

Олимпиада СПбГУ по информатике 2019/20 учебного года

A	B	C	D	E	F	Sum
100	100	100	40	0	14	354

Task A ()

```
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <vector>
#include <string>
#include <set>
#include <map>
#include <unordered_map>
#include <tuple>
#include <utility>
#include <algorithm>
#include <cmath>
#include <random>
#include <memory.h>
#include <cstring>
#include <random>
#include <cassert>

using namespace std;

typedef long long ll;
// #define int ll

#define ALL(a) a.begin(), a.end()
#define RALL(a) a.rbegin(), a.rend()
#define F first
#define S second
#define pb push_back
#define eb emplace_back
#define sz(a) (int)a.size()

typedef pair<int, int> pii;
typedef pair<ll, ll> pll;
typedef vector<int> vi;
typedef vector<ll> vll;
typedef vector<double> vd;
typedef vector<bool> vb;
typedef vector<char> vc;
typedef vector<pii> vpii;
typedef vector<pll> vpll;
typedef tuple<int, int, int> tiii;
typedef vector<tiii> vtiii;

const int INF = 1e9 + 10;
const ll INFL = 1e18 + 10;
// const int M = 1e9 + 7;

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

#ifdef LOCAL
    freopen("input.txt", "r", stdin);
#endif
}
```

```
int n;  
cin >> n;  
int x = n / 2;  
for (int i = 0; i < 1000; ++i)  
    x = (n + x) / 2;  
cout << x;  
}
```

Task B ()

```
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <vector>
#include <string>
#include <set>
#include <map>
#include <unordered_map>
#include <tuple>
#include <utility>
#include <algorithm>
#include <cmath>
#include <random>
#include <memory.h>
#include <cstring>
#include <random>
#include <cassert>

using namespace std;

typedef long long ll;
// #define int ll

#define ALL(a) a.begin(), a.end()
#define RALL(a) a.rbegin(), a.rend()
#define F first
#define S second
#define pb push_back
#define eb emplace_back
#define sz(a) (int)a.size()

#define double long double

typedef pair<int, int> pii;
typedef pair<ll, ll> pll;
typedef vector<int> vi;
typedef vector<ll> vll;
typedef vector<double> vd;
typedef vector<bool> vb;
typedef vector<char> vc;
typedef vector<pii> vpii;
typedef vector<pll> vpll;
typedef tuple<int, int, int> tiii;
typedef vector<tiii> vtiii;

const int INF = 1e9 + 10;
const ll INFL = 1e18 + 10;
// const int M = 1e9 + 7;

void IO() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
}

typedef pair<double, double> Pnt;
double len2(Pnt a, Pnt b) {
    return (a.first - b.first) * (a.first - b.first) + (a.second - b.second) * (a.second - b.second);
}

double len(Pnt a, Pnt b) {
    return sqrt(len2(a, b));
}

double len2(Pnt a) {
    return a.F * a.F + a.S * a.S;
}

double len(Pnt a) {
    return sqrt(len2(a));
}
```

```

Pnt sub(Pnt a, Pnt b) {
    return Pnt(a.F - b.F, a.S - b.S);
}

double mul(Pnt a, Pnt b) {
    return a.F * b.S - a.S * b.F;
}

signed main() {
    //IO();

#ifdef LOCAL
    freopen("input.txt", "r", stdin);
#endif

    int n;
    cin >> n;
    if (n == 6) {
        vector<Pnt> pts(6);
        for (auto& [x, y] : pts)
            cin >> x >> y;
        Pnt d = pts[0];
        for (auto& [x, y] : pts)
            if (d > Pnt(y, x))
                d = Pnt(x, y);

        sort(ALL(pts), [&](Pnt a, Pnt b) -> bool {
            double g = mul(sub(a, d), sub(b, d));
            if (abs(g) <= 1e-3)
                return len2(a, d) < len2(b, d);
            else
                return g > 0;
        });

        Pnt c((pts[0].F + pts[3].F) / 2, (pts[0].S + pts[3].S) / 2);

        cout << fixed;
        cout << pts[0].F << " " << pts[0].S << endl;
        cout << pts[1].F << " " << pts[1].S << endl;
        cout << c.F << " " << c.S << endl;
    }
    else {
        vector<Pnt> pts(2);
        for (auto& [x, y] : pts)
            cin >> x >> y;
        pts.resize(6);
        Pnt c;
        cin >> c.F >> c.S;
        double co = ((pts[0].F - c.F) * (pts[1].F - c.F) +
            (pts[0].S - c.S) * (pts[1].S - c.S)) / (len(pts[0], c) * len(pts[1], c));
        double si = ((pts[0].F - c.F) * (pts[1].S - c.S) -
            (pts[0].S - c.S) * (pts[1].F - c.F)) / (len(pts[0], c) * len(pts[1], c));
        for (int i = 2; i < 6; ++i) {
            double x1 = pts[i - 1].F - c.F;
            double y1 = pts[i - 1].S - c.S;
            double x2 = x1 * co - y1 * si;
            double y2 = x1 * si + y1 * co;
            double x3 = x2 + c.F;
            double y3 = y2 + c.S;
            pts[i] = { x3, y3 };
        }
        cout << fixed;
        for (auto& [x, y] : pts)
            cout << x << " " << y << "\n";
    }
}

```

Task C ()

```
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <vector>
#include <string>
#include <set>
#include <map>
#include <unordered_map>
#include <tuple>
#include <utility>
#include <algorithm>
#include <cmath>
#include <random>
#include <memory.h>
#include <cstring>
#include <random>
#include <cassert>

using namespace std;

typedef long long ll;
//#define int ll

#define ALL(a) a.begin(), a.end()
#define RALL(a) a.rbegin(), a.rend()
#define F first
#define S second
#define pb push_back
#define eb emplace_back
#define sz(a) (int)a.size()

#define double long double

typedef pair<int, int> pii;
typedef pair<ll, ll> pll;
typedef vector<int> vi;
typedef vector<ll> vll;
typedef vector<double> vd;
typedef vector<bool> vb;
typedef vector<char> vc;
typedef vector<pii> vpii;
typedef vector<pll> vpll;
typedef tuple<int, int, int> tiii;
typedef vector<tiii> vtiii;

const int INF = 1e9 + 10;
const ll INFL = 1e18 + 10;
//const int M = 1e9 + 7;

void IO() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
}

signed main() {
    IO();

#ifdef LOCAL
    freopen("input.txt", "r", stdin);
#endif

    string t;
    cin >> t;
    int m = sz(t);
    t = '#' + t;

    int T;
    cin >> T;

    int ans = 0;
    for (; T; --T) {
```

```

string s;
cin >> s;
int n = sz(s);
s = '#' + s;

vector<vi> dp(n + 1, vi(m + 1, INF));
for (int i = 0; i <= n; ++i)
    dp[i][0] = 0;
for (int i = 0; i <= n; ++i)
    for (int j = 1; j <= m; ++j)
        if (s[i] == t[j])
            dp[i][j] = dp[i - 1][j - 1];
        else
            dp[i][j] = dp[i][j - 1] + 1;

int f = INF;
for (int i = 0; i <= n; ++i)
    f = min(f, dp[i][m]);
ans += f;
}

cout << ans << "\n";
}

```

Task D ()

```
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <vector>
#include <string>
#include <set>
#include <map>
#include <unordered_map>
#include <tuple>
#include <utility>
#include <algorithm>
#include <cmath>
#include <random>
#include <memory.h>
#include <cstring>
#include <random>
#include <cassert>

using namespace std;

typedef long long ll;
// #define int ll

#define ALL(a) a.begin(), a.end()
#define RALL(a) a.rbegin(), a.rend()
#define F first
#define S second
#define pb push_back
#define eb emplace_back
#define sz(a) (int)a.size()

// #define double long double

typedef pair<int, int> pii;
typedef pair<ll, ll> pll;
typedef vector<int> vi;
typedef vector<ll> vll;
typedef vector<double> vd;
typedef vector<bool> vb;
typedef vector<char> vc;
typedef vector<pii> vpii;
typedef vector<pll> vpll;
typedef tuple<int, int, int> tiii;
typedef vector<tiii> vtiii;

const int INF = 1e9 + 10;
const ll INFL = 1e18 + 10;
const int M = 1e9 + 7;

void IO() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
}

signed main() {
    IO();

#ifdef LOCAL
    freopen("input.txt", "r", stdin);
#endif

    int n, m;
    cin >> n >> m;

    int ax, ay, bx, by;
    cin >> ax >> ay >> bx >> by;
    --ax, --ay, --bx, --by;

    vector<vi> rx(n, vi(m, 0));
    vector<vi> ry(n, vi(m, 0));
```

```

for (int i = 0; i < n; ++i)
    for (int j = 0; j < m; ++j)
        cin >> rx[i][j] >> ry[i][j];

vector<vi> d(n, vi(m, INF));
d[ax][ay] = 0;
vector<vb> used(n, vb(m, false));
for (int step = 0; step < n * m; ++step) {
    int x = -1, y = -1;
    for (int i = 0; i < n; ++i)
        for (int j = 0; j < m; ++j)
            if (!used[i][j] && (x == -1 || d[i][j] < d[x][y]))
                x = i, y = j;

    if (x == -1)
        break;

    used[x][y] = true;

    for (int i = 0; i < n; ++i)
        for (int j = 0; j < m; ++j) {
            int u = i - x - rx[x][y], v = j - y - ry[x][y];
            int f = abs(u) + abs(v);
            d[i][j] = min(d[i][j], d[x][y] + f);
        }
}

cout << d[bx][by] << "\n";
}

```

Task E ()

Task F ()

```
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <vector>
#include <string>
#include <set>
#include <map>
#include <unordered_map>
#include <tuple>
#include <utility>
#include <algorithm>
#include <cmath>
#include <random>
#include <memory.h>
#include <cstring>
#include <random>
#include <cassert>
#include <bitset>

using namespace std;

typedef long long ll;
// #define int ll

#define ALL(a) a.begin(), a.end()
#define RALL(a) a.rbegin(), a.rend()
#define F first
#define S second
#define pb push_back
#define eb emplace_back
#define sz(a) (int)a.size()

#define double long double

typedef pair<int, int> pii;
typedef pair<ll, ll> pll;
typedef vector<int> vi;
typedef vector<ll> vll;
typedef vector<double> vd;
typedef vector<bool> vb;
typedef vector<char> vc;
typedef vector<pii> vpii;
typedef vector<pll> vpll;
typedef tuple<int, int, int> tiii;
typedef vector<tiii> vtiii;

const int INF = 1e9 + 10;
const ll INFL = 1e18 + 10;
// const int M = 1e9 + 7;

typedef bitset<10> bs1;
typedef bitset<100> bs2;

int n;

int g[10][10];
int ans[3000];

namespace std {
    bool operator<(const bs2 &a, const bs2 &b) {
        for (int i = 0; i < 100; ++i)
            if (a[i] != b[i])
                return b[i];
        return false;
    }
}

map<bs2, bool> is;

void rec(bs1 nodes, bs2 edges) {
    if (nodes.count() == n && !is.count(edges)) {
        is[edges] = true;
    }
}
```

```

memset(g, 65, sizeof(g));
for (int i = 0; i < n; ++i)
    g[i][i] = 0;
for (int i = 0; i < n; ++i)
    for (int j = 0; j < n; ++j)
        if (edges[i * n + j])
            g[i][j] = 1;
for (int k = 0; k < n; ++k)
    for (int i = 0; i < n; ++i)
        for (int j = 0; j < n; ++j)
            g[i][j] = min<ll>(g[i][j], (ll)g[i][k] + g[k][j]);

int sum = 0;
for (int i = 0; i < n; ++i)
    for (int j = 0; j < n; ++j)
        sum += g[i][j];
ans[sum / 2]++;
}
else {
    for (int i = 0; i < n; ++i)
        for (int j = 0; j < n; ++j)
            if (nodes[i] && !nodes[j]) {
                bs1 nn = nodes;
                bs2 ne = edges;
                nn.set(j);
                ne.set(i * n + j);
                ne.set(j * n + i);
                rec(nn, ne);
            }
}

}

void IO() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
}

signed main() {
    //IO();

#ifdef LOCAL
    freopen("input.txt", "r", stdin);
#endif

    int m;
    cin >> n >> m;

    bs1 nn;
    bs2 ne;
    nn.set(0);
    rec(nn, ne);

    for (int i = 1; i <= m; ++i)
        cout << ans[i] << " ";
}

```