

WORKSHEET 5

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Subject Name: IT Skills (DSA)

Question 1. PRODUCT OF THE LAST K NUMBERS

```
class ProductOfNumbers {
public:
    // vector 'v' will store the prefix products
    vector<int>v;
    ProductOfNumbers() {

    }

    void add(int num) {
        // if num is 0 clear the vector
        if(num==0) {
            v.clear();
            return;
        }

        // otherwise push the prefix product
        if(v.empty()) {
            v.push_back(num);
        }
        else {
            v.push_back(v.back()*num);
        }
    }

    int getProduct(int k) {
        // if k is exceeding the size of the vector that means 0 must have appeared in the stream. 0 has appeared that
        // so product must be 0
        if(k>v.size()) {
            return 0;
        }

        // otherwise find the product of the last k elements
        if(k==v.size()) {
            return v[k-1];
        }
        return v.back()/(v[v.size()-k-1]);
    }
};
```

Console

Run

Submit

Question 2. IMPLEMENT QUEUE USING STACKS

Accepted

Next question

233. Number of Digit One

More challenges

225. Implement Stack using Queues

All statuses

All languages

Accepted

few seconds ago

C++

```

class MyQueue {
public:
    stack<int> s1;
    stack<int> s2;

    MyQueue() {}

    void push(int x) {
        while(!s2.empty()) {
            s1.push(s2.top());
            s2.pop();
        }
        s1.push(x);
    }

    int pop() {
        while(!s1.empty()) {
            s2.push(s1.top());
            s1.pop();
        }
        int x = s2.top();
        s2.pop();
    }
};
    
```

```

        s2.pop();
        return x;
    }

    int peek() {
        while(!s1.empty()) {
            s2.push(s1.top());
            s1.pop();
        }
        int x = s2.top();
        return x;
    }

    bool empty() {
        if(!s2.empty() || !s1.empty()) {
            return false;
        }
        return true;
    }
};

/**
 * Your MyQueue object will be instantiated and called as such:
 * MyQueue* obj = new MyQueue();
 * obj->push(x);
 * int param 2 = obj->pop();
 */
    
```

Question 3. DESIGN CIRCULAR QUEUE

Accepted

Next question

832. Flipping an Image

More challenges

641. Design Circular Deque 1670. Design Front Middle Back Queue

All statuses All languages

Accepted
a few seconds ago

C++

```

class MyCircularQueue {
public:
    int *arr;
    int front;
    int rear;
    int size;
    MyCircularQueue(int k) {
        arr = new int[k];
        front = -1;
        rear = -1;
        size = k;
    }
    bool enqueue(int value) {
        if(isFull()) return false;
        if(isEmpty()) front = 0;
        rear = (rear + 1) % size;
        arr[rear] = value;
        return true;
    }
    bool dequeue() {
        if(isEmpty()) return false;
        if(front == rear) front = rear = -1;
        else front = (front + 1) % size;
        return true;
    }
};

```

```

        return true;
    }
    int Front() {
        if(isEmpty()) return -1;
        return arr[front];
    }
    int Rear() {
        if(isEmpty()) return -1;
        return arr[rear];
    }
    bool isEmpty() {
        return front == -1;
    }
    bool isFull() {
        return ((rear + 1) % size) == front;
    }
};

```

Question 4. DESIGN FRONT MIDDLE BACK QUEUE

Accepted

Next question

1628. Design an Expression Tree With Evaluate Function

More challenges

641. Design Circular Deque

All statuses

All languages

Accepted
a few seconds ago

C++

```

// Time: O(1) for all
// Space: O(N)
class FrontMiddleBackQueue {
    deque<int> a, b;
    void a2b() {
        if (a.size() <= b.size()) return;
        b.push_front(a.back());
        a.pop_back();
    }
    void b2a() {
        if (b.size() <= a.size() + 1) return;
        a.push_back(b.front());
        b.pop_front();
    }
public:
    FrontMiddleBackQueue() {}
    void pushFront(int val) {
        a.push_front(val);
        a2b();
    }
    void pushMiddle(int val) {
        a.push_back(val);
        a2b();
    }
    void pushBack(int val) {
        b.push_back(val);
        b2a();
    }
    int popFront() {
        if (a.empty() && b.empty()) return -1;
        int ans;
        if (a.empty()) {
            ans = b.front();
            b.pop_front();
        } else {
            ans = a.front();
            a.pop_front();
            b2a();
        }
        return ans;
    }
    int popMiddle() {
        if (a.empty() && b.empty()) return -1;
        int ans;
        if (a.size() == b.size()) {
            ans = a.back();
            a.pop_back();
        } else {
            ans = b.front();
            b.pop_front();
        }
        return ans;
    }
    int popBack() {
        if (a.empty() && b.empty()) return -1;
        int ans = b.back();
        b.pop_back();
        a2b();
        return ans;
    }
}


```

Question 5. BOOK EXERCISES

```
Language: C++14

1  #include <iostream>
2  using namespace std;
3  #include<bits/stdc++.h>
4  int main() {
5      // your code goes here
6      ios_base::sync_with_stdio(false);
7      cin.tie(NULL);
8      int n;
9      cin>>n;
10     stack<pair<pair<int,string>,int>> st1;
11     for(int i=0;i<n;i++){
12         int x;
13         cin>>x;
14         string str;
15         if(x!=-1){
16             cin>>str;
17         }else if(x==-1){
18             cout<<st1.top().second<<" "<<st1.top().first.second<<endl;
19             st1.pop();
20             continue;
21         }
22         if (x==0){
23             continue;
24         }
25         if(!st1.empty() and st1.top().first.first<x ){
26             st1.top().second++;
27             continue;
28         }
29
30         pair<int,string> p = make_pair(x,str);
31         pair<pair<int,string>,int> whole_pair= make_pair(p,0);
32         st1.push(whole_pair);
33     }
34     return 0;
35 }
```

SOLUTION:

Status:  Correct Answer Submission ID: [84843119](#)

Time: 0.82s	Memory: 27.3M
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Question 6. SUBARRAY SUM

```
Language: C++14

1  #include <bits/stdc++.h>
2  using namespace std;
3
4  #define ll long long
5  #define rep(i,a,b) for(int i = a; i <= b; ++i)
6  #define repr(i,a,b) for(int i = a; i>=b; --i)
7  #define all(a) a.begin(), a.end()
8  #define pb push_back
9  #define N 1005
10 #define ii pair<int, int>
11 #define se second
12 #define fi first
13 #define bit(i) (i & (-i))
14 #define base 29
15 #define mod 1000000007ll
16
17 int o1[4] = { 0, 1, 0, -1 };
18 int o2[4] = { -1, 0, 1, 0 };
19
20 string yno[2] = { "NO\n", "YES\n" };
21
22 void print(vector<int>& a) {
23     for (int i : a) cout << i << ' ';
24     cout << endl;
25 }
26
27 void print(ii a) {
28     cout << a.first << ' ' << a.second << endl;
29 }
30
31 void print(int a[], int n) {
32     rep(i, 1, n) cout << a[i] << ' ';
33     cout << endl;
34 }
```

```

35     cout << endl;
36 }
37
38 int p[200005];
39
40 void init() {
41     rep(i, 1, 200000) {
42         p[i] = p[i - 1] + i;
43         p[i] %= mod;
44     }
45 }
46
47 void solve() {
48     int n;
49     cin >> n;
50     vector<int> a(n + 2);
51     rep(i, 1, n) {
52         cin >> a[i];
53     }
54     vector<int> l(n + 2), r(n + 2);
55     stack<int> s;
56     rep(i, 1, n) {
57         while (s.size() && a[s.top()] < a[i]) {
58             s.pop();
59         }
60         if (s.size()) {
61             l[i] = s.top();
62         }
63         else l[i] = 0;
64         s.push(i);
65     }
66     s = stack<int>();
67     repr(i, n, 1) {
68         while (s.size() && a[s.top()] <= a[i]) {
69             s.pop();
70         }
71         if (s.size()) {
72             r[i] = s.top();
73         }
74         else r[i] = 0;
75         s.push(i);
76     }
77 }
```



```

70         r[i] = s.top();
71     }
72     else r[i] = n + 1;
73     s.push(i);
74 }
75 ll ans = 0;
76 rep(i, 1, n) {
77     ll t = (1ll * a[i] * (i - l[i])) % mod;
78     t = t * ((1ll * p[r[i] - i]) % mod);
79     ans += t;
80     ans %= mod;
81     t = (1ll * a[i] * (i - l[i])) % mod;
82     t = t * ((1ll * (r[i] - i) * (n + 1 - r[i])) % mod);
83     ans += t;
84     ans %= mod;
85 }
86 cout << ans << endl;
87 }
88
89 int main() {
90     ios_base::sync_with_stdio(false); cin.tie(0);
91     #ifndef ONLINE_JUDGE
92     #endif
93     init();
94     int t = 1;
95     cin >> t;
96     while (t--) {
97         solve();
98     }
99     return 0;
100 }

```

SOLUTION:

Status: ✔ Correct Answer

Submission ID: [85012356](#)

Score: 100

Time: 0.11s

Memory: 7.1M

Sub-Task	Task #	Result (time)
1	1	AC (0.105002)
1	2	AC (0.094270)
1	3	AC (0.097227)
1	4	AC (0.095927)
1	5	AC (0.077491)
1	6	AC (0.097477)
1	7	AC (0.094990)
1	8	AC (0.083370)

Subtask Score: 100.00%

Result - AC

Total Score = 100.00%



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Question 7. ABSOLUTE MIN MAX

```
Language: C++14

1  #include <bits/stdc++.h>
2
3  using namespace std;
4  using ll=long long;
5
6  #define pb push_back
7
8  ll ans,n;
9  ll arr[250002];
10 vector<ll> li[250002];
11
12 struct fenwick
13 {
14     std::vector<ll> tree;
15
16     void init(ll n)
17     {
18         ll i;
19         tree.resize(n+5);
20         for(i=0;i<=n;i++)
21         {
22             tree[i]=0;
23         }
24     }
25
26     void upd(ll i,ll v)
27     {
28         for(++i;i<=n;i+=(i&(-i)))
29         {
30             tree[i]+=v;
31         }
32     }
33
34     ll calc(ll i)
35     {
36         ll sum=0;
37         for(++i;i>0;i-=(i&(-i)))
38         {
39             sum+=tree[i];
40         }
41         return sum;
42     }
43
44     ll calc(ll l,ll r)
45     {
46         return calc(r)-calc(l-1);
```

```

46         return calc(r)-calc(l-1);
47     }
48 };
49
50 void solve()
51 {
52     stack<ll> stck;
53     ll i;
54     ll nxt[n+5];
55     fenwick tr;
56     tr.init(n+5);
57     for(i=0;i<=n;i++)
58     {
59         li[i].clear();
60     }
61     for(i=0;i<=n;i++)
62     {
63         while(!stck.empty() && arr[stck.top()]<=arr[i])
64         {
65             stck.pop();
66         }
67         if(stck.empty())
68         {
69             tr.upd(i,1);
70         }
71         else
72         {
73             li[stck.top()].pb(i);
74         }
75         stck.push(i);
76     }
77     while(!stck.empty()){stck.pop();}
78     for(i=n-1;i>=0;i--)
79     {
80         while(!stck.empty() && arr[stck.top()]>=arr[i])
81         {
82             stck.pop();
83         }
84         if(stck.empty())
85         {
86             nxt[i]=n;
87         }
88         else
89         {
90             nxt[i]=stck.top();
91         }
92         stck.push(i);
93     }
94     for(i=0;i<=n;i++)
95     {
```

```

94     for(i=0;i<n;i++)
95     {
96         for(ll j:li[i])
97         {
98             tr.upd(j,1);
99         }
100        ans+=tr.calc(i,nxt[i]-1);
101    }
102    return ;
103 }
104
105 int main()
106 {
107     ios_base::sync_with_stdio(false);
108     cin.tie(NULL);
109     ll testcases, i, cur;
110     cin >> testcases;
111     while (testcases--)
112     {
113         cin >> n;
114         ans = 0;
115         for (i = 0; i < n; i++)
116         {
117             cin >> arr[i];
118         }
119         solve();
120         reverse(arr, arr + n);
121         solve();
122         cur = 1;
123         for (i = 1; i < n; i++)
124         {
125             if (arr[i - 1] == arr[i])
126             {
127                 cur++;
128             }
129             else
130             {
131                 ans -= (cur * (cur + 1)) / 2;
132                 cur = 1;
133             }
134         }
135         ans -= (cur * (cur + 1)) / 2;
136         cout << ans << "\n";
137     }
138     return 0;
139 }

```

SOLUTION:

Status: ✓ Correct Answer

Submission ID: 85012429

Score: 100

Time: 0.56s

Memory: 35.6M

Sub-Task	Task #	Result (time)
1	0	AC (0.005792)
1	1	AC (0.007151)
1	2	AC (0.008080)
1	3	AC (0.009422)
Subtask Score: 20.00%		Result - AC
2	4	AC (0.485408)
2	5	AC (0.418104)
2	6	AC (0.555810)
2	7	AC (0.508494)
Subtask Score: 80.00%		Result - AC
Total Score = 100.00%		

Question 8. WEAK IN THE MIDDLE

```
1  #include <bits/stdc++.h>
2  using namespace std;
3
4  void solve() {
5      int n;
6      cin >> n;
7      vector<int> t(n, 0);
8      stack<tuple<int, int, int>> st;
9
10     for(int i = 0; i < n; ++i) {
11         int a, end_time = 0;
12         cin >> a;
13
14         while(st.size() >= 2) {
15             auto x = st.top();
16             st.pop();
17             auto y = st.top();
18             if(get<0>(x) < min(get<0>(y), a))
19                 t[get<2>(x)] = end_time = 1 + max(get<1>(x), end_time);
20             else {
21                 st.push(x);
22                 break;
23             }
24         }
25
26         st.push({a, end_time, i});
27     }
28
29     for(int T : t) cout << T << ' ';
30     cout << '\n';
31 }
32
33 int main() {
34     ios_base :: sync_with_stdio(false);
35     cin.tie(0);
36     int t;
37     cin >> t;
38     while(t--) solve();
39     return 0;
40 }
```

SOLUTION:

Status: ✓ Correct Answer

Submission ID: [85013064](#)

Score: 100

Time: 0.02s

Memory: 5.4M

Sub-Task	Task #	Result (time)
1	0	AC (0.003946)
1	1	AC (0.003859)
Subtask Score: 20.00%		Result - AC
2	2	AC (0.017489)
2	3	AC (0.015301)
2	4	AC (0.014220)
2	5	AC (0.015795)
2	6	AC (0.014426)
Subtask Score: 80.00%		Result - AC

Total Score = 100.00%