

Олимпиада СПбГУ по информатике 2019/20 учебного года

A	B	C	D	E	F	Sum
100	100	100	40	12	0	352

Task A ()

```
#include <bits/stdc++.h>
#define f first
#define s second
#define mp make_pair
#define pb push_back
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend();

typedef long long ll;
typedef long double ld;
typedef unsigned long long ull;

using namespace std;

const ll INF = 1e9 + 7, MAXN = 2e5 + 5, pp = 31;
const ld EPS = 1e-9, PI = acos(-1);

namespace in_out {
    template <typename T>
    istream & operator>> (istream & in, vector <T> & a) {
        for (auto & i : a)
            in >> i;
        return in;
    }

    template <typename T>
    ostream & operator<< (ostream & out, vector <T> & a) {
        for (auto & i : a)
            out << i << " ";
        return out;
    }

    template <typename T1, typename T2>
    istream & operator>> (istream & in, pair <T1, T2> & i) {
        in >> i.f >> i.s;
        return in;
    }

    template <typename T1, typename T2>
    ostream & operator<< (ostream & out, pair <T1, T2> & i) {
        out << i.f << " " << i.s << " ";
        return out;
    }
};

using namespace in_out;

signed main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0); cout.tie(0);

#ifdef DEBUG
    freopen("in.txt", "r", stdin);
    freopen("out.txt", "w", stdout);
#endif
}
```

```
    int n;  
    cin >> n;  
    cout << n - 1;  
  
    return 0;  
}
```

Task B ()

```
#include <bits/stdc++.h>
#define f first
#define s second
#define mp make_pair
#define pb push_back
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend();

typedef long long ll;
typedef long double ld;
typedef unsigned long long ull;

using namespace std;

const ll INF = 1e9 + 7, MAXN = 2e5 + 5, pp = 31;
const ld EPS = 1e-2, PI = acos(-1);

namespace in_out {
    template <typename T>
    istream & operator>> (istream & in, vector <T> & a) {
        for (auto & i : a)
            in >> i;
        return in;
    }

    template <typename T>
    ostream & operator<< (ostream & out, vector <T> & a) {
        for (auto & i : a)
            out << i << " ";
        return out;
    }

    template <typename T1, typename T2>
    istream & operator>> (istream & in, pair <T1, T2> & i) {
        in >> i.f >> i.s;
        return in;
    }

    template <typename T1, typename T2>
    ostream & operator<< (ostream & out, pair <T1, T2> & i) {
        out << i.f << " " << i.s << " ";
        return out;
    }
};

using namespace in_out;

int n;
ld dist(pair <ld, ld> a, pair <ld, ld> b) {
    return hypot(a.f - b.f, a.s - b.s);
}

void solve1() {
    vector <pair <ld, ld>> a(n);
    cin >> a;

    pair <ld, ld> ff, ss, bb;
    ld tt = INF;
    for (int i = 0; i < n; i++)
        for (int j = i + 1; j < n; j++)
            if (tt > dist(a[i], a[j]))
                tt = dist(a[i], a[j]), ff = a[i], ss = a[j];

    for (int i = 0; i < n; i++) {
        if (abs(dist(ss, a[i]) - tt) < EPS && a[i].f != ff.f && a[i].s != ff.s)
            bb = a[i];
    }

    cout.precision(6);
    cout << fixed << ff << "\n" << ss << "\n" << bb << endl;
    exit(0);
}
```

```

ld vec(pair <ld, ld> a, pair <ld, ld> b) {
    return a.f * b.s - a.s * b.f;
}

ld scal(pair <ld, ld> a, pair <ld, ld> b) {
    return a.f * b.f + a.s * b.s;
}

pair <ld, ld> mv(pair <ld, ld> a, ld ang) {
    ld len = dist(mp(0, 0), a);
    ld angl = atan2(vec(mp(1, 0), a), scal(mp(1, 0), a));
    angl += ang;
    return mp(len * cos(angl), len * sin(angl));
}

void solve2() {
    vector <pair <ld, ld>> a(n);
    cin >> a;

    vector <pair <ld, ld>> ans = {a[0], a[1]};
    pair <ld, ld> v1 = mp(a[1].f - a[0].f, a[1].s - a[0].s);
    pair <ld, ld> v2 = mp(a[2].f - a[1].f, a[2].s - a[1].s);
    //cerr << v1 << endl << v2 << endl;
    ld aa = atan2(vec(v1, v2), scal(v1, v2));
    if (aa < 0)
        aa += 2 * PI;

    for (int i = 0; i < 4; i++) {
        auto p1 = ans[ans.size() - 2];
        auto p2 = ans[ans.size() - 1];
        auto v = mp(p2.f - p1.f, p2.s - p1.s);
        v = mv(v, aa);
        ans.pb(mp(p2.f + v.f, p2.s + v.s));
    }

    cout.precision(6);
    for (auto &i : ans)
        cout << fixed << i << endl;
}

signed main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0); cout.tie(0);
#ifdef DEBUG
        freopen("in.txt", "r", stdin);
        freopen("out.txt", "w", stdout);
#endif

    cin >> n;

    if (n == 6)
        solve1();
    else
        solve2();
    return 0;
}

```

Task C ()

```
#include <bits/stdc++.h>
#define f first
#define s second
#define mp make_pair
#define pb push_back
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend();

typedef long long ll;
typedef long double ld;
typedef unsigned long long ull;

using namespace std;

const ll INF = 1e9 + 7, MAXN = 1e4 + 5, pp = 31;
const ld EPS = 1e-2, PI = acos(-1);

namespace in_out {
    template <typename T>
    istream & operator>> (istream & in, vector <T> & a) {
        for (auto & i : a)
            in >> i;
        return in;
    }

    template <typename T>
    ostream & operator<< (ostream & out, vector <T> & a) {
        for (auto & i : a)
            out << i << " ";
        return out;
    }

    template <typename T1, typename T2>
    istream & operator>> (istream & in, pair <T1, T2> & i) {
        in >> i.f >> i.s;
        return in;
    }

    template <typename T1, typename T2>
    ostream & operator<< (ostream & out, pair <T1, T2> & i) {
        out << i.f << " " << i.s << " ";
        return out;
    }
};

using namespace in_out;

int solve(string & s, string & t) {
    vector <vector <int>> dp(s.size() + 1, vector <int> (t.size() + 1));

    vector <vector <int>> in(26);
    for (int i = 0; i < t.size(); i++)
        in[t[i] - 'a'].pb(i);

    //for (int i = 0; i < 26; i++)
    //    cerr << char(i + 'a') << " " << in[i] << endl;

    for (int i = 0; i < s.size(); i++) {
        for (int j = 0; j < t.size(); j++) {
            int a = s[i] - 'a';
            //if (s[i] == 'p')
            //    cerr << char(a + 'a') << " " << in[a].size() << endl;
            for (int k = 0; k < in[a].size(); k++)
                if (in[a][k] + 1 > j) {
                    //cerr << char(a + 'a') << " " << i << " " << j << endl;
                    //cerr << i + 1 << " " << in[a][k] + 1 << endl << endl;
                    dp[i + 1][in[a][k] + 1] = max(dp[i + 1][in[a][k] + 1], dp[i][j] + 1);
                }
        }
    }
}
```

```

int mx = 0;
for (int i = 0; i <= s.size(); i++)
    for (int j = 0; j <= t.size(); j++)
        mx = max(mx, dp[i][j]);

//cerr << s << endl;
//for (auto & i : dp)
//    cerr << i << endl;
//cerr << mx << endl;
return (int)t.size() - mx;
}

signed main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0); cout.tie(0);
#ifdef DEBUG
        freopen("in.txt", "r", stdin);
        freopen("out.txt", "w", stdout);
#endif

    string t;
    cin >> t;

    int n;
    cin >> n;
    vector<string> a(n);
    cin >> a;

    int ans = 0;
    for (int i = 0; i < n; i++)
        ans += solve(a[i], t);

    cout << ans;
    return 0;
}

```

Task D ()

```
#include <bits/stdc++.h>
#define f first
#define s second
#define mp make_pair
#define pb push_back
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend();

typedef long long ll;
typedef long double ld;
typedef unsigned long long ull;

using namespace std;

const ll INF = 1e9 + 7, MAXN = 1e4 + 5, pp = 31;
const ld EPS = 1e-2, PI = acos(-1);

namespace in_out {
    template <typename T>
    istream & operator>> (istream & in, vector <T> & a) {
        for (auto & i : a)
            in >> i;
        return in;
    }

    template <typename T>
    ostream & operator<< (ostream & out, vector <T> & a) {
        for (auto & i : a)
            out << i << " ";
        return out;
    }

    template <typename T1, typename T2>
    istream & operator>> (istream & in, pair <T1, T2> & i) {
        in >> i.f >> i.s;
        return in;
    }

    template <typename T1, typename T2>
    ostream & operator<< (ostream & out, pair <T1, T2> & i) {
        out << i.f << " " << i.s << " ";
        return out;
    }
};

using namespace in_out;

int n, m;
vector <vector <pair <int, int>>>> a;
vector <vector <int>>> dist;
set <pair <int, int>> to;

bool check(int i, int j) {
    return i > -1 && i < n && j > -1 && j < m && to.find(mp(i, j)) != to.end();
}

int get_dist(int x, int y, int c, int d) {
    return abs(x + a[x][y].f - c) + abs(y + a[x][y].s - d);
}

signed main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0); cout.tie(0);
#ifdef DEBUG
        freopen("in.txt", "r", stdin);
        freopen("out.txt", "w", stdout);
#endif

    cin >> n >> m;
    pair <int, int> s, f;
    cin >> s >> f;
```

```

s.f--; s.s--;
f.f--; f.s--;

a.resize(n, vector<pair<int, int>>(m));
dist.resize(n, vector<int>(m, INF));

cin >> a;

dist[s.f][s.s] = 0;

for (int i = 0; i < n; i++)
    for (int j = 0; j < m; j++)
        to.insert(mp(i, j));

for (int i = 0; i < n * m; i++) {
    int mn = INF;

    /*cerr << "in" << endl;
    for (auto & i : dist)
        cerr << i << endl;
    cerr << endl;*/

    pair<int, int> t = {-1, -1};

    /*for (auto & i : to)
        cerr << i.f << " " << i.s << endl;
    cerr << endl;*/

    for (int j = 0; j < n; j++)
        for (int k = 0; k < m; k++)
            if (mn > dist[j][k] && to.size() && to.find({j, k}) != to.end())
                mn = dist[j][k], t = mp(j, k);

    if (t.f == -1 && t.s == -1)
        break;

    to.erase(t);
    for (int j = 0; j < n; j++)
        for (int k = 0; k < m; k++)
            dist[j][k] = min(dist[j][k], dist[t.f][t.s] + get_dist(t.f, t.s, j, k));

    /*cerr << "out" << endl;
    for (auto & i : dist)
        cerr << i << endl;
    cerr << endl;*/
}

cout << dist[f.f][f.s];
return 0;
}

```


Task E ()

```
#include <bits/stdc++.h>
#define f first
#define s second
#define mp make_pair
#define pb push_back
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend();

typedef long long ll;
typedef long double ld;
typedef unsigned long long ull;

using namespace std;

const ll INF = 1e9 + 7, MAXN = 1e4 + 5, pp = 31;
const ld EPS = 1e-2, PI = acos(-1);

namespace in_out {
    template <typename T>
    istream & operator>> (istream & in, vector <T> & a) {
        for (auto & i : a)
            in >> i;
        return in;
    }

    template <typename T>
    ostream & operator<< (ostream & out, vector <T> & a) {
        for (auto & i : a)
            out << i << " ";
        return out;
    }

    template <typename T1, typename T2>
    istream & operator>> (istream & in, pair <T1, T2> & i) {
        in >> i.f >> i.s;
        return in;
    }

    template <typename T1, typename T2>
    ostream & operator<< (ostream & out, pair <T1, T2> & i) {
        out << i.f << " " << i.s;
        return out;
    }
};

using namespace in_out;

int n, m, b;
vector <pair <int, int>> a;

bool operator==(pair <int, int> & a, pair <int, int> & b) {
    return a.f == b.f && a.s == b.s;
}

void solve1() {
    a[0].f--; a[0].s--;
    cout << "? " << a[0].f << " " << a[0].s << " " << a[0].f << " " << a[0].s + 100 << endl;

    pair <int, int> k;
    cin >> k;

    if (k == a[0])
        cout << "! " << 0 << " " << 100 << endl;
    else
        cout << "! " << "0_0" << endl;
    exit(0);
}

pair <int, int> operator+(pair <int, int> a, pair <int, int> b) {
    return mp(a.f + b.f, a.s + b.s);
}
```

```

pair<int, int> get(pair<int, int> x, pair<int, int> y) {
    cout << "?_ " << x << "_ " << y << endl;
    pair<int, int> k;
    cin >> k;
    return k;
}

void solve2() {
    a[0].f--; a[0].s--;
    a[1].f--; a[1].s--;

    pair<int, int> v = mp(a[1].f - a[0].f, a[1].s - a[0].s);
    pair<int, int> b = mp(0, 100);

    set<pair<int, int>> k = {mp(0, 0), b, b + b, b + b + b}, del;

    auto fff = get(mp(0, 0), b);
    k.erase(fff);
    del.insert(fff);

    auto sss = get(b + b, b + b + b);
    k.erase(sss);
    del.insert(sss);

    pair<int, int> a1 = *k.begin();
    auto ppl = *k.begin();
    k.erase(ppl);
    pair<int, int> b1 = *k.begin();
    k.insert(ppl);

    auto p = get(a1 + v, b1 + v);
    del.insert(p);

    for (auto &i : k) {
        if (del.find(i) == del.end() && del.find(i + v) == del.end()) {
            cout << "!_ " << i.f - a[0].f << "_ " << i.s - a[0].s << endl;
            exit(0);
        }
    }
}

signed main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0); cout.tie(0);

    /*#ifdef DEBUG
        freopen("in.txt", "r", stdin);
        freopen("out.txt", "w", stdout);
    #endif*/

    int n, m, b;
    cin >> n >> m >> b;
    a.resize(b);
    cin >> a;

    if (b == 1)
        solve1();

    if (b == 2)
        solve2();

    return 0;
}

```

Task F ()