Олимпиада СПбГУ
по информатике
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A	B	C	D	E	F	sum
100	100	100	35	20	69	424

Task A

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

using namespace std;
using ll = long long;
using ld = long double;

void solve() {
    int a, b;
    int n;
    cin >> a >> b >> n;
    vector<ll> dp(100 * n + 1);
    dp[0] = 1;
    ll ans = 0;
    for (int j = 0; j < n; ++j) {
        std::fill(dp.begin(), dp.end(), 0);
        dp[j] = 1;
        for (int i = j + 1; i < n; ++i) {
            if (b <= i) {
                dp[i] += dp[i - b];
                dp[i] += dp[i - a];
            } else if (a <= i) {
                dp[i] += dp[i - a];
            }
        }
        if (n - a + j >= 0) {
            ans += dp[n - a + j];
        }
        if (n - b + j >= 0) {
            ans += dp[n - b + j];
```

```
        }
    }
    cout << ans;
}

int main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    solve();
    return 0;
}
```

Task B

```
#include <bits/stdc++.h>
#define int long long

using namespace std;
mt19937 rnd(1235);

int get(int x, int y, int z, int x2, int y2, int z2) {
    int a, b, c;
    a = x - x2;
    b = y - y2;
    c = z - z2;
    vector<int> d{a, b, c};
    std::sort(d.begin(), d.end());
    if (d[0] == 0) {
        return 0;
    }
    if (d[1] < 0) {
        return d[2];
    } else {
        return d[1] + d[2];
    }
}

int n;

int f(int x, int y, int z, int x2, int y2, int z2) {
    int ans = get(x, y, z, x2, y2, z2);
    if (x <= y && x <= z) {
        ans = min(ans, get(n, -z - x - n, -y, x2, y2, z2) + x + n);
        ans = min(ans, get(n, -z, -y - x - n, x2, y2, z2) + x + n);
    }
    if (y <= x && y <= z) {
        ans = min(ans, get(-z - y - n, n, -x, x2, y2, z2) + y + n);
        ans = min(ans, get(-z, n, -x - n - y, x2, y2, z2) + y + n);
    }
    if (z <= x && z <= y) {
        ans = min(ans, get(-y - z - n, -x, n, x2, y2, z2) + z + n);
        ans = min(ans, get(-y, -x - z - n, n, x2, y2, z2) + z + n);
    }
```

```
    if (x >= y && x >= z) {
        ans = min(ans, get(-n, -z + n - x, -y, x2, y2, z2) + n - x);
        ans = min(ans, get(-n, -z, -y + n - x, x2, y2, z2) + n - x);
    }
    if (y >= x && y >= z) {
        ans = min(ans, get(-z + n - y, -n, -x, x2, y2, z2) + n - y);
        ans = min(ans, get(-z, -n, -x + n - y, x2, y2, z2) + n - y);
    }
    if (z >= y && z >= x) {
        ans = min(ans, get(-y, -x + n - z, -n, x2, y2, z2) + n - z);
        ans = min(ans, get(-y + n - z, -x, -n, x2, y2, z2) + n - z);
    }
    return ans;
}

/*int f(int x, int y, int z, int x2, int y2, int z2) {
    int ans = get(x, y, z, x2, y2, z2);
    for (int i = 0; i <= n; ++i) {
        ans = min(ans, get(x, y, z, -n, i, n - i) + get(x2, y2, z2, n, i
    - n, -i));
        ans = min(ans, get(x, y, z, i, -n, n - i) + get(x2, y2, z2, i - n
    , n, -i));
        ans = min(ans, get(x, y, z, i, n - i, -n) + get(x2, y2, z2, i - n
    , -i, n));
    }
    return ans;
}*/

void solve() {
    cin >> n;
    int x, y, z;
    int x2, y2, z2;
    cin >> x >> y >> z >> x2 >> y2 >> z2;
    int ans = f(x, y, z, x2, y2, z2);
    ans = min(ans, f(x2, y2, z2, x, y, z));
    cout << ans;
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    solve();
    return 0;
}
```

Task C

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

using namespace std;
using ll = long long;
using ld = long double;
```

```
ll mod, p;

ll get(vector<ll> &s, int start, int end) {
    ll now = 0;
    ll was = 0;
    for (int i = start; i < end; ++i) {
        now = (was * p + (s[i])) % mod;
        was = now;
    }
    return now;
}

void solve() {
    int CN = 6;
    string test;
    cin >> test;
    int n;
    cin >> n;
    string s;
    cin >> s;
    vector<ll> mods{(ll)1e9, (ll)1e9 + 7, (ll)1e9 + 9, (1ll << 32), (ll)1
   e9 + 239, 1235653, 1653, 601}, pr{10, 31, 37, 41, 239, 23, 43};
    if (test[0] == 'f') {
        vector<ll> t;
        for (int i = 0; i < n; ++i) {
            t.push_back((s[i] - '0' + 1));
        }
//        vector<ll> hs;
        for (int i = 0; i < CN; ++i) {
            mod = mods[i];
            p = pr[i];
//            hs.push_back(get(t));
            cout << get(t, 0, n) << ' ';
        }
        return;
    }
    vector<ll> t;
    for (int i = 0; i < n; ++i) {
        t.push_back(s[i] - '0' + 1);
    }
    for (int i = n; i < 2 * n; ++i) {
        t.push_back(t[i - n]);
    }
    t.push_back(t[0]);
    vector<ll> hs(7), now(CN);
    for (int i = 0; i < CN; ++i) {
        cin >> hs[i];
        mod = mods[i];
        p = pr[i];
        now[i] = get(t, 0, n);
    }
    /*int start = 0;
```

```
    while (start < n) {
        bool f = true;
        for (int i = 0; i < CN; ++i) {
            mod = mods[i];
            p = pr[i];
            if (get(t, start, start + n) != hs[i]) {
                f = false;
                break;
            }
        }
        if (f) {
            cout << "YES";
            return;
        }
        ++start;
    }*/
    int start = 0;
    vector<vector<ll>> pw(CN, vector<ll> (n + 1));
    for (int j = 0; j < CN; ++j) {
        pw[j][0] = 1;
        for (int i = 0; i < n; ++i) {
            pw[j][i + 1] = pw[j][i] * pr[j] % mods[j];
        }
    }
    while (start <= n) {
        bool f = true;
        for (int i = 0; i < CN; ++i) {
            if (now[i] != hs[i]) {
                f = false;
                break;
            }
        }
        if (f) {
            cout << "YES";
            return;
        }
        vector<ll> will(CN);
        for (int j = 0; j < CN; ++j) {
            will[j] = (((now[j] - pw[j][n - 1] * t[start] % mods[j] +
    mods[j]) % mods[j]) * pr[j] % mods[j] + t[start + n]) % mods[j];
        }
        now = will;
        ++start;
    }
    cout << "NO";
}

int main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
//    char c = 0;
//    for (int i = 32; i < 126; ++i) {
//        cout << (char) c;
```

```
//          ++c;
//      }
    solve();
    return 0;
}
```

Task D

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

using namespace std;
using ll = long long;
using ld = long double;
mt19937 rnd(23565);

void ask(int i, int j) {
    cout << i + 1 << ' ' << j + 1 << endl;
}

int in() {
    char c;
    cin >> c;
    if (c == '!') {
        exit(0);
    }
    if (c == '<') {
        return 0;
    }
    if (c == '>') {
        return 1;
    }
    return 2;
}

void solve() {
    int n;
    cin >> n;
    vector<int> p(n), sg;
    while (true) {

        ask(rnd() % n, rnd() % n);
        in();
    }
}

int main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    solve();
    return 0;
}
```

Task E

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

using namespace std;
using ll = long long;
using ld = long double;
mt19937 rnd(23565);

vector<vector<int>> g;
vector<int> add;
vector<int> path;

void solve() {
    int n, q;
    cin >> n >> q;
    g.resize(n);
    add.resize(n);
    for (int i = 0; i < n; ++i) {
        int x;
        cin >> x;
        for (int j = 0; j < x; ++j) {
            int u;
            cin >> u;
            --u;
            g[i].push_back(u);
        }
    }
    int v = 0, tim = 0;
    while (tim < 100100) {
        path.push_back(v);
        v = g[v][add[v]++ % g[v].size()];
        ++tim;
    }
    for (int i = 0; i < q; ++i) {
        int x;
        cin >> x;
        cout << path[x % tim] + 1 << ' ';
    }
}

int main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    solve();
    return 0;
}
```

Task F

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

```
using namespace std;
using ll = long long;

void solve() {
    int h, w;
    cin >> h >> w;
    string s;
    vector <vector<ll>> a(h, vector<ll>(w));
    for (int i = 0; i < h; ++i) {
        cin >> s;
        for (int j = 0; j < w; ++j) {
            a[i][j] = s[j] - '0';
        }
    }
    ll ans = 0;
    vector <vector<char>> otv(h, vector<char>(w, '.'));
    vector <pair<int, int>> vis;
    for (int i = 0; i < h / 2; ++i) {
        for (int j = 0; j < w / 2; ++j) {
            ll s1 = a[i * 2][j * 2] * a[i * 2][j * 2 + 1] + a[i * 2 + 1][
   j * 2] * a[i * 2 + 1][j * 2 + 1];
            ll s2 = a[i * 2][j * 2] * a[i * 2 + 1][j * 2] + a[i * 2][j *
   2 + 1] * a[i * 2 + 1][j * 2 + 1];
            if (s1 >= s2) {
                ans += s1;
                if (a[2 * i][2 * j] == 0) {
                    vis.emplace_back(2 * i, 2 * j + 1);
                } else if (a[2 * i][2 * j + 1] == 0) {
                    vis.emplace_back(2 * i, 2 * j);
                } else {
                    otv[2 * i][2 * j] = 'L';
                    otv[2 * i][2 * j + 1] = 'R';
                }
                if (a[2 * i + 1][2 * j] == 0) {
                    vis.emplace_back(2 * i + 1, 2 * j + 1);
                } else if (a[2 * i + 1][2 * j + 1] == 0) {
                    vis.emplace_back(2 * i + 1, 2 * j);
                } else {
                    otv[2 * i + 1][2 * j] = 'L';
                    otv[2 * i + 1][2 * j + 1] = 'R';
                }
            } else {
                ans += s2;
                if (a[2 * i][2 * j] == 0) {
                    vis.emplace_back(2 * i + 1, 2 * j);
                } else if (a[2 * i + 1][2 * j] == 0) {
                    vis.emplace_back(2 * i, 2 * j);
                } else {
                    otv[2 * i][2 * j] = 'T';
                    otv[2 * i + 1][2 * j] = 'B';
                }
                if (a[2 * i][2 * j + 1] == 0) {
```

```
                    vis.emplace_back(2 * i + 1, 2 * j + 1);
                } else if (a[2 * i + 1][2 * j + 1] == 0) {
                    vis.emplace_back(2 * i, 2 * j + 1);
                } else {
                    otv[2 * i][2 * j + 1] = 'T';
                    otv[2 * i + 1][2 * j + 1] = 'B';
                }
            }
        }
    }
    for (auto &[x, y] : vis) {
        if (a[x][y] == 0) {
            continue;
        }
        if (otv[x][y] == '.' && otv[(x - 1 + h) % h][y] == '.' && a[(x -
    1 + h) % h][y] != 0) {
            ans += a[(x - 1 + h) % h][y] * a[x][y];
            otv[(x - 1 + h) % h][y] = 'T';
            otv[x][y] = 'B';
        } else if (otv[x][y] == '.' && otv[x][(y - 1 + w) % w] == '.' &&
    a[x][(y - 1 + w) % w] != 0) {
            ans += a[x][y] * a[x][(y - 1 + w) % w];
            otv[x][(y - 1 + w) % w] = 'L';
            otv[x][y] = 'R';
        }
    }
    cout << ans << '\n';
    for (int i = 0; i < h; ++i) {
        for (int j = 0; j < w; ++j) {
            cout << otv[i][j];
        }
        cout << '\n';
    }
}

int main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    solve();
    return 0;
}
```