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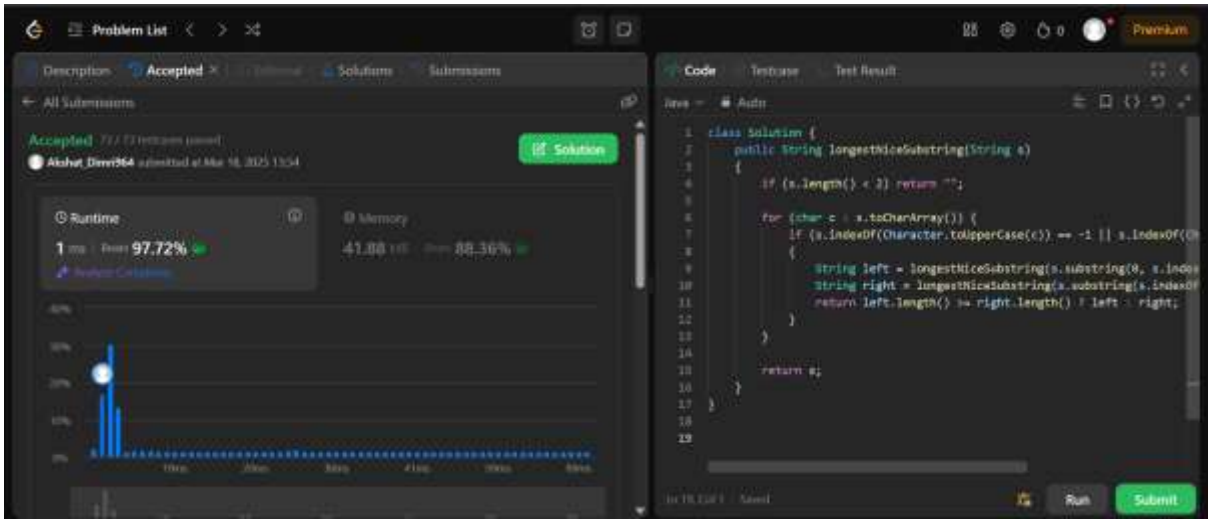
Sec – 608-B

AP Assignment – 04

Q1- Longest Nice Substring

Code –

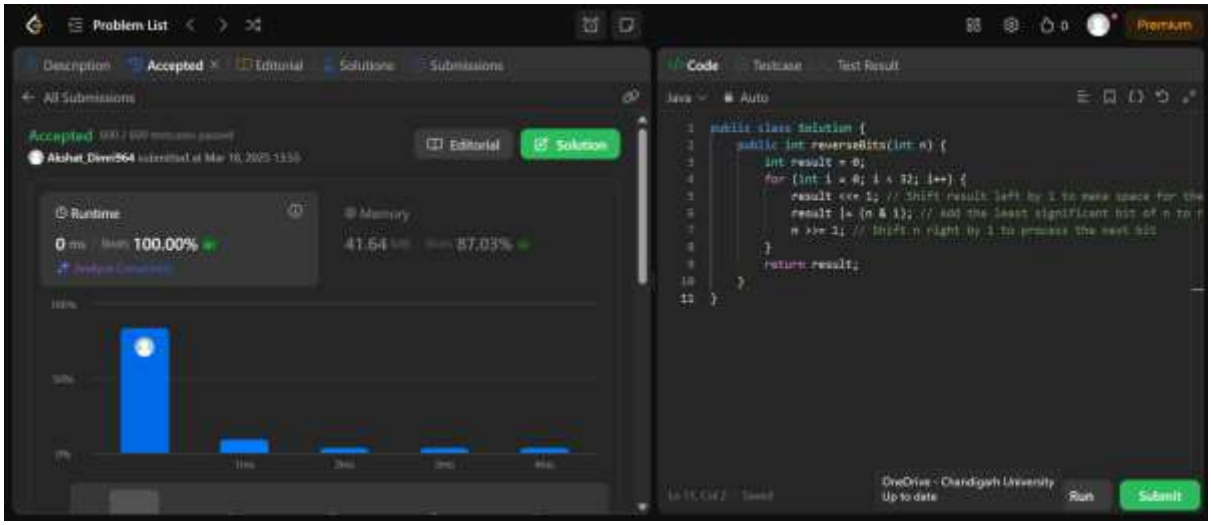
```
class Solution {
    public String longestNiceSubstring(String s)
    {
        if (s.length() < 2) return "";
        for (char c : s.toCharArray()) {
            if (s.indexOf(Character.toUpperCase(c)) == -1 || s.indexOf(Character.toLowerCase(c))
== -1)
            {
                String left = longestNiceSubstring(s.substring(0, s.indexOf(c)));
                String right = longestNiceSubstring(s.substring(s.indexOf(c) + 1));
                return left.length() >= right.length() ? left : right;
            }
        }

        return s;
    }
}
```



Q2-Reverse bits of a given 32 bits unsigned integer.

Code –

```
public class Solution {
    public int reverseBits(int n) {
        int result = 0;
        for (int i = 0; i < 32; i++) {
            result <<= 1; // Shift result left by 1 to make space for the next bit
            result |= (n & 1); // Add the least significant bit of n to result
            n >>= 1; // Shift n right by 1 to process the next bit
        }
        return result;
    }
}
```

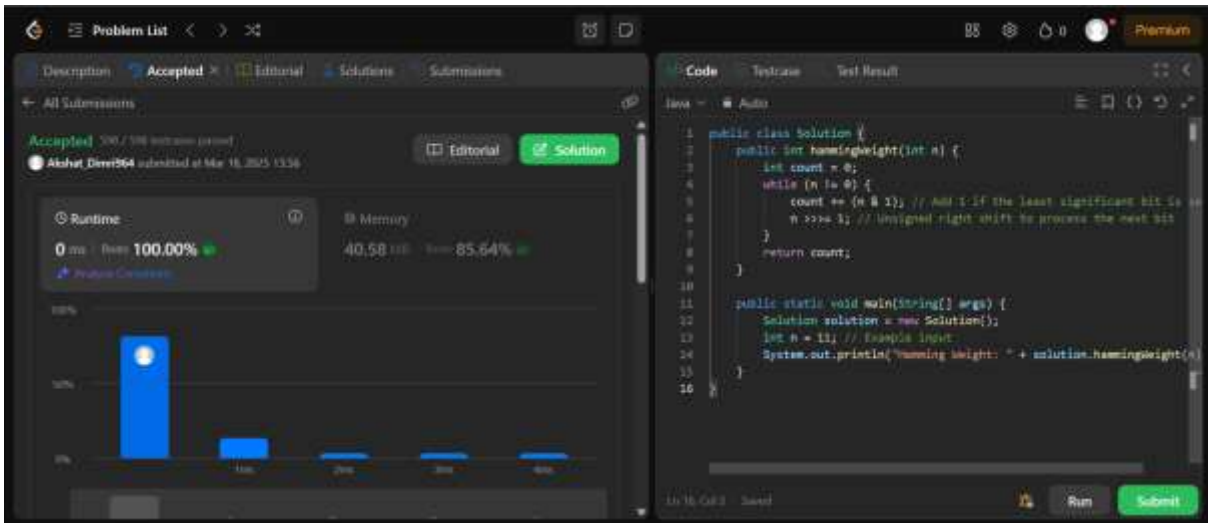


Q3 - Given a positive integer n, write a function that returns the number of set bits in its binary representation (also known as the Hamming weight).

Code –

```
public class Solution {
    public int hammingWeight(int n) {
        int count = 0;
        while (n != 0) {
            count += (n & 1); // Add 1 if the least significant bit is set
            n >>>= 1; // Unsigned right shift to process the next bit
        }
        return count;
    }

    public static void main(String[] args) {
        Solution solution = new Solution();
        int n = 11; // Example input
        System.out.println("Hamming Weight: " + solution.hammingWeight(n));
    }
```

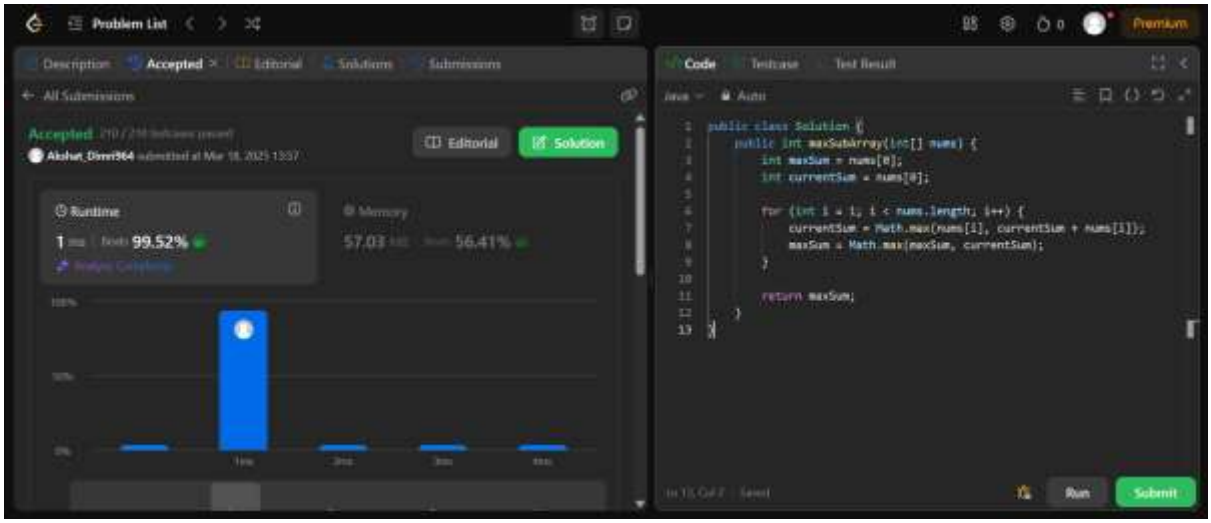
}



Q4 – Given an integer array nums, find the subarray with the largest sum, and return *its sum*.

Code –

```
public class Solution {
    public int maxSubArray(int[] nums) {
        int maxSum = nums[0];
        int currentSum = nums[0];

        for (int i = 1; i < nums.length; i++) {
            currentSum = Math.max(nums[i], currentSum + nums[i]);
            maxSum = Math.max(maxSum, currentSum);
        }

        return maxSum;
    }
}
```

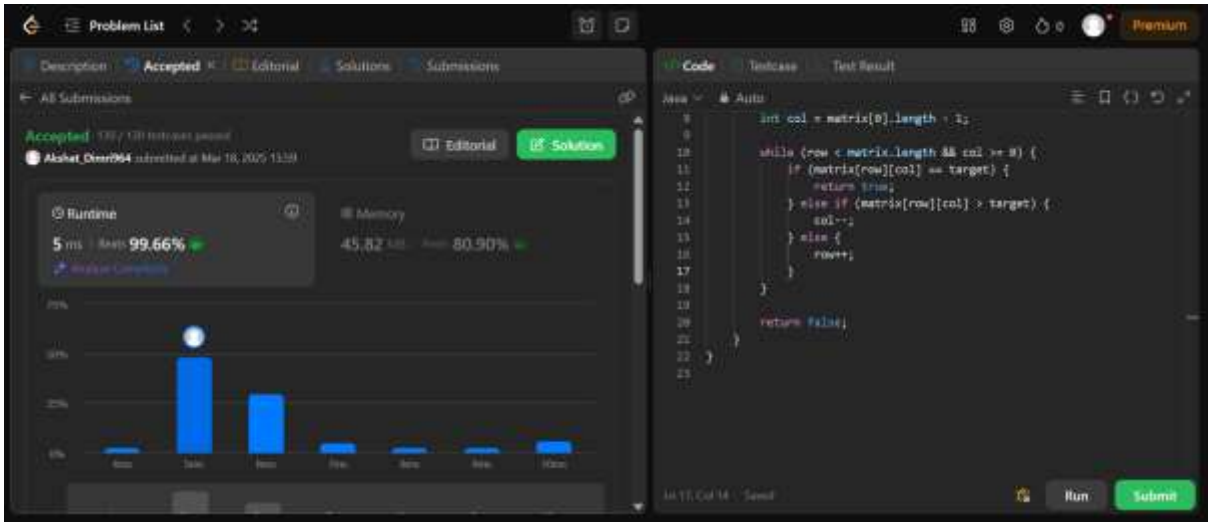


Q5 - Write an efficient algorithm that searches for a value target in an m x n integer matrix matrix. This matrix has the following properties:

Code –

```
public class Solution {
    public boolean searchMatrix(int[][] matrix, int target) {
        if (matrix == null || matrix.length == 0 || matrix[0].length == 0) {
            return false;
        }

        int row = 0;
        int col = matrix[0].length - 1;

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

```
            row++;
        }
    }

    return false;
  }
}
```

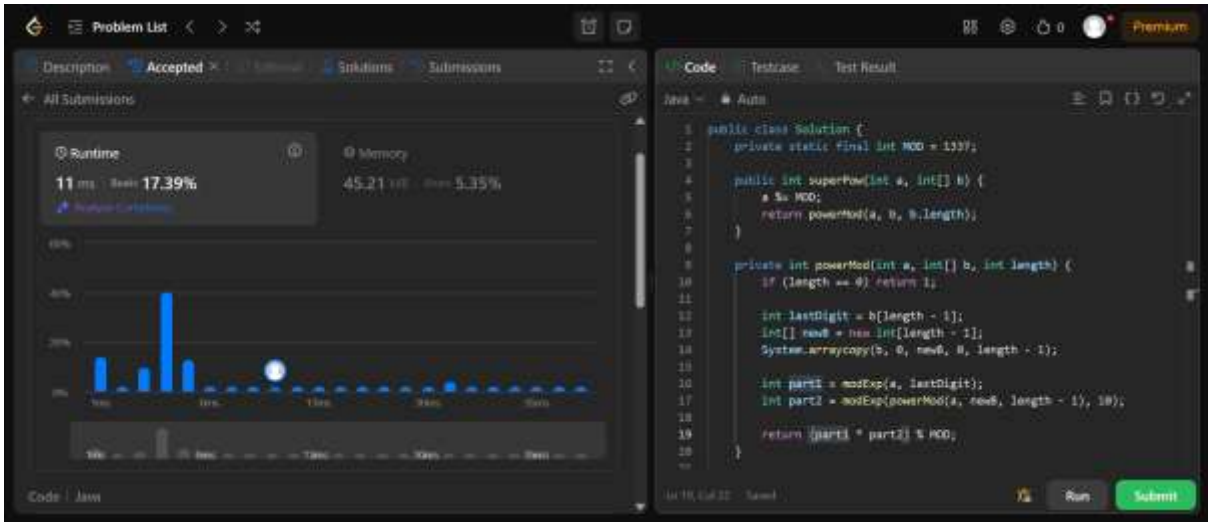


Q6 – Your task is to calculate a^b mod 1337 where a is a positive integer and b is an extremely large positive integer given in the form of an array.

Code –

```
public class Solution {
  private static final int MOD = 1337;

  public int superPow(int a, int[] b) {
    a %= MOD;
    return powerMod(a, b, b.length);
  }
```

```
    private int powerMod(int a, int[] b, int length) {
        if (length == 0) return 1;

        int lastDigit = b[length - 1];
        int[] newB = new int[length - 1];
        System.arraycopy(b, 0, newB, 0, length - 1);

        int part1 = modExp(a, lastDigit);
        int part2 = modExp(powerMod(a, newB, length - 1), 10);

        return (part1 * part2) % MOD;
    }

    private int modExp(int base, int exp) {
        int result = 1;
        base %= MOD;

        for (int i = 0; i < exp; i++) {
            result = (result * base) % MOD;
        }

        return result;
    }
}
```

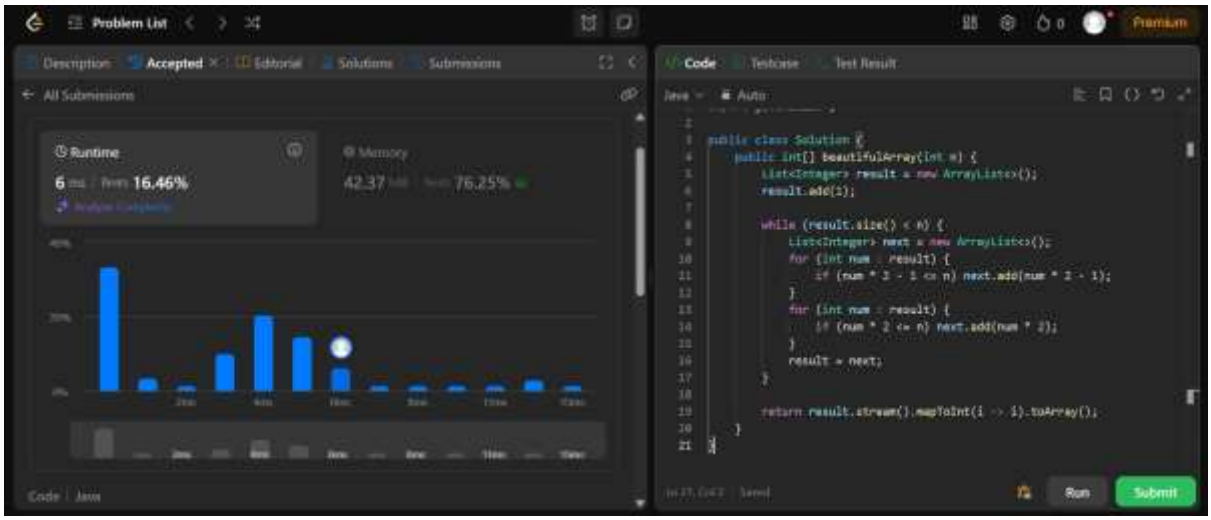


Q7 - Given the integer n, return *any* ***beautiful*** *array* nums *of length* n. There will be at least one valid answer for the given n.

Code-

```
import java.util.*;


public class Solution {
    public int[] beautifulArray(int n) {
        List<Integer> result = new ArrayList<>();
        result.add(1);

        while (result.size() < n) {
            List<Integer> next = new ArrayList<>();
            for (int num : result) {
                if (num * 2 - 1 <= n) next.add(num * 2 - 1);
            }
            for (int num : result) {
                if (num * 2 <= n) next.add(num * 2);
            }
            result = next;
```

```
        }

        return result.stream().mapToInt(i -> i).toArray();
    }
}
```

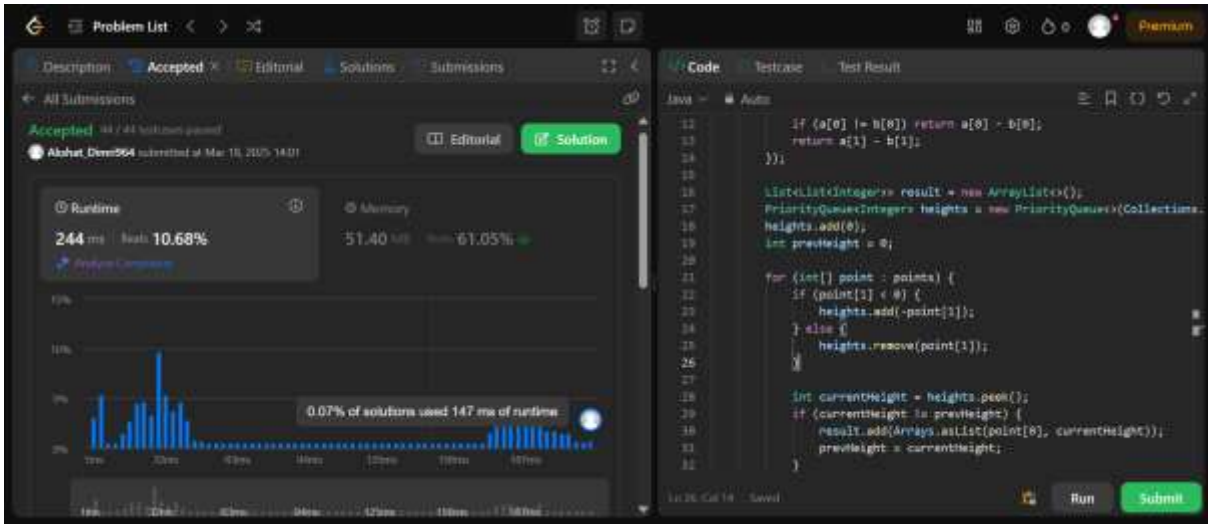


Q8 – A city's **skyline** is the outer contour of the silhouette formed by all the buildings in that city when viewed from a distance. Given the locations and heights of all the buildings, return *the **skyline** formed by these buildings collectively*.

Code –

```
import java.util.*;

public class Solution {
    public List<List<Integer>> getSkyline(int[][] buildings) {
        List<int[]> points = new ArrayList<>();
        for (int[] building : buildings) {
            points.add(new int[]{building[0], -building[2]}); // Start of building
            points.add(new int[]{building[1], building[2]});  // End of building
        }
```

```
        Collections.sort(points, (a, b) -> {
            if (a[0] != b[0]) return a[0] - b[0];
            return a[1] - b[1];
        });

        List<List<Integer>> result = new ArrayList<>();
        PriorityQueue<Integer> heights = new PriorityQueue<>(Collections.reverseOrder());
        heights.add(0);
        int prevHeight = 0;

        for (int[] point : points) {
            if (point[1] < 0) {
                heights.add(-point[1]);
            } else {
                heights.remove(point[1]);
            }

            int currentHeight = heights.peek();
            if (currentHeight != prevHeight) {
                result.add(Arrays.asList(point[0], currentHeight));
                prevHeight = currentHeight;
            }
        }

        return result;
    }
}
```

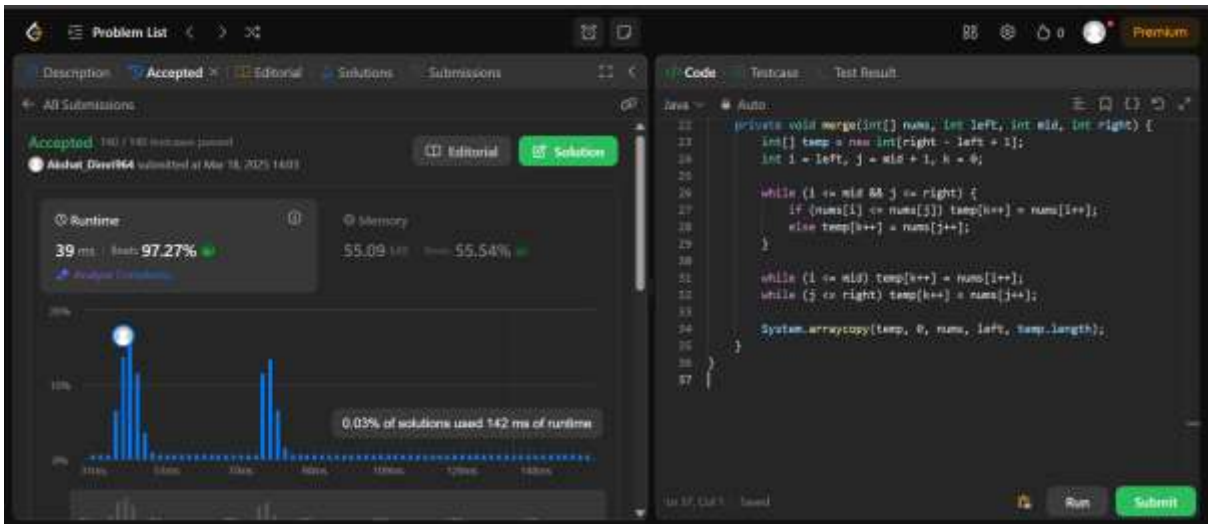


Q9 - Given an integer array nums, return *the number of **reverse pairs** in the array*.

Code –

```
public class Solution {
    public int reversePairs(int[] nums) {
        if (nums == null || nums.length < 2) return 0;
        return mergeSort(nums, 0, nums.length - 1);
    }

    private int mergeSort(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] > 2L * nums[j]) j++;
            count += (j - (mid + 1));
        }
```

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

    private void merge(int[] nums, int left, int mid, int right) {
        int[] temp = new int[right - left + 1];
        int i = left, j = mid + 1, k = 0;

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

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

        System.arraycopy(temp, 0, nums, left, temp.length);
    }
}
```



Q10 - You are given an integer array nums and an integer k.

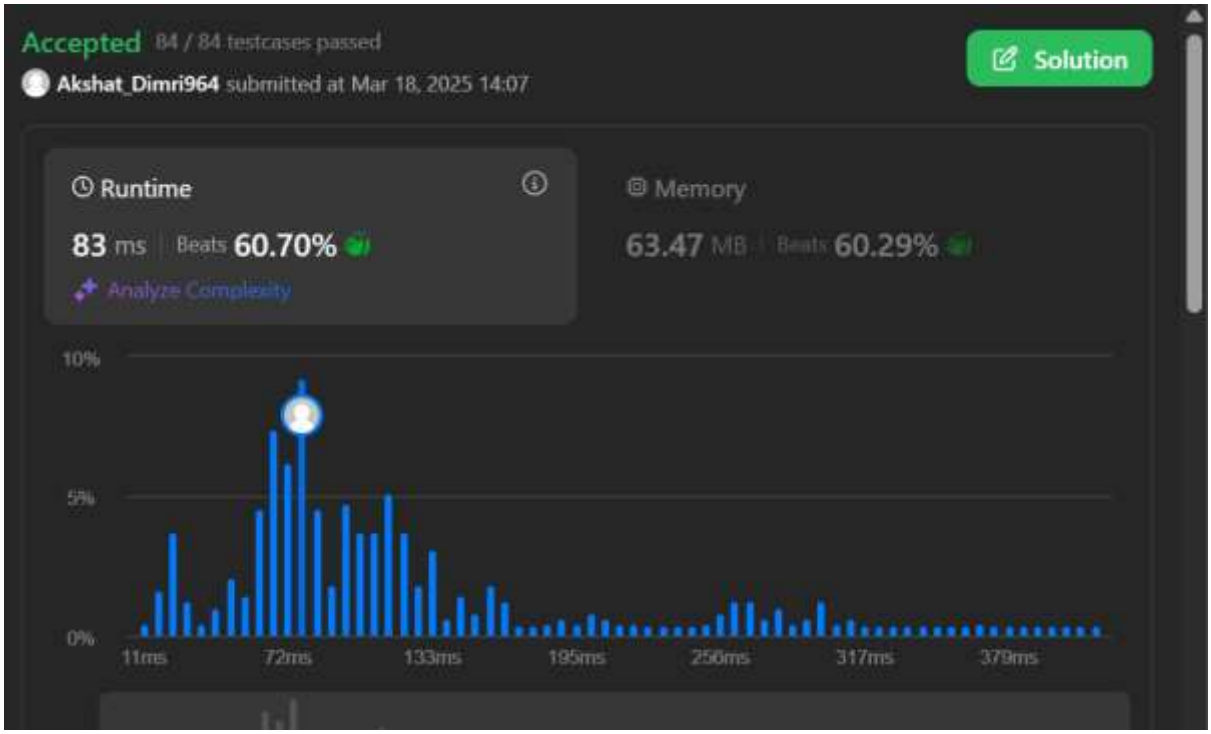
Find the longest subsequence of nums that meets the following requirements:

- The subsequence is **strictly increasing** and
- The difference between adjacent elements in the subsequence is **at most** k.

Return *the length of the **longest subsequence** that meets the requirements.*

Code –

```
class Solution {
public:
    int lengthOfLIS(vector<int>& nums, int k) {
        map<int, int> dp;
        int maxLen = 0;
        for (int num : nums) {
            int maxPrev = 0;
            for (int i = num - k; i <= num - 1; i++) {
                maxPrev = max(maxPrev, dp[i]);
            }
            dp[num] = maxPrev + 1;
            maxLen = max(maxLen, dp[num]);
        }
        return maxLen;
    }
};
```


Accepted 84 / 84 testcases passed
Akshat_Dimri964 submitted at Mar 18, 2025 14:07
Solution
Runtime
83 ms | Beats 60.70%
Analyze Complexity
Memory
63.47 MB | Beats 60.29%
10%
5%
0%
11ms
72ms
133ms
195ms
256ms
317ms
379ms