Олимпиада СПбГУ
по информатике
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A	B	C	D	E	F	sum
100	100	40	100	20	89	449

Task A

```
#include <iostream>
#include <set>
#include <vector>
#include <cmath>
#include <string>
#include <algorithm>
#include <random>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <bitset>
#include <iomanip>
#include <numeric>

using namespace std;
#define fast ios_base::sync_with_stdio(false); cin.tie(0); cout.tie(0)
#define int long long
int answer = 0;
int a, b, n;
signed main() {
    fast;
    cin >> a >> b >> n;
    vector<int> dp(n + 1);
    dp[0] = 1;
    for (int i = 1; i <= n; i++) {
        dp[i] = (i >= a ? dp[i - a] : 0) + (i >= b ? dp[i - b] : 0);
    }
    if (n >= a) answer += dp[n - a] * a;
    if (n >= b) answer += dp[n - b] * b;
```

```
    cout << answer;
    return 0;
}
```

Task B

```
#include <iostream>
#include <set>
#include <vector>
#include <cmath>
#include <string>
#include <algorithm>
#include <random>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <bitset>
#include <iomanip>
#include <numeric>
using namespace std;
#define fast ios_base::sync_with_stdio(false); cin.tie(0); cout.tie(0)
inline int dist(int x1, int y1, int z1, int x2, int y2, int z2, bool flag
    ) {
    if (flag) {
        return (abs(x1 + x2) + abs(y1 + y2) + abs(z1 + z2)) / 2;
    }
    return (abs(x1 - x2) + abs(y1 - y2) + abs(z1 - z2)) / 2;

}
signed main() {
    fast;
    int n;
    int x1, y1, z1, x2, y2, z2;
    cin >> n >> x1 >> y1 >> z1 >> x2 >> y2 >> z2;
    int mn = dist(x1, y1, z1, x2, y2, z2,0);
    for (int i = 0; i <= n; ++i) {
        mn = min(mn, dist(x1,y1,z1, i, (n - i), -n,0) + dist(x2,y2,z2, (n
     - i), i, -n,1));
        mn = min(mn, dist(x1,y1,z1, -n, (n - i), i,0) + dist(x2,y2,z2, -n
    , i, (n - i),1));
        mn = min(mn, dist(x1,y1,z1, i, -n, (n - i),0) + dist(x2,y2,z2, (n
     - i), -n, i,1));
        //
        mn = min(mn, dist(x2,y2,z2, i, (n - i), -n,0) + dist(x1,y1,z1, (n
     - i), i, -n,1));
        mn = min(mn, dist(x2,y2,z2, -n, (n - i), i,0) + dist(x1,y1,z1, -n
    , i, (n - i),1));
        mn = min(mn, dist(x2,y2,z2, i, -n, (n - i),0) + dist(x1,y1,z1, (n
     - i), -n, i,1));
    }
    cout << mn;
    return 0;
}
```

Task C

```
#include <iostream>
#include <set>
#include <vector>
#include <cmath>
#include <string>
#include <algorithm>
#include <random>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <bitset>
#include <iomanip>
#include <numeric>

using namespace std;
#define fast ios_base::sync_with_stdio(false); cin.tie(0); cout.tie(0)
#define int long long
const int inf = 1e18;
int n;
mt19937 rnd(time(0));
signed main() {
    string type;
    cin >> type;
    if (type == "first") {
        cin >> n;
        string s;
        cin >> s;
        int len = min(n, 100LL);
        int i = rnd() % (n - len + 1);
        string t = s.substr(i, min(n, 100LL));
        cout << t;
    } else {
        cin >> n;
        string s, t;
        bool flag = false;
        cin >> s >> t;
        for (int i = 0; i < n; ++i) {
            if (s.substr(0, t.size()) == t) flag = true;
            s.push_back(s[0]);
            s.erase(s.begin());
        }
        if (flag) {
            cout << "YES";
        } else {
            cout << "NO";
        }
    }
    return 0;
}
```

Task D

```
#include <iostream>
#include <set>
#include <vector>
#include <cmath>
#include <string>
#include <algorithm>
#include <random>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <bitset>
#include <iomanip>
#include <numeric>
#include <deque>
using namespace std;
#define fast ios_base::sync_with_stdio(false); cin.tie(0); cout.tie(0)
#define int long long
const int inf = 1e18;
int n;
vector<int> current = {2,5,3,4,1};

char answer(int i, int j) {
    i--;
    j--;
    vector<int> current2 = current;
    swap(current2[i], current2[j]);
    current2.push_back(current2[0]);
    current2.erase(current2.begin());
    if (current2 == vector<int>{5,4,3,2,1}) {
        return '!';
    } if (current2 < current) {
        current = current2;
        return '<';
    } else {
        current = current2;
        return '>';
    }
}
vector<char> upd() {
    vector<char> vec;
    for (int i = 0; i < n; ++i) {
        cout << 1 << ' ' << 1 << '\n';
        //char x = answer(1, 1);
        char x;
        cin >> x;
        if (x == '>')
            vec.push_back('<');
        else
            vec.push_back('>');
    }
    vec.pop_back();
```

```
    return vec;
}
signed main() {
    cin >> n;
    //n = 5;
    vector<char> vec;
    int cnt = 0, cur = 0;
    deque<pair<int, int>> tasks;
    while (true) {
        if (cnt % n == 0) {
            cur = 0;
            vec=upd();
            tasks.clear();
            int prv = -inf;
            for (int i = 0; i < n - 1; ++i) {
                if (vec[i] == '<' && prv != (i - 1)) {
                    tasks.push_back({i + 1, i + 2});
                    prv = i;
                }
            }
        }
        if (tasks.empty()) {
            cout << 1 << ' ' << 1 << '\n';
            //char x = answer(1, 1);
            char x;
            cin >> x;
            if (x == '!') {
                return 0;
            }
        } else {
            int i = tasks[0].first, j = tasks[0].second;
            tasks.pop_front();
#ifdef TEST
            //cout << 1 + (i - 1 - cur + n) % n << ' ' << 1 + (j - 1 -
    cur + n) % n << '\n';
            char x = answer(1 + (i - 1 - cur + n) % n, 1 + (j - 1 - cur +
     n) % n);
            //cin >> x;
#else
            cout << 1 + (i - 1 - cur + n) % n << ' ' << 1 + (j - 1 - cur
    + n) % n << '\n';
            char x;
            cin >> x;
#endif
            if (x == '!') {
                return 0;
            }
        }
        cnt++;
        cur++;
    }
    return 0;
}
```

Task E

```
#include <iostream>
#include <set>
#include <vector>
#include <cmath>
#include <string>
#include <algorithm>
#include <random>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <bitset>
#include <iomanip>
#include <numeric>
#include <deque>
using namespace std;
#define fast ios_base::sync_with_stdio(false); cin.tie(0); cout.tie(0)
#define int long long
const int inf = 1e18;
vector<deque<int>> g;
int n, q, curQ = 0, curT = 0;
vector<int> answer, queries;
void dfs(int v) {
    if (curQ == q) return;
    if (curT == queries[curQ]) {
        answer[curQ] = v + 1;
        curQ++;
    }
    curT++;
    int to = g[v][0];
    g[v].push_back(g[v][0]);
    g[v].pop_front();
    dfs(to);
}
signed main() {
    cin >> n >> q;
    g.resize(n);
    answer.resize(q);
    queries.resize(q);
    for (int i = 0; i < n; ++i) {
        int x;
        cin >> x;
        for (int j = 0; j < x; ++j) {
            int r;
            cin >> r;
            g[i].push_back(r - 1);
        }
    }
    for (int i = 0; i < q; ++i) {
        cin >> queries[i];
    }
    dfs(0);
```

```
    for (int i = 0; i < q; ++i) {
        cout << answer[i] << ' ';
    }
    return 0;
}
```

Task F

```
#include <iostream>
#include <set>
#include <vector>
#include <cmath>
#include <string>
#include <algorithm>
#include <random>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <bitset>
#include <iomanip>
#include <numeric>

using namespace std;
#define fast ios_base::sync_with_stdio(false); cin.tie(0); cout.tie(0)
#define int long long
const int inf = 1e18;

signed main() {
    int h, w;
    cin >> h >> w;
    vector<vector<int>> vec(h, vector<int>(w));
    vector<vector<char>> used(h, vector<char>(w, '.'));
    for (int i = 0; i < h; ++i) {
        string s;
        cin >> s;
        for (int j = 0; j < w; ++j) {
            vec[i][j] = s[j] - '0';
        }
    }
    int answer = 0;
    while (true) {
        int mx = -1;
        int mx1i = -1, mx1j = -1;
        int mx2i = -1, mx2j = -1;
        int char1 = '.', char2 = '.';
        for (int i = 0; i < h; ++i) {
            for (int j = 0; j < w; j++) {
                if (used[i][j] != '.') continue;
                if ((i > 0 && i < h - 1) && used[i - 1][j] == '.') {
                    if (mx < vec[i - 1][j] * vec[i][j]) {
                        mx1i = i - 1;
                        mx1j = j;
                        mx2i = i;
```

```
                    mx2j = j;
                    char1 = 'T';
                    char2 = 'B';
                }
                mx = max(mx, vec[i - 1][j] * vec[i][j]);
            }
            if (i == 0 && used[h - i - 1][j] == '.') {
                if (mx < vec[h - i - 1][j] * vec[i][j]) {
                    mx1i = h - i - 1;
                    mx1j = j;
                    mx2i = i;
                    mx2j = j;
                    char1 = 'T';
                    char2 = 'B';
                }
                mx = max(mx, vec[h - i - 1][j] * vec[i][j]);
            }
            ////
            if ((j > 0 && j < w - 1) && used[i][j - 1] == '.') {
                if (mx < vec[i][j - 1] * vec[i][j]) {
                    mx1i = i;
                    mx1j = j - 1;
                    mx2i = i;
                    mx2j = j;
                    char1 = 'L';
                    char2 = 'R';
                }
                mx = max(mx, vec[i][j - 1] * vec[i][j]);
            }
            if (j == 0 && used[i][w - j - 1] == '.') {
                if (mx < vec[i][w - j - 1] * vec[i][j]) {
                    mx1i = i;
                    mx1j = w - j - 1;
                    mx2i = i;
                    mx2j = j;
                    char1 = 'L';
                    char2 = 'R';
                }
                mx = max(mx, vec[i][w - j - 1] * vec[i][j]);
            }
            //
        }
    }
    if (mx1i == -1) break;
    used[mx1i][mx1j] = char1;
    used[mx2i][mx2j] = char2;
    answer += mx;
}
cout << answer << '\n';
for (int i = 0; i < h; ++i) {
    for (int j = 0; j < w; ++j) {
        cout << used[i][j];
    }
```

```
        cout << '\n';
    }
    return 0;
}
```