Олимпиада СПбГУ
по информатике
2023/24 учебного года

24fin0253 – Куринов Михаил Дмитриевич

A	B	C	D	E	F	sum
100	100	100	100	20	67	487

Task A

```
#include <iostream>
#include <string>
#include <deque>
#include <vector>
#include <algorithm>
#include <fstream>
#include <set>
#include <map>
#include <cassert>
#include <bitset>
#include <stdio.h>
#include <cstdio>

using namespace std;

#define int long long

int calc(int n, int a, int b) {
    if (n < 0) {
        return 0;
    }
    vector<int> dp(n + 1);
    dp[0] = 1;
    for (int i = 1; i < n + 1; ++i) {
        dp[i] = 0;
        if (i >= a) {
            dp[i] += dp[i - a];
        }
        if (i >= b) {
```

```
            dp[i] += dp[i - b];
        }
    }
    return dp[n];
}

signed main() {
    ios::sync_with_stdio(false);
    cin.tie(NULL);
    int a, b, n;
    cin >> a >> b >> n;
    int ans = 0;
    for (int left = 1; left <= n; ++left) {
        if (left <= a) {
            ans += calc(n - a, a, b);
        }
        if (left <= b) {
            ans += calc(n - b, a, b);
        }
    }
    cout << ans;
    return 0;
}
```

Task B

```
#include <iostream>
#include <string>
#include <deque>
#include <vector>
#include <algorithm>
#include <fstream>
#include <set>
#include <map>
#include <cassert>
#include <bitset>
#include <stdio.h>
#include <cstdio>

using namespace std;

#define int long long

int dist(int a, int b, int c, int a1, int b1, int c1) {
    int da = abs(a - a1);
    int db = abs(b - b1);
    int dc = abs(c - c1);
    return (da + db + dc) / 2;
}

signed main() {
    ios::sync_with_stdio(false);
    cin.tie(NULL);
```

```
    int n; cin >> n;
    int x, y, z, x1, y1, z1;
    cin >> x >> y >> z >> x1 >> y1 >> z1;

    int d = dist(x, y, z, x1, y1, z1);
    d = min(dist(x, y, z, x1 + 2 * n, y1 - n, z1 - n), d);
    d = min(dist(x, y, z, x1 - 2 * n, y1 + n, z1 + n), d);
    d = min(dist(x, y, z, x1 - n, y1 + 2 * n, z1 - n), d);
    d = min(dist(x, y, z, x1 + n, y1 - 2 * n, z1 + n), d);
    d = min(dist(x, y, z, x1 - n, y1 - n, z1 + 2 * n), d);
    d = min(dist(x, y, z, x1 + n, y1 + n, z1 - 2 * n), d);
    cout << d << '\n';
}
```

Task C

```
#include <iostream>
#include <string>
#include <deque>
#include <vector>
#include <algorithm>
#include <fstream>
#include <set>
#include <cassert>
#include <bitset>
#include <stdio.h>
#include <cstdio>

using namespace std;
#define int long long
const int maxn = 1e5;
const int mod1 = 1e9 + 7;
const int P1 = 37;
const int P2 = 113;
int p1[maxn + 1];
int p2[maxn + 1];
const int mod2 = 1e9 + 11;

signed main() {
    ios::sync_with_stdio(false);
    cin.tie(NULL);
    p1[0] = 1;
    p2[0] = 1;
    for (int i = 1; i < maxn + 1; ++i) {
        p1[i] = p1[i - 1] * P1 % mod1;
        p2[i] = p2[i - 1] * P2 % mod2;
    }
    string type;
    cin >> type;
    if (type == "first") {
        int hash1 = 0;
        int hash2 = 0;
        int n;
```

```
        cin >> n;
        string s;
        cin >> s;
        for (int i = 0; i < n; ++i) {
            hash1 = hash1 * P1 + s[i] - '0' + 1;
            hash1 %= mod1;
            hash2 = hash2 * P2 + s[i] - '0' + 1;
            hash2 %= mod2;
        }
        cout << hash1 /*<< " " << hash2*/ << '\n';
    }
    else {
        int n;
        cin >> n;
        string t;
        cin >> t;
        int hash1, hash2;
        cin >> hash1 >> hash2;
        vector<int> pref1(n + 1);
        vector<int> pref2(n + 1);
        pref1[0] = 0;
        pref2[0] = 0;
        for (int i = 0; i < n; ++i) {
            pref1[i + 1] = (pref1[i] * P1 + t[i] - '0' + 1) % mod1;
            pref2[i + 1] = (pref2[i] * P2 + t[i] - '0' + 1) % mod2;
        }
        int H1 = 0;
        int H2 = 0;
        for (int i = n; i >= 0; --i) {
            if (i != n) {
                H1 += p1[n - i - 1] * (t[i] - '0' + 1);
                H1 %= mod1;
                H2 += p2[n - i - 1] * (t[i] - '0' + 1);
                H2 %= mod2;
            }
            int totalh1 = (H1 * p1[i] % mod1 + pref1[i]) % mod1;
            int totalh2 = H2 * p2[i] % mod2 + pref2[i] % mod2;
            if (totalh1 == hash1/* && totalh2 == hash2*/) {
                cout << "YES\n";
                exit(0);
            }
        }
        cout << "NO\n";
    }
}
```

Task D

```
#include <iostream>
#include <string>
#include <deque>
#include <vector>
#include <algorithm>
```

```
#include <fstream>
#include <set>
#include <map>
#include <cassert>
#include <bitset>
#include <stdio.h>
#include <cstdio>

using namespace std;
#define int long long
#define all(x) x.begin(), x.end()

char ask(int i, int j) {
    cout << i + 1 << " " << j + 1 << endl;
    char ans;
    cin >> ans;
    if (ans == '!') {
        exit(0);
    }
    return ans;
}

signed main() {
    ios::sync_with_stdio(false);
    cin.tie(NULL);
    cin.tie(NULL);
    int n; cin >> n;
    for (int iter = 0; iter < n - 1; ++iter) {
        char cur = ask(0, 0);
        bool was = false;
        for (int i = 0; i < n - iter - 1; ++i) {
            if (cur == '>') {
                cur = ask(0, n - 1);
                if (cur == '<') {
                    was = true;
                }
            }
            else {
                cur = ask(0, 0);
            }
        }
        for (int i = 0; i < iter; ++i) {
            ask(0, 0);
        }
        if (was) {
            --iter;
        }
    }
}
```

Task E

```
#include <iostream>
```

```
#include <string>
#include <deque>
#include <vector>
#include <algorithm>
#include <fstream>
#include <set>
#include <map>
#include <cassert>
#include <bitset>
#include <stdio.h>
#include <cstdio>

using namespace std;

typedef long long ll;

int n, q;
vector<vector<ll>> g;
vector<ll> cnt;

int main() {
    ios::sync_with_stdio(false);
    cin.tie(NULL);
    cin >> n >> q;
    g.resize(n);
    cnt.resize(n);
    ll tmax = 0;
    for (ll i = 0; i < n; ++i) {
        ll sz;
        cin >> sz;
        for (ll j = 0; j < sz; ++j) {
            ll x;
            cin >> x;
            --x;
            g[i].push_back(x);
        }
    }
    vector<ll> qs;
    for (ll i = 0; i < q; ++i) {
        ll t;
        cin >> t;
        qs.push_back(t);
        tmax = max(tmax, t);
    }
    vector<ll> vert = { 1 };
    ll cur = 0;
    for (ll i = 0; i <= tmax; ++i) {
        ll to = g[cur][cnt[cur] % g[cur].size()];
        cnt[cur]++;
        cur = to;
        vert.push_back(cur + 1);
    }
    for (ll i = 0; i < q; ++i) {
```

```
        cout << vert[qs[i] % vert.size()] << " ";
    }
    return 0;
}
```

Task F

```
#include <iostream>
#include <string>
#include <deque>
#include <vector>
#include <algorithm>
#include <fstream>
#include <set>
#include <cassert>
#include <stdio.h>
#include <cstdio>

using namespace std;

typedef long long ll;

int main() {
    ios::sync_with_stdio(false);
    cin.tie(NULL);
    ll h, w;
    cin >> h >> w;
    vector<vector<ll>> a(h, vector<ll>(w));
    for (ll i = 0; i < h; ++i) {
        for (ll j = 0; j < w; ++j) {
            char x; cin >> x;
            a[i][j] = x - '0';
        }
    }
    ll cnt = 0;
    vector<vector<char>> ans(h, vector<char>(w));
    for (ll i = 0; i < h; i += 2) {
        for (ll j = 0; j < w; j += 2) {
            ll ans1 = a[i][j] * a[i][j + 1] + a[i + 1][j] * a[i + 1][j +
    1];

            ll ans2 = a[i][j] * a[i + 1][j] + a[i][j + 1] * a[i + 1][j +
    1];
            if (ans1 > ans2) {
                ans[i][j] = 'L';
                ans[i][j + 1] = 'R';
                ans[i + 1][j] = 'L';
                ans[i + 1][j + 1] = 'R';
            }
            else {
                ans[i][j] = 'T';
                ans[i + 1][j] = 'B';
                ans[i][j + 1] = 'T';
```

```
                ans[i + 1][j + 1] = 'B';
            }
            cnt += max(ans1, ans2);
        }
    }
    cout << cnt << '\n';

    for (ll i = 0; i < h; ++i) {
        for (ll j = 0; j < w; ++j) {
            cout << ans[i][j];
        }
        cout << '\n';
    }

}
```