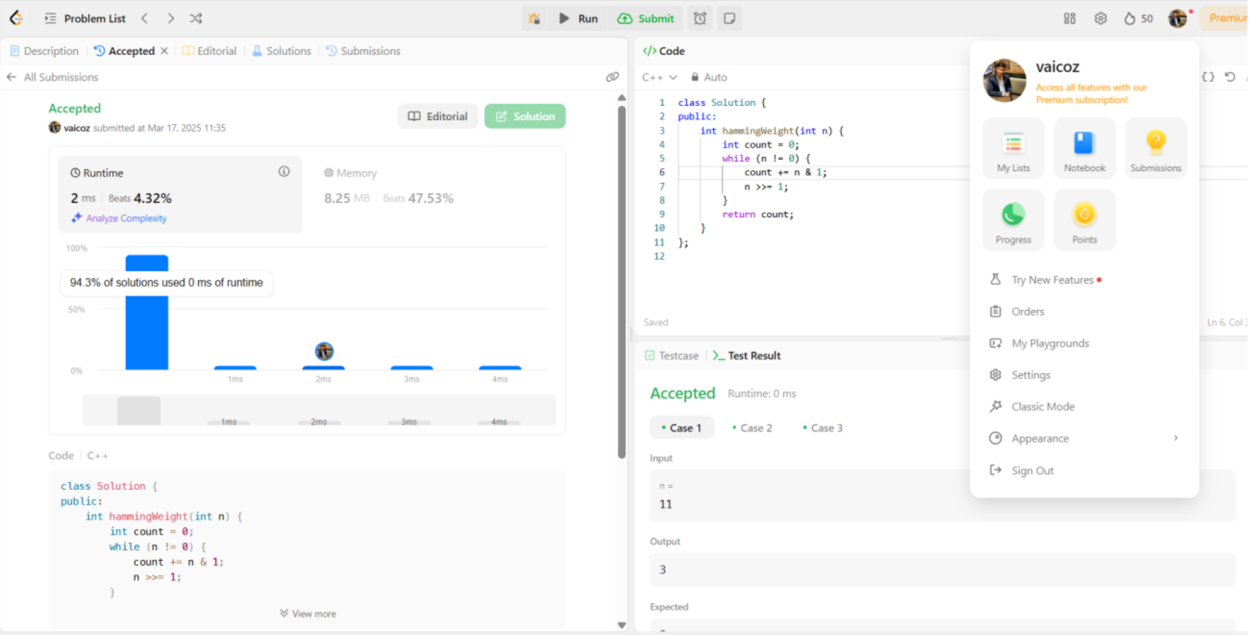
Number of 1 Bits

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:



Accepted
vaicoz submitted at Mar 17, 2025 11:35

Runtime 2 ms | Beats 4.32%

Memory 8.25 MB | Beats 47.53%

94.3% of solutions used 0 ms of runtime

Code | C++

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

View more

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

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Accepted Runtime: 0 ms

Case 1 Case 2 Case 3

Input

n =
11

Output

3

Expected

4. Problem Statement:

Maximum Subarray

https://leetcode.com/problems/maximum-subarray/description/

CODE:

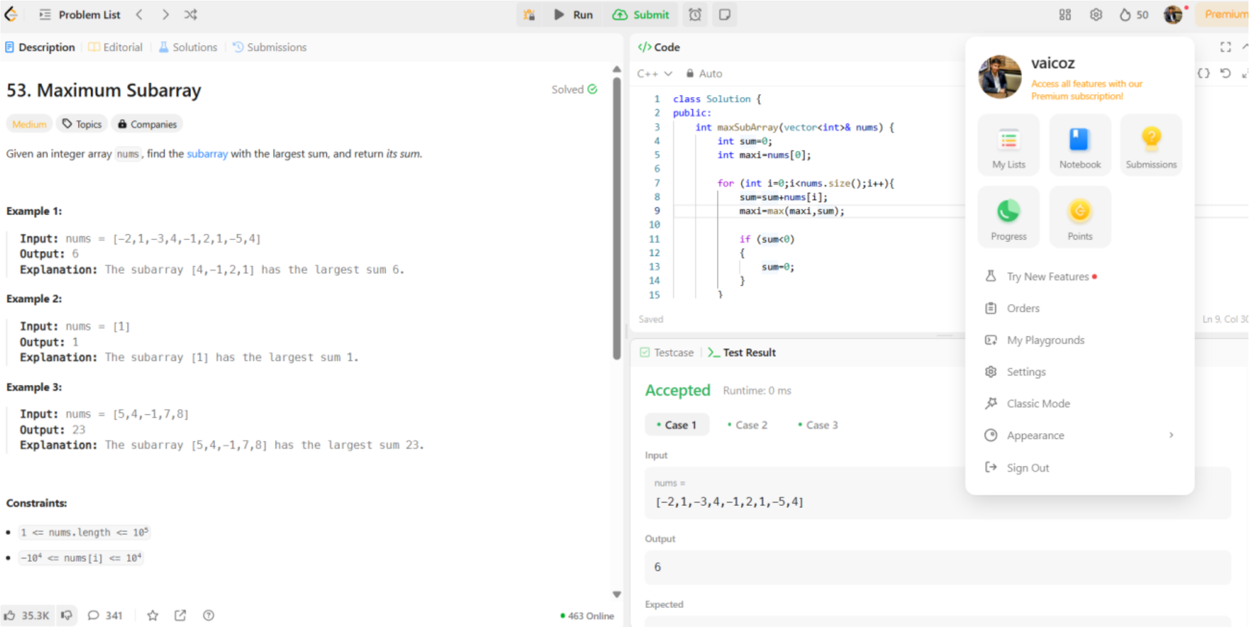
```
class Solution {
public:
    int maxSubArray(vector<int>& nums) {
        int sum=0;
        int maxi=nums[0];

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

            if (sum<0)
            {
                sum=0;
            }
        }
        return maxi;

    }
};
```

OUTPUT:



53. Maximum Subarray

Given an integer array `nums`, find the subarray with the largest sum, and return *its sum*.

Example 1:

```
Input: nums = [-2,1,-3,4,-1,2,1,-5,4]
Output: 6
Explanation: The subarray [4,-1,2,1] has the largest sum 6.
```

Example 2:

```
Input: nums = [1]
Output: 1
Explanation: The subarray [1] has the largest sum 1.
```

Example 3:

```
Input: nums = [5,4,-1,7,8]
Output: 23
Explanation: The subarray [5,4,-1,7,8] has the largest sum 23.
```

Constraints:

- `1 <= nums.length <= 10`^{5}
- `-10`^{4} `<= nums[i] <= 10`^{4}

```
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;
            }
        }
```

Accepted Runtime: 0 ms

• Case 1 • Case 2 • Case 3

Input

```
nums =
[-2,1,-3,4,-1,2,1,-5,4]
```

Output

```
6
```

Expected

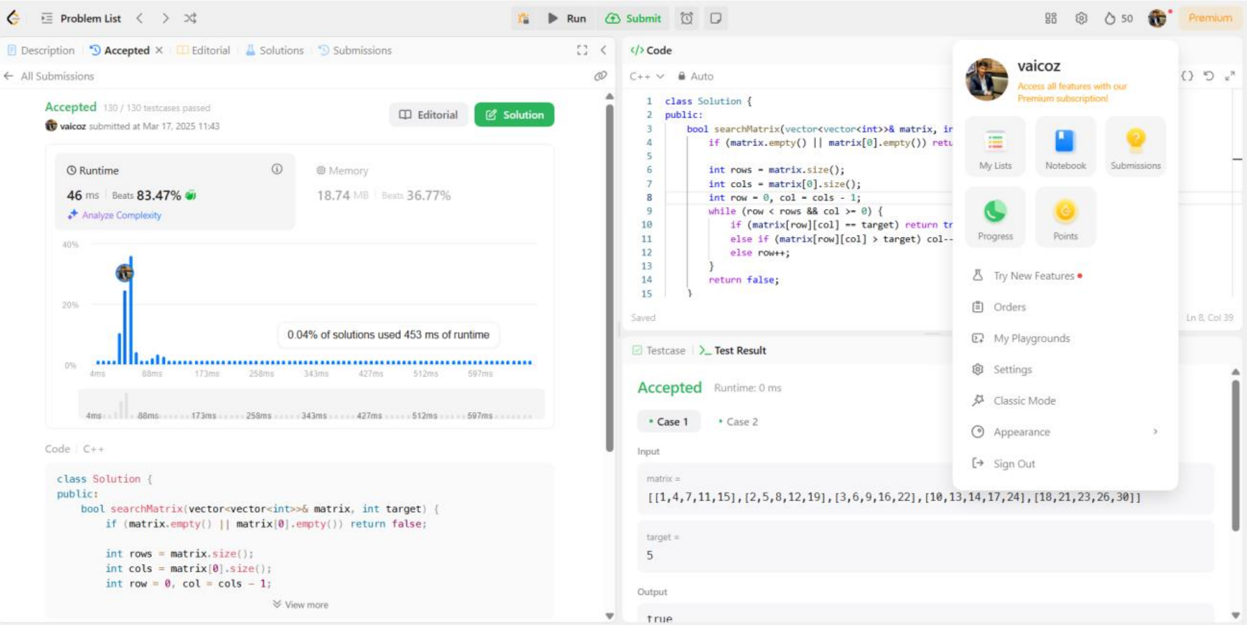
5. **Problem Statement:**
Search a 2D Matrix II
https://leetcode.com/problems/search-a-2d-matrix-ii/description/

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:



Accepted 130 / 130 testcases passed

vaicoz submitted at Mar 17, 2025 11:43

46 ms | Beats 83.47%

18.74 MB | Beats 36.77%

0.04% of solutions used 453 ms of runtime

```
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;
```

View more

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

        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 tr
            else if (matrix[row][col] > target) col--
            else row++;
        }
        return false;
    }
```

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Accepted Runtime: 0 ms

Input

```
matrix =
[[1,4,7,11,15],[2,5,8,12,19],[3,6,9,16,22],[10,13,14,17,24],[18,21,23,26,30]]
target =
5
```

Output

```
true
```

6. Problem Statement:

Super Pow

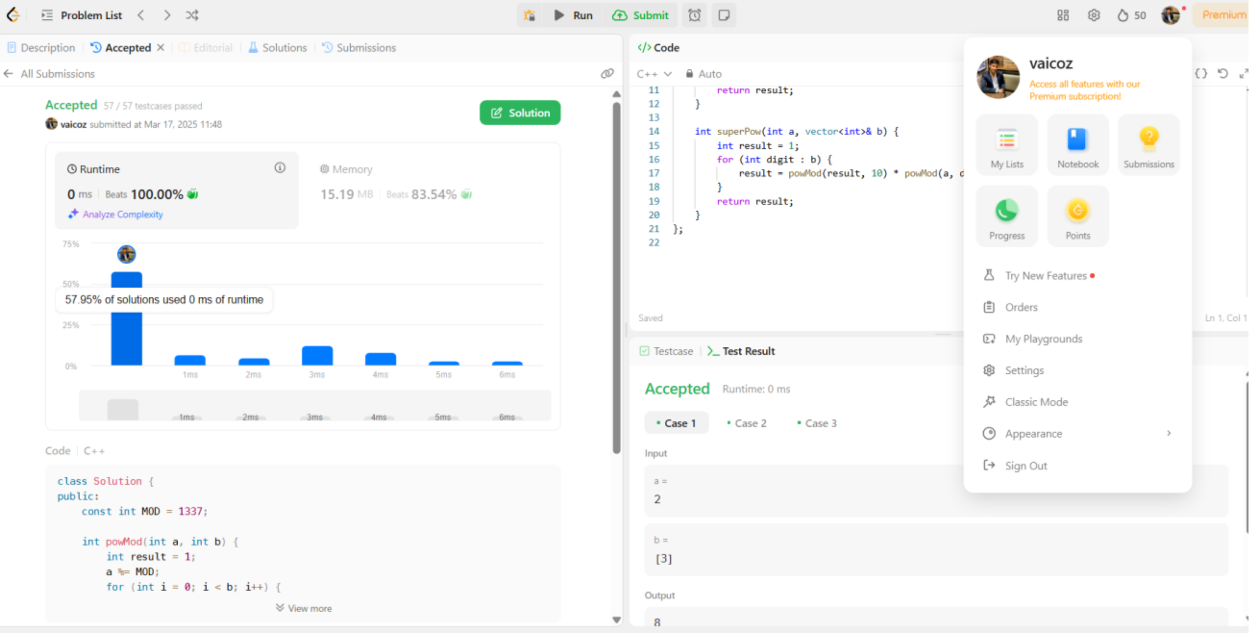
https://leetcode.com/problems/super-pow/description/

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:



Accepted 57 / 57 testcases passed

vaicoz submitted at Mar 17, 2025 11:48

Runtime 0 ms | Beats 100.00%

Memory 15.19 MB | Beats 83.54%

57.95% of solutions used 0 ms of runtime

Code | C++

```
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++) {
```

```
        return result;
    }

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

Accepted Runtime: 0 ms

Input

a =
2

b =
[3]

Output

8

7. Problem Statement:

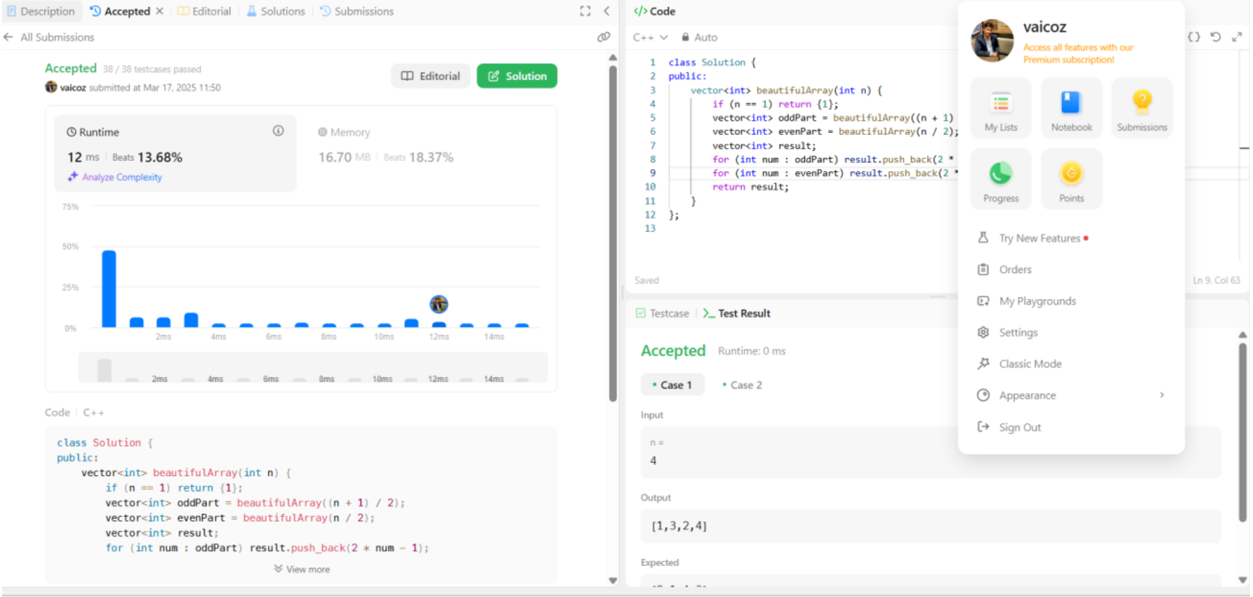
Beautiful Array

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:



Accepted 38 / 38 testcases passed

vaicoz submitted at Mar 17, 2025 11:50

Runtime

12 ms | Beats 13.68%

Analyze Complexity

Memory

16.70 MB | Beats 18.37%

Code | C++

```
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);
```

View more

C++

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

Saved

Ln 9, Col 63

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Accepted Runtime: 0 ms

Input

n =

4

Output

```
[1,3,2,4]
```

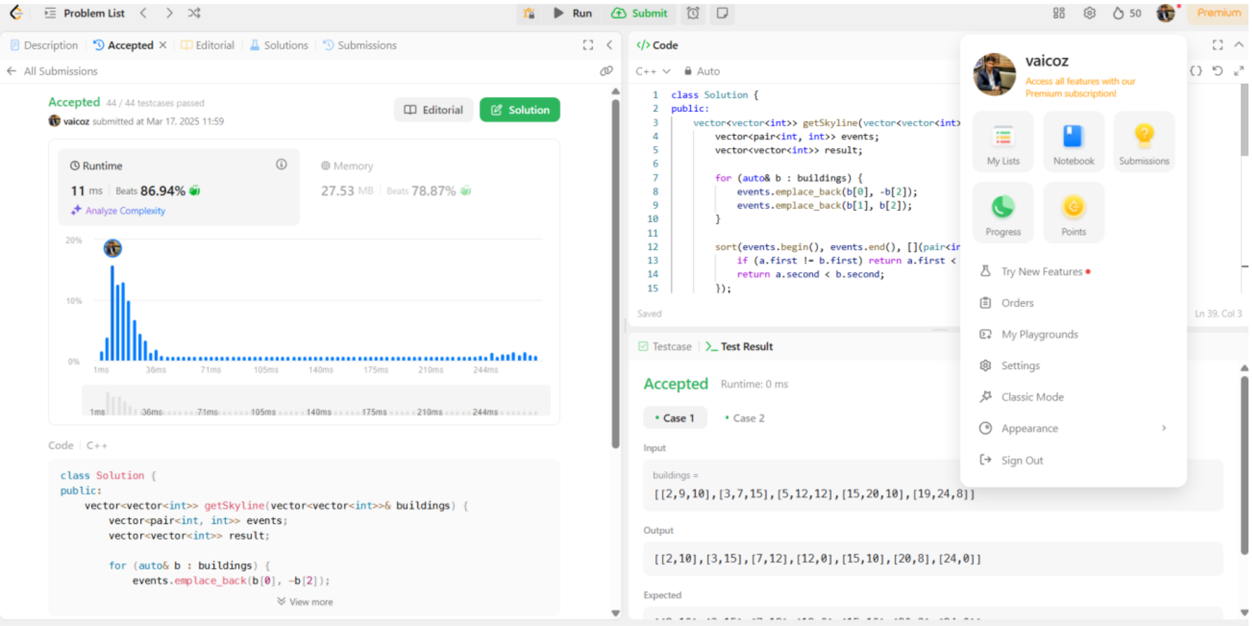
Expected

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:



Accepted 44 / 44 testcases passed
vaicoz submitted at Mar 17, 2025 11:59

Runtime
11 ms | Beats 86.94%

Memory
27.53 MB | Beats 78.87%

Code | C++

```
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]);
```

```
class Solution {
public:
    vector<vector<int>> getSkyline(vector<vector<int>
        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<in
            if (a.first != b.first) return a.first <
            return a.second < b.second;
        });
```

Accepted Runtime: 0 ms

Input

buildings =
```
[[2,9,10],[3,7,15],[5,12,12],[15,20,10],[19,24,8]]
```

Output
```
[[2,10],[3,15],[7,12],[12,0],[15,10],[20,8],[24,0]]
```

Expected

9. Problem Statement:

Reverse Pairs

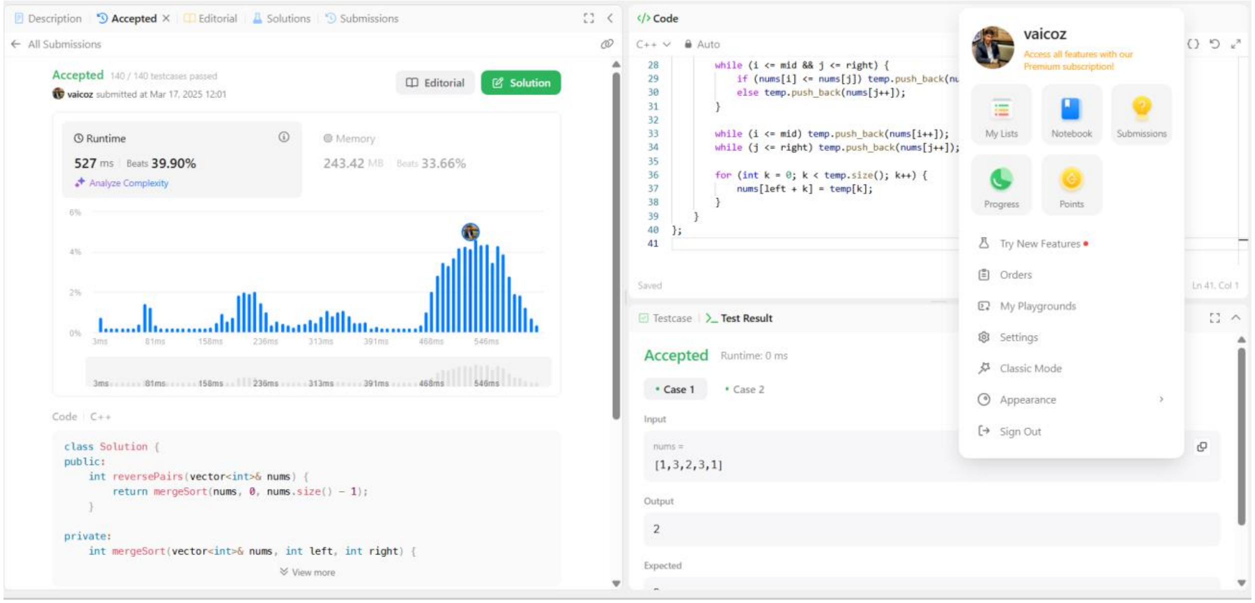
https://leetcode.com/problems/reverse-pairs/description/

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:



Accepted 140 / 140 testcases passed
vaicoz submitted at Mar 17, 2025 12:01

Runtime
527 ms | Beats 39.90%
Analyze Complexity

Memory
243.42 MB | Beats 33.66%

Code | C++

```
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) {
```

View more

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

Accepted Runtime: 0 ms

Input

nums =
[1,3,2,3,1]

Output

2

Expected

10. Problem Statement

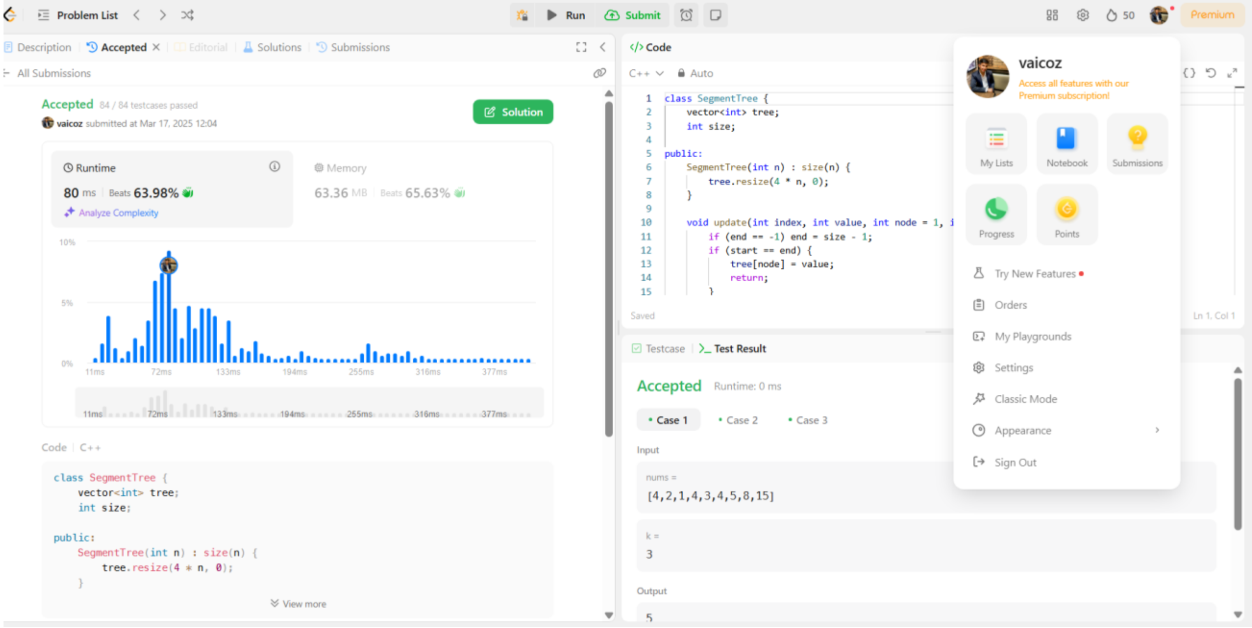
Longest Increasing Subsequence II:

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:



Accepted 84 / 84 testcases passed

vaicoz submitted at Mar 17, 2025 12:04

Runtime
80 ms | Beats 63.98%

Memory
63.36 MB | Beats 65.63%

Code | C++

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

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

```
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, i
        if (end == -1) end = size - 1;
        if (start == end) {
            tree[node] = value;
            return;
        }
```

Accepted Runtime: 0 ms

• Case 1 • Case 2 • Case 3

Input

nums =
[4,2,1,4,3,4,5,8,15]

k =
3

Output

5