Олимпиада СПбГУ
по информатике
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A	B	C	D	E	F	sum
30	100	100	75	20	90	415

Task A

```
#include <iostream>
#include <vector>
#include <algorithm>
#include <climits>
#include <numeric>
#include <queue>
#include <set>
#include <string>
#include <random>
#include <iomanip>
#include <cmath>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <fstream>
#include <chrono>
#include <cassert>

using namespace std;

using ll = long long;
using ui = unsigned int;

#define int long long

//mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

void solve() {
    int a, b, n; cin >> a >> b >> n;
```

```
    assert(n <= 15);
    int ans = 0;
    for (int mask = 1; mask < (1 << n); mask++) {
        vector<int> mas;
        for (int i = 0; i < n; i++) {
            if (((mask >> i) & 1) == 1) {
                mas.emplace_back(i + 1);
            }
        }
        if (mas.size() < 2) {
            if (n == b || n == a) ans++;
        } else {
            bool flag = true;
            int y = n - abs(mas[0] - mas[mas.size() - 1]);
            if (y != a && y != b) flag = false;
            for (int i = 0; i < mas.size() - 1; i++) {
                int x=abs(mas[i] - mas[i + 1]);
                if (x != a && x != b) {
                    flag = false;
                    break;
                }
            }
            if (flag) {
                ans++;
            }
        }
    }
    cout << ans << endl;
}

signed main()
{
    ios::sync_with_stdio(0); cin.tie(0);
    ll t = 1; // cin >> t;
    while (t--) {
        solve();
    }
    return 0;
}
```

Task B

```
#include <iostream>
#include <vector>
#include <algorithm>
#include <climits>
#include <numeric>
#include <queue>
#include <set>
#include <string>
#include <random>
#include <iomanip>
#include <cmath>
```

```
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <fstream>
#include <chrono>
#include <cassert>

using namespace std;

using ll = long long;
using ui = unsigned int;

#define int long long

//mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

void solve() {
    int n; cin >> n;
    int x1, y1, z1; cin >> x1 >> y1 >> z1;
    int x2, y2, z2; cin >> x2 >> y2 >> z2;
    int summa = (abs(x1 - x2) + abs(y1 - y2) + abs(z1 - z2)) / 2;

    int x3 = x2 + 2 * n, y3 = y2 - n, z3 = z2 - n;
    int summa2 = (abs(x1 - x3) + abs(y1 - y3) + abs(z1 - z3)) / 2;
    summa = min(summa, summa2);

    x3 = x2 + n;
    y3 = y2 + n;
    z3 = z2 - 2 * n;
    summa2 = (abs(x1 - x3) + abs(y1 - y3) + abs(z1 - z3)) / 2;
    summa = min(summa, summa2);

    x3 = x2 - n;
    y3 = y2 - n;
    z3 = z2 + 2 * n;
    summa2 = (abs(x1 - x3) + abs(y1 - y3) + abs(z1 - z3)) / 2;
    summa = min(summa, summa2);

    x3 = x2 - 2 * n;
    y3 = y2 + n;
    z3 = z2 + n;
    summa2 = (abs(x1 - x3) + abs(y1 - y3) + abs(z1 - z3)) / 2;
    summa = min(summa, summa2);

    x3 = x2 + n;
    y3 = y2 - 2 * n;
    z3 = z2 + n;
    summa2 = (abs(x1 - x3) + abs(y1 - y3) + abs(z1 - z3)) / 2;
    summa = min(summa, summa2);

    x3 = x2 - n;
    y3 = y2 + 2 * n;
    z3 = z2 - n;
```

```
    summa2 = (abs(x1 - x3) + abs(y1 - y3) + abs(z1 - z3)) / 2;
    summa = min(summa, summa2);


    cout << summa << endl;

}

signed main()
{
    ios::sync_with_stdio(0); cin.tie(0);
    ll t = 1;// cin >> t;
    while (t--) {
        solve();
    }
    return 0;
}
```

Task C

```
#include <iostream>
#include <vector>
#include <algorithm>
#include <climits>
#include <numeric>
#include <queue>
#include <set>
#include <string>
#include <random>
#include <iomanip>
#include <cmath>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <fstream>
#include <chrono>
#include <cassert>

using namespace std;

using ll = long long;
using ui = unsigned int;

#define int long long

//mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

int M = (int) (1e9 + 7), P = 1559;

int add(int x, int y) {
    if (x + y >= M) {
        return x + y - M;
    }
```

```
    return x + y;
}

int sub(int x, int y) {
    if (x < y) {
        return x - y + M;
    }
    return x - y;
}

int mul(int x, int y) {
    return 1LL * x * y % M;
}

void first() {
    int n; cin >> n;
    string s; cin >> s;
    int hash = 0;
    for (int i = 0; i < s.size(); i++) {
        hash = add(mul(hash, P), (int) (s[i] - '0'));
    }
    cout << hash << endl;
}

void second() {
    int n; cin >> n;
    string s; cin >> s;
    int h; cin >> h;
    int hash = 0;
    int cr = 1;
    for (int i = 0; i < s.size(); i++) {
        hash = add(mul(hash, P), (int) (s[i] -'0'));
        if (i != 0) {
            cr = mul(cr, P);
        }
    }
    if (h == hash) {
        cout << "YES" << endl;
        exit(0);
    }
    s += s;
    for (int i = n; i < s.size(); i++) {
        hash = sub(hash, (s[i - n] - '0') * cr);
        hash = add(mul(hash, P), (int) (s[i] - '0'));
        if (h == hash) {
            cout << "YES" << endl;
            exit(0);
        }
    }
    cout << "NO" << endl;
}

void solve() {
```

```
    string s; cin >> s;
    if (s == "first") {
        first();
    } else {
        second();
    }
}

signed main()
{
    ios::sync_with_stdio(0); cin.tie(0);
    ll t = 1; // cin >> t;
    while (t--) {
        solve();
    }
    return 0;
}
```

Task D

```
#include <iostream>
#include <vector>
#include <algorithm>
#include <climits>
#include <numeric>
#include <queue>
#include <set>
#include <string>
#include <random>
#include <iomanip>
#include <cmath>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <fstream>
#include <chrono>
#include <cassert>

using namespace std;

using ll = long long;
using ui = unsigned int;

#define int long long

//mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

char ask(int i, int j) {
    cout << i << " " << j << endl;
    cout.flush();
    char c; cin >> c;
    if (c == '!') {
        exit(0);
```

```
    }
    return c;
}

void solve() {
    int n; cin >> n;
    int ind = n;
    for (int i = 0; i < n - 1; i++) {
        for (int j = 1; j < ind; j++) {
            char c = ask(2, j + 1);
            if (c == '>') {
                ask(1, n);
                for (int _ = 2; _ < n; _++) {
                    ask(1, 1);
                }
            } else {
                for (int _ = 1; _ < n; _++) {
                    ask(1, 1);
                }
            }
        }
        ask(1, 1);
        ind--;
    }
    for (int _ = 0; _ < n; _++) {
        ask(1, 1);
    }
}

signed main()
{
//    ios::sync_with_stdio(0); cin.tie(0);
    ll t = 1; // cin >> t;
    while (t--) {
        solve();
    }
    return 0;
}
```

Task E

```
#include <iostream>
#include <vector>
#include <algorithm>
#include <climits>
#include <numeric>
#include <queue>
#include <set>
#include <string>
#include <random>
#include <iomanip>
#include <cmath>
#include <map>
```

```
#include <unordered_set>
#include <unordered_map>
#include <fstream>
#include <chrono>
#include <cassert>

using namespace std;

using ll = long long;
using ui = unsigned int;

#define int long long

//mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

vector<vector<int>> g;
vector<int> firsts;
vector<bool> ready;
vector<int> qs;
int kol = -1;
int n, q;
int ind = 0;

void dfs(int v) {
    while (true) {
        kol++;
        if (qs[ind] == kol) {
            qs[ind] = v;
            ind++;
            if (ind == q) {
                for (auto a : qs) {
                    cout << a << " ";
                }
                exit(0);
            }
        }
        int t = g[v][0];
        g[v].emplace_back(g[v][0]);
        g[v].erase(g[v].begin());
        dfs(t);
    }
}

void solve() {
    cin >> n >> q;
    g.resize(n + 1);
    firsts.resize(n + 1);
    ready.resize(n + 1);
    for (int i = 1; i < n + 1; i++) {
        int d; cin >> d;
        for (int j = 0; j < d; j++) {
            int x; cin >> x;
            if (j == 0) {
```

```
                firsts[i] = x;
            }
            g[i].emplace_back(x);
        }
    }
    qs.resize(q);
    for (int i = 0; i < q; i++) {
        cin >> qs[i];
    }
    dfs(1);
}

signed main()
{
    ios::sync_with_stdio(0); cin.tie(0);
    ll t = 1;// cin >> t;
    while (t--) {
        solve();
    }
    return 0;
}
```

Task F

```
#include <iostream>
#include <vector>
#include <algorithm>
#include <climits>
#include <numeric>
#include <queue>
#include <set>
#include <string>
#include <random>
#include <iomanip>
#include <cmath>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <fstream>
#include <chrono>
#include <cassert>

using namespace std;

using ll = long long;
using ui = unsigned int;

#define int long long

//mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

struct dom {
    int i, j, kol;
```

```
    dom() = default;
};

void solve() {
    int h, w; cin >> h >> w;
    vector<vector<int>> mat(h, vector<int>(w));
    vector<vector<char>> ans(h, vector<char>(w, '.'));
    vector<dom> d(h * w);
    vector<bool> used(h * w);
    for (int i = 0; i < h; i++) {
        string s; cin >> s;
        for (int j = 0; j < w; j++) {
            int x = s[j] - '0';
            d[i * w + j].i = i;
            d[i * w + j].j = j;
            d[i * w + j].kol = x;
            mat[i][j] = x;
        }
    }
    sort(d.begin(), d.end(), [](dom& a, dom& b) {
        return a.kol > b.kol;
    });
    int ans_kol = 0;
    for (auto v : d) {
        int ind = v.i * w + v.j;
        if (used[ind]) continue;
        vector<dom> a;
        if (v.i == 0) {
            dom u;
            u.i = h - 1;
            u.j = v.j;
            u.kol = mat[u.i][u.j];
            if (!used[u.i * w + u.j]) {
                a.emplace_back(u);
            }
        } else {
            dom u;
            u.i = v.i - 1;
            u.j = v.j;
            u.kol = mat[u.i][u.j];
            if (!used[u.i * w + u.j]) {
                a.emplace_back(u);
            }
        }
        if (v.i == h - 1) {
            dom u;
            u.i = 0;
            u.j = v.j;
            u.kol = mat[u.i][u.j];
            if (!used[u.i * w + u.j]) {
                a.emplace_back(u);
            }
        } else {
```

```
        dom u;
        u.i = v.i + 1;
        u.j = v.j;
        u.kol = mat[u.i][u.j];
        if (!used[u.i * w + u.j]) {
            a.emplace_back(u);
        }
    }
    if (v.j == 0) {
        dom u;
        u.i = v.i;
        u.j = w - 1;
        u.kol = mat[u.i][u.j];
        if (!used[u.i * w + u.j]) {
            a.emplace_back(u);
        }
    } else {
        dom u;
        u.i = v.i;
        u.j = v.j - 1;
        u.kol = mat[u.i][u.j];
        if (!used[u.i * w + u.j]) {
            a.emplace_back(u);
        }
    }
    if (v.j == w - 1) {
        dom u;
        u.i = v.i;
        u.j = 0;
        u.kol = mat[u.i][u.j];
        if (!used[u.i * w + u.j]) {
            a.emplace_back(u);
        }
    } else {
        dom u;
        u.i = v.i;
        u.j = v.j + 1;
        u.kol = mat[u.i][u.j];
        if (!used[u.i * w + u.j]) {
            a.emplace_back(u);
        }
    }
    if (a.empty()) continue;
    sort(a.begin(), a.end(), [](dom& a, dom& b) {
        return a.kol > b.kol;
    });
    dom u = a[0];
    ans_kol += v.kol * u.kol;
    used[ind] = true;
    used[u.i * w + u.j] = true;
    if (u.i != v.i) {
        if ((u.i == 0 && v.i == h - 1) || (u.i - 1 == v.i)) {
            ans[v.i][v.j] = 'T';
```

```
                ans[u.i][u.j] = 'B';
            } else {
                ans[v.i][v.j] = 'B';
                ans[u.i][u.j] = 'T';
            }
        } else {
            if ((u.j == 0 && v.j == w - 1) || (v.j + 1 == u.j)) {
                ans[v.i][v.j] = 'L';
                ans[u.i][u.j] = 'R';
            } else {
                ans[v.i][v.j] = 'R';
                ans[u.i][u.j] = 'L';
            }
        }
    }
    cout << ans_kol << endl;
    for (auto u : ans) {
        for (auto j : u) {
            cout << j;
        }
        cout << endl;
    }
}

signed main()
{
//    ios::sync_with_stdio(0); cin.tie(0);
    ll t = 1; // cin >> t;
    while (t--) {
        solve();
    }
    return 0;
}
```