Олимпиада СПбГУ
по информатике
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A	B	C	D	E	F	sum
100	100	100	100	40	87	527

Task A

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

using namespace std;

typedef long long ll;
typedef unsigned long long ull;

const ll INF = 1e18;
const ll mod = 1e9 + 7;

int main() {
    cout.precision(15);
    cout << fixed;
#ifdef DEBUGMB
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
#else
    ios::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
#endif

    ll a, b, n;
    cin >> a >> b >> n;
    vector<ll> dp(n + 15, 0);
    dp[0] = 1;
    for (ll i = 0; i < n; ++i) {
        dp[i + a] += dp[i];
        dp[i + b] += dp[i];
```

```
    }
    if (a <= n) {
        dp[n] += dp[n - a] * (a - 1);
    }
    if (b <= n) {
        dp[n] += dp[n - b] * (b - 1);
    }
    cout << dp[n] << "\n";


    return 0;
}
```

Task B

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

using namespace std;

typedef long long ll;
typedef unsigned long long ull;

const ll INF = 1e18;
const ll mod = 1e9 + 7;

ll n;


ll dist(ll dx, ll dy, ll dz) {
    dx = abs(dx);
    dy = abs(dy);
    dz = abs(dz);
    if (dx < dy) swap(dx, dy);
    if (dy < dz) swap(dy, dz);
    if (dx < dy) swap(dx, dy);
    ll ans = max(dx, (dx + dy + dz) / 2);
    return ans;
}

int main() {
    cout.precision(15);
    cout << fixed;
#ifdef DEBUGMB
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
#else
    ios::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
#endif

    cin >> n;
    ll nn = n + n;
```

```
    ll x1, y1, z1, x2, y2, z2;
    cin >> x1 >> y1 >> z1 >> x2 >> y2 >> z2;

    ll ans = dist(x1 - x2, y1 - y2, z1 - z2);
    ans = min(ans, dist(x1 + nn - x2, y1 - n - y2, z1 - n - z2));
    ans = min(ans, dist(x1 - nn - x2, y1 + n - y2, z1 + n - z2));
    ans = min(ans, dist(x1 - n - x2, y1 + nn - y2, z1 - n - z2));
    ans = min(ans, dist(x1 + n - x2, y1 - nn - y2, z1 + n - z2));
    ans = min(ans, dist(x1 - n - x2, y1 - n - y2, z1 + nn - z2));
    ans = min(ans, dist(x1 + n - x2, y1 + n - y2, z1 - nn - z2));
    cout << ans;



    return 0;
}
```

Task C

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

using namespace std;

typedef long long ll;
typedef unsigned long long ull;

const ll INF = 1e18;
const ll mod = 1e9 + 7;

__int128 P = 103;
__int128 Q = 1e9 + 7;

int main() {
    cout.precision(15);
    cout << fixed;
#ifdef DEBUGMB
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
#else
    ios::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
#endif

    string t;
    cin >> t;
    if (t[0] == 'f') {
        ll n;
        cin >> n;
        string s;
        cin >> s;
        __int128 h = 0;
        for (ll i = 0; i < n; ++i) {
```

```
            h *= P;
            h += s[i] - '0';
            h %= Q;
        }
        cout << (ll)h << "\n";
    } else {
        ll n;
        string s;
        cin >> n >> s;
        ll _code;
        cin >> _code;
        __int128 code = _code;
        vector<__int128> h(n + 1);
        h[0] = 0;
        for (ll i = 0; i < n; ++i) {
            h[i + 1] = (h[i] * P + (s[i] - '0')) % Q;
        }
        vector<__int128> power(100010);
        power[0] = 1;
        for (ll i = 1; i < 100010; ++i) {
            power[i] = power[i - 1] * P % Q;
        }
        // cerr << (ll)h[n] << "\n";
        for (ll i = 0; i < n; ++i) {
            __int128 newh = (((h[n] - power[n - i - 1] * h[i + 1]) % Q +
    Q) * power[i + 1] + h[i + 1]) % Q;
            // cerr << (ll)newh << "\n";
            if (newh == code) {
                cout << "YES\n";
                return 0;
            }
        }
        cout << "NO\n";
    }



    return 0;
}
```

Task D

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

using namespace std;

typedef long long ll;
typedef unsigned long long ull;

const ll INF = 1e18;
const ll mod = 1e9 + 7;

__int128 P = 103;
```

```
__int128 Q = 1e9 + 7;

int main() {
    cout.precision(15);
    cout << fixed;
#ifdef DEBUGMB1
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
#else
    ios::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
#endif

    ll n;
    cin >> n;
    ll cnt = 0;
    while (true) {
        cnt++;
        char res;
        vector<ll> used(n, false);
        cout << "1 1" << endl;
        for (ll i = 0; i < n - 1; ++i) {
            cin >> res;
            if (res == '!') return 0;
            if (res == '>') {
                used[i] = true;
            }
            cout << "1 1" << endl;
        }
        cin >> res;
        if (res == '!') return 0;
        for (ll i = 0; i < n; ++i) {
            if (used[i]) {
                cout << "1 2" << endl;
            } else {
                cout << "1 1" << endl;
            }
            cin >> res;
            if (res == '!') return 0;
        }
    }



    return 0;
}
```

Task E

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

using namespace std;
```

```
typedef long long ll;
typedef unsigned long long ull;

const ll INF = 1e18;
const ll mod = 1e9 + 7;

vector<vector<ll>> g;
vector<ll> t;
vector<ll> used;

int main() {
    cout.precision(15);
    cout << fixed;
#ifdef DEBUGMB
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
#else
    ios::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
#endif

    ll n, q;
    cin >> n >> q;
    g.resize(n);
    t.assign(n, 0);
    used.assign(n, false);
    ll k = 0;
    for (ll i = 0; i < n; ++i) {
        ll K;
        cin >> K;
        for (ll j = 0; j < K; ++j) {
            ll x;
            cin >> x;
            x--;
            g[i].push_back(x);
            k++;
        }
    }

    if (n <= 100000) {
        ll cnt = 1;
        ll x;
        ll j = 0;
        ll pos = 0;
        used[0] = true;
        cin >> x;
        if (j == x) {
            cout << pos + 1 << " ";
            q--;
            cin >> x;
        }
```

```
        if (q == 0) return 0;
        while (true) {
            pos = g[pos][t[pos]++ % g[pos].size()];
            if (!used[pos]) {
                used[pos] = true;
                cnt++;
            }
            j++;
            if (j == x) {
                cout << pos + 1 << " ";
                cin >> x;
                q--;
            }
            if (q == 0) return 0;
            if (cnt == n && pos == 0) break;
        }
        if (q == 0) return 0;
        ll minus = j;
        x -= minus;
        cerr << minus << "\n";
        vector<ll> a(k);
        pos = 0;
        for (ll i = 0; i < k; ++i) {
            a[i] = pos;
            pos = g[pos][t[pos]++ % g[pos].size()];
        }
        cout << a[x % k] + 1 << " ";
        while (cin >> x) {
            x -= minus;
            cout << a[x % k] + 1 << " ";
        }
        return 0;
    }

    ll x;
    ll j = 0;
    ll pos = 0;
    while (q--) {
        cin >> x;
        for (; j < x; ++j) {
            pos = g[pos][t[pos]++ % g[pos].size()];
        }
        cout << pos + 1 << " ";
    }



    return 0;
}
```

Task F

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

```
using namespace std;

typedef long long ll;
typedef unsigned long long ull;

const ll INF = 1e18;
const ll mod = 1e9 + 7;

mt19937 rnd(134323);

vector<vector<ll>> a;
vector<vector<char>> b;
ll res = 0;
ll h, w;

ll get(ll x, ll y) {
    ll x2 = x, y2 = y;
    if (b[x][y] == 'B') {
        x2--;
        if (x2 == -1) x2 = h - 1;
    } else if (b[x][y] == 'T') {
        x2++;
        if (x2 == h) x2 = 0;
    } else if (b[x][y] == 'L') {
        y2++;
        if (y2 == w) y2 = 0;
    } else if (b[x][y] == 'R') {
        y2--;
        if (y2 == -1) y2 = w - 1;
    } else {
        return 0;
    }
    return a[x][y] * a[x2][y2];
}

void destroy(ll x, ll y) {
    ll x2 = x, y2 = y;
    if (b[x][y] == 'B') {
        x2--;
        if (x2 == -1) x2 = h - 1;
    } else if (b[x][y] == 'T') {
        x2++;
        if (x2 == h) x2 = 0;
    } else if (b[x][y] == 'L') {
        y2++;
        if (y2 == w) y2 = 0;
    } else if (b[x][y] == 'R') {
        y2--;
        if (y2 == -1) y2 = w - 1;
    } else {
        return;
    }
```

```
    b[x][y] = '.';
    b[x2][y2] = '.';
    res -= a[x][y] * a[x2][y2];
}
void build(ll x, ll y, ll dir) {
    ll x2 = x, y2 = y;
    if (dir == 0) {
        x2--;
        if (x2 == -1) x2 = h - 1;
        b[x][y] = 'B';
        b[x2][y2] = 'T';
    } else if (dir == 2) {
        x2++;
        if (x2 == h) x2 = 0;
        b[x][y] = 'T';
        b[x2][y2] = 'B';
    } else if (dir == 1) {
        y2++;
        if (y2 == w) y2 = 0;
        b[x][y] = 'L';
        b[x2][y2] = 'R';
    } else {
        y2--;
        if (y2 == -1) y2 = w - 1;
        b[x][y] = 'R';
        b[x2][y2] = 'L';
    }
    res += a[x][y] * a[x2][y2];
}

int main() {
    cout.precision(15);
    cout << fixed;
#ifdef DEBUGMB
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
#else
    ios::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
#endif

    cin >> h >> w;
    a.assign(h, vector<ll>(w));
    for (ll i = 0; i < h; ++i) {
        string s;
        cin >> s;
        for (ll j = 0; j < w; ++j) {
            a[i][j] = s[j] - '0';
        }
    }
    b.assign(h, vector<char>(w, '.'));
    // for (ll i = 0; i < h; ++i) {
```

```
    //      for (ll j = 0; j < w; j += 2) {
    //          res += a[i][j] * a[i][j + 1];
    //          b[i][j] = 'L';
    //          b[i][j + 1] = 'R';
    //      }
    // }
    ll mxtemp = 25000000;
    ll temp = mxtemp;
    while (temp-- > -10000000) {
        ll x = rnd() % h;
        ll y = rnd() % w;
        ll dir = rnd() % 4;
        ll x2 = x, y2 = y;
        if (dir == 0) {
            x2--;
            if (x2 == -1) x2 = h - 1;
        } else if (dir == 2) {
            x2++;
            if (x2 == h) x2 = 0;
        } else if (dir == 1) {
            y2++;
            if (y2 == w) y2 = 0;
        } else {
            y2--;
            if (y2 == -1) y2 = w - 1;
        }
        if (get(x, y) + get(x2, y2) < a[x][y] * a[x2][y2] || rnd() %
    mxtemp < temp) {
            destroy(x, y);
            destroy(x2, y2);
            build(x, y, dir);
        }
    }
    cout << res << "\n";
    for (ll i = 0; i < h; ++i) {
        for (ll j = 0; j < w; ++j) {
            cout << b[i][j];
        }
        cout << "\n";
    }



    return 0;
}
```