

# Олимпиада СПбГУ по информатике 2019/20 учебного года

A	B	C	D	E	F	Sum
100	100	100	40	100	14	454

## Task A ()

```
#define _CRT_SECURE_NO_WARNINGS
#include <iostream>
#include <vector>
#include <map>
#include <set>
#include <math.h>
#include <cmath>
#include <algorithm>
#include <bitset>
#include <queue>
#include <deque>
#include <unordered_map>
#include <unordered_set>
#include <random>
#include <fstream>

// #define int long long

#define endl '\n'

#define all(v) (v).begin(), (v).end()
#define rall(v) (v).rbegin(), (v).rend()
#define mp(a, b) make_pair(a, b)

typedef long long ll;
using namespace std;

mt19937 rand(random_device{}());

#ifdef _DEBUG
    fstream fin("input.txt");
    #define cin fin
#endif

void solve();
int main(){
    cin.tie(0); cout.tie(0); ios_base::sync_with_stdio(false);
    cout.precision(15); cout << fixed;
    solve();
    // system("pause");
    return 0;
}

void solve(){
    int n; cin >> n;
    cout << n - 1 << endl;
}
```

## Task B ()

```
#define _CRT_SECURE_NO_WARNINGS
#include <iostream>
#include <vector>
#include <map>
#include <set>
#include <math.h>
#include <cmath>
#include <algorithm>
#include <bitset>
#include <queue>
#include <deque>
#include <unordered_map>
#include <unordered_set>
#include <random>
#include <fstream>

// #define int long long

#define endl '\n'

#define all(v) (v).begin(), (v).end()
#define rall(v) (v).rbegin(), (v).rend()
#define mp(a, b) make_pair(a, b)

typedef long long ll;
using namespace std;

mt19937 rand(random_device{}());

#ifdef _DEBUG
    fstream fin("input.txt");
    #define cin fin
#endif

void solve();
int main(){
    cin.tie(0); cout.tie(0); ios_base::sync_with_stdio(false);
    cout.precision(15); cout << fixed;
    solve();
#ifdef _DEBUG
    system("pause");
#endif
    return 0;
}

struct pt{
    double x, y;
    pt(){}
    pt(double x, double y) : x(x), y(y){}
};

double sq(double a){
    return a * a;
}

double dist(pt a, pt b){
    return sq(a.x - b.x) + sq(a.y - b.y);
}

pt mid(pt a, pt b){
    pt ans;
    ans.x = (a.x + b.x) / 2;
    ans.y = (a.y + b.y) / 2;
    return ans;
}

struct vc{
    double x, y;
    vc(){}
    vc(double x, double y) : x(x), y(y){}
    vc(pt A, pt B) : x(B.x - A.x), y(B.y - A.y){}
};
```

```

vc mul(vc a, double k){
    vc ans;
    ans.x = a.x * k;
    ans.y = a.y * k;
    return ans;
}

pt add(pt A, vc a){
    pt ans;
    ans.x = A.x + a.x;
    ans.y = A.y + a.y;
    return ans;
}

vc inv(vc a){
    vc ans;
    ans.x = -a.y;
    ans.y = a.x;
    return ans;
}

void pr(pt A){
    cout << A.x << " " << A.y << endl;
}

void solve(){
    int n; cin >> n;
    vector<pt> a(n);
    for (int i = 0; i < n; i++){
        cin >> a[i].x >> a[i].y;
    }
    pair<int, int> ans = { 0, 1 };
    for (int i = 0; i < n; i++){
        for (int j = i + 1; j < n; j++){
            if (dist(a[i], a[j]) > dist(a[ans.first], a[ans.second]))
                ans = { i, j };
        }
    }
    if (n == 6){
        cout << a[ans.first].x << " " << a[ans.first].y << endl;
        pt m = mid(a[ans.first], a[ans.second]);
        cout << m.x << " " << m.y << endl;
        cout << a[ans.second].x << " " << a[ans.second].y << endl;
    }
    else{
        pt A = a[ans.first];
        pt B = a[ans.second];
        vc main = vc(A, B);
        vc a = mul(main, 0.5);
        vc rev_a = inv(mul(a, sqrt(3) / 2));
        pt M = add(A, mul(main, 0.25));
        pt kek_1 = add(M, rev_a);
        pt kek_2 = add(kek_1, a);
        vc inv_a = vc(-rev_a.x, -rev_a.y);
        pt lol_2 = add(M, inv_a);
        pt lol_1 = add(lol_2, a);
        pr(A);
        pr(kek_1);
        pr(kek_2);
        pr(B);
        pr(lol_1);
        pr(lol_2);
    }
}

```

## Task C ()

```
#define _CRT_SECURE_NO_WARNINGS
#include <iostream>
#include <vector>
#include <map>
#include <set>
#include <math.h>
#include <cmath>
#include <algorithm>
#include <bitset>
#include <queue>
#include <deque>
#include <unordered_map>
#include <unordered_set>
#include <random>
#include <fstream>

// #define int long long

#define endl '\n'

#define all(v) (v).begin(), (v).end()
#define rall(v) (v).rbegin(), (v).rend()
#define mp(a, b) make_pair(a, b)

typedef long long ll;
using namespace std;

mt19937 rand(random_device{}());

const int inf0 = 1024 * 1024 * 1024;

#ifdef _DEBUG
    fstream fin("input.txt");
    #define cin fin
#endif

void solve();
int main(){
    cin.tie(0); cout.tie(0); ios_base::sync_with_stdio(false);
    cout.precision(15); cout << fixed;
    solve();
#ifdef _DEBUG
    system("pause");
#endif
    return 0;
}

const int N = 1e4 + 6;
const int M = 501;

int dp[N][M];

void solve(){
    string t; cin >> t;
    int m = t.size();
    int tmp; cin >> tmp;
    int tot = 0;
    for (int i = 0; i < tmp; i++){
        string s; cin >> s;
        int n = s.size();
        int ans = m;
        for (int i = 0; i < n; i++){
            for (int j = 0; j < m; j++){
                if (s[i] != t[j]){
                    dp[i][j] = inf0;
                }
                else{
                    dp[i][j] = j;
                    if (i){
                        for (int c = 1; c <= j; c++){
                            dp[i][j] = min(dp[i][j], dp[i - 1][j - c]
                                + c - 1);
                        }
                    }
                }
            }
        }
    }
}
```

```

    }
    ans = min(ans, dp[i][j] + m - j - 1);
}
}
}
tot += ans;
}
cout << tot << endl;
}

```

## Task D ()

```
#define _CRT_SECURE_NO_WARNINGS
#include <iostream>
#include <vector>
#include <map>
#include <set>
#include <math.h>
#include <cmath>
#include <algorithm>
#include <bitset>
#include <queue>
#include <deque>
#include <unordered_map>
#include <cassert>
#include <unordered_set>
#include <random>
#include <fstream>

// #define int long long

#define endl '\n'

#define all(v) (v).begin(), (v).end()
#define rall(v) (v).rbegin(), (v).rend()
#define mp(a, b) make_pair(a, b)

typedef long long ll;
using namespace std;

mt19937 rand(random_device{}());

const int inf0 = 1024 * 1024 * 1024;

#ifdef _DEBUG
    fstream fin("input.txt");
    #define cin fin
#endif

void solve();
signed main(){
    cin.tie(0); cout.tie(0); ios_base::sync_with_stdio(false);
    cout.precision(15); cout << fixed;
    solve();
#ifdef _DEBUG
    system("pause");
#endif
    return 0;
}

const int N = 5e3 + 7;
vector<pair<int, int>> g[N];

int m;

int id(int i, int j){
    return i * m + j;
}

int sign(int a){
    if (a >= 1) return 1;
    if (!a) return 0;
    return -1;
}

int dist[N];

void djikstra(int s){
    fill(dist, dist + N, inf0);
    dist[s] = 0;
    set<pair<int, int>> f;
    for (int i = 0; i < N; i++){
        f.insert({ dist[i], i });
    }
}
```

```

while (!f.empty()){
    pair<int, int> v = *f.begin();
    f.erase(f.begin());
    //cout << v.first << " " << v.second << endl;
    if (v.first == inf0) break;
    for (int i = 0; i < g[v.second].size(); i++){
        pair<int, int> u = g[v.second][i];
        if (dist[u.first] > v.first + u.second){
            f.erase(mp(dist[u.first], u.first));
            dist[u.first] = v.first + u.second;
            f.insert(mp(dist[u.first], u.first));
        }
    }
}

void solve(){
    int n; cin >> n >> m;
    pair<int, int> a, b;
    cin >> a.first >> a.second >> b.first >> b.second;
    a.first--; a.second--; b.first--; b.second--;
    vector<vector<pair<int, int>>> r(n, vector<pair<int, int>>(m));
    for (int i = 0; i < n; i++){
        for (int j = 0; j < m; j++){
            cin >> r[i][j].first >> r[i][j].second;
        }
    }
    for (int i = 0; i < n; i++){
        for (int j = 0; j < m; j++){
            for (int il = 0; il < n; il++){
                for (int jl = 0; jl < m; jl++){
                    if (il == i && jl == j) continue;
                    int d = abs(il - i) + abs(jl - j);
                    if (sign(il - i) == r[i][j].first && r[i][j].first) d--;
                    else if (sign(il - i) != r[i][j].first && r[i][j].first) d++;
                    if (sign(jl - j) == r[i][j].second && r[i][j].second) d--;
                    else if (sign(jl - j) != r[i][j].second && r[i][j].second) d++;
                    g[id(i, j)].push_back({ id(il, jl), d });
                }
            }
        }
    }
    djikstra(id(a.first, a.second));
    cout << dist[id(b.first, b.second)] << endl;
}

```

## Task E ()

```
#define _CRT_SECURE_NO_WARNINGS
#include <iostream>
#include <vector>
#include <map>
#include <set>
#include <math.h>
#include <cmath>
#include <algorithm>
#include <bitset>
#include <queue>
#include <deque>
#include <unordered_map>
#include <cassert>
#include <unordered_set>
#include <random>
#include <fstream>

#define int long long

// #define endl '\n'

#define all(v) (v).begin(), (v).end()
#define rall(v) (v).rbegin(), (v).rend()
#define mp(a, b) make_pair(a, b)

typedef long long ll;
using namespace std;

mt19937 rand(random_device{}());

const int inf0 = 1024 * 1024 * 1024;

#ifdef _DEBUG
// fstream fin("input.txt");
// #define cin fin
#endif

void solve();
signed main() {
    cin.tie(0); cout.tie(0); ios_base::sync_with_stdio(false);
    cout.precision(15); cout << fixed;
    solve();
#ifdef _DEBUG
    system("pause");
#endif
    return 0;
}

const int K = 3e5 + 7;

void solve() {
    int n, m;
    cin >> n >> m;
    int B;
    cin >> B;
    int t = (1 << B);
    vector<pair<int, int>> f(B);
    for (int i = 0; i < B; i++) {
        cin >> f[i].first >> f[i].second;
        f[i].first--; f[i].second--;
    }
    vector<bool> kek(t, false);
    for (int i = 0; i < B; i++) {
        int lol = -1;
        int cnt = 0;
        int need = (1 << (B - i));
        for (int j = 0; j < t; j++) {
            if (kek[j]) continue;
            if (!kek[j]) {
                if (lol == -1) {
                    lol = j;
                }
            }
        }
    }
}
```



```

else{
    cnt += 2;
    cout << "?_ " << K * lol + f[i].first << "_ " << f[i].second
        << "_ " << K * j + f[i].first << "_ " << f[i].second <<
        endl;
    lol = -1;
    ll s, t;
    cin >> s >> t;
    kek[s / K] = true;
    if (cnt == need)
        break;
    }
    }
}
for (int i = 0; i < t; i++){
    if (!kek[i]){
        cout << "!_ " << K * i << "_0 " << endl;
        break;
    }
}
}

```

## Task F ()

```
#define _CRT_SECURE_NO_WARNINGS
#include <iostream>
#include <vector>
#include <map>
#include <set>
#include <math.h>
#include <cmath>
#include <algorithm>
#include <bitset>
#include <queue>
#include <deque>
#include <unordered_map>
#include <cassert>
#include <unordered_set>
#include <random>
#include <fstream>

// #define int long long

#define endl '\n'

#define all(v) (v).begin(), (v).end()
#define rall(v) (v).rbegin(), (v).rend()
#define mp(a, b) make_pair(a, b)

typedef long long ll;
using namespace std;

mt19937 rand(random_device{}());

const int inf0 = 1024 * 1024 * 1024;
const ll mod = 1e9 + 7;

#ifdef _DEBUG
    fstream fin("input.txt");
    #define cin fin
#endif

void solve();
signed main(){
    cin.tie(0); cout.tie(0); ios_base::sync_with_stdio(false);
    cout.precision(15); cout << fixed;
    solve();
#ifdef _DEBUG
    system("pause");
#endif
    return 0;
}

const int N = 50 + 7;

int n, m;

int ans[1000];

vector<int> g[N];

set<vector<vector<int>>> was;

void dfs(int i, vector<int> &f, vector<bool> &used, vector<vector<int>> &d, int c = 0){
    if (n == i){
        // cout << c << endl;
        vector<vector<int>> ng(n + 1);
        for (int i = 1; i <= n; i++){
            for (int j : g[i])
                ng[i].push_back(j);
            sort(all(ng[i]));
        }
        if (was.find(ng) != was.end()) return;
        // cout << "c lol\n";
        was.insert(ng);
    }
}
```

```

        ans[c]++;
        return;
    }
    for (int t = 1; t <= n; t++){
        if (used[t]) continue;
        for (int j = 1; j <= n; j++){
            if (!used[j]) continue;
            f[t] = f[j] + i;
            for (int k = 1; k <= n; k++){
                if (used[k]){
                    d[k][t] = d[t][k] = d[k][j] + 1;
                    f[k] += d[k][t];
                }
            }
            used[t] = true;
            g[j].push_back(t);
            g[t].push_back(j);
            //cout << d[1][3] << " " << d[2][3] << endl;
            //cout << t << " " << j << ": ";
            //for (int k : f)
            //    cout << k << " ";
            //cout << endl;
            dfs(i + 1, f, used, d, c + f[t]);
            used[t] = false;
            for (int k = 1; k <= n; k++){
                if (used[k]){
                    f[k] -= d[k][t];
                    d[k][t] = d[t][k] = 0;
                }
            }
            g[j].pop_back();
            g[t].pop_back();
            f[t] = 0;
        }
    }
}

void solve(){
    fill(ans, ans + N, 0);
    cin >> n >> m;
    vector<int> c(n + 1, 0);
    vector<bool> used(n + 1, false);
    vector<vector<int>> d(1 + n, vector<int>(n + 1));
    used[1] = true;
    dfs(1, c, used, d, 0);
    for (int i = 1; i <= m; i++)
        cout << ans[i] << " ";
}

```