Problem 1

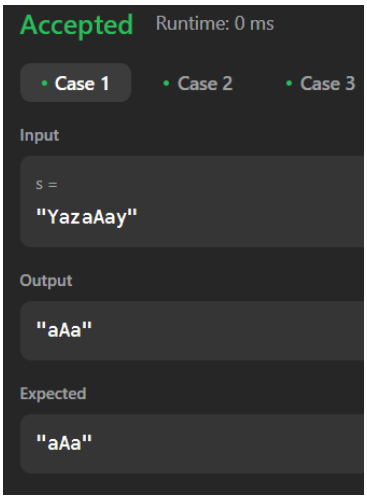
Aim:

Longest Nice Substring

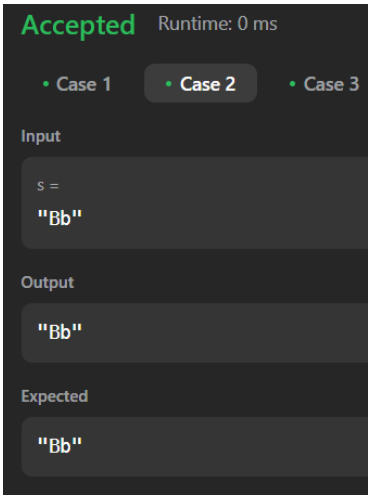
Code:

```
class Solution {
public:
   string longestNiceSubstring(string s) {
      string output = "";
      int count = 0;
      for(int i = 0;i<s.length();i++){
         int smallMask=0;
         int largeMask = 0;
         char ch = s[i];
         int chint = 0;
         if(ch>=65 && ch<=90){
            chint = ch-'A';
            largeMask = 1<<chint;
         }
         else{
            chint = ch-'a';
            smallMask = 1<<chint;
         }
         for(int j = i+1;j<s.length();j++){
            ch = s[j];
            if(ch>=65 && ch<=90){
               chint = ch-'A';
               largeMask |= 1<<chint;
            }
            else{
               chint = ch-'a';
               smallMask |= 1<<chint;
            }
            //checking for nice
            if((smallMask^largeMask) == 0){
               if(count<j-i+1){
                  count = j-i+1;
                  string temp(s.begin()+i,s.begin()+j+1);
                  output = temp;
               }
            }
         }
      }
      return output;
   }
};
```

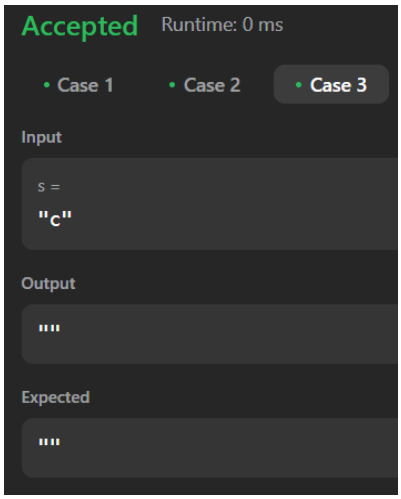
Output:



Case 1



Case 2



Case 3

Problem 2

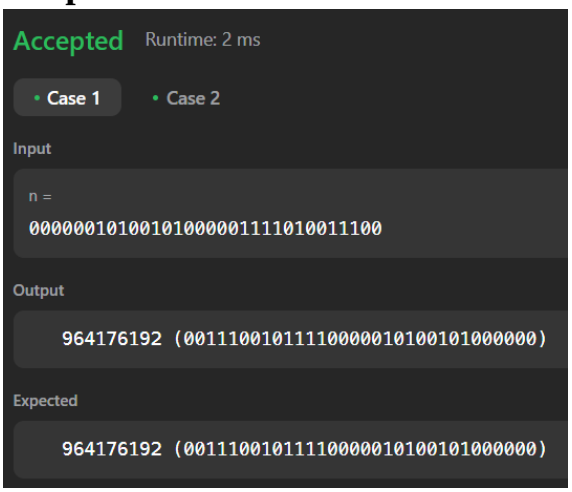
Aim:

Reverse Bits

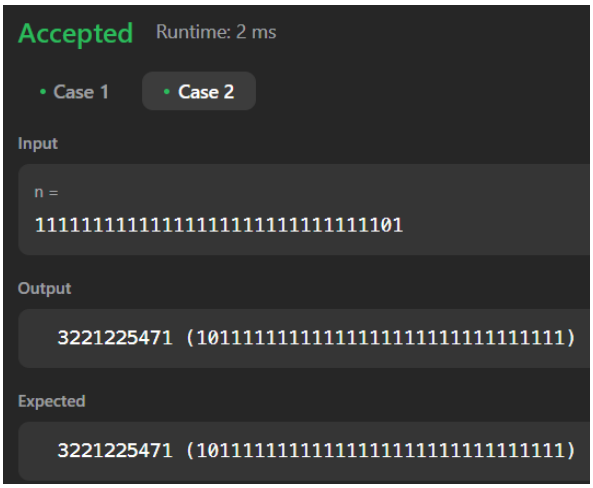
Code:

```
class Solution {
public:
    uint32_t reverseBits(uint32_t n) {
        uint32_t result = 0;
        for (int i = 0; i < 32; i++) {
            int bit = n & 1;       // Extract the least significant bit
            result = (result << 1) | bit; // Append the bit to the result
            n = n >> 1;           // Right-shift n to process the next bit
        }
        return result;
    }
};
```

Output:



Test Case 1



Test Case 2

Problem 3

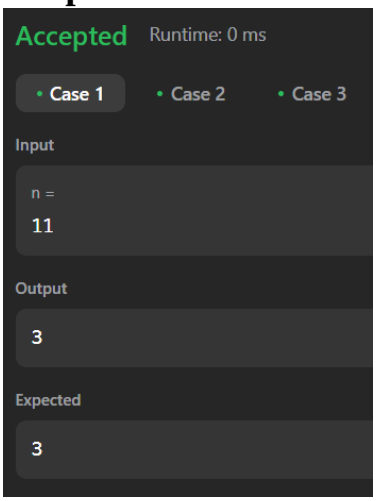
Aim:

Number of 1 bits

Code:

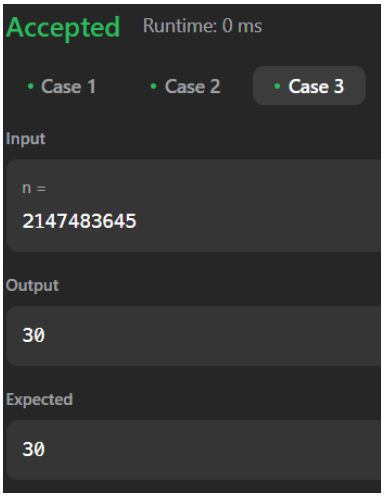
```
class Solution {
public:
   int hammingWeight(int n) {
      bitset<32> b(n);
      int ans=0;
      for(size_t i=0;i<b.size();i++){
       if(b[i]==1) ans++;
      }
      return ans;
   }
};
```

Output:



Case 1

Case 2



Case 3

Problem 4

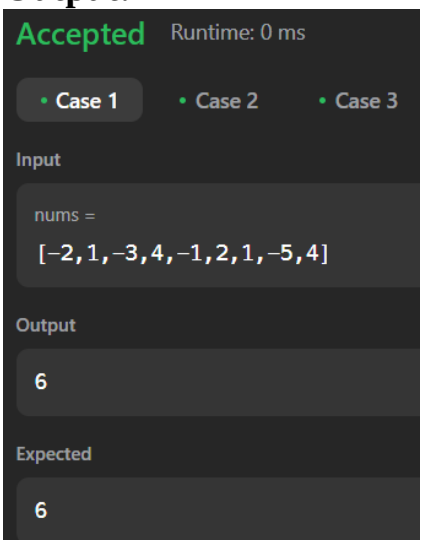
Aim:

Max Subarray

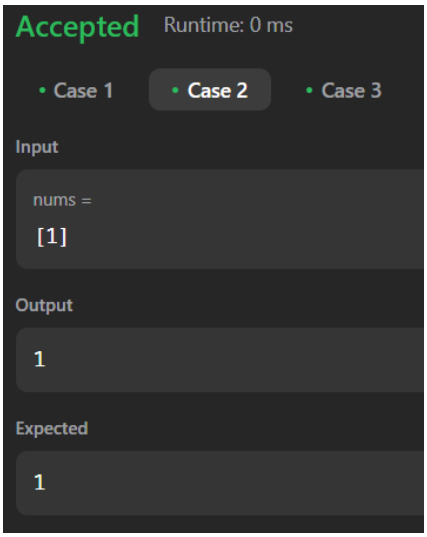
Code:

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

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

            total += n;
            res = max(res, total);
        }

        return res;
    }
};
```

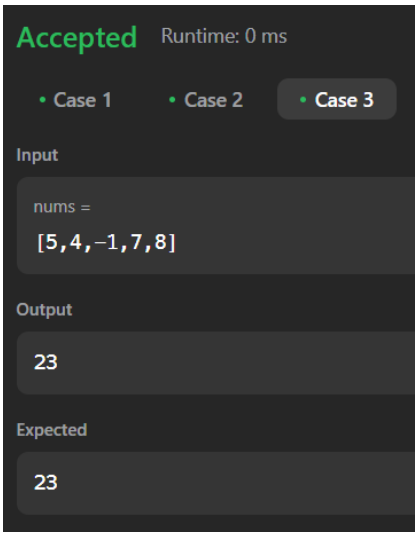
Output:



Case 1



Case 2



Case 3

Problem 5

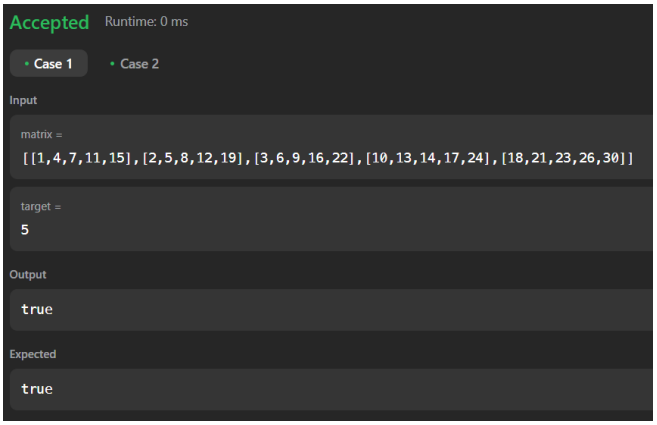
Aim:

Search 2d matrix 2

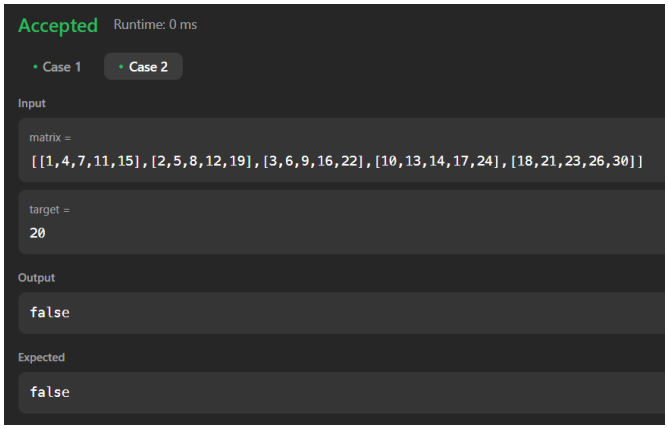
Code:

```
class Solution {
public:
   bool searchMatrix(vector<vector<int>>& matrix, int target) {
      int n = matrix.size(), m = matrix[0].size();
      int row = 0, col = m - 1;

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

Output:



Case 1



Case 2

Problem 6

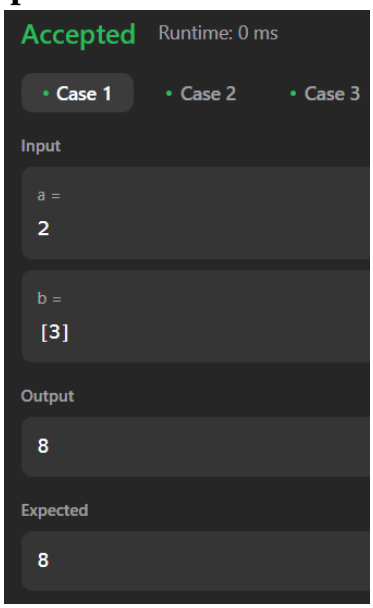
Aim:

Super Pow

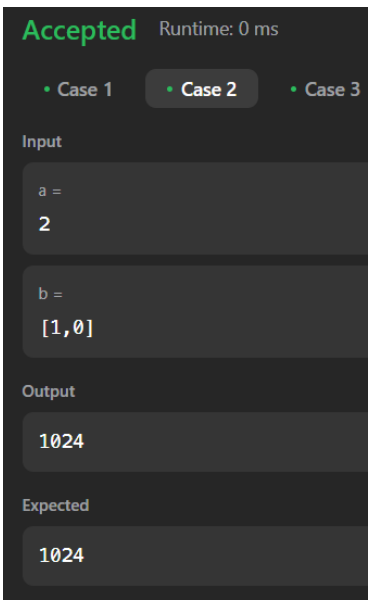
Code:

```
class Solution {
private:
    int solve(int base, int power, int mod) {
        int ans = 1;
        while (power > 0) {
            if (power & 1) {
                ans = (ans * base) % mod;
            }
            base = (base * base) % mod;
            power >>= 1;
        }
        return ans;
    }

public:
    int superPow(int a, vector<int>& b) {
        a%=1337;
        int n = b.size();
        int m = 1140;
        int expi = 0;
        for(int i : b){
            expi = (expi*10+i)%m;
        }
        if (expi == 0) {
            expi = m;
        }
        return solve(a,expi,1337);
    }
};
```

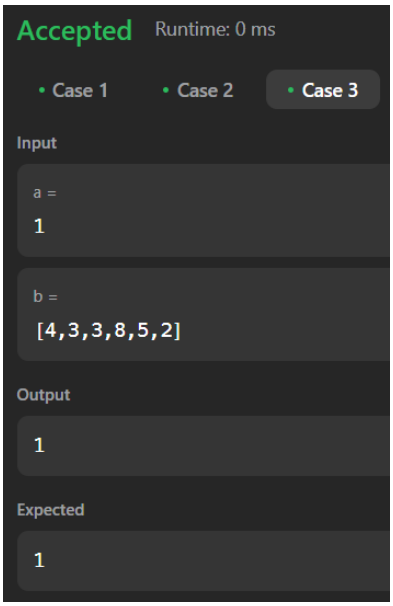
Output:



Case 1



Case 2



Case 3

Problem 7

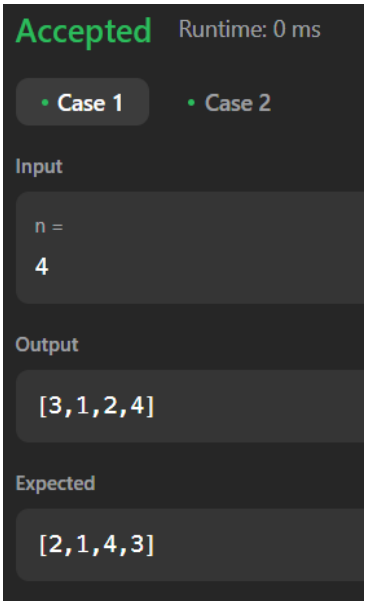
Aim:

Beautiful Array

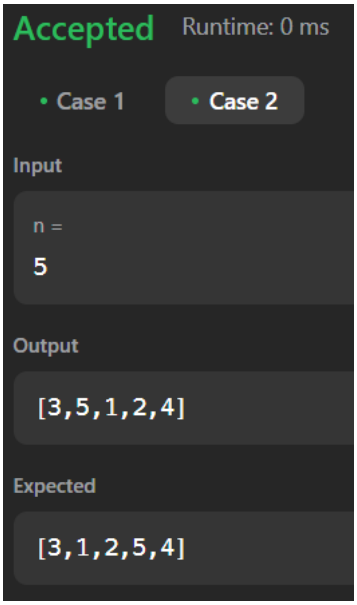
Code:

```
class Solution {
public:
   int partition(vector<int> &v, int start, int end, int mask)
   {
      int j = start;
      for(int i = start; i <= end; i++)
      {
         if((v[i] & mask) != 0)
         {
            swap(v[i], v[j]);
            j++;
         }
      }
      return j;
   }

   void sort(vector<int> & v, int start, int end, int mask)
   {
      if(start >= end) return;
      int mid = partition(v, start, end, mask);
      sort(v, start, mid - 1, mask << 1);
      sort(v, mid, end, mask << 1);
   }

   vector<int> beautifulArray(int N) {
      vector<int> ans;
      for(int i = 0; i < N; i++) ans.push_back(i + 1);
      sort(ans, 0, N - 1, 1);
      return ans;
   }
};
```

Output:



Case 1



Case 2

Problem 8

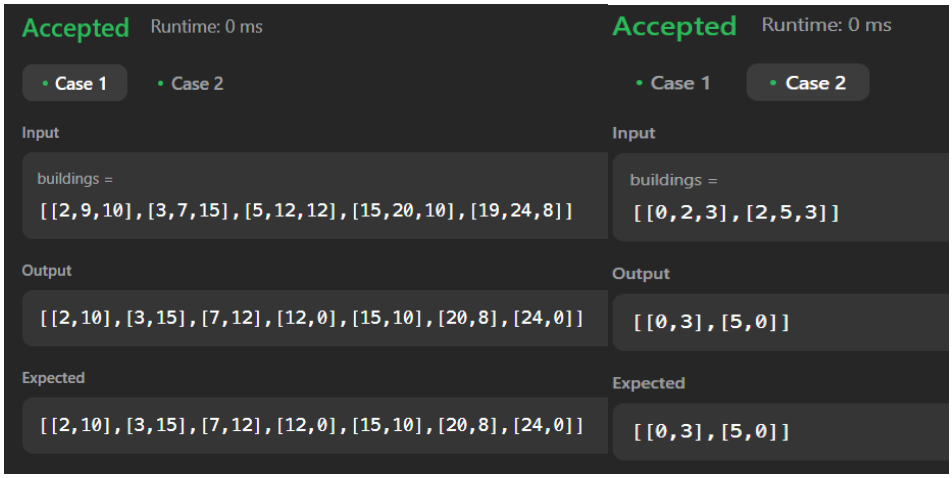
Aim:

The Skyline Problem

Code:

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

      for (int i = 0; i < buildings.size(); ++i) {
         const auto &b = buildings[i];
         edges.emplace_back(b[0], i);
         edges.emplace_back(b[1], i);
      }
      std::sort(edges.begin(), edges.end());

      while (edge_idx < edges.size()) {
         int curr_height;
         const auto &[curr_x, _] = edges[edge_idx];
         while (edge_idx < edges.size() &&
                curr_x == edges[edge_idx].first) {
            const auto &[_, building_idx] = edges[edge_idx];
            const auto &b = buildings[building_idx];
            if (b[0] == curr_x)
               pq.emplace(b[2], b[1]);
            ++edge_idx;
         }
         while (!pq.empty() && pq.top().second <= curr_x)
            pq.pop();
         curr_height = pq.empty() ? 0 : pq.top().first;
         if (skyline.empty() || skyline.back()[1] != curr_height)
            skyline.push_back({curr_x, curr_height});
      }
      return skyline;
   }
};
```

Output:



Case 1 Case 2

Problem 9

Aim:

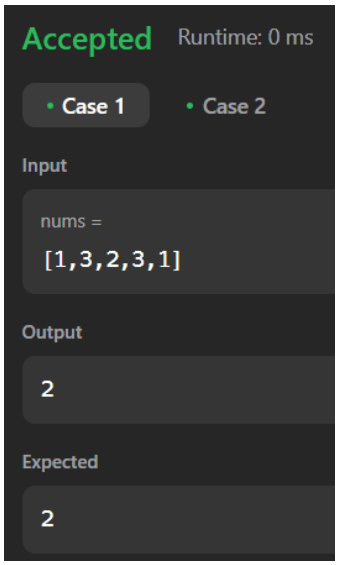
Reverse Pairs

Code:

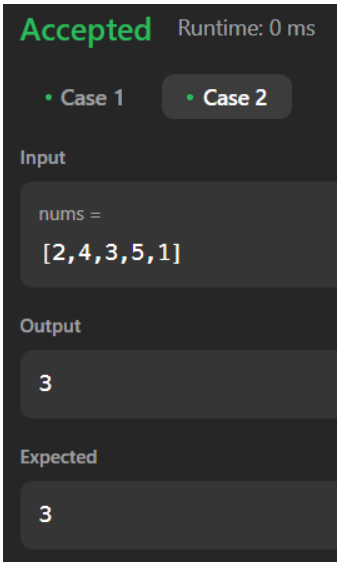
```
class SegTree {
private:
    int tree_size;
    vector<int> tree;

    void update(int lx, int rx, int ni, int idx) {

        if (rx - lx == 1) {
            tree[ni]++;
            return;
        }

        int m = (lx + rx) >> 1;

        if (idx < m)
            update(lx, m, ni * 2 + 1, idx);
        else
            update(m, rx, ni * 2 + 2, idx);

        tree[ni] = tree[ni * 2 + 1] + tree[ni * 2 + 2];
    }

    int query(int l, int r, int lx, int rx, int ni) {

        if (l >= rx || r <= lx)
            return 0;

        if (l <= lx && r >= rx)
            return tree[ni];

        int m = (lx + rx) >> 1;
        return query(l, r, lx, m, ni * 2 + 1) + query(l, r, m, rx, ni * 2 + 2);
    }

public:
    SegTree(int n) {
        tree_size = 1;

        while (tree_size < n)
            tree_size <<= 1;

        tree = vector<int>(tree_size * 2);
    }

    void update(int idx) {
        update(0, tree_size, 0, idx);
    }

    int query(int l, int r) {
        return query(l, r + 1, 0, tree_size, 0);
    }
```

```
};

class Solution {
public:
    int reversePairs(vector<int>& nums) {

        int n = nums.size();
        set<long long> values;

        for(const auto& num : nums) {
            values.insert(num);
            values.insert(2LL * num);
        }

        int last_index = 0;
        unordered_map<long long, int> values_indices;

        for(const auto& val : values)
            values_indices[val] = last_index++;

        SegTree seg_tree(last_index);
        int ans = 0;

        for(int i = 0; i < n; ++i) {
            ans += seg_tree.query(values_indices[2LL * nums[i]] + 1, last_index);
            seg_tree.update(values_indices[nums[i]]);
        }

        return ans;
    }
};
```

Output:



Case 1



Case 2

Problem 10

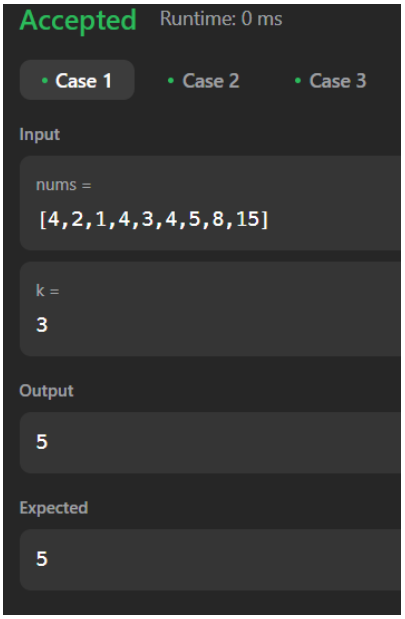
Aim:

Longest increasing subsequence 2

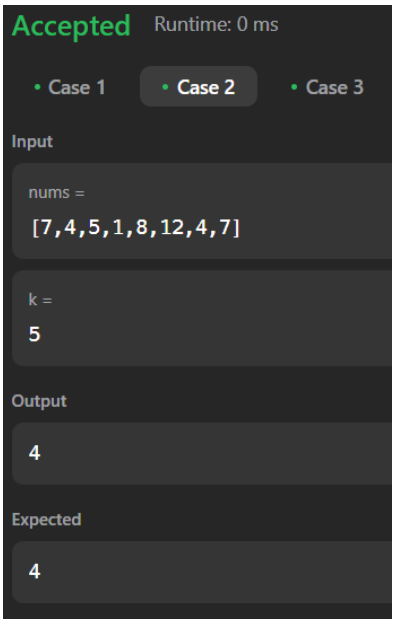
Code:

```
class Solution {
public:
    vector<int>tree;
    void update(int node,int st,int end,int i,int val){
        if(st==end){
            tree[node]=max(tree[node],val);
            return;
        }
        int mid=(st+end)/2;
        if(i<=mid){
            update(node*2,st,mid,i,val);
        }else{
            update(node*2+1,mid+1,end,i,val);
        }
        tree[node]=max(tree[node*2],tree[node*2+1]);
    }
    int query(int node,int st,int end,int x,int y){
        if(x>end || y<st) return -1e9;
        if(st>=x && end<=y){
            return tree[node];
        }
        int mid=(st+end)/2;
        int left=query(2*node,st,mid,x,y);
        int right=query(2*node+1,mid+1,end,x,y);
        return max(left,right);
    }
    int lengthOfLIS(vector<int>& nums, int k) {
        int n=nums.size();
        if(n==1) return 1;
        int m=*max_element(nums.begin(),nums.end());
        tree.clear();
        tree.resize(4*m+10);
        for(int i=n-1;i>=0;i--){
            int l=nums[i]+1,r=min(nums[i]+k,m);
            int x=query(1,0,m,l,r);
            if(x==-1e9) x=0;
            update(1,0,m,nums[i],x+1);
        }
        return tree[1];
    }
};
```

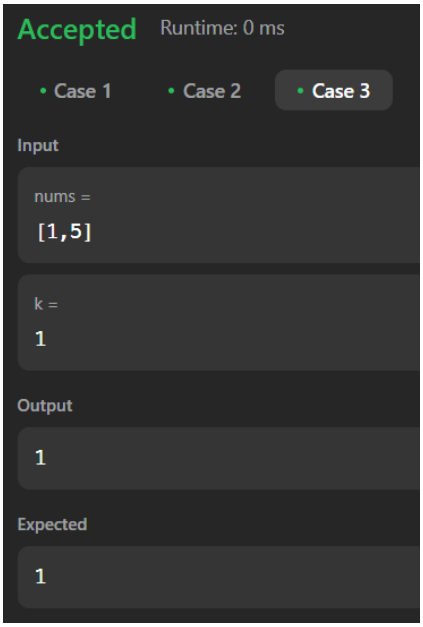
Output:



Case 1



Case 2



Case 3