Олимпиада СПбГУ
по информатике
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A	B	C	D	E	F	sum
100	50	100	75	20	89	434

Task A

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

using namespace std;

#define int long long
#define all(x) x.begin(), x.end()
using ll = long long;
using ld = long double;
const ll INF = 2e9 + 100, MOD = 1e9 + 7, N = 15e2, K = 20, MX = 45e4 +
    100;
const ld Pi = acos(-1);
mt19937 rnd(148);


void solve1() {
    int a, b, n;
    cin >> a >> b >> n;
    vector<__int128> dp(n + 1);
    dp[0] = 1;
    for (int i = a; i <= n; i++) {
        dp[i] += dp[i - a];
        if (i >= b)
            dp[i] += dp[i - b];
    }
    __int128 ans = 0;
    for (int i = 1; i <= a; i++) {
        if (n >= a)
        ans += dp[n - a];
    }
```

```
    for (int i = a + 1; i <= b; i++) {
        if (n - b - a >= 0)
            ans += dp[n - b - a];
    }
    for (int i = 1; i <= a; i++) {
        if (n >= b)
        ans += dp[n - b];
    }
    for (int i = a + 1; i <= b; i++) {
        if (n - b - b >= 0)
        ans += dp[n - b - b];
    }
    if (n == b) ans += b - a;
    string s = "";
    while (ans > 0) {
        s += to_string(ll(ans % 10));
        ans /= 10;
    }
    reverse(s.begin(), s.end());
    if (s.empty())
        s += '0';
    cout << s;
}

void solve2() {
}

signed main() {
//    freopen("input.txt", "r", stdin);
//    freopen("output.txt", "w", stdout);
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    ll tt = 1;
//    cin >> tt;
    while (tt--) {
        solve1();
    }
    return 0;
}
```

Task B

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

using namespace std;

#define int long long
#define all(x) x.begin(), x.end()
using ll = long long;
using ld = long double;
const ll INF = 2e9 + 100, MOD = 1e9 + 7, N = 15e2, K = 20, MX = 45e4 +
    100;
```

```
const ld Pi = acos(-1);
mt19937 rnd(148);


void solve1() {
    int n;
    cin >> n;
    int x1, y1, z1;
    int x2, y2, z2;
    cin >> x1 >> y1 >> z1;
    cin >> x2 >> y2 >> z2;
    cout << ((abs(x1 - x2) + abs(y1 - y2) + abs(z1 - z2))) / 2;
}

void solve2() {
}

signed main() {
//    freopen("input.txt", "r", stdin);
//    freopen("output.txt", "w", stdout);
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    ll tt = 1;
//    cin >> tt;
    while (tt--) {
        solve1();
    }
    return 0;
}
```

Task C

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

using namespace std;

#define int long long
#define all(x) x.begin(), x.end()
using ll = long long;
using ld = long double;
const ll INF = 2e9 + 100, MOD = 1e9 + 123, N = 15e2, K = 20, MX = 45e4 +
    100, bse = 3;
const ld Pi = acos(-1);
mt19937 rnd(148);

struct Hash{
    vector<int> pref, p;
    int mod, base;
    Hash(string s, int base2, int mod2) {
        mod = mod2;
        base = base2;
        int n = s.size();
```

```
        pref.assign(n + 1, 0);
        p.assign(n + 1, 1);
        for (int i = 1; i <= n; i++) {
            p[i] = p[i - 1] * base % mod;
            pref[i] = (pref[i - 1] * base + s[i - 1] - '0' + 1) % mod;
        }
    }

    int get_h(int l, int r) {
        return ((pref[r] - pref[l - 1] * p[r - l + 1]) % mod + mod) % mod
    ;
    }
};


void solve1() {
    int n;
    cin >> n;
    string s;
    cin >> s;
    int h = 0;
    for (int i = 0; i < n; i++) {
        h = (h * bse + s[i] - '0' + 1) % MOD;
    }
    cout << h;
}

void solve2() {
    int n;
    cin >> n;
    string t, s;
    cin >>  t >> s;
    t = t + t;
    Hash h = Hash(t, bse, MOD);
    for (int i = 0; i < n; i++) {
        if (to_string(h.get_h(i + 1, i + n)) == s) {
            cout << "YES";
            return;
        }
    }
    cout << "NO";
}

signed main() {
//    freopen("input.txt", "r", stdin);
//    freopen("output.txt", "w", stdout);
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    ll tt = 1;
//    cin >> tt;
    while (tt--) {
        string s;
```

```
        cin >> s;
        if (s[0] == 'f') {
            solve1();
        } else {
            solve2();
        }
    }
    return 0;
}
```

Task D

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

using namespace std;

//#define int long long
#define all(x) x.begin(), x.end()
using ll = long long;
using ld = long double;
const ll INF = 2e9 + 100, MOD = 1e9 + 7, N = 15e2, K = 20, MX = 45e4 +
    100;
const ld Pi = acos(-1);
mt19937 rnd(148);
deque<int> d, d2;

void print(int i, int j) {
    swap(d[i - 1], d[j - 1]);
//    swap(d2[i - 1], d2[j - 1]);
    cout << i << " " << j << endl;
}

void solve1() {
    int n;
    cin >> n;
    vector<int> a(n + 1);
    for (int i = 1; i <= n; i++) {
        d.push_back(i);
    }
//    d2 = {2, 5, 3, 4, 1};

    for (int i = 1; i <= n; i++) {
        int cnt = 0, fir = d[0];
        if (a[fir] != 0) {
            print(1, 1);
            char c;
            cin >> c;
            if (c == '!') return;
            d.push_back(d[0]);
            d.pop_front();
//            d2.push_back(d2[0]);
//            d2.pop_front();
            i--;
```

```
            continue;
        }
        for (int j = 0; j < n - 1; j++) {
            print(1, 1);
            d.push_back(d[0]);
            d.pop_front();
            char c;
            cin >> c;
            if (c == '!') return;
            if (c == '<') cnt++;
            print(1, j + 2);
            d.push_back(d[0]);
            d.pop_front();
            cin >> c;
            if (c == '!') return;
            while (d[0] != fir) {
                print(1, 1);
                d.push_back(d[0]);
                d.pop_front();
                cin >> c;
                if (c == '!') return;

            }
        }
        a[fir] = cnt + 1;
//        print(1, 1);
//        char c;
//        cin >> c;
//        d.push_back(d[0]);
//        d.pop_front();
//        d2.push_back(d2[0]);
//        d2.pop_front();
    }
//    assert(a[2] == 5);
//    a = {0, 2, 5, 3, 4, 1};
    char c = ' ';
    while (c != '!') {
        for (int i = n; i > 0; i--) {
            bool f = 1;
            for (int j = 0; j < n; j++) {

                if (a[d[j]] == i) {
                    f = 0;
                    print(1, j + 1);
                    cin >> c;
                    if (c == '!') return;
                    d.push_back(d[0]);
                    d.pop_front();
//                    d2.push_back(d2[0]);
//                    d2.pop_front();
                    break;
                }
            }
```

```
        }
        while (c != '!') {
            print(1, 1);
            cin >> c;
        }
        break;
    }
//    cout << "!";


}

void solve2() {
}

signed main() {
//    freopen("input.txt", "r", stdin);
//    freopen("output.txt", "w", stdout);
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    ll tt = 1;
//    cin >> tt;
    while (tt--) {
        solve1();
    }
    return 0;
}
/*
 5 3 4 1 2
 3 5 4 1 2
 5 4 1 2 3
 4 1 2 3 5
 1 2 3 5 4
 2 3 5 4 1
 3 5 4 1 2
 5 3 1 2 4

 */
```

Task E

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

using namespace std;

#define int long long
#define all(x) x.begin(), x.end()
using ll = long long;
using ld = long double;
const ll INF = 2e9 + 100, MOD = 1e9 + 7, N = 1e5 + 100, K = 20, MX = 45e4
    + 100;
const ld Pi = acos(-1);
```

```
mt19937 rnd(148);
int cnt = 0;
vector<int> ans(N);
vector<deque<int>> g(N);



void solve1() {
    int n, q;
    cin >> n >> q;
    for (int i = 1; i <= n; i++) {
        int d;
        cin >> d;
        for (int j = 0; j < d; j++) {
            int x;
            cin >> x;
            g[i].push_back(x);
        }
    }
    int v = 1;
    while (cnt < N) {
        ans[cnt] = v;
        cnt++;
        int to = g[v][0];
        g[v].push_back(g[v][0]);
        g[v].pop_front();
        v = to;
    }
    for (int i = 0; i < q; i++) {
        int x;
        cin >> x;
        cout << ans[x] << " ";
    }

}

void solve2() {
}

signed main() {
//    freopen("input.txt", "r", stdin);
//    freopen("output.txt", "w", stdout);
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    ll tt = 1;
//    cin >> tt;
    while (tt--) {
        solve1();
    }
    return 0;
}
```

Task F

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

using namespace std;
#define int long long
#define all(x) x.begin(), x.end()
using ll = long long;
using ld = long double;
const ll INF = 1e15, MOD = 998244353, N = 1e5 + 100, K = 25, MX = 45e4 +
    100;
const ld Pi = acos(-1);
mt19937 rnd(148822869);

void solve() {
    int n, m;
    cin >> n >> m;
    char a[n][m];
    for (int i = 0; i < n; i++) {
        for (int j = 0; j < m; j++) {
            cin >> a[i][j];
        }
    }
    vector<tuple<int, int, int, int, int>> ed;
    for (int i = 0; i < n; i++) {
        for (int j = 0; j < m; j++) {
            if (i < n - 1)
                ed.push_back({(a[i][j] - '0') * (a[i + 1][j] - '0'), i, j
    , i + 1, j});
            if (j < m - 1)
                ed.push_back({(a[i][j] - '0') * (a[i][j + 1] - '0'), i, j
    , i, j + 1});
        }
    }
    sort(ed.rbegin(), ed.rend());
    int sum3 = 0;
    vector<vector<char>> ans3(n, vector<char>(m, '.'));
    for (auto [val, i1, j1, i2, j2] : ed) {
        if (ans3[i1][j1] == '.' && ans3[i2][j2] == '.') {
            sum3 += val;
            if (i1 == i2) {
                ans3[i1][j1] = 'L', ans3[i2][j2] = 'R';
            } else {
                ans3[i1][j1] = 'T', ans3[i2][j2] = 'B';
            }
        }
    }
    vector<vector<char>> ans1(n, vector<char>(m, '.'));
    int sum1 = 0;
    for (int i = 0; i < n; i++) {
        for (int j = 0; j < m; j += 2) {
            ans1[i][j] = 'L';
            ans1[i][j + 1] = 'R';
```

```
            sum1 += (a[i][j] - '0') * (a[i][j + 1] - '0');
        }
    }
    vector<vector<char>> ans2(n, vector<char>(m, '.'));
    int sum2 = 0;
    for (int j = 0; j < m; j++) {
        for (int i = 0; i < n; i += 2) {
            ans2[i][j] = 'T';
            ans2[i + 1][j] = 'B';
            sum2 += (a[i][j] - '0') * (a[i + 1][j] - '0');
        }
    }
    if (sum1 < sum2) {
        swap(sum1, sum2);
        swap(ans1, ans2);
    }if (sum1 < sum3) {
        swap(sum1, sum3);
        swap(ans1, ans3);
    }

        cout << sum1 << endl;
        for (int i = 0; i < n; i++) {
            for (int j = 0; j < m; j++) {
                cout << ans1[i][j];
            }
            cout << endl;
        }


}

signed main() {
//    freopen("input.txt", "r", stdin);
//    freopen("output.txt", "w", stdout);
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    ll tt = 1;
//    cin >> tt;
    while (tt--) {
        solve();
    }
    return 0;
}
```