Олимпиада СПбГУ
по информатике
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A	B	C	D	E	F	sum
100	100	100	35	20	90	445

Task A

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

using namespace std;

long long ans = 0;

int a, b, n;

bool used[100][100];

long long dp[100][100];

long long rec(int st, int pos) {
    if (pos > n) {
        return 0;
    }
    if (used[st][pos]) {
        return dp[st][pos];
    }
    used[st][pos] = true;
    int c = 0;
    if (pos + a > n && pos + a - n == st) {
        c++;
    }
    if (pos + b > n && pos + b - n == st) {
        c++;
    }
    dp[st][pos] = c + rec(st, pos + a) + rec(st, pos + b);
    return dp[st][pos];
```

```
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    cin >> a >> b >> n;
    for (int i = 1; i <= n; ++i) {
        ans += rec(i, i);
    }
    cout << ans << '\n';
    return 0;
}
```

Task B

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

using namespace std;

#define int long long

int dist(int x1, int y1, int z1, int x2, int y2, int z2) {
    int ans = abs(x1 - x2) + abs(y1 - y2) + abs(z1 - z2);
    return ans / 2;
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    int n, x1, y1, z1, x2, y2, z2, mn = 1e18;
    cin >> n;
    cin >> x1 >> y1 >> z1;
    cin >> x2 >> y2 >> z2;
    mn = min(mn, dist(x1, y1, z1, x2, y2, z2));
    for (int y = 0; y >= -n; --y) {
        int x11 = n, y11 = y, z11 = -(n + y);
        int x22 = -n, y22 = -z11, z22 = -y11;
        mn = min(mn, dist(x1, y1, z1, x11, y11, z11) + dist(x22, y22, z22
    , x2, y2, z2));
        mn = min(mn, dist(x1, y1, z1, x22, y22, z22) + dist(x11, y11, z11
    , x2, y2, z2));
    }
    for (int z = 0; z >= -n; --z) {
        int x11 = -(n + z), y11 = n, z11 = z;
        int x22 = -z11, y22 = -n, z22 = -x11;
        mn = min(mn, dist(x1, y1, z1, x11, y11, z11) + dist(x22, y22, z22
    , x2, y2, z2));
        mn = min(mn, dist(x1, y1, z1, x22, y22, z22) + dist(x11, y11, z11
    , x2, y2, z2));
    }
    for (int x = 0; x >= -n; --x) {
```

```
        int x11 = x, y11 = -(n + x), z11 = n;
        int x22 = -y11, y22 = -x11, z22 = -n;
        mn = min(mn, dist(x1, y1, z1, x11, y11, z11) + dist(x22, y22, z22
    , x2, y2, z2));
        mn = min(mn, dist(x1, y1, z1, x22, y22, z22) + dist(x11, y11, z11
    , x2, y2, z2));
    }
    cout << mn << '\n';
    return 0;
}
```

Task C

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

using namespace std;

#define int long long

const int P1 = 239, MOD1 = 972663749;

struct Hash {
    int P, MOD;
    Hash(int _P, int _MOD, string _s) {
        P = _P;
        MOD = _MOD;
        build(_s);
    }
    vector <int> h;
    vector <int> powers;
    int add(int a, int b) {
        if (a + b >= MOD) {
            return a + b - MOD;
        }
        return a + b;
    }
    int sub(int a, int b) {
        if (a >= b) {
            return a - b;
        }
        return a - b + MOD;
    }
    int mult(int a, int b) {
        return a * b % MOD;
    }
    void build(string s) {
        int n = (int)s.size();
        h.resize(n + 1, 0);
        powers.resize(n + 1, 1);
        for (int i = 1; i <= n; ++i) {
            h[i] = add(mult(h[i - 1], P), s[i - 1]);
            powers[i] = mult(powers[i - 1], P);
        }
```

```
    }
    int get(int l, int r) {
        return sub(h[r], mult(h[l], powers[r - l]));
    }
};

int binpow(int a, int n) {
    if (n == 0) {
        return 1;
    }
    if (n % 2) {
        return a * binpow(a, n - 1) % MOD1;
    }
    int ans = binpow(a, n / 2);
    return ans * ans % MOD1;
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    string type, s, s1;
    int n;
    cin >> type >> n >> s;
    Hash h = Hash(P1, MOD1, s);
    if (type == "first") {
        cout << h.get(0, n) << endl;
    } else {
        int x;
        cin >> x;
        if (h.get(0, n) == x) {
            cout << "YES" << endl;
            return 0;
        }
        for (int i = 1; i < n; ++i) {
            int ans = (h.get(i, n) * binpow(P1, i) + h.get(0, i)) % MOD1;
            if (ans == x) {
                cout << "YES" << endl;
                return 0;
            }
        }
        cout << "NO" << endl;
    }
    return 0;
}
```

Task D

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

using namespace std;

#define int long long
```

```
signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    int n;
    char c;
    cin >> n;
    vector <int> per(n);
    vector <pair <int, int>> query;
    iota(per.begin(), per.end(), 1);
    do {
      deque <int> q;
      for (int i = 0; i < n; ++i) {
        q.push_back(per[i]);
      }
      for (int i = 0; i < query.size(); ++i) {
        auto [l, r] = query[i];
        swap(q[l], q[r]);
        q.push_back(q.front());
        q.pop_front();
      }
      for (int i = n; i > 1; --i) {
         int pos = 0, pos1 = 0;
         for (int j = 0; j < n; ++j) {
            if (q[j] == i) {
                pos = j;
            }
            if (q[j] == i - 1) {
                pos1 = j;
            }
         }
         cout << (pos + 1) % n + 1 << " " << pos1 + 1 << endl;
         query.push_back({(pos + 1) % n, pos1});
         swap(q[(pos + 1) % n], q[pos1]);
         q.push_back(q.front());
         q.pop_front();
         cin >> c;
         if (c == '!') {
            return 0;
         }
      }
      for (int i = 0; i < n; ++i) {
        cout << n << " " << n << endl;
        query.push_back({n - 1, n - 1});
        cin >> c;
        if (c == '!') {
            return 0;
        }
      }
    } while (next_permutation(per.begin(), per.end()));
    return 0;
}
```

Task E

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

using namespace std;

#define int long long

const int MAXN = 1e5 + 5;

vector <deque <int>> g(MAXN);

int ans[MAXN];

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    int n, q;
    cin >> n >> q;
    for (int i = 0; i < n; ++i) {
        int d;
        cin >> d;
        while (d--) {
            int x;
            cin >> x;
            g[i].push_back(x - 1);
        }
    }
    int v = 0;
    for (int i = 0; i < MAXN; ++i) {
        ans[i] = v;
        int x = g[v].front();
        g[v].pop_front();
        g[v].push_back(x);
        v = x;
    }
    while (q--) {
        int t;
        cin >> t;
        cout << ans[t] + 1 << " ";
    }
    return 0;
}
```

Task F

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

using namespace std;

#define int long long
```

```
int a[100][100], dx[4] = {-1, 0, 0, 1}, dy[4] = {0, -1, 1, 0}, h, w, mx =
    0, tot = 0;

char ans[100][100], ans1[100][100];

void gen(int cnt = 0) {
    if (cnt > mx) {
        mx = cnt;
        for (int i = 0; i < h; ++i) {
            for (int j = 0; j < w; ++j) {
                ans1[i][j] = ans[i][j];
            }
        }
    }
    if (tot * h * w > 1e8) {
        return;
    }
    pair <int, int> p, p1;
    int maxi = 0;
    for (int i = 0; i < h; ++i) {
        for (int j = 0; j < w; ++j) {
            if (ans[i][j] != '.') {
                continue;
            }
            for (int k = 0; k < 4; ++k) {
                int x = (i + dx[k]) % h;
                int y = (j + dy[k]) % w;
                if (ans[x][y] == '.' && a[i][j] * a[x][y] > maxi) {
                    maxi = a[i][j] * a[x][y];
                    p = {i, j};
                    p1 = {x, y};
                }
            }
        }
    }
    if (maxi == 0) {
        return;
    }
    if (p.first == p1.first) {
        ans[p.first][p.second] = 'L';
        ans[p1.first][p1.second] = 'R';
        tot++;
        gen(cnt + maxi);
        ans[p.first][p.second] = ans[p1.first][p1.second] = '.';
    } else {
        ans[p.first][p.second] = 'T';
        ans[p1.first][p1.second] = 'B';
        tot++;
        gen(cnt + maxi);
        ans[p.first][p.second] = ans[p1.first][p1.second] = '.';
    }
}
```

```
signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    cin >> h >> w;
    for (int i = 0; i < h; ++i) {
        for (int j = 0; j < w; ++j) {
            char c;
            cin >> c;
            a[i][j] = c - '0';
            ans[i][j] = '.';
            ans1[i][j] = '.';
        }
    }
    gen();
    cout << mx << '\n';
    for (int i = 0; i < h; ++i) {
        for (int j = 0; j < w; ++j) {
            cout << ans1[i][j];
        }
        cout << '\n';
    }
    return 0;
}
```