Experiment 4

Student Name: Kuldeep	**UID:** 22BET10168
Branch: IT	**Section/Group:** 22BET_IOT-702/A
Semester: 6th	**Date of Performance:** 14/02/25
Subject Name: Advance Programming-II	**Subject Code:** 22ITP-367

Problem: 1.4.1: Longest Nice Substring

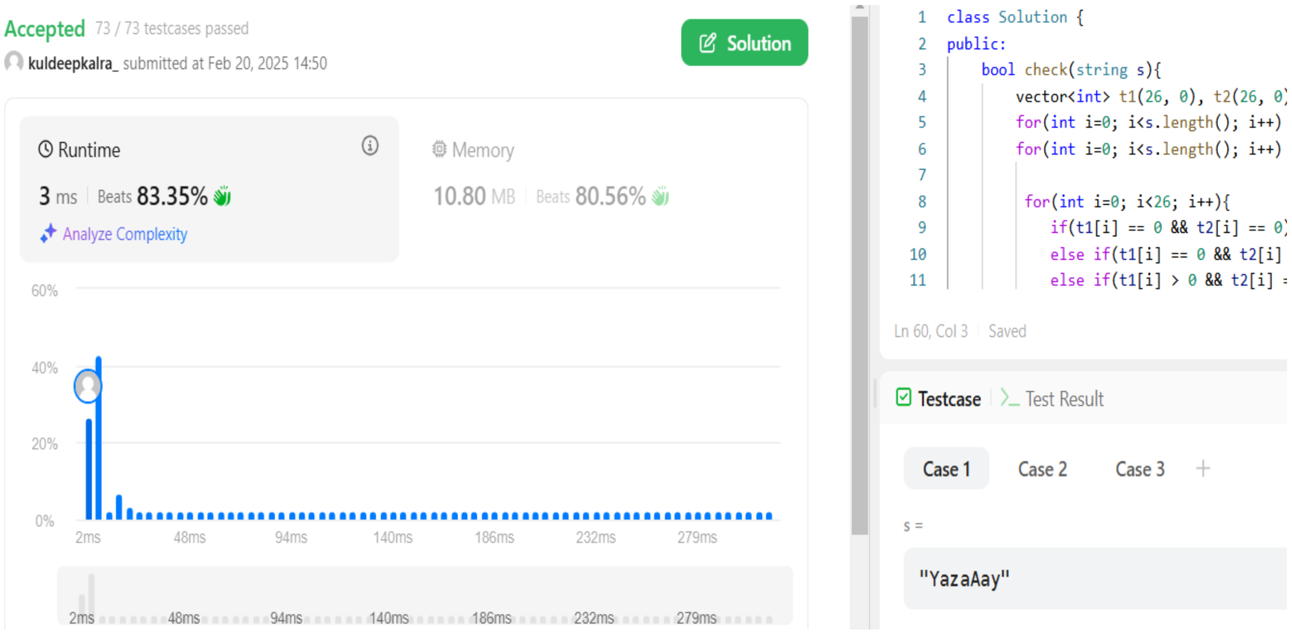
Problem Statement: A string s is considered **nice** if, for every character in the string, the character's uppercase and lowercase forms both exist in the string.

1. **Objective:** Find the longest contiguous substring where every character has both its uppercase and lowercase counterpart present.

2. **Code:**

```
class Solution:
 def longestNiceSubstring(self, s: str) -> str:
    # Base case: if the string is empty or has only one character, return ""
    if len(s) < 2:
        return ""

    # Check for invalid characters
    for i, ch in enumerate(s):
        if ch.swapcase() not in s:
            # Split around the invalid character and check both parts
            left = self.longestNiceSubstring(s[:i])
            right = self.longestNiceSubstring(s[i+1:])
            # Return the longer substring
            return left if len(left) >= len(right) else right

    # If all characters are valid, return the entire string
    return s
```

3. Result:



Accepted 73 / 73 testcases passed

kuldeepkalra_ submitted at Feb 20, 2025 14:50

Runtime

3 ms | Beats 83.35%

Memory

10.80 MB | Beats 80.56%

```
class Solution {
public:
    bool check(string s){
        vector<int> t1(26, 0), t2(26, 0)
        for(int i=0; i<s.length(); i++)
        for(int i=0; i<s.length(); i++)

         for(int i=0; i<26; i++){
            if(t1[i] == 0 && t2[i] == 0)
            else if(t1[i] == 0 && t2[i]
            else if(t1[i] > 0 && t2[i] =
```

Ln 60, Col 3 | Saved

s =

"YazaAay"

Problem 1.4.2: Reverse Bits

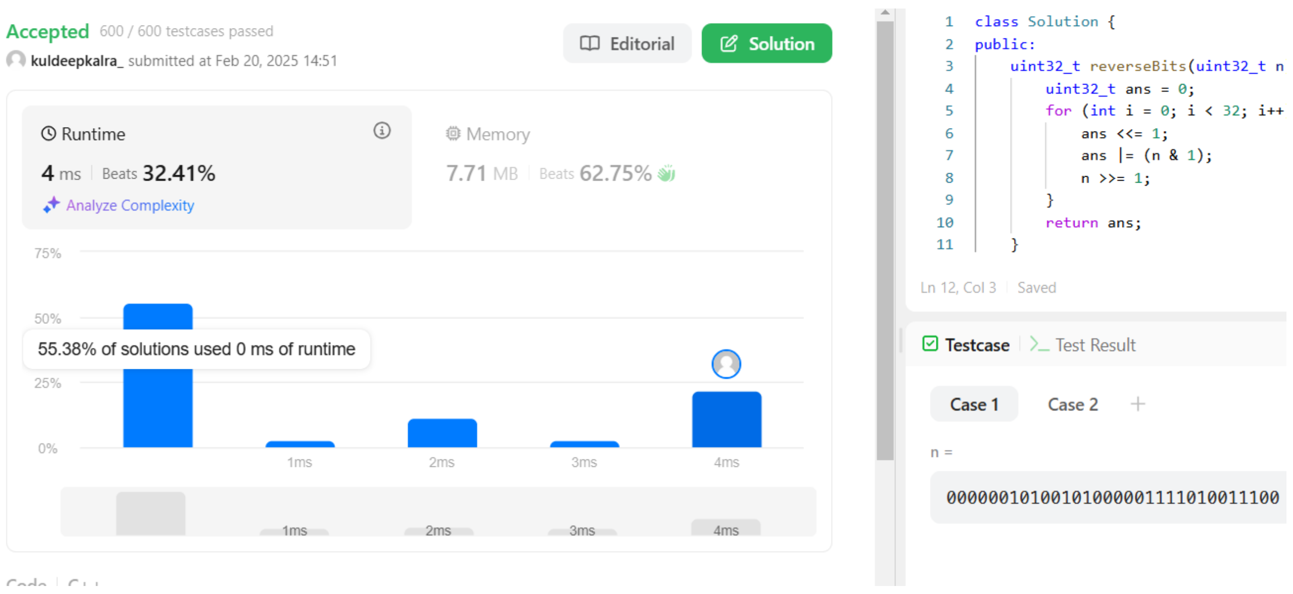
Problem Statement: You are given a 32-bit unsigned integer n. Your task is to reverse the bits of n and return the result as an unsigned integer.

1. **Objective:** Reverse the order of bits in the given 32-bit unsigned integer.

2. **Code:**

```
class Solution {
public:
    uint32_t reverseBits(uint32_t n) {
        // Swap adjacent bits
        n = ((n >> 1) & 0x55555555) | ((n & 0x55555555) << 1);
        // Swap pairs of bits
        n = ((n >> 2) & 0x33333333) | ((n & 0x33333333) << 2);
        // Swap nibbles (4-bit groups)
        n = ((n >> 4) & 0x0F0F0F0F) | ((n & 0x0F0F0F0F) << 4);
        // Swap bytes
        n = ((n >> 8) & 0x00FF00FF) | ((n & 0x00FF00FF) << 8);
        // Swap 16-bit halves
        n = (n >> 16) | (n << 16);
        return n;
    }
};
```

3. **Result:**



Accepted 600 / 600 testcases passed

kuldeepkalra_ submitted at Feb 20, 2025 14:51

Runtime

4 ms | Beats 32.41%

Analyze Complexity

Memory

7.71 MB | Beats 62.75%

55.38% of solutions used 0 ms of runtime

```
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;
    }
```

Ln 12, Col 3 | Saved

Testcase | Test Result

Case 1 | Case 2

n =

```
00000010100101000001111010011100
```

Problem 1.4.3: Number of 1 bits

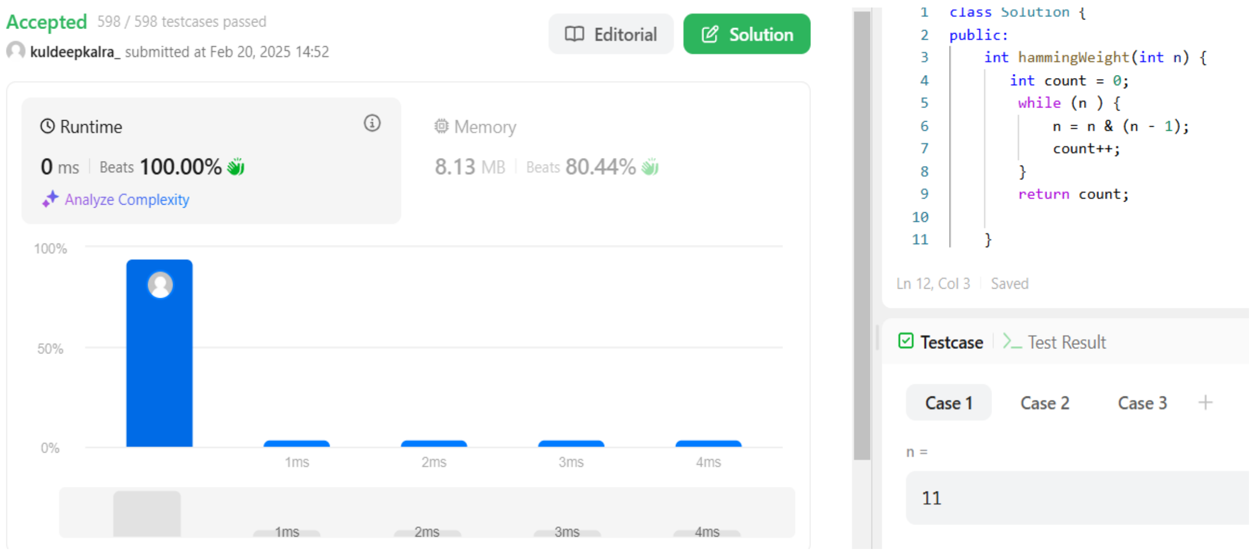
Problem Statement: You are given a 32-bit unsigned integer n. Your task is to return the number of '1' bits it has, also known as the **Hamming Weight**.

1. **Objective:** Count the number of '1' bits in the 32-bit binary representation of n.

2. **Code:**

```
class Solution {
public:
    int hammingWeight(uint32_t n) {
        int count = 0;
        while (n) {
            n &= (n - 1);  // Remove the lowest set b

         count++;
          }
         return count;
        }
};
```

3. **Result:**



Accepted 598 / 598 testcases passed
kuldeepkalra_ submitted at Feb 20, 2025 14:52

Runtime
0 ms | Beats 100.00%

Memory
8.13 MB | Beats 80.44%

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

    }
```

Ln 12, Col 3 | Saved

Testcase | Test Result
Case 1 Case 2 Case 3

n =
11

Problem 1.3.4: Max Subarray

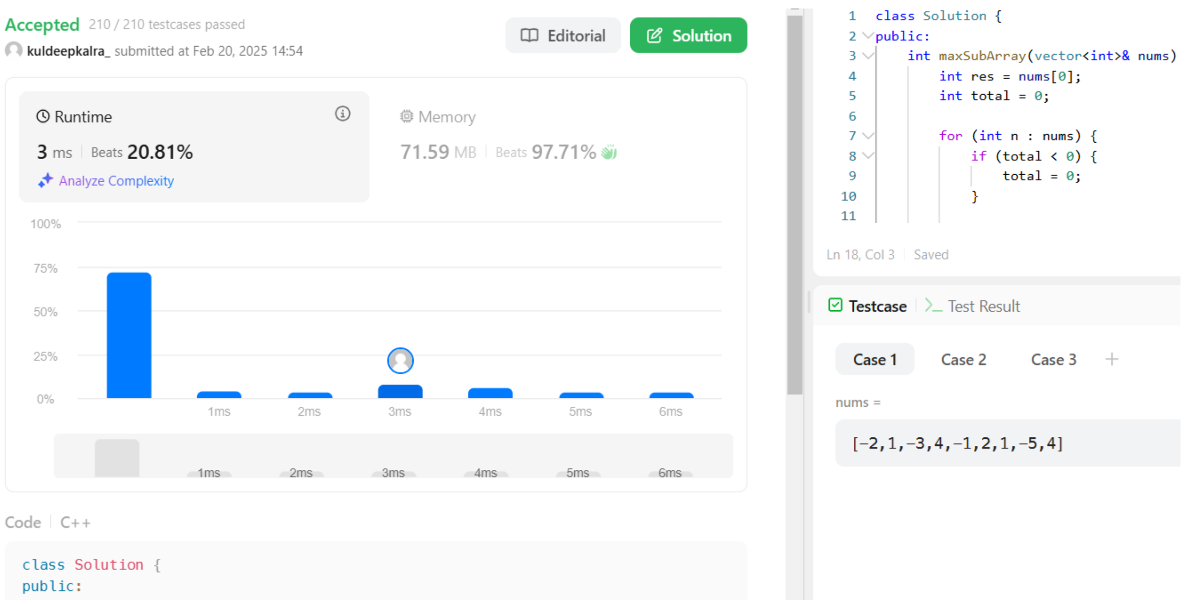
Problem Statement: Given an integer array nums, find the contiguous subarray (containing at least one number) which has the largest sum and return its sum.

1. **Objective:** Identify the contiguous subarray within the given array that has the maximum sum.

2. **Code:**

```
class Solution {
public:
    int maxSubArray(vector<int>& nums) {
        int maxSum = nums[0];
        int currentSum = nums[0];
        for (int i = 1; i < nums.size(); i++) {
            currentSum = max(nums[i], currentSum + nums[i]);
            maxSum = max(maxSum, currentSum);
        }
        return maxSum;
    }
};
```

3. Result:



Accepted 210 / 210 testcases passed
kuldeepkalra_ submitted at Feb 20, 2025 14:54

Editorial | Solution

Runtime
3 ms | Beats 20.81%
Analyze Complexity

Memory
71.59 MB | Beats 97.71%

Code | C++

```
class Solution {
public:
```

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

        for (int n : nums) {
            if (total < 0) {
                total = 0;
            }

```

Ln 18, Col 3 | Saved

Testcase | Test Result

Case 1 | Case 2 | Case 3 | +

nums =

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

Problem 1.4.5: The Skyline Problem

Problem Statement: Given a list of buildings, where each building is represented as a triplet [L,R,H][L, R, H][L,R,H] (with LLL as the left x-coordinate, RRR as the right x-coordinate, and HHH as the height), your task is to output the skyline formed by these buildings. The skyline is a list of "key points" [x,y][x, y][x,y] that represent where the height of the skyline changes. Key points should be output in sorted order by the x-coordinate.

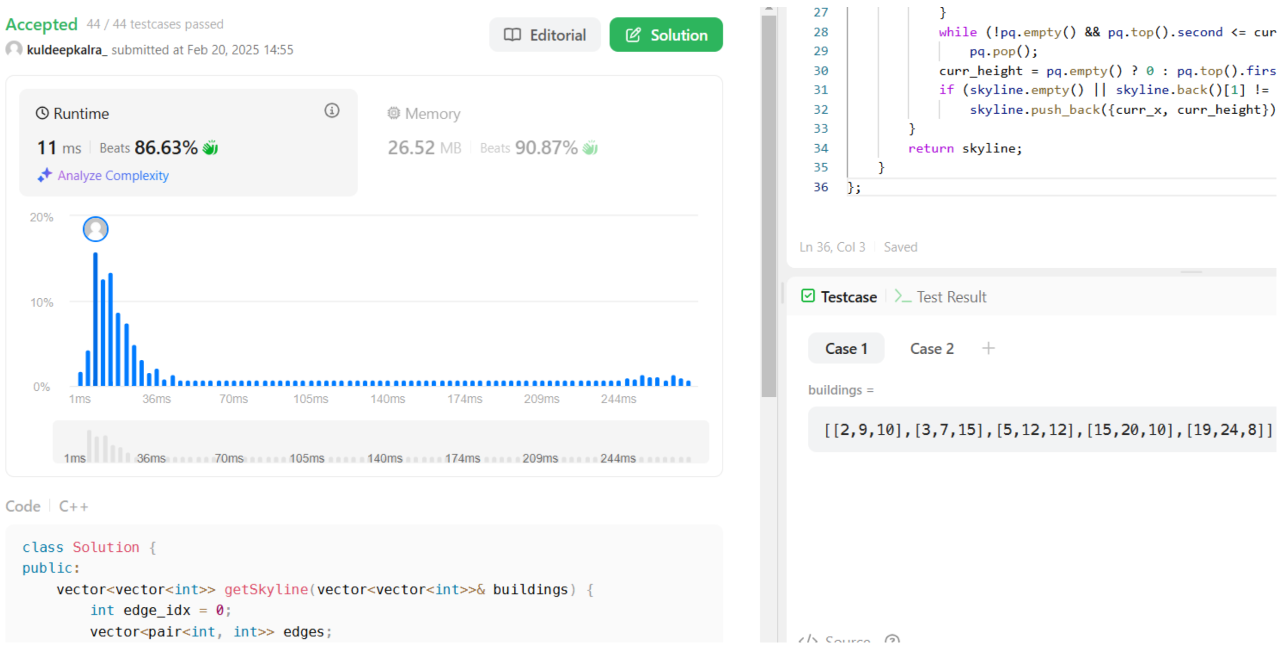
1. **Objective:** Determine the key points that form the outer contour (skyline) when the buildings are viewed from a distance.

2. **Code:**

```
#include <vector>
#include <queue>
#include <algorithm>
#include <climits>
using namespace std;

// Custom comparator: orders by first element ascending.
struct cmp {
    bool operator()(const pair<int,int>& a, const pair<int,int>& b) {
        return a.first > b.first; // smaller (more negative) first element has higher priority.
    }
};

class Solution {
public:
    vector<vector<int>> getSkyline(vector<vector<int>>& buildings) {
        // Create events: for each building [L, R, H]:
        // - Start event: (L, -H, R)
        // - End event: (R, 0, 0)
        vector<vector<int>> events;
        for (const auto& b : buildings) {
            int L = b[0], R = b[1], H = b[2];
            events.push_back({L, -H, R});
            events.push_back({R, 0, 0});
        }

        // Sort events by x-coordinate.
        // If two events share the same x, the one with smaller second value (i.e. start
events with higher heights) comes first.
        sort(events.begin(), events.end(), [](const vector<int>& a, const vector<int>& b)
{
            if(a[0] != b[0])
```

```
                return a[0] < b[0];
            return a[1] < b[1];
        });

        // Priority queue (min-heap using custom comparator) to track active buildings.
        // Each element is a pair (height, right), where height is stored as a negative
value.
        priority_queue<pair<int,int>, vector<pair<int,int>>, cmp> live;
        // Add a dummy building with height 0 lasting indefinitely.
        live.push({0, INT_MAX});

        vector<vector<int>> result;
        int i = 0, n = events.size();
        while (i < n) {
            int x = events[i][0];
            // Process all events at the same x-coordinate.
            while (i < n && events[i][0] == x) {
                if (events[i][1] < 0) {  // start event
                    live.push({events[i][1], events[i][2]});
                }
                // End events are implicitly handled by removing expired buildings.
                i++;
            }

            // Remove buildings from the heap that have ended.
            while (!live.empty() && live.top().second <= x)
                live.pop();

            // The current skyline height is the negative of the top element's first value.
            int currHeight = -live.top().first;
            // If the height has changed, record a new key point.
            if (result.empty() || result.back()[1] != currHeight)
                result.push_back({x, currHeight});
        }

        return result;
    }
};
```

3. Result:



Accepted 44 / 44 testcases passed
kuldeepkalra_ submitted at Feb 20, 2025 14:55

Runtime
11 ms | Beats 86.63%
Analyze Complexity

Memory
26.52 MB | Beats 90.87%

Code | C++

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

```
            }
            while (!pq.empty() && pq.top().second <= cur
                pq.pop();
            curr_height = pq.empty() ? 0 : pq.top().firs
            if (skyline.empty() || skyline.back()[1] !=
                skyline.push_back({curr_x, curr_height})
        }
        return skyline;
    }
};
```

Ln 36, Col 3 | Saved

Testcase | Test Result

Case 1 Case 2

buildings =

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