Олимпиада СПбГУ
по информатике
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A	B	C	D	E	F	sum
100	100	100	75	20	53	448

Task A

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

using ll = long long;
using ld = long double;
using ull = unsigned long long;

#define int ll
#define vec vector
#define all(x) x.begin(), x.end()
#define endl "\n"
#define mp(a, b) make_pair(a, b)
#define eb emplace_back
#define sz(v) (int)(v.size())


using pii = pair<int, int>;



const int N = 101;

int dp[N];


signed main() {
#ifdef RODYA
    freopen("C:\\Users\\tyrep\\Documents\\ContestMisis0309DFS\\bigTest.in
    ", "r", stdin);
```

```
#else
    ios_base::sync_with_stdio(false), cin.tie(0);
#endif



    int a, b, n; cin >> a >> b >> n;

    dp[0] = 1;
    for (int x = 1; x < N; ++x) {
        dp[x] = 0;
        if (x >= a) dp[x] += dp[x - a];
        if (x >= b) dp[x] += dp[x - b];
        //cout << "x : " << x << " dp : " << dp[x] << endl;
    }

    int ans = 0;
    for (int l = 0; l <= n; ++l) {
        for (int r = 0; r <= n; ++r) {
            int left = n - (l + r);
            int s = (l + r);
            if (s != a && s != b && s != 0) continue;
            if (min(l, r) == 0 && max(l, r) != 0) continue;
            if (left < 0) continue;

            //cout << "l : " << l << " r : " << r << " left : " << left
   << " val : " << dp[left] << endl;
            ans += dp[left];
        }
    }

    cout << ans << endl;

}
```

Task B

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

using ll = long long;
using ld = long double;
using ull = unsigned long long;

#define int ll
#define vec vector
#define all(x) x.begin(), x.end()
#define endl "\n"
#define mp(a, b) make_pair(a, b)
#define eb emplace_back
#define sz(v) (int)(v.size())
```

```
using pii = pair<int, int>;



int f(int x1, int y1, int z1, int x2, int y2, int z2) {
    // cout << "bra " << x1 << " " << y1 << " " << z1 << endl;
    return (abs(x1 - x2) + abs(y1 - y2) + abs(z1 - z2)) / 2;
}


signed main() {
#ifdef RODYA
    freopen("C:\\Users\\tyrep\\Documents\\ContestMisis0309DFS\\bigTest.in
   ", "r", stdin);
#else
    ios_base::sync_with_stdio(false), cin.tie(0);
#endif


    int n; cin >> n;
    int x1, y1, z1; cin >> x1 >> y1 >> z1;
    int x2, y2, z2; cin >> x2 >> y2 >> z2;

    int s = 2 * n;
    int ans = f(x1, y1, z1, x2, y2, z2);
    ans = min(ans, f(x1 - s / 2, y1 - s / 2, z1 + s, x2, y2, z2));
    ans = min(ans, f(x1 + s / 2, y1 + s / 2, z1 - s, x2, y2, z2));

    ans = min(ans, f(x1 - s / 2, y1 + s, z1 - s / 2, x2, y2, z2));
    ans = min(ans, f(x1 + s / 2, y1 - s, z1 + s / 2, x2, y2, z2));

    ans = min(ans, f(x1 + s, y1 - s / 2, z1 - s / 2, x2, y2, z2));
    ans = min(ans, f(x1 - s, y1 + s / 2, z1 + s / 2, x2, y2, z2));

    cout << ans << endl;
}
```

Task C

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

using ll = long long;
using ld = long double;
using ull = unsigned long long;

#define int ll
#define vec vector
#define all(x) x.begin(), x.end()
#define endl "\n"
#define mp(a, b) make_pair(a, b)
#define eb emplace_back
#define sz(v) (int)(v.size())
```

```
using pii = pair<int, int>;
using T = pair<int, ull>;

int n;


const int MOD = 1e9 + 7;
const int P = 17;


int add(int x, int y) { return (x + y) % MOD; }
int mul(int x, int y) { return (1LL * x * y) % MOD; }


string findMinMove(const string& s) {
    string w = s + s;
    string res = s;
    for (int i = 1; i + sz(s) - 1 < sz(w); ++i) {
        res = min(res, w.substr(i, sz(s)));
    }
    return res;
}



T getHash(const string& s) {
    int heh = 0; ull heh2 = 0;
    for (auto& it : s) {
        int ch = it - '0' + 1;
        heh = add(mul(heh, P), ch);
        heh2 = heh2 * P + ch;
    }
    return {heh, heh2};
}


void First() {
    cin >> n;
    string s; cin >> s;
    string mi = findMinMove(s);
    auto [h1, h2] = getHash(mi);
    // cout << "mi : " << mi << endl;
    // cout << "hehs : " << h1 << " " << h2 << endl;
    cout << h1 << " " << h2 << endl;
}


void Second() {
    cin >> n;
    string t; cin >> t;
    int h1; ull h2;
```

```
    cin >> h1 >> h2;
    string mi = findMinMove(t);
    auto [h3, h4] = getHash(mi);
    bool f = h1 == h3 && h2 == h4;
    cout << (f ? "YES" : "NO") << endl;
}


signed main() {
#ifdef RODYA
    freopen("C:\\Users\\tyrep\\Documents\\ContestMisis0309DFS\\bigTest.in
   ", "r", stdin);
#else
    ios_base::sync_with_stdio(false), cin.tie(0);
#endif


    string typ; cin >> typ;


    if (typ == "first") {
        First();
        exit(0);
    }


    Second();


}
```

Task D

```
#pragma GCC optimize("Ofast")

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

using ll = long long;
using ld = long double;
using ull = unsigned long long;

//#define int ll
#define vec vector
#define all(x) x.begin(), x.end()
//#define endl "\n"
#define mp(a, b) make_pair(a, b)
#define eb emplace_back
#define sz(v) (int)(v.size())


using pii = pair<int, int>;
```

```
mt19937_64 rnd(chrono::steady_clock::now().time_since_epoch().count());

int dice(int a, int b) {
    return uniform_int_distribution<int>(a, b)(rnd);
}

int n;

inline int ask(int i, int j) {
    cout << i << " " << j << endl;
    char ch; cin >> ch;
    if (ch == '!') {
        exit(0);
    }
    return ch == '<' ? -1 : ch == '>';
}



signed main() {
#ifdef RODYA
    //freopen("C:\\Users\\tyrep\\Documents\\ContestMisis0309DFS\\bigTest.
   in", "r", stdin);
#else
    ios_base::sync_with_stdio(false), cin.tie(0);
#endif


    cin >> n;


    for (int i = 1; i <= n; ++i) {
        for (int j = 0; j < i - 1; ++j)
            ask(1, 1); // move left

        // ????????????
        for (int j = 1; j <= n - i; ++j) {
            int ch = ask(1, 1);
            if (ch == 1) {
                ask(1, n);
                for (int q = 0; q < n - 1; ++q)
                    ask(1, 1);
            }
        }
    }


}
```

Task E

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

```
using namespace std;

using ll = long long;
using ld = long double;
using ull = unsigned long long;

#define int ll
#define vec vector
#define all(x) x.begin(), x.end()
#define endl "\n"
#define mp(a, b) make_pair(a, b)
#define eb emplace_back
#define sz(v) (int)(v.size())


using pii = pair<int, int>;



const int N = 1e5 + 10, A = 1e5 + 10;


int n, q;
int ptr[N];
vec<int> g[N];
int ans[A];
int pr[N];


void input() {
    cin >> n >> q;
    for (int i = 1; i <= n; ++i) {
        int x; cin >> x;
        g[i].resize(x);
        for (auto& it : g[i]) cin >> it;
        ptr[i] = 0;
    }
}

void findPr(int v) {
    for (auto& to : g[v]) {
        if (to == pr[v]) continue;
        pr[to] = v;
        findPr(to);
    }
}

vec<int> order;

void findOrder(int v) {
    order.eb(v);
    for (int i = 0; i < sz(g[v]); ++i) {
        int to = g[v][ptr[v]];
```

```
        ptr[v] = (ptr[v] + 1) % sz(g[v]);
        if (to == pr[v]) return;
        findOrder(to);
        order.eb(v);
    }
}



signed main() {
#ifdef RODYA
    freopen("C:\\Users\\tyrep\\Documents\\ContestMisis0309DFS\\bigTest.in
   ", "r", stdin);
#else
    ios_base::sync_with_stdio(false), cin.tie(0);
#endif

    input();
    pr[1] = -1;
    findPr(1);
    vec<int> arr;
    map<vec<int>, bool> is;
    for (int i = 0; i < A; ++i) {
        order.clear();
        findOrder(1);
        order.pop_back();
        //if (is[order]) break;
        is[order] = true;
        for (auto& it : order)
            arr.eb(it);
        if (sz(arr) > 1e5 + 5) break;

        // cout << "order : ";
        // for (auto& it : order) cout << it << " ";
        // cout << endl;
    }

    while (q--) {
        int t; cin >> t;
        // if (t < sz(arr)) {
        //     cout << arr[t] << " ";
        //     continue;
        // }
        // t -= sz(arr);
        cout << arr[t % sz(arr)] << " ";
    }
}
```

Task F

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

```
using ll = long long;
using ld = long double;
using ull = unsigned long long;

//#define int ll
#define vec vector
#define all(x) x.begin(), x.end()
#define endl "\n"
#define mp(a, b) make_pair(a, b)
#define eb emplace_back
#define sz(v) (int)(v.size())


using pii = pair<int, int>;


int h, w;
int best;
vec<string> a, m;
vec<string> ans;


void countScore() {
    // cout << h << " " << w << endl;
    // cout << "m : " << endl;
    // for (auto& it : m) cout << it << endl;
    // cout << endl;

    // cout << h << " " << w << endl;

    int res = 0;
    for (int i = 0; i < h; ++i) {
        for (int j = 0; j < w; ++j) {
            char ch = m[i][j];
            int d = a[i][j] - '0';
            //cout << "ch : " << ch << " d : " << d << endl;
            if (ch == '.') continue;
            if (ch == 'R') res += (a[i][(j - 1 + w) % w] - '0') * d;
            if (ch == 'B') res += (a[(i - 1 + h) % h][j] - '0') * d;
        }
    }
    //cout << "res : " << res << endl;

    if (res > best) {
        best = res;
        ans = m;
    }
}


signed main() {
#ifdef RODYA
    freopen("C:\\Users\\tyrep\\Documents\\ContestMisis0309DFS\\bigTest.in
```

```
    ", "r", stdin);
#else
    ios_base::sync_with_stdio(false), cin.tie(0);
#endif



    cin >> h >> w;
    a.resize(h, string(w, '0'));
    m.resize(h, string(w, '.'));
    for (auto& it : a) cin >> it;



    for (int i = 0; i < h; ++i) {
        for (int j = 1; j < w; j += 2)
            m[i][j] = 'R', m[i][j - 1] = 'L';
    }
    countScore();
    for (int i = 0; i < h; ++i) {
        for (int j = 0; j < w; j += 2)
            m[i][j] = 'R', m[i][(j - 1 + w) % w] = 'L';
    }
    countScore();



    for (int i = 1; i < h; i += 2) {
        for (int j = 0; j < w; ++j)
            m[i][j] = 'B', m[i - 1][j] = 'T';
    }
    countScore();
     for (int i = 0; i < h; i += 2) {
        for (int j = 0; j < w; ++j)
            m[i][j] = 'B', m[(i - 1 + h) % h][j] = 'T';
    }
    countScore();



    for (int t = 0; t < 10000; ++t) {
        mt19937_64 rnd(chrono::steady_clock::now().time_since_epoch().
   count());
        for (auto& it : m)
            it.assign(w, '.');

        vec<pii> be;
        for (int i = 0; i < h; ++i)
            for (int j = 0; j < w; ++j)
                be.eb(i, j);
        shuffle(all(be), rnd);
```

```
        for (auto& [i, j] : be) {
            if (m[i][j] != '.') continue;
            vec<int> bo = {0, 1};
            if (rnd() & 1) swap(bo[0], bo[1]);

            for (auto& dir : bo) {
                int ni = i, nj = j;
                if (dir == 0) --nj;
                else --ni;
                ni = (ni + h) % h;
                nj = (nj + w) % w;
                if (m[ni][nj] != '.') continue;
                m[ni][nj] = dir == 0 ? 'L' : 'T';
                m[i][j] = dir == 0 ? 'R' : 'B';
                break;
            }
        }

        countScore();
    }


    cout << best << endl;
    for (auto& it : ans) cout << it << endl;

}
```