

## WORKSHEET 5

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**Subject Name:** IT Skills (DSA)

**UID:** 20BCS2050

**Section/Group:** DWWC-43

### 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

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## 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) {

```

```

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 }

```

0:0

## SOLUTION:

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

Time: 0.82s

Memory: 27.3M

## 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 10000000711
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 }
36 int p[200005];
37
38 void init() {
39     rep(i, 1, 200000) {
40         p[i] = p[i - 1] + i;
41         p[i] %= mod;
42     }
43 }
44
45 void solve() {
46     int n;
47     cin >> n;
48     vector<int> a(n + 2);
49     rep(i, 1, n) {
50         cin >> a[i];
51     }
52     vector<int> l(n + 2), r(n + 2);
53     stack<int> s;
54     rep(i, 1, n) {
55         while (s.size() && a[s.top()] < a[i]) {
56             s.pop();
57         }
58         if (s.size()) {
59             l[i] = s.top();
60         }
61         else l[i] = 0;
62         s.push(i);
63     }
64     s = stack<int>();
65     repr(i, n, 1) {
66         while (s.size() && a[s.top()] <= a[i]) {
67             s.pop();
68         }
69         if (s.size()) {
70             r[i] = s.top();

```

```

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%

## 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);
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     {
96         if(li[i].size()==0)
97             continue;
98         ll mn=li[i][0];
99         ll mx=li[i][li[i].size()-1];
100        ll val=arr[mn];
101        ll val2=arr[mx];
102        ll ans1=0;
103        ll ans2=0;
104        for(j=mn;j<mx;j++)
105        {
106            ans1+=arr[j];
107            ans2+=arr[j];
108        }
109        if(val<val2)
110            ans+=ans1;
111        else
112            ans+=ans2;
113    }
114    cout<<ans<<endl;
115 }
```

```

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     {
96         if(li[i].size()==0)
97             continue;
98         ll mn=li[i][0];
99         ll mx=li[i][li[i].size()-1];
100        ll val=arr[mn];
101        ll val2=arr[mx];
102        ll ans1=0;
103        ll ans2=0;
104        for(j=mn;j<mx;j++)
105        {
106            ans1+=arr[j];
107            ans2+=arr[j];
108        }
109        if(val<val2)
110            ans+=ans1;
111        else
112            ans+=ans2;
113    }
114    cout<<ans<<endl;
115 }
```

```

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%