Олимпиада СПбГУ
по информатике
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A	B	C	D	E	F	sum
30	75	100	100	20	49	374

Task A

```
#include <iostream>
#include <vector>
#include <algorithm>
#include <set>

using namespace std;

int a, b, n;
int BASE = 179, MOD = 1e9 + 7;
int var = 0;
vector<int> no;
long long ans = 0;
vector<int> p;
set<int> ste;

void f(int last, int st) {
    if ((last != st && (last - st + n) % n < min(a, b))) {
        return;
    }
    //cout << last << "?\n";
    if (last == st && p.size() > 1) {
        ans++;
        ste.insert(var);
        /*for (auto x : p) {
            cout << x << " ";
        }
        cout << "\n";*/
        return;
    }
```

```
    if ((last + a < n || (last + a) <= n + st) && ((last + a) % n == st
    || !no[(last + a) % n])) {
        p.push_back((last + a) % n);
        int vari = var;
        var = ((var * 1LL * BASE) % MOD + (last + a) % n + 1) % MOD;
        f((last + a) % n, st);
        p.pop_back();
        var = vari;
    }
    if ((last + b < n || (last + b) <= n + st) && ((last + b) % n == st
    || !no[(last + b) % n])) {
        int vari = var;
        var = ((var * 1LL * BASE) % MOD + (last + b) % n + 1) % MOD;
        p.push_back((last + b) % n);
        f((last + b) % n, st);
        p.pop_back();
        var = vari;
    }
}

int main() {
    cin >> a >> b >> n;
    no.resize(n);
    /*if (min(a, b) > n) {
        cout << "0\n";
        return 0;
    }*/
    for (int i = 0; i < n; i++) {
        //cout << i << "!\n";
        p.push_back(i);
        f(i, i);
        p.pop_back();
        no[i] = 1;
    }
    cout << ste.size() << "\n";
    return 0;
}
```

Task B

```
#include <iostream>
#include <vector>
#include <algorithm>
#include <queue>

using namespace std;

struct Point {
    int x, y, z;
};

int dist(Point a, Point b) {
    return max(abs(a.x - b.x), max(abs(a.y - b.y), abs(a.z - b.z)));
```

```
}

int main() {
    int n;
    cin >> n;
    Point A, b;
    cin >> A.x >> A.y >> A.z >> b.x >> b.y >> b.z;
    if (n > 10) {
        cout << dist(A, b) << "\n";
        return 0;
    }
    int ans = dist(A, b);
    queue<pair<Point, pair<int, int>>> Q;
    Q.push({A, {0, 0}});
    while (Q.size()) {
        Point a = Q.front().first;
        auto [cnt, d] = Q.front().second;
        Q.pop();
        ans = min(ans, d + dist(a, b));
        if (d >= ans || cnt > 1) {
            continue;
        }
        for (int i = 0; i <= n; i++) {
            Point p = {i, n - i, -n};
            Point q = {i - n, -i, n};
            Q.push({q, {cnt + 1, d + dist(a, p)}});
        }
        for (int i = 0; i <= n; i++) {
            Point q = {i, n - i, -n};
            Point p = {i - n, -i, n};
            Q.push({q, {cnt + 1, d + dist(a, p)}});
        }

        for (int i = 0; i <= n; i++) {
            Point p = {i, -n, n - i};
            Point q = {i - n, n, -i};
            Q.push({q, {cnt + 1, d + dist(a, p)}});
        }
        for (int i = 0; i <= n; i++) {
            Point q = {i, -n, n - i};
            Point p = {i - n, n, -i};
            Q.push({q, {cnt + 1, d + dist(a, p)}});
        }

        for (int i = 0; i <= n; i++) {
            Point p = {-n, n - i, i};
            Point q = {n, -i, i - n};
            Q.push({q, {cnt + 1, d + dist(a, p)}});
        }
        for (int i = 0; i <= n; i++) {
            Point q = {-n, n - i, i};
            Point p = {n, -i, i - n};
            Q.push({q, {cnt + 1, d + dist(a, p)}});
```

```
        }
    }
    cout << ans << "\n";
    return 0;
}
```

Task C

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

using namespace std;

vector<int> base = {179, 239}, mod = {1000000007, 1000000009};

struct Hash {
    string s;
    int n;
    vector<vector<int>> pow, h;

    Hash(string &data) {
        s = data;
        n = s.size();
        pow.resize(n + 1, vector<int>(2));
        h.resize(n + 1, vector<int>(2));
        build();
    }

    void build() {
        for (int k = 0; k < 2; k++) {
            pow[0][k] = 1;
            for (int i = 0; i < n; i++) {
                h[i + 1][k] = ((h[i][k] * 1LL * base[k]) % mod[k] + (s[i]
 - '0')) % mod[k];
                pow[i + 1][k] = (pow[i][k] * 1LL * base[k]) % mod[k];
            }
        }
    }

    vector<int> get_hash(int i, int j) {
        vector<int> ans(2);
        for (int k = 0; k < 2; k++) {
            ans[k] = (h[j][k] + mod[k] - (h[i][k] * 1LL * pow[j - i][k])
% mod[k]) % mod[k];
        }
        return ans;
    }
};

int main() {
    string check;
    cin >> check;
```

```
    if (check == "first") {
        int n;
        cin >> n;
        string s;
        cin >> s;
        Hash hash(s);
        vector<int> ans = hash.get_hash(0, n);
        cout << ans[0] << " " << ans[1] << "\n";
    }
    else {
        int n;
        cin >> n;
        string s;
        cin >> s;
        s = s + s;
        Hash hash(s);
        vector<int> v(2);
        cin >> v[0] >> v[1];
        int c = 0;
        for (int i = 0; i < n; i++) {
            vector<int> ans = hash.get_hash(i, i + n);
            if (ans[0] == v[0] && ans[1] == v[1]) {
                c = 1;
                break;
            }
        }
        if (c) {
            cout << "YES\n";
        }
        else {
            cout << "NO\n";
        }
    }
    return 0;
}
```

Task D

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

using namespace std;

int main() {
    int n;
    cin >> n;
    vector<vector<int>> G(n, vector<int>(n));
    vector<int> p(n), v(n), st(n), f(n);
    for (int i = 0; i < n; i++) {
        v[i] = i;
    }
    int w = 0;
```

```
while (1) {
    if (w > n) {
        break;
    }
    int check = 1;
    for (int i = 1; i < n; i++) {
        if (!G[v[0]][v[i]]) {
            int a = 2;
            cout << a << " " << i + 1 << "\n";
            fflush(stdout);
            string s;
            cin >> s;
            if (s == "!") {
                return 0;
            }
            if (s == ">") {
                st[v[i]]++;
            }
            else {
                st[v[0]]++;
            }
            G[v[0]][v[i]] = 1;
            G[v[i]][v[0]] = 1;
            int x = v[1];
            v[1] = v[i];
            v[i] = x;
            check = 0;
            w = 0;
            break;
        }
    }
    int x = v[0];
    for (int i = 0; i < n - 1; i++) {
        v[i] = v[i + 1];
    }
    v[n - 1] = x;
    if (check == 1) {
        int a = 1;
        cout << a << " " << a << "\n";
        fflush(stdout);
        string s;
        cin >> s;
        if (s == "!") {
            return 0;
        }
        w++;
    }
}
for (int i = 0; i < n; i++) {
    f[st[v[i]]] = i;
    p[i] = st[v[i]];
}
for (int i = n - 1; i >= 0; i--) {
```

```
        int a = 1;
        cout << a << " " << f[i] + 1 << "\n";
        fflush(stdout);
        string s;
        cin >> s;
        if (s == "!") {
            return 0;
        }
        int x = p[f[i]];
        p[f[i]] = p[0];
        p[0] = x;
        f[p[f[i]]] = i;
        f[p[0]] = 0;
        x = p[0];
        for (int j = 0; j < n - 1; j++) {
            p[j] = p[j + 1];
            f[p[j]] = j;
        }
        p[n - 1] = x;
        f[p[n - 1]] = n - 1;
    }
    cout << "loh" << endl;
    return 0;
}
```

Task E

```
#include <iostream>
#include <vector>
#include <algorithm>
#include <random>
#include <map>

using namespace std;

vector<vector<int>> G;
vector<int> t, p;
int ma = 0, n, q;

void solve_1() {
    vector<int> ans(ma + 1);
    ans[0] = 0;
    for (int tim = 1; tim <= ma; tim++) {
        int u = ans[tim - 1];
        ans[tim] = G[u][p[u]];
        p[u] = (p[u] + 1) % G[u].size();
    }
    for (int i = 0; i < q; i++) {
        cout << ans[t[i]] + 1 << " ";
    }
    cout << "\n";
}
```

```
int base = 179, mod = 1e9 + 7;

void solve_2() {
    map<pair<int, int>, int> mp;
    vector<int> ans;
    ans.push_back(0);
    int pos = -1, it = 0;
    while (ans.size() < 20) {
        int u = ans.back();
        //cout << u << "?\n";
        int h = 0;
        for (int i = 0; i < n; i++) {
            //cout << p[i] << " ";
            h = ((h * 1LL * base) % mod + (p[i] + 1)) % mod;
        }
        //cout << "\n";
        if (mp.find({u, h}) != mp.end()) {
            pos = mp[{u, h}];
            break;
        }
        mp[{u, h}] = it;
        it++;
        ans.push_back(G[u][p[u]]);
        p[u] = (p[u] + 1) % G[u].size();
    }
    ans.pop_back();
    //cout << pos << " " << ans.size() << "?\n";
    for (int i = 0; i < q; i++) {
        if (t[i] < pos) {
            cout << ans[t[i]] + 1 << " ";
        }
        else {
            cout << ans[pos + (t[i] - pos) % (ans.size() - 1)] + 1 << " "
    ;
        }
    }
    cout << "\n";
}

int main() {
    cin >> n >> q;
    G.resize(n);
    p.resize(n);
    for (int i = 0; i < n; i++) {
        int k;
        cin >> k;
        G[i].resize(k);
        for (int j = 0 ; j < k; j++) {
            cin >> G[i][j];
            G[i][j]--;
        }
    }
    t.resize(q);
```

```
    for (int i = 0; i < q; i++) {
        cin >> t[i];
        ma = max(ma, t[i]);
    }
    if (ma <= 100000) {
        solve_1();
    }
    else {
        solve_2();
    }
    return 0;
}
```

Task F

```
#include <iostream>
#include <vector>
#include <algorithm>
#include <random>

using namespace std;

int main() {
    int h, w;
    cin >> h >> w;
    vector<vector<int>> a(h, vector<int>(w));
    for (int i = 0; i < h; i++) {
        for (int j = 0; j < w; j++) {
            char c;
            cin >> c;
            a[i][j] = c - '0';
        }
    }
    int ans = 0;
    for (int i = 0; i < h; i++) {
        for (int j = 0; j < w; j += 2) {
            ans += a[i][j] * a[i][j + 1];
        }
    }
    int ans2 = 0;
    for (int i = 0; i < h; i += 2) {
        for (int j = 0; j < w; j++) {
            ans2 += a[i][j] * a[i + 1][j];
        }
    }
    if (ans >= ans2) {
        cout << ans << "\n";
        for (int i = 0; i < h; i++) {
            for (int j = 0; j < w; j += 2) {
                cout << "LR";
            }
            cout << "\n";
        }
```

```
    }
    else {
        cout << ans2 << "\n";
        for (int i = 0; i < h; i++) {
            for (int j = 0; j < w; j++) {
                if (i % 2) {
                    cout << "B";
                }
                else {
                    cout << "T";
                }
            }
            cout << "\n";
        }
    }
    return 0;
}
```