Олимпиада СПбГУ
по информатике
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A	B	C	D	E	F	sum
100	100	100	100	40	70	510

Task A

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

#define int long long
#define endl "\n"

template<typename T>
ostream& operator << (ostream& out, vector<T>& a) {
    for (auto el : a) out << el << " ";
    return out;
}

void solve() {
    int a, b, n;
    cin >> a >> b >> n;
    vector<int> dpa(n + 1, 0);
    vector<int> dpb(n + 1, 0);

    if (a <= n) {
        dpa[a] = 1;
    }
    if (b <= n) {
        dpb[b] = 1;
    }
    for (int i = 0; i < n + 1; i++) {
        if (i - a >= 0) {dpa[i] += dpa[i - a]; dpb[i] += dpb[i - a];}
        if (i - b >= 0) {dpa[i] += dpa[i - b]; dpb[i] += dpb[i - b];}
    }
```

```
    cout << dpa[n] * a + dpb[n] * b << endl;
}

signed main() {
    int tests = 1;

#ifdef LOCALIC
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
    cin >> tests;
#else
    ios::sync_with_stdio(false);
    cin.tie(nullptr); cout.tie(nullptr);
#endif

    while (tests --> 0) solve();
}
```

Task B

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

#define int long long
#define endl "\n"

template<typename T>
istream& operator >> (istream& in, vector<T>& a) {
    for (auto& el : a) in >> el;
    return in;
}

template<typename T>
ostream& operator << (ostream& out, vector<T>& a) {
    for (auto el : a) out << el << " ";
    return out;
}

constexpr int N = 1e5 + 556;
constexpr long long inf = 1e18;

int get(int x1, int y1, int z1, int x2, int y2, int z2) {
    return max({abs(x1 - x2), abs(y1 - y2), abs(z1 - z2)});
}

void solve() {
    int n;
    cin >> n;
    int x1, y1, z1;
    cin >> x1 >> y1 >> z1;
    int x2, y2, z2;
    cin >> x2 >> y2 >> z2;
    int ans = get(x1, y1, z1, x2, y2, z2);
```

```
    // while (x1 != x2 || y1 != y2 || z1 != z2) {
    //     if (x1 > x2 && y1 < y2) {
    //         x1--; y1++;
    //     } else if (x1 > x2 && z1 < z2) {
    //         x1--; z1++;
    //     } else if (x1 < x2 && y1 > y2) {
    //         x1++; y1--;
    //     } else if (x1 < x2 && z1 > z2) {
    //         x1++; z1--;
    //     } else if (y1 > y2 && z1 < z2) {
    //         y1--; z1++;
    //     } else {
    //         y1++; z1--;
    //     }


    //     ans++;
    // }

    for (int x = 0; x <= n; x++) {
        int y = n - x, z = -n;

        ans = min(ans, get(x1, y1, z1, x, y, z) + get(x2, y2, z2, -y, -x,
     -z));
        ans = min(ans, get(x1, y1, z1, -x, -y, -z) + get(x2, y2, z2, y, x
    , z));
    }

    for (int x = 0; x <= n; x++) {
        int z = n - x, y = -n;


        ans = min(ans, get(x1, y1, z1, x, y, z) + get(x2, y2, z2, -z, -y,
     -x));
        ans = min(ans, get(x1, y1, z1, -x, -y, -z) + get(x2, y2, z2, z, y
    , x));
    }

    for (int y = 0; y <= n; y++) {
        int z = n - y, x = -n;

        // cout << x << " " << y << " " << z << " " << get(x1, y1, z1, -x
    , -y, -z) << " " << endl;

        ans = min(ans, get(x1, y1, z1, x, y, z) + get(x2, y2, z2, -x, -z,
     -y));
        ans = min(ans, get(x1, y1, z1, -x, -y, -z) + get(x2, y2, z2, x, z
    , y));
    }
    cout << ans << endl;
}
```

```
signed main() {
    int tests = 1;

#ifdef LOCALIC
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
    cin >> tests;
#else
    ios::sync_with_stdio(false);
    cin.tie(nullptr); cout.tie(nullptr);
#endif

    while (tests --> 0) solve();
}
```

Task C

```
mod = int(1e70 - 556)
p = 2

def bpow(a: int, p: int):
    if (p == 0): return 1
    if (p % 2 == 0): return bpow((a * a) % mod, p // 2)
    return (a * bpow(a, p - 1)) % mod

tp = input()
if (tp == "first"):
    n = int(input())
    a = input()

    h = 0
    for i in range(n):
        h = (h * p + (1 if a[i] == '1' else 0)) % mod

    print(h)
else:
    n = int(input())
    a = input()
    b = int(input())

    ans = 0

    h = 0
    for i in range(n):
        h = (h * p + (1 if a[i] == '1' else 0)) % mod

    if (h == b):
        ans = 1

    for i in range(n):
        h = (h * p + (1 if a[i] == '1' else 0)) % mod
        if (a[i] == '1'):
```

```
            h = (h - bpow(2, n) + mod) % mod

        if (h == b):
            ans = 1

    if (ans == 1): print("YES")
    else: print("NO")
```

Task D

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

#define int long long
#define endl "\n"

template<typename T>
istream& operator >> (istream& in, vector<T>& a) {
    for (auto& el : a) in >> el;
    return in;
}

template<typename T>
ostream& operator << (ostream& out, vector<T>& a) {
    for (auto el : a) out << el << " ";
    return out;
}

constexpr int inf = 1e18;

int n;
vector<int> a;
vector<int> b;

int ask(int i, int j) {
#ifdef LOCALIC
    swap(b[i], b[j]);
    vector<int> c = b;
    for (int i = 0; i < n - 1; i++) {
        c[i] = b[i + 1];
    }
    c[n - 1] = b[0];
    b = c;

    int ans = 0;
    if (a < c) ans = -1;
    else ans = 1;

    a = b;
    return ans;
#endif
    cout << i + 1 << " " << j + 1 << endl; cout.flush();
    string ret; cin >> ret;
```

```
    if (ret == "!") exit(0);
    if (ret == "<") return 1;
    else return -1;
}

void solve() {
    cin >> n;

#ifdef LOCALIC
    a.resize(n);
    cin >> a;
    b = a;
#endif
    // cout << a << endl;

    for (int t = 0; t < n; t++) {
        int l = 1;
        for (int i = 0; i < n; i++) {
            if (l == -1) l = ask(0, n - 1);
            else l = ask(0, 0);
        }
        // cout << a << endl;
        // l = 1;
        // for (int i = 0; i < n; i++) {
        //     if (l == -1) l = ask(0, n - 1);
        //     else l = ask(0, 0);
        // }
        // l = 1;
        // for (int i = 0; i < n; i++) {
        //     if (l == -1) l = ask(0, n - 1);
        //     else l = ask(0, 0);
        // }
    }

    // cout << a << endl;

}

signed main() {
    int tests = 1;

#ifdef LOCALIC
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
    cin >> tests;
#else
    ios::sync_with_stdio(false);
    cin.tie(nullptr); cout.tie(nullptr);
#endif

    while (tests --> 0) solve();
}
```

Task E

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

#define int long long
#define endl "\n"

template<typename T>
istream& operator >> (istream& in, vector<T>& a) {
    for (auto& el : a) in >> el;
    return in;
}

template<typename T>
ostream& operator << (ostream& out, vector<T>& a) {
    for (auto el : a) out << el << " ";
    return out;
}

constexpr int N = 1e5 + 556;
constexpr long long inf = 1e18;

void solve() {
    int n, q;
    cin >> n >> q;

    vector<deque<int>> gr(n);
    for (int v = 0; v < n ; v++) {
        int k; cin >> k;
        for (int i = 0; i < k; i++) {
            int x; cin >> x; x--;
            gr[v].push_back(x);
        }
    }
    vector<int> qs(q);
    cin >> qs;

    if (qs.back() > N) {
        vector<int> cur(n, 0);

        vector<int> pr(n, -1);
        auto dfs1 = [&](auto dfs1, int v, int p) -> void {
            for (int to : gr[v]) {
                // cout << v + 1 << " -> " << to + 1 << endl;
                if (to != p) {
                    pr[to] = v;
                    dfs1(dfs1, to, v);
                }
            }
        };

        dfs1(dfs1, 0, -1);
```

```
    int cnt = 0;
    vector<int> isb(n, 0);
    for (int v = 0; v < n; v++) {
        for (int i = 0; i + 1 < gr[v].size(); i++) {
            if (gr[v][i] == pr[v]) {
                isb[v]++;
                cnt++;
            }
        }
    }

    vector<int> prec;
    int t = 0;
    auto dfs2 = [&](auto dfs2, int v) -> void {
        if (cnt == 0 && v == 0) return;
        t++;
        prec.push_back(v);
        // if (t == N) return;
        gr[v].push_back(gr[v].front());
        gr[v].pop_front();
        // cout << v + 1 << " " << pr[v] + 1 << " " << gr[v].back() +
1 << endl;
        if (isb[v] && gr[v].back() == pr[v]) {
            cnt--;
            isb[v] = 0;
        }

        dfs2(dfs2, gr[v].back());
    };

    dfs2(dfs2, 0);

    vector<int> eu;

    auto dfs3 = [&](auto dfs3, int v, int p) -> void {
        eu.push_back(v);
        for (int to : gr[v]) {
            if (to != p) {
                dfs3(dfs3, to, v);
                eu.push_back(v);
            }
        }
    };
    dfs3(dfs3, 0, -1);
    if (eu.size() > 1) eu.pop_back();
    // cout << eu << endl;

    for (auto x : qs) {
        if (x < prec.size()) cout << prec[x] + 1 << " ";
        else cout << eu[(x - prec.size()) % eu.size()] + 1 << " ";
    }
    cout << endl;
```

```
    } else {

        int t = 0;
        vector<int> ans(N, 0);
        auto dfs = [&](auto dfs, int v) -> void {
            ans[t] = v;
            // cout << v + 1 << endl;
            t++;
            if (t == N) return;

            gr[v].push_back(gr[v].front());
            gr[v].pop_front();
            dfs(dfs, gr[v].back());
        };
        dfs(dfs, 0);

        for (auto x : qs) cout << ans[x] + 1 << " ";
        cout << endl;
    }
}

signed main() {
    int tests = 1;

#ifdef LOCALIC
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
    cin >> tests;
#else
    ios::sync_with_stdio(false);
    cin.tie(nullptr); cout.tie(nullptr);
#endif

    while (tests --> 0) solve();
}
```

Task F

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

#define int long long
#define endl "\n"

template<typename T>
istream& operator >> (istream& in, vector<T>& a) {
    for (auto& el : a) in >> el;
    return in;
}

template<typename T>
ostream& operator << (ostream& out, vector<T>& a) {
    for (auto el : a) out << el << " ";
```

```
    return out;
}

void solve() {
    int n, m;
    cin >> n >> m;
    vector<string> a(n);
    cin >> a;
    vector<string> ans(n, string (m, '&'));

    int pr = 0;
    for (int i = 0; i < n; i++) {
        for (int j = 0; j + 1 < m; j += 2) {
            ans[i][j] = 'L'; ans[i][j + 1] = 'R';
            pr += ((a[i][j] - '0') * (a[i][j + 1] - '0'));
        }
    }

    for (int i = 0; i + 1 < n; i += 2) {
        for (int j = 0; j + 1 < m; j += 2) {
            if ((a[i][j] - '0') * (a[i][j + 1] - '0') + (a[i + 1][j] - '0
    ') * (a[i + 1][j + 1] - '0') <
                (a[i][j] - '0') * (a[i + 1][j] - '0') + (a[i][j + 1] - '0
    ') * (a[i + 1][j + 1] - '0')) {
                pr -= (a[i][j] - '0') * (a[i][j + 1] - '0') + (a[i + 1][j
    ] - '0') * (a[i + 1][j + 1] - '0');
                pr += (a[i][j] - '0') * (a[i + 1][j] - '0') + (a[i][j +
    1] - '0') * (a[i + 1][j + 1] - '0');
                ans[i][j] = 'T'; ans[i + 1][j] = 'B';
                ans[i][j + 1] = 'T'; ans[i + 1][j + 1] = 'B';
            }
        }
    }

    int fin_pr = pr;
    auto fin_ans = ans;

    pr = 0;
    for (int i = 0; i < n; i++) {
        ans[i][m - 1] = 'L';
        ans[i][0] = 'R';
        pr += (a[i][m - 1] - '0') * (a[i][0] - '0');
        for (int j = 1; j + 1 < m; j += 2) {
            ans[i][j] = 'L'; ans[i][j + 1] = 'R';
            pr += ((a[i][j] - '0') * (a[i][j + 1] - '0'));
        }
    }
    for (int i = 0; i + 1 < n; i += 2) {
        if ((a[i][0] - '0') * (a[i][m - 1] - '0') + (a[i + 1][0] - '0') *
     (a[i + 1][m - 1] - '0') <
            (a[i][0] - '0') * (a[i + 1][0] - '0') + (a[i][m - 1] - '0') *
     (a[i + 1][m - 1] - '0')) {
            pr -= (a[i][0] - '0') * (a[i][m - 1] - '0') + (a[i + 1][0] -
```

```
'0') * (a[i + 1][m - 1] - '0');
        pr += (a[i][0] - '0') * (a[i + 1][0] - '0') + (a[i][m - 1] -
'0') * (a[i + 1][m - 1] - '0');
        ans[i][0] = 'T'; ans[i + 1][0] = 'B';
        ans[i][m - 1] = 'T'; ans[i + 1][m - 1] = 'B';
    }

    for (int j = 1; j + 1 < m; j += 2) {
        if ((a[i][j] - '0') * (a[i][j + 1] - '0') + (a[i + 1][j] - '0
') * (a[i + 1][j + 1] - '0') <
            (a[i][j] - '0') * (a[i + 1][j] - '0') + (a[i][j + 1] - '0
') * (a[i + 1][j + 1] - '0')) {
            pr -= (a[i][j] - '0') * (a[i][j + 1] - '0') + (a[i + 1][j
] - '0') * (a[i + 1][j + 1] - '0');
            pr += (a[i][j] - '0') * (a[i + 1][j] - '0') + (a[i][j +
1] - '0') * (a[i + 1][j + 1] - '0');
            ans[i][j] = 'T'; ans[i + 1][j] = 'B';
            ans[i][j + 1] = 'T'; ans[i + 1][j + 1] = 'B';
        }
    }
}
// for (auto el : ans) cout << el << endl;

if (pr > fin_pr) {
    fin_pr = pr;
    fin_ans = ans;
}

pr = 0;
for (int i = 0; i < n; i++) {
    for (int j = 0; j + 1 < m; j += 2) {
        ans[i][j] = 'L'; ans[i][j + 1] = 'R';
        pr += ((a[i][j] - '0') * (a[i][j + 1] - '0'));
    }
}

for (int i = 1; i + 1 < n; i += 2) {
    for (int j = 0; j + 1 < m; j += 2) {
        if ((a[i][j] - '0') * (a[i][j + 1] - '0') + (a[i + 1][j] - '0
') * (a[i + 1][j + 1] - '0') <
            (a[i][j] - '0') * (a[i + 1][j] - '0') + (a[i][j + 1] - '0
') * (a[i + 1][j + 1] - '0')) {
            pr -= (a[i][j] - '0') * (a[i][j + 1] - '0') + (a[i + 1][j
] - '0') * (a[i + 1][j + 1] - '0');
            pr += (a[i][j] - '0') * (a[i + 1][j] - '0') + (a[i][j +
1] - '0') * (a[i + 1][j + 1] - '0');
            ans[i][j] = 'T'; ans[i + 1][j] = 'B';
            ans[i][j + 1] = 'T'; ans[i + 1][j + 1] = 'B';
        }
    }
}
for (int j = 0; j < m; j += 2) {
    if ((a[0][j] - '0') * (a[0][j + 1] - '0') + (a[n - 1][j] - '0') *
```

```
     (a[n - 1][j + 1] - '0') <
            (a[0][j] - '0') * (a[n - 1][j] - '0') + (a[n - 1][j + 1] - '0
    ') * (a[0][j + 1] - '0')) {
            pr -= (a[0][j] - '0') * (a[0][j + 1] - '0') + (a[n - 1][j] -
    '0') * (a[n - 1][j + 1] - '0');
            pr += (a[0][j] - '0') * (a[n - 1][j] - '0') + (a[n - 1][j +
    1] - '0') * (a[0][j + 1] - '0');
            ans[0][j] = 'B'; ans[n - 1][j] = 'T';
            ans[0][j + 1] = 'B'; ans[n - 1][j + 1] = 'T';
        }
    }
    // cout << pr << endl;
    // for (auto el : ans) cout << el << endl;

    // cout << pr << endl;

    if (pr > fin_pr) {
        fin_pr = pr;
        fin_ans = ans;
    }

    cout << fin_pr << endl;
    for (auto el : fin_ans) cout << el << endl;
}

signed main() {
    int tests = 1;

#ifdef LOCALIC
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
    cin >> tests;
#else
    ios::sync_with_stdio(false);
    cin.tie(nullptr); cout.tie(nullptr);
#endif

    while (tests --> 0) solve();
}
```