Experiment 4

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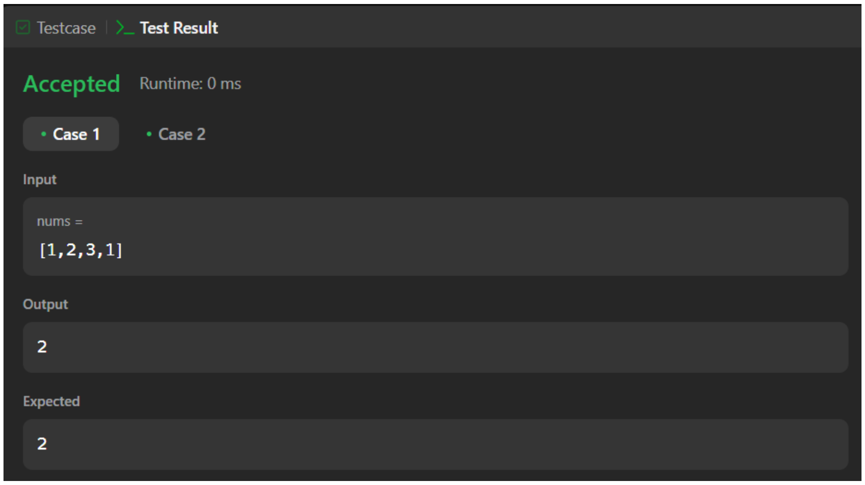
Subject Name: Advanced Programming Lab-2 **Subject Code: 22ITP-351**

Problem 1. A peak element is an element that is strictly greater than its neighbors.

Code:

```
class Solution {
public:
    int findPeakElement(vector<int>& nums) {
        int n= nums.size();
        int s=0;
        int e=n-1;

        while(s<e){
            int m = s + (e-s) / 2;
            if(nums[m] > nums[m+1]){
                e = m;
            }
            else{
                s = m +1;
            }
        }
        return s;
    }
};
```

Output:



Accepted Runtime: 0 ms

Input

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

Output

```
2
```

Expected

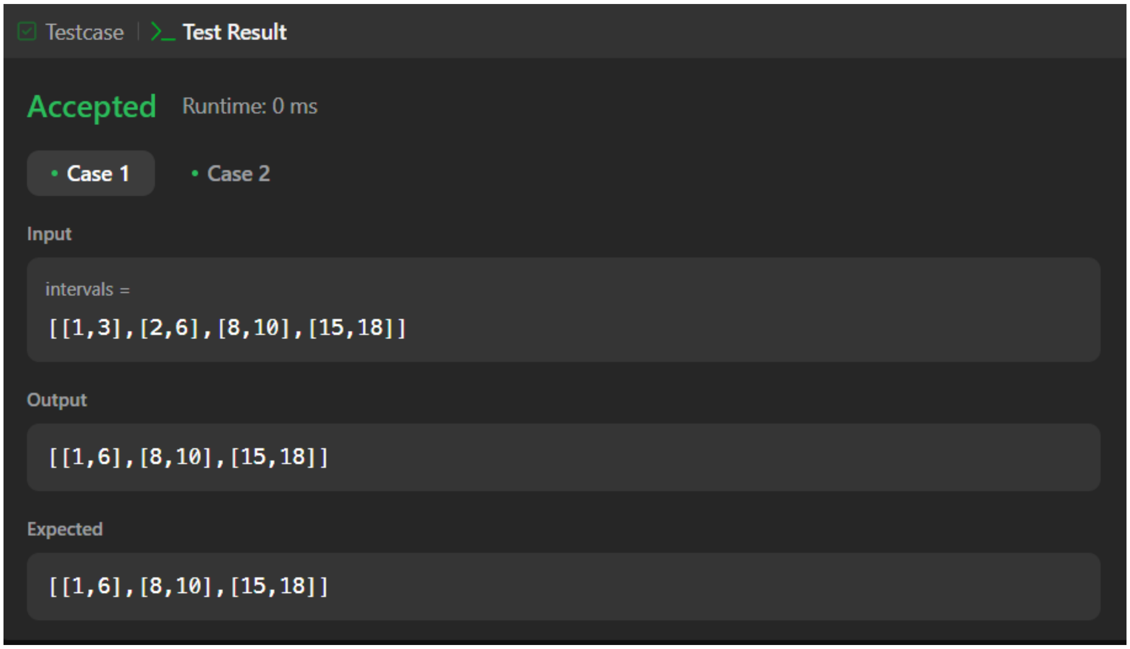
```
2
```

Problem 2. Given an array of intervals where intervals[i] = [starti, endi], merge all overlapping intervals, and return an array of the non-overlapping intervals that cover all the intervals in the input.

Code:

```
class Solution {
public:
    vector<vector<int>> merge(vector<vector<int>>& intervals) {
        int n = intervals.size();
        sort(intervals.begin(), intervals.end());
        vector<vector<int>> output;
        for(auto interval : intervals){
            if(output.empty() || output.back()[1] < interval[0]){
                output.push_back(interval);
            }
            else{
                output.back()[1] = max(output.back()[1], interval[1]);
            }
        }
        return output;
    }
};
```

Output:



Accepted Runtime: 0 ms

Input

intervals =

```
[[1,3],[2,6],[8,10],[15,18]]
```

Output

```
[[1,6],[8,10],[15,18]]
```

Expected

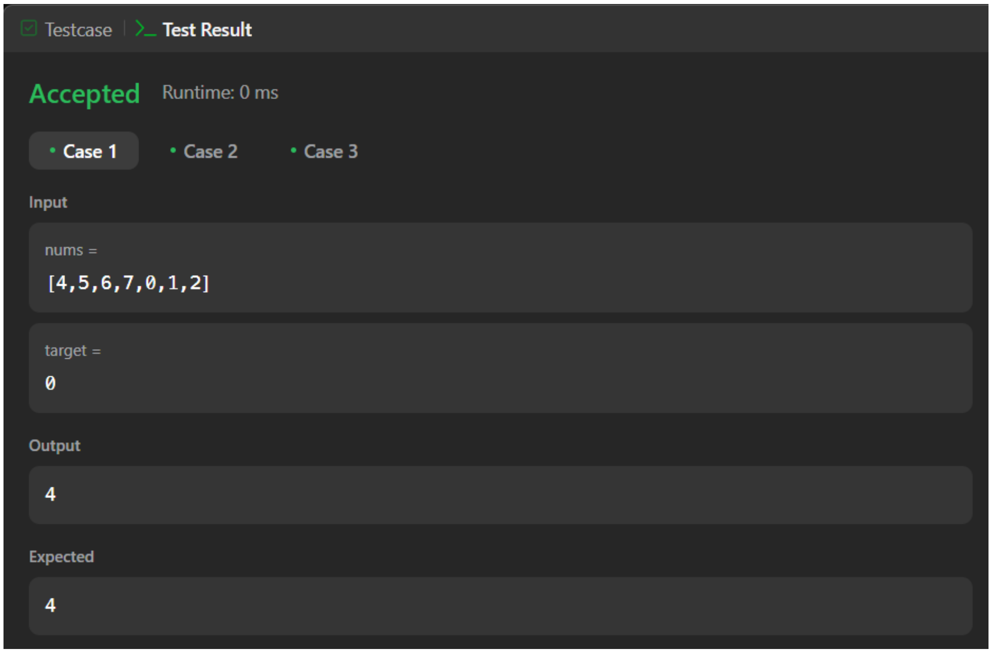
```
[[1,6],[8,10],[15,18]]
```

Problem 3. There is an integer array nums sorted in ascending order (with distinct values).

Code:

```
class Solution {
public:
    int search(vector<int>& nums, int target) {
        int left = 0;
        int right = nums.size() - 1;

        while (left <= right) {
            int mid = (left + right) / 2;

            if (nums[mid] == target) {
                return mid;
            } else if (nums[mid] >= nums[left]) {
                if (nums[left] <= target && target <= nums[mid]) {
                    right = mid - 1;
                } else {
                    left = mid + 1;
                }
            } else {
                if (nums[mid] <= target && target <= nums[right]) {
                    left = mid + 1;
                } else {
                    right = mid - 1;
                }
            }
        }

        return -1;
    }
};
```

Output:



Accepted Runtime: 0 ms

Input

```
nums =
[4,5,6,7,0,1,2]
```

```
target =
0
```

Output

```
4
```

Expected

```
4
```

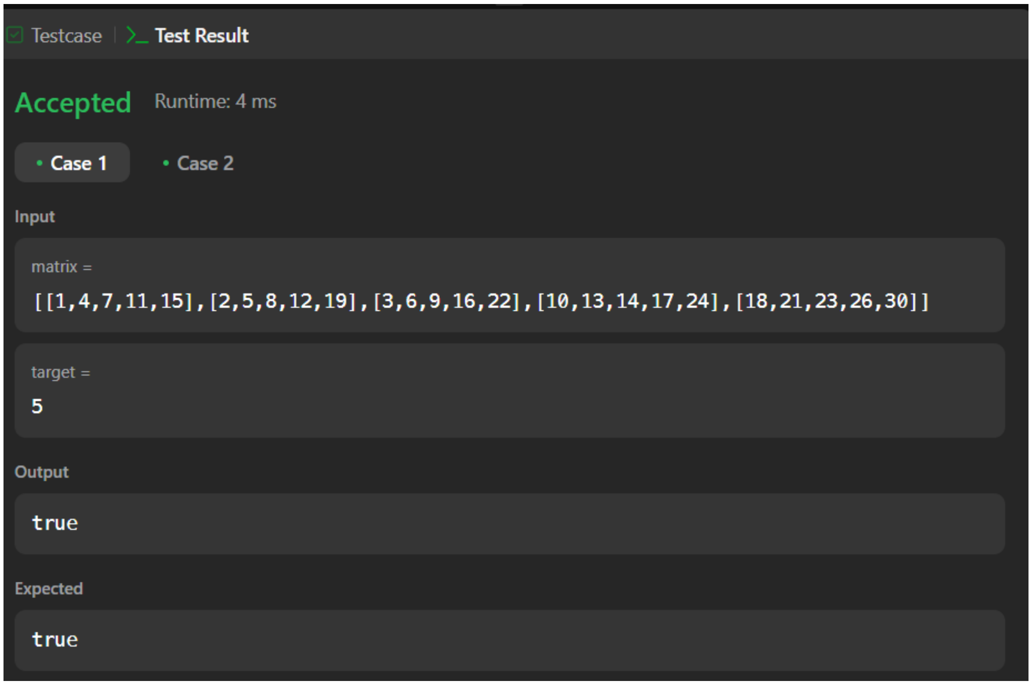
Problem 4. Write an efficient algorithm that searches for a value target in an m x n integer matrix matrix. This matrix has the following properties:

- ❖ Integers in each row are sorted in ascending from left to right.
- ❖ Integers in each column are sorted in ascending from top to bottom.

Code:

```
class Solution {
public:
   bool searchMatrix(vector<vector<int>>& matrix, int target) {
      int m = matrix.size(), n = m ? matrix[0].size() : 0, r = 0, c = n - 1;
      while (r < m && c >= 0) {
         if (matrix[r][c] == target) {
            return true;
         }
         matrix[r][c] > target ? c-- : r++;
      }
      return false;
   }
};
```

Output:



Accepted Runtime: 4 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
```

Expected

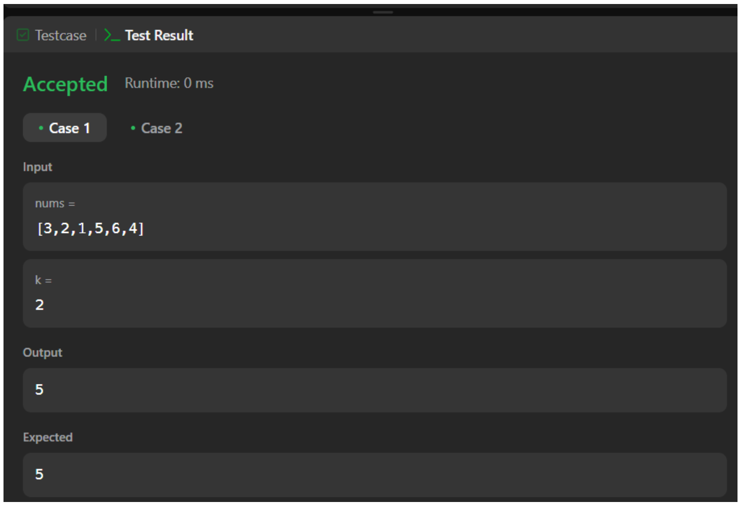
```
true
```

Problem 5. Given an integer array nums and an integer k, return the kth largest element in the array.

Code:

```
class Solution {
public:
    int findKthLargest(std::vector<int>& nums, int k) {
        std::sort(nums.begin(), nums.end(), std::greater<int>());
        return nums[k-1];
    }
};
```

Output:



Accepted Runtime: 0 ms

Input

```
nums =
[3,2,1,5,6,4]
k =
2
```

Output

```
5
```

Expected

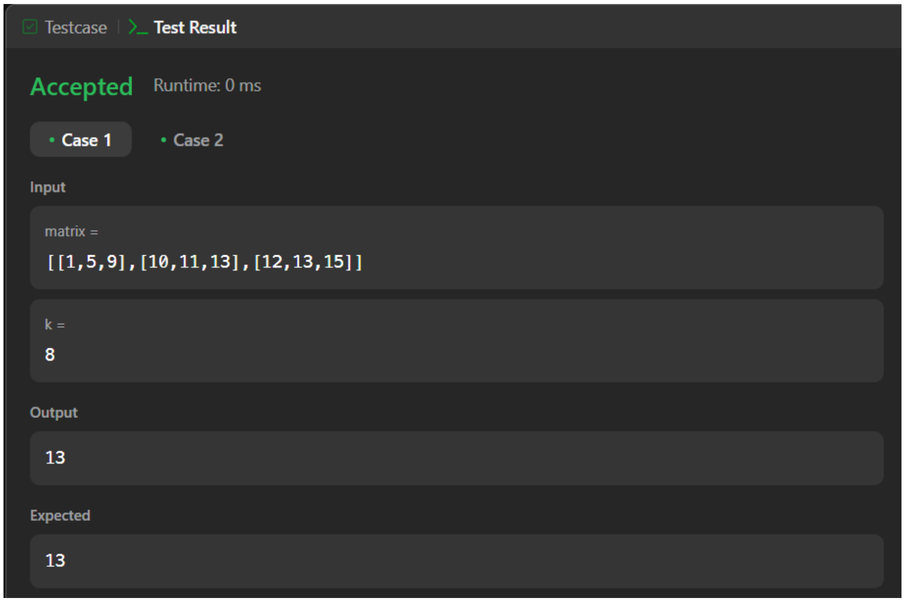
```
5
```

Problem 6. Given an n x n matrix where each of the rows and columns is sorted in ascending order, return the kth smallest element in the matrix.

Code:

```
class Solution {
public:
   int kthSmallest(vector<vector<int>>& matrix, int k) {

 int n= matrix.size();
      int l=matrix[0][0];
      int h = matrix[n-1][n-1];
      int mid;
      int count;
      while(l<h)
      {
         count=0;
         mid = l + (h-l)/2;

         for(int i=0;i<n;i++)
         {
          count += upper_bound(matrix[i].begin() , matrix[i].end(),mid) - matrix[i].begin();
         }
            if(count<k)
         {
            l =mid+1;
         }
         else
         {
            h=mid;
         }
         }

      return l;
           }
};
```

Output:



```
Accepted    Runtime: 0 ms

• Case 1    • Case 2

Input

matrix =
[[1,5,9],[10,11,13],[12,13,15]]

k =
8

Output

13

Expected

13
```

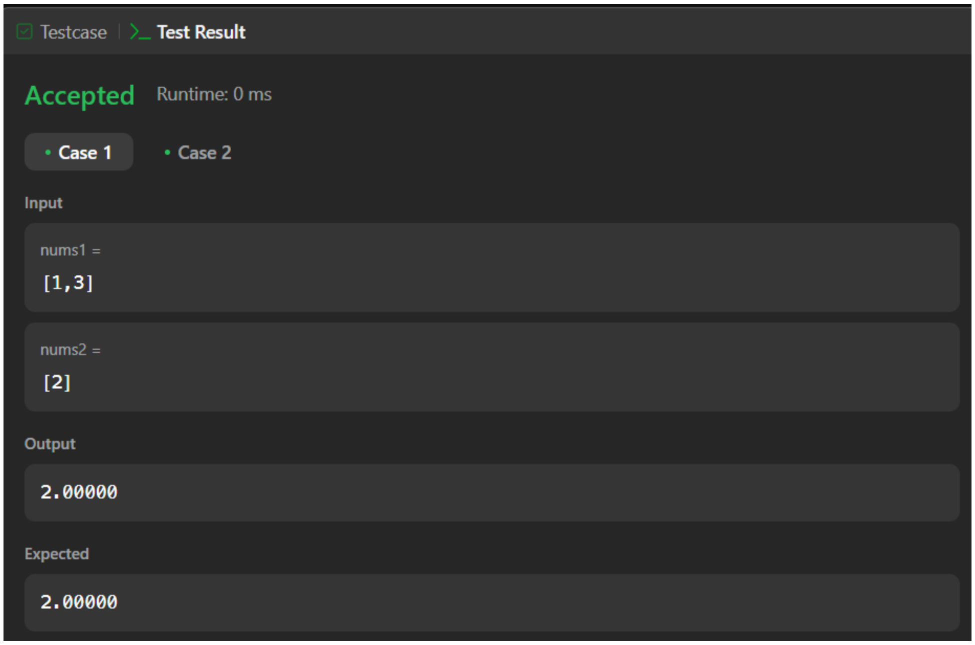
Problem 7. Given two sorted arrays nums1 and nums2 of size m and n respectively, return the median of the two sorted arrays.

Code:

```
class Solution {
public:
   double findMedianSortedArrays(vector<int>& nums1, vector<int>& nums2) {

      int n = nums1.size();
      int m = nums2.size();

      vector<int> num(n+m);
      int i=0, j=0;
      int k=0;
      while(i<n && j<m){
         if(nums1[i] < nums2[j]){
            num[k++] = nums1[i++];
         }
         else{
            num[k++] = nums2[j++];
         }
      }
      while(i<n){num[k++] = nums1[i++];}
      while(j<m){num[k++] = nums2[j++];}

      int median = (n+m)/2;
```

```
            // cout<<median<<endl;
            double ans = 0;
            if((n+m)%2==0){
                ans = (num[median]+num[median-1])/2.0;
                // cout<<num[median]<< num[median-1]<<endl;
            }
            else{
                ans=num[median];
            }
            return ans;

        }
    };
```

Output:



Accepted Runtime: 0 ms

Input

```
nums1 =
[1,3]

nums2 =
[2]
```

Output

```
2.00000
```

Expected

```
2.00000
```