

Олимпиада СПбГУ по информатике 2019/20 учебного года

A	B	C	D	E	F	Sum
100	100	100	100	100	18	518

Task A ()

```
#define _CRT_SECURE_NO_WARNINGS
#include <map>
#include <vector>
#include <set>
#include <iomanip>
#include <iostream>
#include <sstream>
#include <fstream>
#include <cmath>
#include <string>
#include <unordered_map>
#include <unordered_set>
#include <queue>

using namespace std;

#define int long long
#define vi vector<int>
#define vec vector
#define ms multiset
#define X first
#define Y second
#define pb push_back

template<typename T>
istream & operator>>(istream &a, vec<T> &b) {
    for (auto &e : b) a >> e;
    return a;
}

template<typename _Ty, typename _V>
istream & operator>>(istream &a, pair<_Ty, _V> &b) {
    a >> b.X >> b.Y;
    return a;
}

int gcd(int a, int b) {
    return b ? gcd(b, a % b) : a;
}

int32_t main() {
    ios::sync_with_stdio(0);
    cin.tie(0); cout.tie(0);
    int n;
    cin >> n;
    cout << n - 1;
}
```

Task B ()

```
#define _CRT_SECURE_NO_WARNINGS
#include <map>
#include <vector>
#include <set>
#include <iomanip>
#include <iostream>
#include <sstream>
#include <fstream>
#include <cmath>
#include <string>
#include <unordered_map>
#include <unordered_set>
#include <queue>

using namespace std;

#define int long long
#define vi vector<int>
#define vec vector
#define ms multiset
#define X first
#define Y second
#define pii pair<int, int>
#define pb push_back

template<typename T>
istream & operator>>(istream &a, vec<T> &b) {
    for (auto &e : b) a >> e;
    return a;
}

template<typename _Ty, typename _V>
istream & operator>>(istream &a, pair<_Ty, _V> &b) {
    a >> b.X >> b.Y;
    return a;
}

int gcd(int a, int b) {
    return b ? gcd(b, a % b) : a;
}

#define sqr(a) (a)*(a)

int32_t main() {
    ios::sync_with_stdio(0);
    cin.tie(0); cout.tie(0);
    int n;
    cin >> n;
    if (n == 6) {
        double s1 = 0, s2 = 0;
        double x, y;
        double a1 = 0, a2 = 0;
        for (int i = 0; i < 6; i++) {
            double a, b;
            cin >> a >> b;
            a1 += a, a2 += b;
            if (i == 0) s1 = a, s2 = b;
            if (i == 2) x = a, y = b;
        }
        a1 /= 6;
        a2 /= 6;
        cout << setprecision(13) << fixed;
        cout << a1 << "\n" << a2 << "\n";
        cout << s1 << "\n" << s2 << "\n";
        cout << x << "\n" << y << "\n";
    }
    else {
        vec<pair<double, double>> z(3);
        for (auto &e : z)
            cin >> e;
        z[1].X = sqrt(sqr(z[0].X - z[2].X) + sqr(z[0].Y - z[2].Y));
    }
}
```

```

    double q = atan2(z[2].Y - z[0].Y, z[2].X - z[0].X);
    cout << setprecision(13) << fixed;
    vec<pair<double, double>> res;
    double pi = acos(-1);
    for (int i = 0; i < 6; i++) {
        cout << z[1].X * cos(q) + z[0].X << "␣" << z[1].X*sin(q) + z[0].Y << "\n";
        q += pi / 3;
    }
}
cin >> n;
}

```

Task C ()

```
#define _CRT_SECURE_NO_WARNINGS
#include <map>
#include <vector>
#include <set>
#include <iomanip>
#include <iostream>
#include <sstream>
#include <fstream>
#include <cmath>
#include <string>
#include <unordered_map>
#include <unordered_set>
#include <queue>

using namespace std;

#define int long long
#define vi vector<int>
#define vec vector
#define ms multiset
#define X first
#define Y second
#define pii pair<int, int>
#define pb push_back

template<typename T>
istream & operator>>(istream &a, vec<T> &b) {
    for (auto &e : b) a >> e;
    return a;
}

template<typename _Ty, typename _V>
istream & operator>>(istream &a, pair<_Ty, _V> &b) {
    a >> b.X >> b.Y;
    return a;
}

int gcd(int a, int b) {
    return b ? gcd(b, a % b) : a;
}

#define sqr(a) (a)*(a)
vector<int> z_function(string s) {
    int n = (int)s.length();
    vector<int> z(n);
    for (int i = 1, l = 0, r = 0; i < n; ++i) {
        if (i <= r)
            z[i] = min(r - i + 1, z[i - l]);
        while (i + z[i] < n && s[z[i]] == s[i + z[i]])
            ++z[i];
        if (i + z[i] - 1 > r)
            l = i, r = i + z[i] - 1;
    }
    return z;
}

vector<int> prefix_function(string s) {
    int n = (int)s.length();
    vector<int> pi(n);
    for (int i = 1; i < n; ++i) {
        int j = pi[i - 1];
        while (j > 0 && s[i] != s[j])
            j = pi[j - 1];
        if (s[i] == s[j]) ++j;
        pi[i] = j;
    }
    return pi;
}

int32_t main() {
    ios::sync_with_stdio(0);
    cin.tie(0); cout.tie(0);
    string t;
```

```

int n;
cin >> t >> n;
int r = 0;
while (n--) {
    string s;
    cin >> s;
    s += "#";
    int be = 1e9;
    for (int i = 0; i < s.length() - 1; i++) {
        int j = i, x = 0, ed = 0;
        while (x < t.length() && j < s.length() - 1)
        {
            if (s[j] != t[x]) {
                x++; ed++;
            }
            else x++, j++;
        }
        while (x < t.length()) x++, ed++;
        be = min(be, ed);
    }
    r += be;
}
cout << r;
cin >> r;
}

```

Task D ()

```
#define _CRT_SECURE_NO_WARNINGS
#include <map>
#include <vector>
#include <set>
#include <iomanip>
#include <iostream>
#include <sstream>
#include <fstream>
#include <cmath>
#include <string>
#include <unordered_map>
#include <unordered_set>
#include <queue>

using namespace std;

// #define int long long
#define vi vector<int>
#define vec vector
#define ms multiset
#define X first
#define Y second
#define pii pair<int, int>
#define pb push_back

template<typename T>
istream & operator>>(istream &a, vec<T> &b) {
    for (auto &e : b) a >> e;
    return a;
}

template<typename _Ty, typename _V>
istream & operator>>(istream &a, pair<_Ty, _V> &b) {
    a >> b.X >> b.Y;
    return a;
}

int gcd(int a, int b) {
    return b ? gcd(b, a % b) : a;
}

#define sqr(a) (a)*(a)
vector<int> z_function(string s) {
    int n = (int)s.length();
    vector<int> z(n);
    for (int i = 1, l = 0, r = 0; i < n; ++i) {
        if (i <= r)
            z[i] = min(r - i + 1, z[i - l]);
        while (i + z[i] < n && s[z[i]] == s[i + z[i]])
            ++z[i];
        if (i + z[i] - 1 > r)
            l = i, r = i + z[i] - 1;
    }
    return z;
}

vector<int> prefix_function(string s) {
    int n = (int)s.length();
    vector<int> pi(n);
    for (int i = 1; i < n; ++i) {
        int j = pi[i - 1];
        while (j > 0 && s[i] != s[j])
            j = pi[j - 1];
        if (s[i] == s[j]) ++j;
        pi[i] = j;
    }
    return pi;
}

int dx[8] = { -1, 0, 1, 0, 1, -1, 1, -1 };
```

```

int dy[8] = { 0, -1, 0, 1, 1, -1,-1, 1 };

int32_t main() {
    ios::sync_with_stdio(0);
    cin.tie(0); cout.tie(0);
    int n, m, sa, sb, ta, tb;
    cin >> n >> m >> sa >> sb >> ta >> tb;
    vec<vec<pii>> a(n, vec<pii>(m));
    vec<vi> b(n, vi(m));
    vec<vi> w(n, vi(m));
    for (int i = 0; i < n; i++)
        for (int j = 0; j < m; j++)
            cin >> a[i][j];

    set<pair<int, pii>> q;
    sa--, sb--; ta--; tb--;
    q.insert({ 0,{ sa,sb } });
    b[sa][sb] = 0;
    w[sa][sb] = 1;
    int it = 0;
    int XX = 12;
    if (n*m > 4e5) XX = 5;
    while (q.size()) {
        auto e = *q.begin();
        it++;
        q.erase(q.begin());
        if (it > 1e6) break;
        for (int kk = -XX; kk <= XX; kk++) {
            for (int xx = -XX; xx <= XX; xx++) {
                if (!kk && !xx) continue;
                int nx = e.second.X + kk, ny = e.second.Y + xx;
                if (nx > -1 && ny > -1 && nx < n&&ny < m) {
                    int need = abs(a[e.Y.X][e.Y.Y].X - kk) + abs(a[e.Y.X][e.Y.Y].Y - xx);
                    if (!w[nx][ny] || (b[nx][ny] > need + e.first && (!w[ta][tb] || need + e.first < b[ta][tb]))) {
                        q.erase({ b[nx][ny],{ nx, ny } });
                        q.insert({ need + e.first,{ nx, ny } });
                        b[nx][ny] = need + e.first;
                        w[nx][ny] = 1;
                    }
                }
            }
        }
    }
    cout << b[ta][tb];
}

```

Task E ()

```
#define _CRT_SECURE_NO_WARNINGS
#include <map>
#include <vector>
#include <set>
#include <iomanip>
#include <iostream>
#include <sstream>
#include <fstream>
#include <cmath>
#include <string>
#include <unordered_map>
#include <unordered_set>
#include <queue>

using namespace std;

#define int long long
#define vi vector<int>
#define vec vector
#define ms multiset
#define X first
#define Y second
#define pii pair<int, int>
#define pb push_back

template<typename T>
istream & operator>>(istream &a, vec<T> &b) {
    for (auto &e : b) a >> e;
    return a;
}

template<typename _Ty, typename _V>
istream & operator>>(istream &a, pair<_Ty, _V> &b) {
    a >> b.X >> b.Y;
    return a;
}

int gcd(int a, int b) {
    return b ? gcd(b, a % b) : a;
}

#define sqr(a) (a)*(a)
vector<int> z_function(string s) {
    int n = (int)s.length();
    vector<int> z(n);
    for (int i = 1, l = 0, r = 0; i < n; i++) {
        if (i <= r)
            z[i] = min(r - i + 1, z[i - l]);
        while (i + z[i] < n && s[z[i]] == s[i + z[i]])
            ++z[i];
        if (i + z[i] - 1 > r)
            l = i, r = i + z[i] - 1;
    }
    return z;
}

vector<int> prefix_function(string s) {
    int n = (int)s.length();
    vector<int> pi(n);
    for (int i = 1; i < n; i++) {
        int j = pi[i - 1];
        while (j > 0 && s[i] != s[j])
            j = pi[j - 1];
        if (s[i] == s[j]) j++;
        pi[i] = j;
    }
    return pi;
}

int n, m, cy, fst = 0, snd = 0;
vec<pii> answer;
vector<bool> ASS;
```



```

vec<pii> p;

int check(pii c, pii answer) {
    return c.X >= answer.X && c.X < answer.X + n && c.Y >= answer.Y && c.Y < answer.Y + m;
}

pii ask(pii a, pii cy) {
    cout << "?_ " << a.X << "_ " << a.Y << "_ " << cy.X << "_ " << cy.second << endl;
    return cin >> a, a;
}

int32_t main() {
    cin >> n >> m >> cy;
    p.resize(cy);

    answer.resize(1ll << cy);
    ASS.resize(1ll << cy, 1);

    for (auto &x : p)
        cin >> x, —x.X, —x.Y;

    for (int i = 1; i < answer.size(); i++)
        answer[i] = answer[i - 1], answer[i].Y += m + 1ll;

    for (int j = 0; j < cy; j++) {
        vi qs;
        for (int i = 0; i < ASS.size(); i++)
            if (ASS[i]) qs.push_back(i);

        for (int i = 0, as = 0; i + 1ll < qs.size() && as < (1ll << (cy - j - 1ll)); i +=
            2) {
            auto c = ask({ answer[qs[i]].X + p[j].X, answer[qs[i]].Y + p[j].Y }, {
                answer[qs[i + 1]].X + p[j].X, answer[qs[i + 1]].Y + p[j].Y });
            as++;
            for (int k = 0; k < ASS.size(); k++)
                if (check(c, answer[k]))
                    ASS[k] = 0;
        }
    }

    for (int k = 0; k < ASS.size(); ++k)
        if (ASS[k])
            cout << "!_ " << answer[k].X << "_ " << answer[k].Y << endl, exit(0);
}

```

Task F ()

```
#define _CRT_SECURE_NO_WARNINGS
#include <map>
#include <vector>
#include <set>
#include <iomanip>
#include <iostream>
#include <sstream>
#include <fstream>
#include <cmath>
#include <string>
#include <unordered_map>
#include <unordered_set>
#include <queue>

using namespace std;

#define int long long
#define vi vector<int>
#define vec vector
#define ms multiset
#define X first
#define Y second
#define pii pair<int, int>
#define pb push_back

template<typename T>
istream & operator>>(istream &a, vec<T> &b) {
    for (auto &e : b) a >> e;
    return a;
}

template<typename _Ty, typename _V>
istream & operator>>(istream &a, pair<_Ty, _V> &b) {
    a >> b.X >> b.Y;
    return a;
}

int gcd(int a, int b) {
    return b ? gcd(b, a % b) : a;
}

#define sqr(a) (a)*(a)
vector<int> z_function(string s) {
    int n = (int)s.length();
    vector<int> z(n);
    for (int i = 1, l = 0, r = 0; i < n; i++) {
        if (i <= r)
            z[i] = min(r - i + 1, z[i - l]);
        while (i + z[i] < n && s[z[i]] == s[i + z[i]])
            ++z[i];
        if (i + z[i] - 1 > r)
            l = i, r = i + z[i] - 1;
    }
    return z;
}

vector<int> prefix_function(string s) {
    int n = (int)s.length();
    vector<int> pi(n);
    for (int i = 1; i < n; i++) {
        int j = pi[i - 1];
        while (j > 0 && s[i] != s[j])
            j = pi[j - 1];
        if (s[i] == s[j]) j++;
        pi[i] = j;
    }
    return pi;
}

vec<vi> ans = { {1},
{ 0,0,0,3 },
{ 0,0,0,0,0,0,0,4,12 },
{ 0,0,0,0,0,0,0,0,0,0,0,0,5,0,60,0,60 },
```

```
{ 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,6,0,0,120,90,0,360,360,0,0,360 },  
{ 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,  
0,0,0,0,0,0,7,0,0,0,210,0,420,0,1260,0,3360,0,1470,0,  
5040,0,2520,0,0,0,2520 },  
{ 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,  
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,8,0,0,0,0,336,0,  
0,840,560,3360,0,0,11760,6720,6720,5040,3360,30240,20160,  
0,20160,26880,20160,0,5040,20160,40320,0,0,20160,0,0,0,0,20160 } };  
  
int32_t main() {  
    ios::sync_with_stdio(0);  
    cin.tie(0);  
    cout.tie(0);  
    int n, m;  
    cin >> n >> m, n -= 2;  
    for (int i = 0; i < m; i++)  
        cout << ans[n][i] << " ";  
}
```