Worksheet 5

Domain Winter Winning Camp

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Section: DWWC - 43
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Subject Name: IT Skills

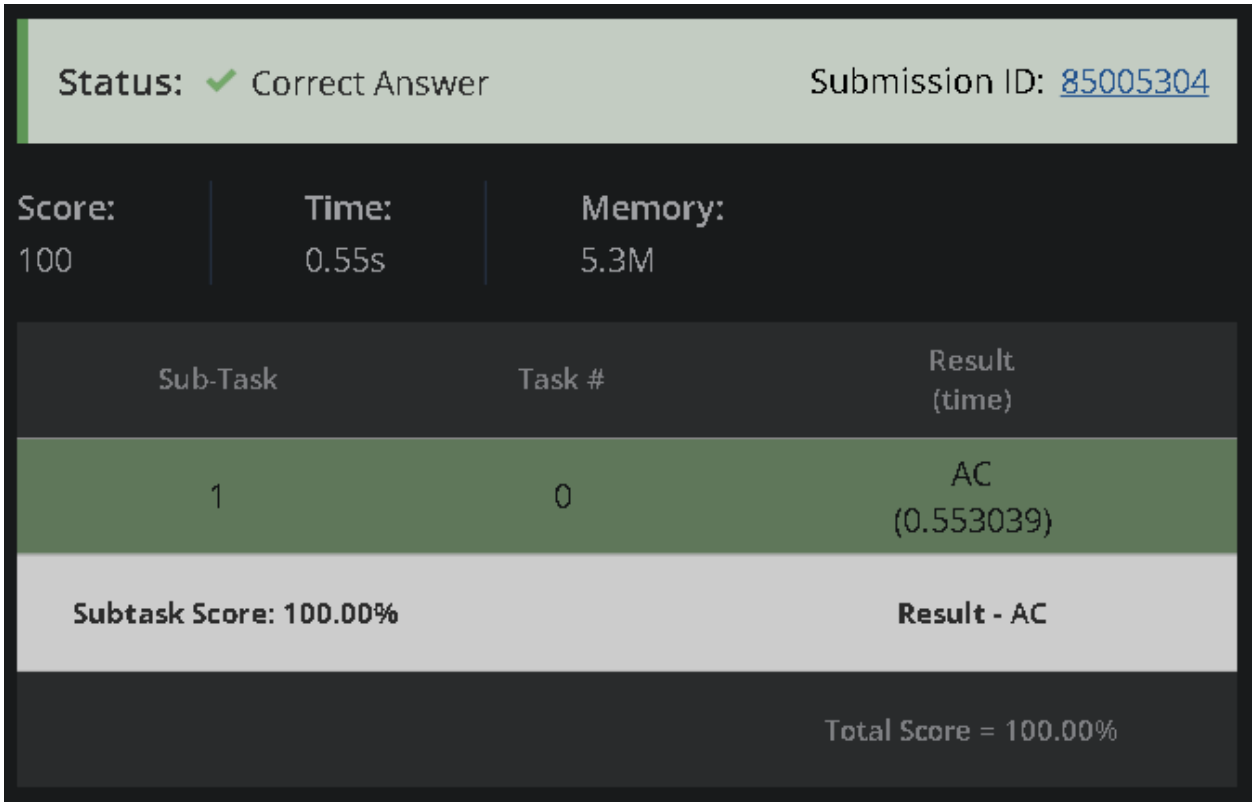
1. Dr Phil goes to the ranch

Code:

```
#include <iostream>
#include <queue>
#include <algorithm>
#include <stack>
using namespace std;

int main()
{
   cin.sync_with_stdio(false);
   cin.tie(NULL);
   cout.tie(NULL);
   int t;
   cin>>t;
   while(t--)
   {
      int n;
      cin>>n;
      queue <int> arr, book;
      vector<bool> av(n+1,0);
      stack<int> missed;
      for (int i = 1; i <=n; i++)
      {
         int t;
         cin>>t;
         arr.push(t);
```

```
            book.push(i);
        }
        while (!arr.empty() or !book.empty())
        {
            if (!arr.empty() and !book.empty() and arr.front()==book.front())
            {
                cout<<arr.front()<<" ";
                arr.pop();
                book.pop();
            }
            else if(!book.empty() and book.front()<arr.front())
            {
                missed.push(book.front());
                book.pop();
            }
            else if (book.empty() or arr.front()<book.front())
            {
                av[arr.front()]=1;
                if(arr.front()==missed.top())
                {
                    while(!missed.empty() and av[missed.top()])
                    {
                        cout<<missed.top()<<" ";
                        missed.pop();
                    }
                }
                arr.pop();
            }
        }
        cout<<endl;
    }
}
```

Output:



2. Book Exercises

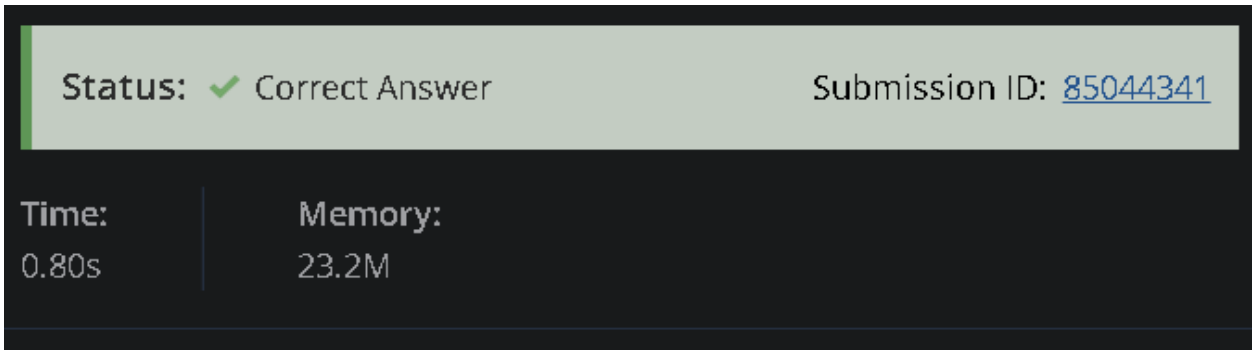
Code:

```
#include<iostream>
#include<cstdlib>
#include<algorithm>
#include<stack>
using namespace std;

class Node

{
public:
string book;
int ex;
int top;

Node (string _book, int _ex, int _top)
```

```
{
book = _book;
ex = _ex;
top = _top;
}
};

int main()
{
ios::sync_with_stdio(0);
cin.tie(0);

int N;
cin>>N;


int val;
stack<Node> mins;
string book;

while (N-- > 0)
{
cin>>val;

if (val == -1)
{
cout<<mins.top().top<<" ";
cout<<mins.top().book<<endl;
mins.pop();
}
else
{
cin>>book;
if (val <= 0)
{
```

```
}
else if (mins.size() == 0)
{
mins.push(Node(book, val, 0));
}
else if (mins.top().ex < val)
{
mins.top().top++;
}
else
{
mins.push(Node(book, val, 0));
}
}
}

return 0;
}
```

Output:



3. Hussain Set

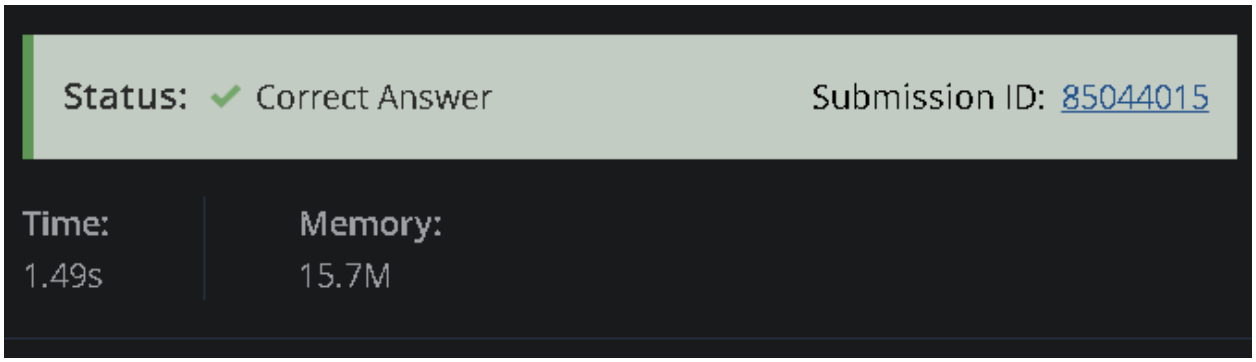
Code:

```
#include <iostream>
#include<bits/stdc++.h>
```

```
using namespace std;

int main()
{
int n,q,end_p,acqui = 0;

cin >> n >> q;
vector<long long> vec(n);
queue<long long> que;
end_p = n-1;

for(int i=0;i<n;i++)
{
cin>>vec[i];
}

sort(vec.begin(),vec.end());
long long ans = 0;

for(int i=0;i<q;i++)
{
int curr_q = 0;
cin >> curr_q;
for(;acqui<curr_q;acqui++)
{
if((end_p >=0)&&(que.empty()||(vec[end_p]>=que.front())))
{
ans = vec[end_p];
end_p--;
}
else
{
ans = que.front();
que.pop();
}
```

```
que.push(ans/2);
}
cout << ans << endl;
}

return 0;
}
```

Output:



4. Weak in the Middle

Code:

```
#include <bits/stdc++.h>
using namespace std;

void solve() {
int n;
cin >> n;
vector<int> t(n, 0);
stack<tuple<int, int, int>> st;

for(int i = 0; i < n; ++i) {
int a, end_time = 0;
cin >> a;

while(st.size() >= 2) {
auto x = st.top();
```

```
st.pop();
auto y = st.top();
if(get<0>(x) < min(get<0>(y), a))
t[get<2>(x)] = end_time = 1 + max(get<1>(x), end_time);
else {
st.push(x);
break;
}
}

st.push({a, end_time, i});
}

for(int T : t) cout << T << ' ';
cout << '\n';
}

int main() {
ios_base :: sync_with_stdio(false);
cin.tie(0);
int t;
cin >> t;
while(t--) solve();
return 0;
}
```

Output:

Status: ✔ Correct Answer Submission ID: 85043567

Score:	Time:	Memory:
100	0.02s	5.3M

Sub-Task	Task #	Result (time)
1	0	AC (0.003828)
1	1	AC (0.003763)
Subtask Score: 20.00%		**Result - AC**
2	2	AC (0.017159)
2	3	AC (0.015205)
2	4	AC (0.014139)
2	5	AC (0.015586)
2	6	AC (0.014377)
Subtask Score: 80.00%		**Result - AC**

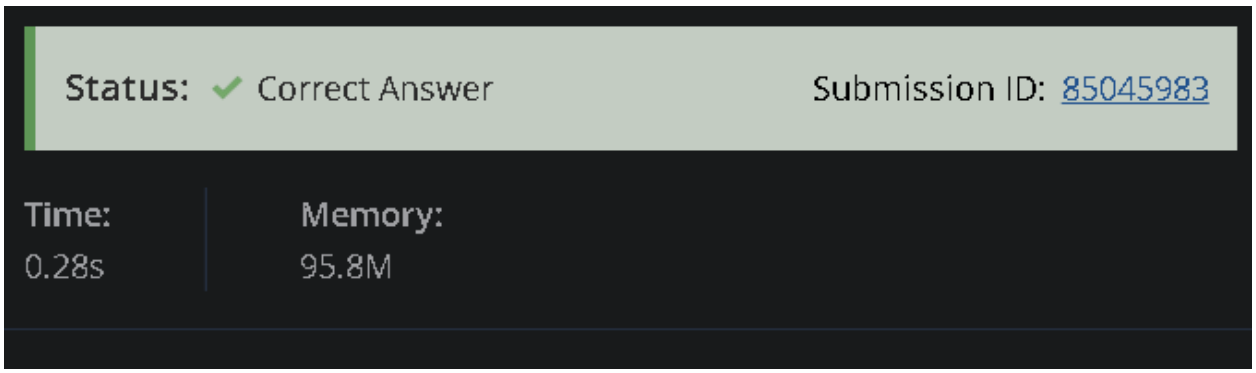
5. Doof fires Brackets

Code:

```
#include<bits/stdc++.h>
using namespace std;
const int MAXN = 1e6 + 5;
const long long mod = 1e9 + 7;

int n, q;
string s;
int queries[MAXN];

void solve()
{
n = s.length();
stack<int> st;
vector<int> nxt(n, -2);
int i = 0;
for(i = 0; i < n; i++)
{
if(s[i] == '(')
st.push(i);
else if(st.size() > 0)
nxt[st.top()] = i, st.pop();
}
for(i = n - 2; i >= 0; i--)
{
if(s[i] == ')')
nxt[i] = nxt[i + 1];
}
for(i = 0; i < q; i++)
cout << nxt[queries[i] - 1] + 1 << "\n";
}

int main()
{
```

```
ios_base::sync_with_stdio(false);
cin.tie(NULL);
int t;
cin >> t;
while(t--)
{
cin >> s >> q;
int i = 0;
for(i = 0; i < q; i++)
cin >> queries[i];
solve();
}
return 0;
}
```

Output:



6. Absolute Min Max

Code:

```
#include <bits/stdc++.h>

using namespace std;
using ll=long long;

#define pb push_back

ll ans,n;
```

```
ll arr[250002];
vector<ll> li[250002];

struct fenwick
{
std::vector<ll> tree;


void init(ll n)
{
ll i;
tree.resize(n+5);
for(i=0;i<=n;i++)
{
tree[i]=0;
}
}

void upd(ll i,ll v)
{
for(++i;i<=n;i+=(i&(-i)))
{
tree[i]+=v;
}
}

ll calc(ll i)
{


ll sum=0;
for(++i;i>0;i-=(i&(-i)))
{
sum+=tree[i];
}
```

```
return sum;
}

ll calc(ll l,ll r)
{
return calc(r)-calc(l-1);
}
};

void solve()
{
stack<ll> stck;
ll i;
ll nxt[n+5];
fenwick tr;
tr.init(n+5);


for(i=0;i<=n;i++)
{
li[i].clear();
}
for(i=0;i<n;i++)
{
while(!stck.empty() && arr[stck.top()]<=arr[i])
{
stck.pop();
}
if(stck.empty())
{
tr.upd(i,1);
}
else
{
li[stck.top()].pb(i);
```

```
}
stck.push(i);
}
while(!stck.empty()){stck.pop();}



for(i=n-1;i>=0;i--)
{
while(!stck.empty() && arr[stck.top()]>=arr[i])
{
stck.pop();
}
if(stck.empty())
{
nxt[i]=n;
}
else
{
nxt[i]=stck.top();
}
stck.push(i);
}
for(i=0;i<n;i++)
{
for(ll j:li[i])
{
tr.upd(j,1);

}
ans+=tr.calc(i,nxt[i]-1);
}
return ;
}
```

```
int main()
{
ios_base::sync_with_stdio(false);
cin.tie(NULL);
ll testcases, i, cur;
cin >> testcases;
while (testcases--)
{
cin >> n;
ans = 0;
for (i = 0; i < n; i++)
{
cin >> arr[i];
}
solve();
reverse(arr, arr + n);
solve();
cur = 1;
for (i = 1; i < n; i++)
{
if (arr[i - 1] == arr[i])
{
cur++;
}
else
{
ans -= (cur * (cur + 1)) / 2;
cur = 1;
}
}
ans -= (cur * (cur + 1)) / 2;
cout << ans << "\n";
}
return 0;
}
```

Output:

Status: ✔ Correct Answer Submission ID: 85045008

Score:	Time:	Memory:
100	0.57s	35.4M

Sub-Task	Task #	Result (time)
1	0	AC (0.005995)
1	1	AC (0.007119)
1	2	AC (0.008456)
1	3	AC (0.009634)
Subtask Score: 20.00%		**Result - AC**
2	4	AC (0.508839)
2	5	AC (0.441288)
2	6	AC (0.568609)
2	7	AC (0.531002)
Subtask Score: 80.00%		**Result - AC**

7. Subarray Sum

Code:

```
#include <iostream>
#include <vector>
#define ll long long

using namespace std;

const int MOD = 1e9 + 7;

ll S(ll x) {
	return (x * (x + 1) / 2) % MOD;
}

int main()
{
	int T;  scanf("%d", &T);
	while (T--) {
		int n;  scanf("%d", &n);
		vector <int> arr(n);
		for (int& x : arr)
			scanf("%d", &x);

		vector <ll> st;
		vector <ll> nxt(n, n), pre(n, -1);
		for (int i = n - 1; i >= 0; i--) {
			while (st.size() && arr[st.back()] <= arr[i])
				st.pop_back();
			if (st.size()) nxt[i] = st.back();
			st.push_back(i);
		}

		st.clear();
		for (int i = 0; i < n; i++) {
			while (st.size() && arr[st.back()] < arr[i])
```

```
                st.pop_back();
            if (st.size()) pre[i] = st.back();
            st.push_back(i);
        }

        ll ans = 0;
        for (int i = 0; i < n; i++) {
            ll L = i - pre[i];
            ll R = (S(nxt[i] - i) + (n - nxt[i]) * (nxt[i] - i) % MOD) % MOD;
            ll add = (L * R % MOD) * arr[i] % MOD;
            ans = (ans + add) % MOD;
        }

    printf("%lld\n", ans);
      }

      return 0;
}
```

Output:

Status: ✔ Correct Answer **Submission ID:** 85018144

Score:	Time:	Memory:
100	0.12s	10.7M

Sub-Task	Task #	Result (time)
1	1	AC (0.116847)
1	2	AC (0.109662)
1	3	AC (0.109712)
1	4	AC (0.111410)
1	5	AC (0.084607)
1	6	AC (0.109414)
1	7	AC (0.105341)
1	8	AC (0.096291)

Subtask Score: 100.00% **Result - AC**