Олимпиада СПбГУ
по информатике
2023/24 учебного года

24fin0295 – Махмутов Марсель Наилевич

A	B	C	D	E	F	sum
100	100	100	0	20	91	411

Task A

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

using namespace std;
#define ll long long
#define pb push_back
#define endl '\n'
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend()
#define ld long double
#define vi vector<ll>
#define vii vector<vi>

void solve() {
    ll n, a, b;
    cin >> a >> b >> n;
    set<ll> s;
    ll ans = 0;
    for (ll i = 1; i <= n; i++) {
        vi dp(n + 1), used(n + 1);
        dp[i] = 1;
        used[i] = 1;
        for (ll j = (i + 1 > n) ? 1 : i + 1; j != i; j = (j + 1 > n) ? 1
    : j + 1) {
            if (j > a && s.count(j - a) == 0 && used[j - a]) {
                dp[j] += dp[j - a];
            }
            if (j > b && s.count(j - b) == 0 && used[j - b]) {
                dp[j] += dp[j - b];
            }
```

```
            if (j <= a) {
                ll j2 = n - (a - j);
                if (j2 > 0 && j2 < n + 1 && s.count(j2) == 0 && used[j2])
    {
                    dp[j] += dp[j2];
                }
            }
            if (j <= b) {
                ll j2 = n - (b - j);
                if (j2 > 0 && j2 < n + 1 && s.count(j2) == 0 && used[j2])
    {
                    dp[j] += dp[j2];
                }
            }
            used[j] = 1;
        }
        ll res = 0;
        ll j = i;
        if (j > a && s.count(j - a) == 0) {
            res += dp[j - a];
        }
        if (j > b && s.count(j - b) == 0) {
            res += dp[j - b];
        }
        if (j <= a) {
            ll j2 = n - (a - j);
            if (j2 > 0 && j2 < n + 1  && s.count(j2) == 0) {
                res += dp[j2];
            }
        }
        if (j <= b) {
            ll j2 = n - (b - j);
            if (j2 > 0 && j2 < n + 1 && s.count(j2) == 0) {
                res+= dp[j2];
            }
        }
        s.insert(i);
        ans += res;
    }
    cout << ans;
}

int main() {
#ifdef LOCAL
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
    clock_t timer = clock();
#endif
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    ll t = 1;
    // cin >> t;
```

```
    while (t--) {
        solve();
    }
#ifdef LOCAL
    // cout << endl << "time: " << (ld) (clock() - timer) /
    CLOCKS_PER_SEC;
#endif
}
```

Task B

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

using namespace std;
#define ll long long
#define pb push_back
#define endl '\n'
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend()
#define ld long double
#define vi vector<ll>
#define vii vector<vi>

ll ans = 1e18;

ll dist(ll x1, ll y1, ll z1, ll x2, ll y2, ll z2) {
    return (abs(x1 - x2) + abs(y1 - y2) + abs(z1 - z2)) / 2;
}

void solve() {
    ll n;
    cin >> n;
    ll x1, y1, z1;
    cin >> x1 >> y1 >> z1;
    ll x2, y2, z2;
    cin >> x2 >> y2 >> z2;
    ans = dist(x1, y1, z1, x2, y2, z2);
    ll x3, y3, z3;
    if (x2 < x1) {
        swap(x1, x2);
        swap(y1, y2);
        swap(z1, z2);
    }
    x3 = n + x1 - (-n);
    y3 = y1 - n;
    z3 = z1 - n;
    ans = min(ans, dist(x3, y3, z3, x2, y2, z2));
    if (y2 < y1) {
        swap(x1, x2);
        swap(y1, y2);
        swap(z1, z2);
    }
    x3 = x1 - n;
```

```
    y3 = n + y1 - (-n);
    z3 = z1 - n;
    ans = min(ans, dist(x3, y3, z3, x2, y2, z2));
    if (z2 < z1) {
        swap(x1, x2);
        swap(y1, y2);
        swap(z1, z2);
    }
    x3 = x1 - n;
    y3 = y1 - n;
    z3 = n + z1 - (-n);
    ans = min(ans, dist(x3, y3, z3, x2, y2, z2));
    cout << ans;
}

int main() {
#ifdef LOCAL
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
    clock_t timer = clock();
#endif
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    ll t = 1;
    // cin >> t;
    while (t--) {
        solve();
    }
#ifdef LOCAL
    // cout << endl << "time: " << (ld) (clock() - timer) /
    CLOCKS_PER_SEC;
#endif
}
```

Task C

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

using namespace std;
#define ll long long
#define pb push_back
#define endl '\n'
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend()
#define ld long double
#define vi vector<ll>
#define vii vector<vi>

ll p1 = 3, p2 = 47, mod = 1791791791;

void solve() {
    string gg;
```

```
cin >> gg;
if (gg[0] == 'f') {
    ll n;
    cin >> n;
    string s;
    cin >> s;
    ll hash1 = 0, hash2 = 0;
    for (ll i = 0; i < n; i++) {
        hash1 = (hash1 * p1 + s[i] - '0') % mod;
        hash2 = (hash2 * p2 + s[i] - '0') % mod;
    }
    cout << hash1 << " " << hash2 << endl;
} else {
    ll n;
    cin >> n;
    string t;
    cin >> t;
    ll h1 = 0, h2 = 0;
    string res1, res2;
    cin >> res1 >> res2;
    reverse(all(res1));
    reverse(all(res2));
    ll pp = 1;
    for (ll i = 0 ; i < (ll) res1.size(); i++) {
        h1 += (res1[i] - '0') * pp;
        pp *= 10;
    }
    pp = 1;
    for (ll i = 0 ; i < (ll)res2.size(); i++) {
        h2 += (res2[i] - '0') * pp;
        pp *= 10;
    }
    //cout << h1 << " " << h2 << endl;

    vector<ll> hash1(n + 1), hash2(n + 1);
    for (ll i = 0 ; i < n; i++) {
        hash1[i + 1] = (hash1[i] * p1 + t[i] - '0') % mod;
        hash2[i + 1] = (hash2[i] * p2 + t[i] - '0') % mod;
    }

    vector<ll> pw1(n + 1), pw2(n + 1);
    pw1[0]=1;
    pw2[0] = 1;
    for (ll i = 1; i <= n; i++) {
        pw1[i] = pw1[i-1] * p1 % mod;
        pw2[i] = pw2[i-1] * p2 % mod;
    }

    for (ll i = 1; i <= n; i++) {
        ll gg1 = ((hash1[n] - hash1[i-1] * pw1[n - i + 1]) % mod +
mod) % mod;
        gg1 = gg1 * pw1[i-1] + hash1[i-1];
        gg1 %= mod;
```

```
            ll gg2 = ((hash2[n] - hash2[i-1] * pw2[n - i + 1]) % mod +
    mod) % mod;
            gg2 = gg2 * pw2[i-1] + hash2[i-1];
            gg2 %= mod;
            if (gg1 == h1 && gg2 == h2) {
                cout << "YES";
                return;
            }
        }
        cout << "NO";
    }
}

int main() {
#ifdef LOCAL
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
    clock_t timer = clock();
#endif
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    ll t = 1;
    // cin >> t;
    while (t--) {
        solve();
    }
#ifdef LOCAL
    // cout << endl << "time: " << (ld) (clock() - timer) /
    CLOCKS_PER_SEC;
#endif
}
```

Task D

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

using namespace std;
#define ll long long
#define pb push_back
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend()
#define ld long double
#define vi vector<ll>
#define vii vector<vi>

void solve() {
    ll n;
    cin >> n;
    while (true) {
        cout << 1 << " " << 1 << endl;
        char c;
        cin >> c;
```

```
        if (c == '!') {
            return;
        }
        if (c == '<') {
            for (ll j = 0; j < n; j++) {
                cout << 1 << " " << 1 << endl;
                char f;
                cin >> f;
            }
            cout << 1 << " " << 2 << endl;
            char f;
            cin >> f;
            if (f == '!')
                return;
        }
    }
}

int main() {
#ifdef LOCAL
    clock_t timer = clock();
#endif
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    ll t = 1;
    // cin >> t;
    while (t--) {
        solve();
    }
#ifdef LOCAL
    // cout << endl << "time: " << (ld) (clock() - timer) /
    CLOCKS_PER_SEC;
#endif
}
```

Task E

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

using namespace std;
#define ll long long
#define pb push_back
//#define endl '\n'
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend()
#define ld long double
#define vi vector<ll>
#define vii vector<vi>

const ll N = 1e5;

vii g(N);
```

```
vi nxt(N), ans(N + 1);

void dfs(ll v, ll t) {
    if (t > N) return;
    ans[t] = v;
    ll sz = (ll) g[v].size();
    ll last = nxt[v];
    nxt[v] += 1;
    nxt[v] %= sz;
    dfs(g[v][last], t + 1);
}

void solve() {
    ll n, q;
    cin >> n >> q;
    for (ll i = 0; i < n; i++) {
        ll sz;
        cin >> sz;
        g[i].resize(sz);
        for (ll j = 0; j < sz;j++) {
            cin >> g[i][j];
            g[i][j]--;
        }
    }
    dfs(0, 0);
    while (q--) {
        ll t;
        cin >> t;
        cout << ans[t] + 1<< " ";
    }
}

int main() {
#ifdef LOCAL
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
    clock_t timer = clock();
#endif
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    ll t = 1;
    // cin >> t;
    while (t--) {
        solve();
    }
#ifdef LOCAL
    // cout << endl << "time: " << (ld) (clock() - timer) /
    CLOCKS_PER_SEC;
#endif
}
```

Task F

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

using namespace std;
#define ll long long
#define pb push_back
#define endl '\n'
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend()
#define ld long double
#define vi vector<ll>
#define vii vector<vi>

void solve() {
    ll n, m;
    cin >> n >> m;
    vector<string> a(n);
    for (ll i = 0; i < n; i++) {
        cin >> a[i];
    }
    vector<pair<ll, pair<pair<ll, ll>, pair<ll, ll>>>> c;
    for (ll i = 0; i < n; i++) {
        for (ll j = 0; j < m; j++) {
            if (j > 0) {
                ll res = (a[i][j] - '0') * (a[i][j - 1] - '0');
                c.pb({res, {{i, j}, {i, j - 1}}});
            }
            if (i > 0) {
                ll res = (a[i][j] - '0') * (a[i - 1][j] - '0');
                c.pb({res, {{i, j}, {i - 1, j}}});
            }
            if (i == 0) {
                ll res = (a[i][j] - '0') * (a[n - 1][j] - '0');
                c.pb({res, {{i, j}, {n - 1, j}}});
            }
            if (j == 0) {
                ll res = (a[i][j] - '0') * (a[i][m - 1] - '0');
                c.pb({res, {{i, j}, {i, m - 1}}});
            }
        }
    }
    sort(rall(c));
    ll ans = 0;
    vector<vector<ll>> gg(n, vector<ll>(m));
    ll x = 1000;
    while (x--) {
        vector<vector<ll>> used(n, vector<ll>(m));
        ll res = 0;
        for (auto e : c) {
            ll val = e.first;
            auto cor = e.second;
            if (used[cor.first.first][cor.first.second] == 0 && used[cor.
```

```
    second.first][cor.second.second] == 0) {
                res += val;
                ll x1 = cor.first.first, y1 = cor.first.second;
                ll x2 = cor.second.first, y2 = cor.second.second;
                swap(x1, x2);
                swap(y1, y2);
                if (x1 == x2 - 1) {
                    used[x1][y1] = 3;
                    used[x2][y2] = 4;
                } else if (y1 == y2 - 1) {
                    used[x1][y1] = 1;
                    used[x2][y2] = 2;
                } else if (x1 == n-1 && x2 == 0) {
                    used[x1][y1] = 3;
                    used[x2][y2] = 4;
                } else if (y1 == m-1 && y2 == 0) {
                    used[x1][y1] = 1;
                    used[x2][y2] = 2;
                }
            }
        }
        if (res > ans) {
            ans = res;
            gg = used;
        }
    }
    cout << ans << endl;
    for (ll i = 0 ;i  < n; i++) {
        for (ll j = 0; j < m; j++) {
            ll res = gg[i][j];
            if (res == 1) {
                cout << 'L';
            }
            if (res == 2) {
                cout << 'R';
            }
            if (res == 3) {
                cout << 'T';
            }
            if (res == 4) {
                cout << 'B';
            }
            if (res == 0) {
                cout << '.';
            }
        }
        cout << endl;
    }
}

int main() {
#ifdef LOCAL
    freopen("input.txt", "r", stdin);
```

```
    freopen("output.txt", "w", stdout);
    clock_t timer = clock();
#endif
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    ll t = 1;
    // cin >> t;
    while (t--) {

        solve();
    }
#ifdef LOCAL
    // cout << endl << "time: " << (ld) (clock() - timer) /
    CLOCKS_PER_SEC;
#endif
}
```