AP ASSIGNEMENT – 4

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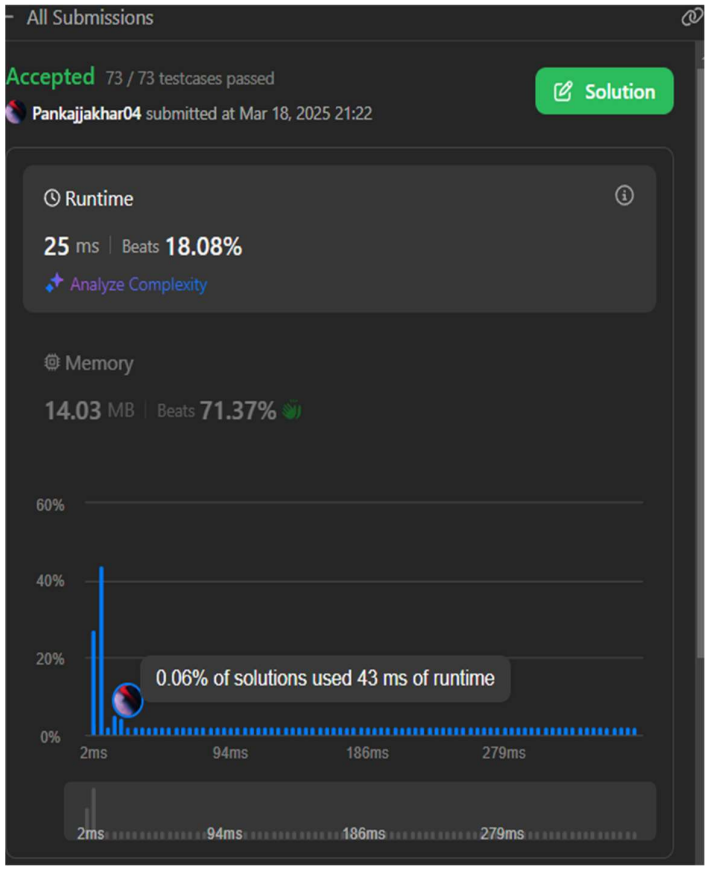
1. Longest Nice Substring: https://leetcode.com/problems/longest-nice-substring/description/

CODE:

```
class Solution {
public:
    string longestNiceSubstring(string s) {
        int n = s.size();
        string longest = "";

        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() > longest.length()) {
                        longest = sub;
                    }
                }
            }
        }
        return longest;
    }
```

```
private:
    bool isNice(const string& s) {
        int lower = 0, upper = 0;
        for (char c : s) {
            if (islower(c)) {
                lower |= (1 << (c - 'a'));
            } else {
                upper |= (1 << (c - 'A'));
            }
        }
        return lower == upper;
    }
};
```

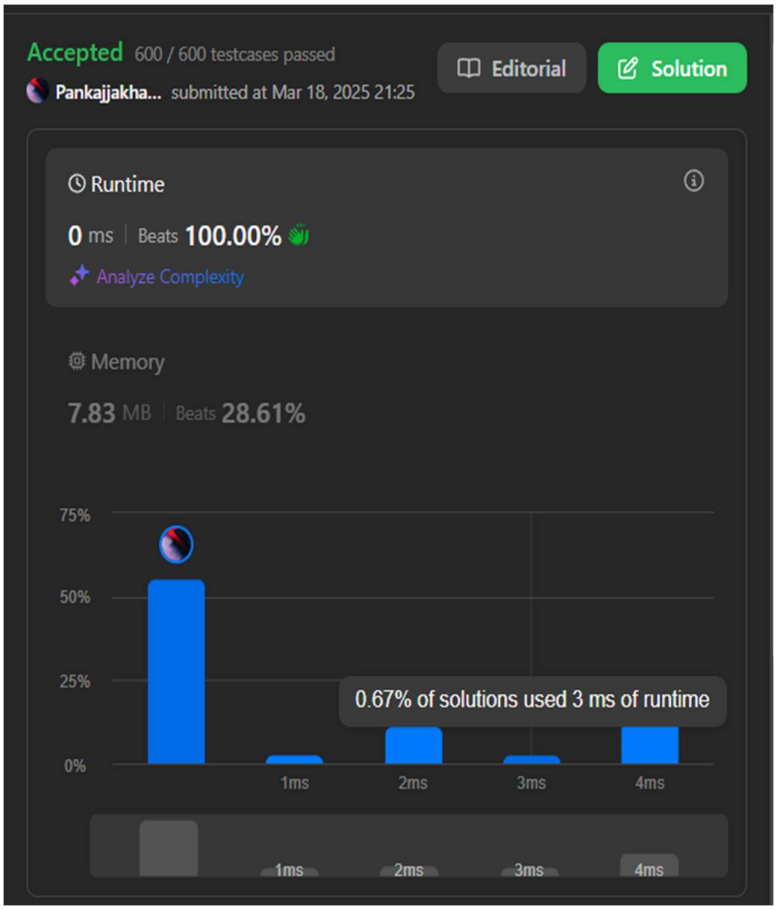


2. Reverse Bits: https://leetcode.com/problems/reverse-bits/description/

CODE:

```
class Solution {
public:
    uint32_t reverseBits(uint32_t n) {
        uint32_t result = 0;
        for (int i = 0; i < 32; i++) {
```

```
            result = (result << 1) | (n & 1);
            n >>= 1;
        }
        return result;
    }
};
```

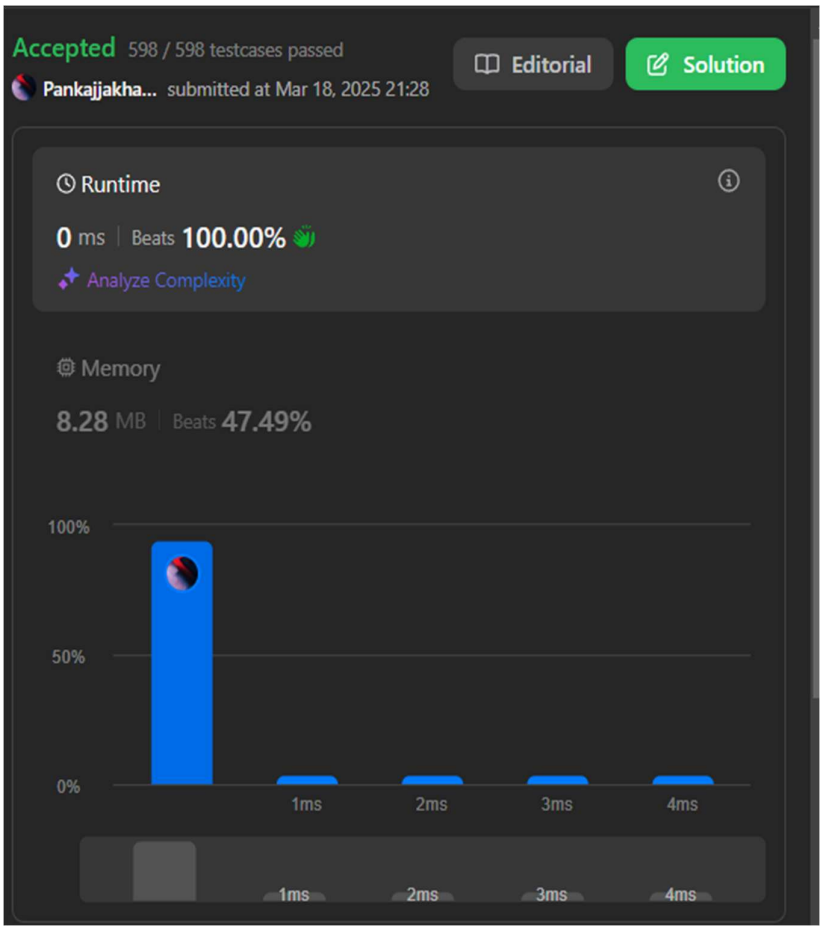


3. Number of 1 Bits: https://leetcode.com/problems/number-of-1-bits/description/

CODE:

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

```
            n >>= 1;
        }
        return count;
    }
};
```

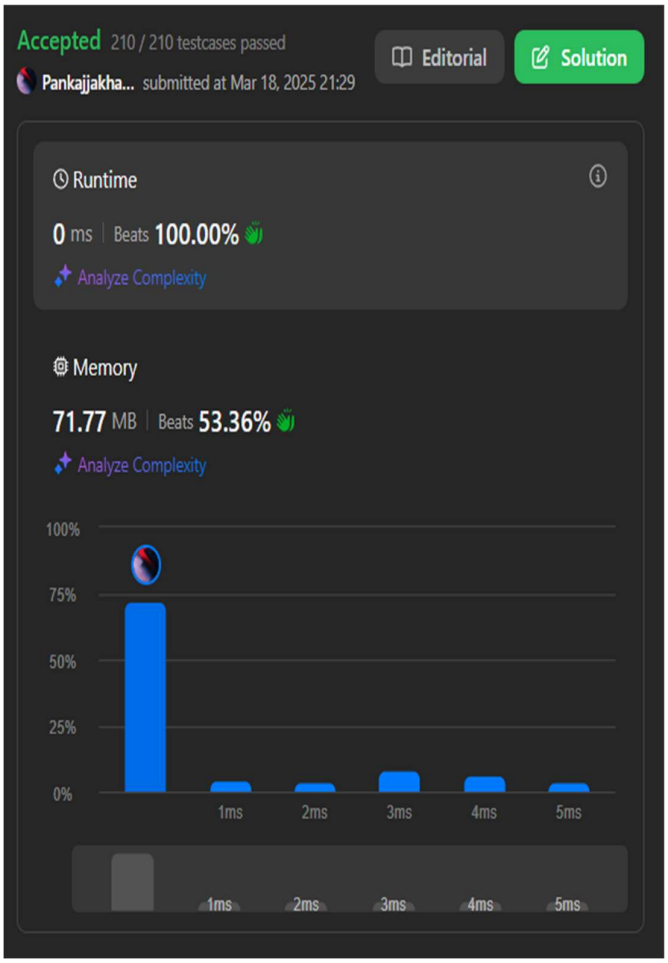


4. Maximum Subarray: https://leetcode.com/problems/maximum-subarray/description/

CODE:

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

        for(int i=1;i<nums.size();i++){
```

```
            maxend=max(maxend+nums[i],nums[i]);

            res=max(res,maxend);
        }

        return res;
    }
};
```

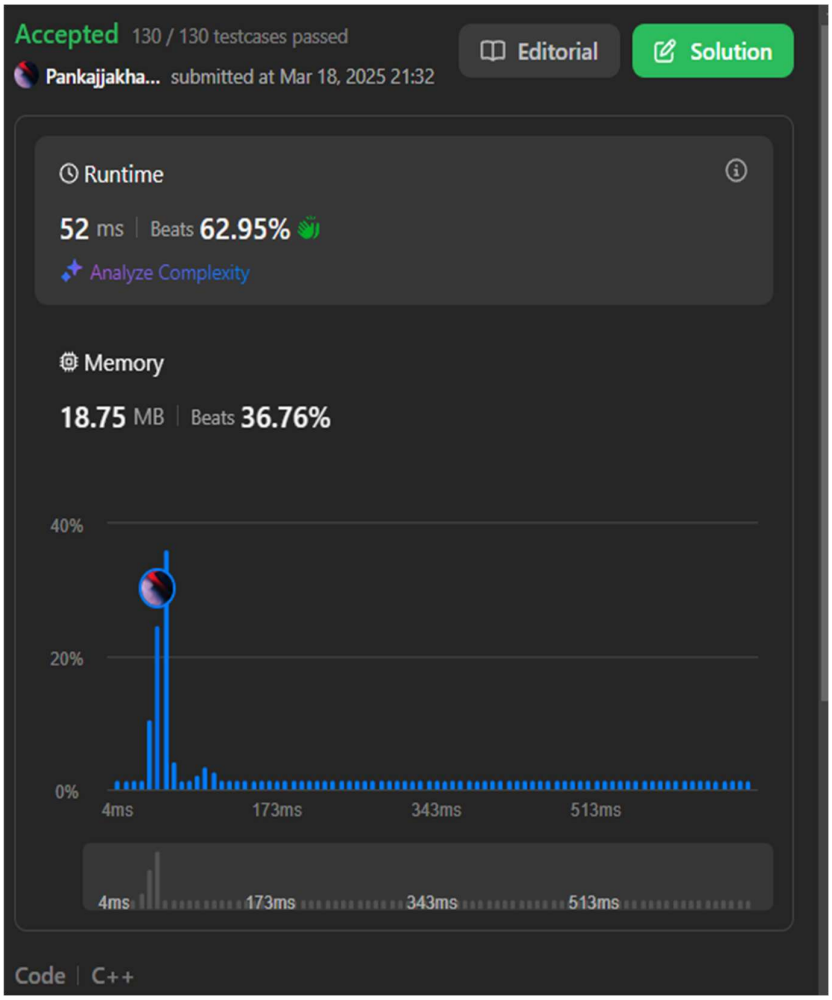


5. Search a 2D Matrix II: https://leetcode.com/problems/search-a-2d-matrix-ii/description/

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;
    }
};
```

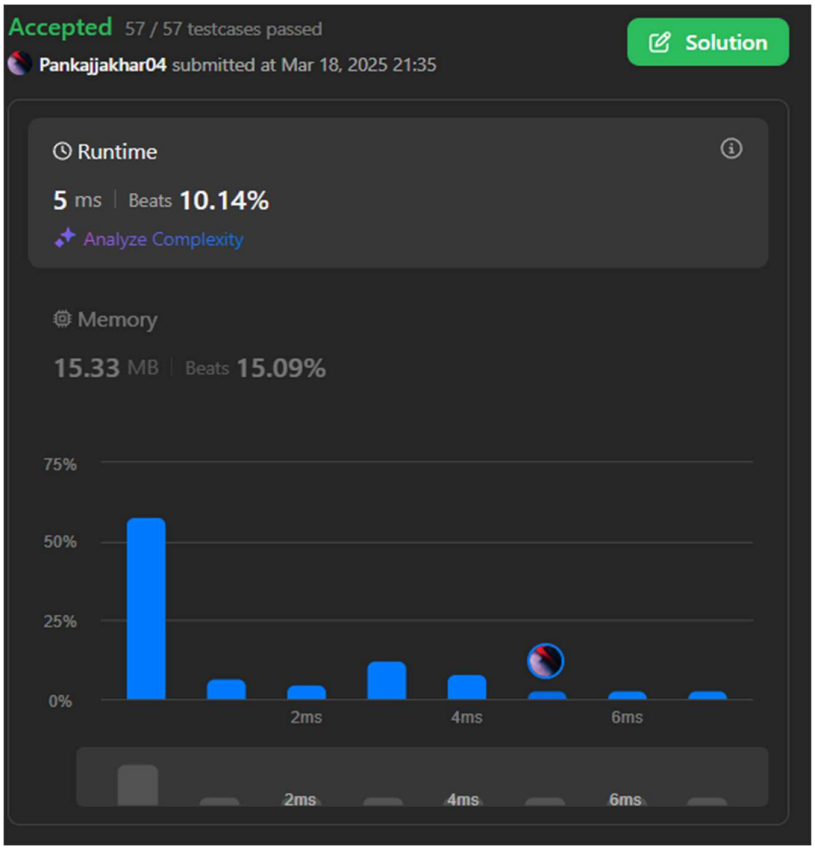


6. Super Pow: https://leetcode.com/problems/super-pow/description/

CODE:

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

    int modPow(int x, int n) {
        int res = 1;
        x %= MOD;
        while (n) {
            if (n % 2) res = (res * x) % MOD;
            x = (x * x) % MOD;
            n /= 2;
        }
        return res;
    }

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

```
        return result;
    }
};
```

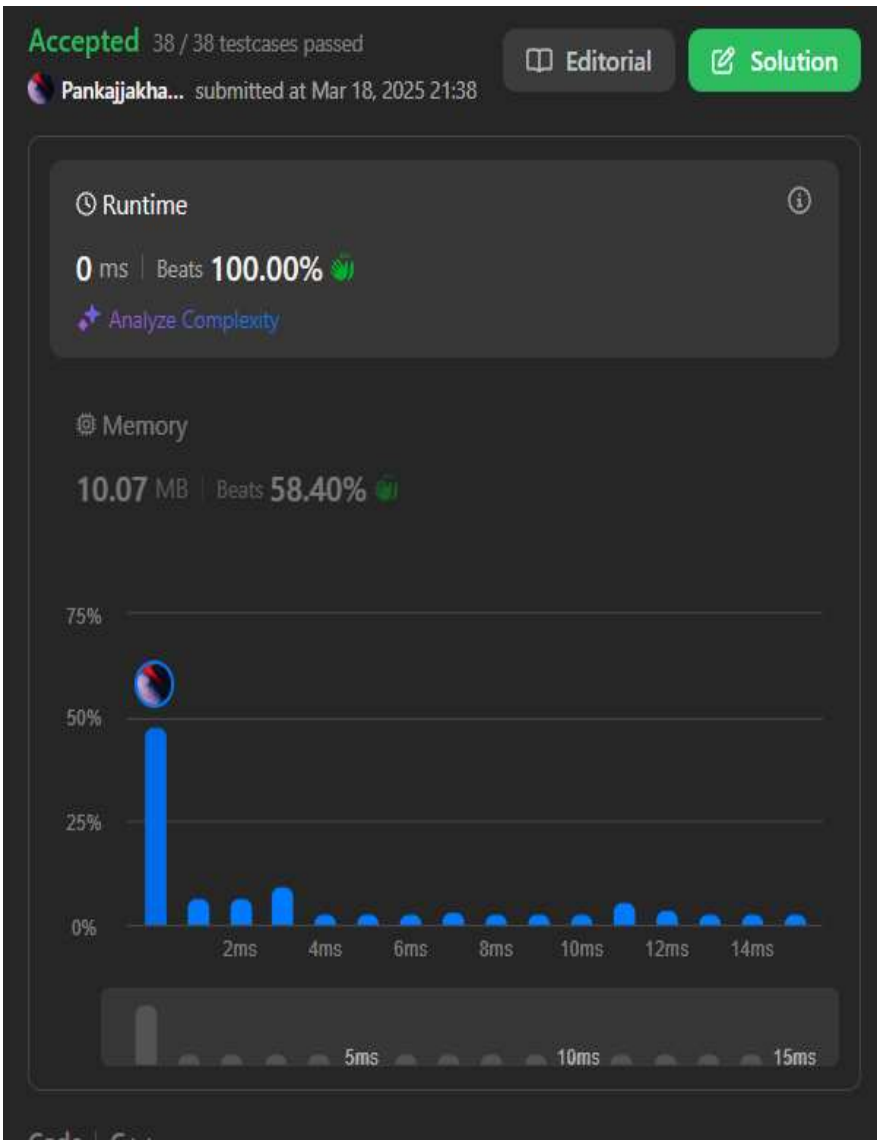


7. Beautiful Array: https://leetcode.com/problems/beautiful-array/description/

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 (2 * num - 1 <= n) temp.push_back(2 * num - 1);  // Odd numbers
        }
        for (int num : result) {
            if (2 * num <= n) temp.push_back(2 * num);  // Even numbers
        }
        result = temp;
    }

    return result;
  }
};
```

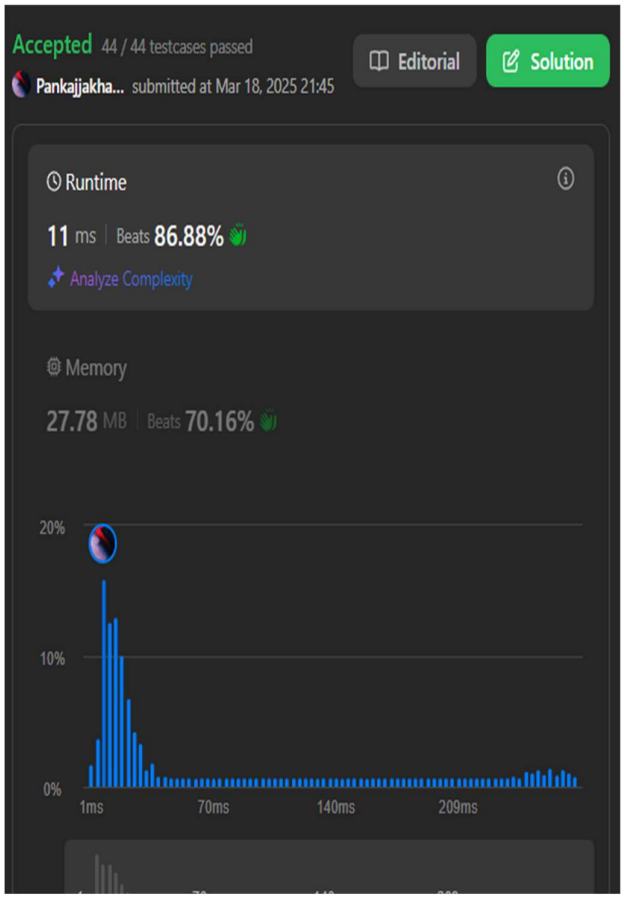


8. The Skyline Problem: https://leetcode.com/problems/the-skyline-problem/description/

CODE:

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

        // Step 1: Convert buildings into events
        for (auto& b : buildings) {
            events.emplace_back(b[0], -b[2]); // Left edge (negative height for entering)
            events.emplace_back(b[1], b[2]);  // Right edge (positive height for leaving)
        }

        // Step 2: Sort events
        sort(events.begin(), events.end());

        // Step 3: Process events using max heap
        multiset<int> heights = {0}; // Initial ground height
        int prevMax = 0;
```

```
        for (auto& [x, h] : events) {
            if (h < 0) {
                heights.insert(-h); // Entering event, add height
            } else {
                heights.erase(heights.find(h)); // Leaving event,
remove height
            }

            int currMax = *heights.rbegin(); // Get current max
height

            if (currMax != prevMax) { // If height changed, add key
point
                result.push_back({x,
currMax});
                prevMax = currMax;
            }
        }

        return result;
    }
};
```



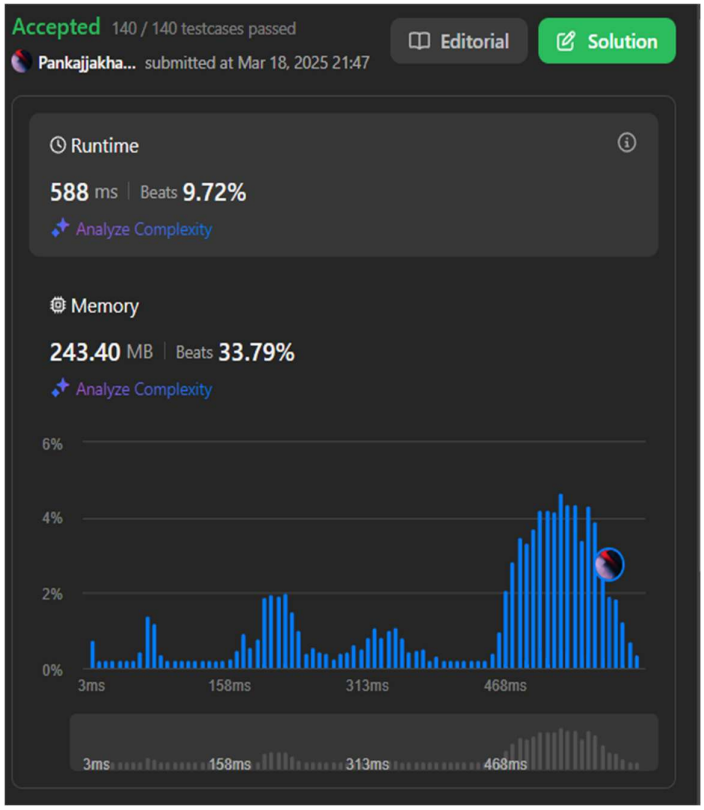
9. Reverse Pairs: https://leetcode.com/problems/reverse-pairs/description/

CODE:

```
class Solution {
public:
    int mergeAndCount(vector<int>& nums, int left, int mid, int right) {
        int count = 0;
        int j = mid + 1;

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

        // Merge step
        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++]);

    // Copy sorted elements back
    for (int i = left; i <= right; i++) {
        nums[i] = temp[i - left];
    }

    return count;
}

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) +
                mergeAndCount(nums, left, mid, right);
```

```
        return count;
    }

    int reversePairs(vector<int>& nums) {
        return mergeSortAndCount(nums, 0, nums.size() - 1);
    }
};
```



10. Longest Increasing Subsequence II: https://leetcode.com/problems/longest-increasing-subsequence-ii/description/

CODE:

```
class Solution {
public:
    class SegmentTree {
    private:
```

```
    vector<int> tree;
    int n;

    void update(int idx, int l, int r, int pos, int value) {
        if (l == r) {
            tree[idx] = value;
            return;
        }
        int mid = (l + r) / 2;
        if (pos <= mid) {
            update(2 * idx + 1, l, mid, pos, value);
        } else {
            update(2 * idx + 2, mid + 1, r, pos, value);
        }
        tree[idx] = max(tree[2 * idx + 1], tree[2 * idx + 2]);
    }

    int query(int idx, int l, int r, int ql, int qr) {
        if (ql > r || qr < l) return 0;
        if (ql <= l && r <= qr) return tree[idx];
        int mid = (l + r) / 2;
        return max(query(2 * idx + 1, l, mid, ql, qr), query(2 *
idx + 2, mid + 1, r, ql, qr));
    }
```

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

    void update(int pos, int value) {
        update(0, 0, n - 1, pos, value);
    }

    int query(int left, int right) {
        if (left > right) return 0;
        return query(0, 0, n - 1, left, right);
    }
};

int lengthOfLIS(vector<int>& nums, int k) {
    int maxValue = *max_element(nums.begin(), nums.end());
    SegmentTree segTree(maxValue + 1);

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

```
            maxLIS = max(maxLIS, currLIS);
        }

        return maxLIS;
    }
};
```