Олимпиада СПбГУ по информатике 2019/20 учебного года

A	B	C	D	E	F	Sum
100	100	100	40	45	0	385

Task A ()

```cpp
#include <iostream>&#65279;
#include <cstdio>
#include <cstring>
#include <cmath>
#include <cctype>
#include <cassert>
#include <algorithm>
#include <iostream>
#include <sstream>
#include <string>
#include <vector>
#include <deque>
#include <stack>
#include <queue>
#include <set>
#include <map>
#include <bitset>
#include <iterator>
#include <functional>
#include <numeric>
#include <unordered_set>
#include <unordered_map>
#include <random>
using namespace std;

typedef long long ll;
typedef long double ld;
typedef double db;
typedef string str;

typedef pair<int, int> pi;
typedef pair<ll, ll> pl;
typedef pair<ld, ld> pd;

typedef vector<int> vi;
typedef vector<ll> vl;
typedef vector<ld> vd;
typedef vector<str> vs;
typedef vector<pi> vpi;
typedef vector<pl> vpl;
typedef vector<pd> vpd;

#define sz(x) (int)x.size()
#define all(x) (x).begin(), (x).end()
#define rall(x) (x).rbegin(), (x).rend()
#define mp make_pair
#define nxt_prm next_permutation

#define FOR(i, a, b) for (int i = (a); i <= (b); ++i)
#define F0R(i, a) FOR(i, 0, a)
#define ROF(i, a, b) for (int i = (b); i >= (a); --i)
#define R0F(i, a) ROF(i, 0, a)
#define trav(a, x) for each (auto x in a)

const int INT_INF = 2e9;
const ll LL_INF = 1e18;
```

```cpp
const ld PI = acos(ld(-1));

template<class T> bool ckmin(T &a, const T &b) {
        return a > b ? a = b, 1 : 0;
}
template<class T> bool ckmax(T &a, const T &b) {
        return a < b ? a = b, 1 : 0;
}

namespace io {
        void setIO(){
#ifdef _DEBUG
                freopen("input.txt","r",stdin);
#endif
                ios::sync_with_stdio(0);
                cin.tie(0);
                cout.setf(ios::fixed);
                cout.precision(20);
        }
}

using namespace io;

const int N = 1e4+15;
int dp[N][N],q;
string t,s;

int main(){
        setIO();
        int n;
        cin>>n;
        cout<<n-1;
        return 0;
}
```

Task B ()

```cpp
#include <iostream>&#65279;
#include <cstdio>
#include <cstring>
#include <cmath>
#include <cctype>
#include <cassert>
#include <algorithm>
#include <iostream>
#include <sstream>
#include <string>
#include <vector>
#include <deque>
#include <stack>
#include <queue>
#include <set>
#include <map>
#include <bitset>
#include <iterator>
#include <functional>
#include <numeric>
#include <unordered_set>
#include <unordered_map>
#include <random>
using namespace std;

typedef long long ll;
typedef long double ld;
typedef double db;
typedef string str;

typedef pair<int, int> pi;
typedef pair<ll, ll> pl;
typedef pair<ld, ld> pd;

typedef vector<int> vi;
typedef vector<ll> vl;
typedef vector<ld> vd;
typedef vector<str> vs;
typedef vector<pi> vpi;
typedef vector<pl> vpl;
typedef vector<pd> vpd;

#define sz(x) (int)x.size()
#define all(x) (x).begin(), (x).end()
#define rall(x) (x).rbegin(), (x).rend()
#define mp make_pair
#define nxt_prm next_permutation

#define FOR(i, a, b) for (int i = (a); i <= (b); ++i)
#define F0R(i, a) FOR(i, 0, a)
#define ROF(i, a, b) for (int i = (b); i >= (a); --i)
#define R0F(i, a) ROF(i, 0, a)
#define trav(a, x) for each (auto x in a)

const int INT_INF = 2e9;
const ll LL_INF = 1e18;
const ld PI = acos(ld(-1));

template<class T> bool ckmin(T &a, const T &b) {
        return a > b ? a = b, 1 : 0;
}
template<class T> bool ckmax(T &a, const T &b) {
        return a < b ? a = b, 1 : 0;
}

namespace io {
        void setIO(){
#ifdef _DEBUG
                freopen("input.txt","r",stdin);
#endif
                ios::sync_with_stdio(0);
                cin.tie(0);
```

```cpp
                cout.setf(ios::fixed);
                cout.precision(20);
        }
}

using namespace io;

struct pt{
        ld x,y;
        pt(ld a=0,ld b=0){ x=a,y=b;}
        ld len(){
                return sqrt(x*x+y*y);
        }
        void norm(){
                ld opr=len();
                x/=opr;
                y/=opr;
        }
};

pt operator-(pt a,pt b){return pt(a.x-b.x,a.y-b.y);}
pt operator-(pt a) { return pt(-a.x,-a.y); }
pt operator+(pt a, pt b){ return pt(a.x+b.x,a.y+b.y);}
ld operator*(pt a, pt b) {return a.x*b.y-b.x*a.y;}

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

struct line {
        ld A, B, C;
        line(pt a, pt b){
                A=a.y-b.y;
                B=b.x-a.x;
                C=a.x*b.y-b.x*a.y;
        }
};

ld det(ld a, ld b, ld c, ld d){
        return a * d - c * b;
}

pt intersect (line m, line n) {
        pt res;
        ld zn = det (m.A, m.B, n.A, n.B);
        res.x = - det (m.C, m.B, n.C, n.B) / zn;
        res.y = - det (m.A, m.C, n.A, n.C) / zn;
        return res;
}

int cm[2][2]={{2,1},{3,0}};

int quad(pt a){
        return cm[a.x>=0][a.y>=0];
}

bool cmp (pt a, pt b) {
        return a.x < b.x || a.x == b.x && a.y < b.y;
}

bool cw (pt a, pt b, pt c) {
        return a.x*(b.y-c.y)+b.x*(c.y-a.y)+c.x*(a.y-b.y) < 0;
}

bool ccw (pt a, pt b, pt c) {
        return a.x*(b.y-c.y)+b.x*(c.y-a.y)+c.x*(a.y-b.y) > 0;
}

void convex_hull (vector<pt> & a) {
        if (a.size() == 1)  return;
        sort (a.begin(), a.end(), &cmp);
        pt p1 = a[0],  p2 = a.back();
        vector<pt> up, down;
        up.push_back (p1);
```

```cpp
                down.push_back (p1);
                for (size_t i=1; i<a.size(); ++i) {
                        if (i==a.size()-1 || cw (p1, a[i], p2)) {
                                while (up.size()>=2 && !cw (up[up.size()-2], up[up.size()-1], a[i]))
                                        up.pop_back();
                                up.push_back (a[i]);
                        }
                        if (i==a.size()-1 || ccw (p1, a[i], p2)) {
                                while (down.size()>=2 && !ccw (down[down.size()-2], down[down.size()-1], a
                                    [i]))
                                        down.pop_back();
                                down.push_back (a[i]);
                        }
                }
                a.clear();
                for (size_t i=0; i<up.size(); ++i)
                        a.push_back (up[i]);
                for (size_t i=down.size()-2; i>0; --i)
                        a.push_back (down[i]);
}

int main(){
        setIO();

        int n;
        cin>>n;

        vector<pt>a(n);
        FOR(i,0,n-1)cin>>a[i].x>>a[i].y;

        if(n==6){
                convex_hull(a);
                FOR(i,0,n-1){
                        if(i%2==0)cout<<a[i].x<<"␣"<<a[i].y<<"\n";
                }
                return 0;
        }

        line fir = line(a[0], mid(a[1], a[2]));
        line sec = line(a[1], mid(a[2], a[0]));

        pt x = intersect(fir, sec);

        vector<pt> ans;
        ans.push_back(a[0]);
        ans.push_back((x-a[2])+x);
        ans.push_back(a[1]);
        ans.push_back((x-a[0])+x);
        ans.push_back(a[2]);
        ans.push_back((x-a[1])+x);


        FOR(i,0,5){
                cout<<ans[i].x<<"␣"<<ans[i].y<<"\n";
        }

        return 0;
}
```

Task C ()

```cpp
#include <iostream>&#65279;
#include <cstdio>
#include <cstring>
#include <cmath>
#include <cctype>
#include <cassert>
#include <algorithm>
#include <iostream>
#include <sstream>
#include <string>
#include <vector>
#include <deque>
#include <stack>
#include <queue>
#include <set>
#include <map>
#include <bitset>
#include <iterator>
#include <functional>
#include <numeric>
#include <unordered_set>
#include <unordered_map>
#include <random>
using namespace std;

typedef long long ll;
typedef long double ld;
typedef double db;
typedef string str;

typedef pair<int, int> pi;
typedef pair<ll, ll> pl;
typedef pair<ld, ld> pd;

typedef vector<int> vi;
typedef vector<ll> vl;
typedef vector<ld> vd;
typedef vector<str> vs;
typedef vector<pi> vpi;
typedef vector<pl> vpl;
typedef vector<pd> vpd;

#define sz(x) (int)x.size()
#define all(x) (x).begin(), (x).end()
#define rall(x) (x).rbegin(), (x).rend()
#define mp make_pair
#define nxt_prm next_permutation

#define FOR(i, a, b) for (int i = (a); i <= (b); ++i)
#define F0R(i, a) FOR(i, 0, a)
#define ROF(i, a, b) for (int i = (b); i >= (a); --i)
#define R0F(i, a) ROF(i, 0, a)
#define trav(a, x) for each (auto x in a)

const int INT_INF = 2e9;
const ll LL_INF = 1e18;
const ld PI = acos(ld(-1));

template<class T> bool ckmin(T &a, const T &b) {
        return a > b ? a = b, 1 : 0;
}
template<class T> bool ckmax(T &a, const T &b) {
        return a < b ? a = b, 1 : 0;
}

namespace io {
        void setIO(){
#ifdef _DEBUG
                freopen("input.txt","r",stdin);
#endif
                ios::sync_with_stdio(0);
                cin.tie(0);
```

```cpp
                cout.setf(ios::fixed);
                cout.precision(20);
        }
}

using namespace io;

int q,ans,n,mn;
string s,t;

int main(){
        setIO();
        cin>>t>>q;

        while(q--){
                cin>>s;
                mn=INT_INF;
                n=sz(s);
                FOR(i,0,n-1){
                        int ptr=0,was=0;
                        FOR(j,i,n-1){
                                while(ptr<sz(t)&&t[ptr]!=s[j])ptr++;
                                if(ptr==sz(t))break;
                                ptr++;
                                was++;
                        }
                        ckmin(mn,sz(t)-was);
                }
                ans+=mn;
        }
        cout<<ans;

        return 0;
}
```

Task D ()

```cpp
#include <iostream>&#65279;
#include <cstdio>
#include <cstring>
#include <cmath>
#include <cctype>
#include <cassert>
#include <algorithm>
#include <iostream>
#include <sstream>
#include <string>
#include <vector>
#include <deque>
#include <stack>
#include <queue>
#include <set>
#include <map>
#include <bitset>
#include <iterator>
#include <functional>
#include <numeric>
#include <unordered_set>
#include <unordered_map>
#include <random>
#include <utility>
using namespace std;

typedef long long ll;
typedef long double ld;
typedef double db;
typedef string str;

typedef pair<int, int> pi;
typedef pair<ll, ll> pl;
typedef pair<ld, ld> pd;

typedef vector<int> vi;
typedef vector<ll> vl;
typedef vector<ld> vd;
typedef vector<str> vs;
typedef vector<pi> vpi;
typedef vector<pl> vpl;
typedef vector<pd> vpd;

#define sz(x) (int)x.size()
#define all(x) (x).begin(), (x).end()
#define rall(x) (x).rbegin(), (x).rend()
#define mp make_pair
#define nxt_prm next_permutation
#define x first
#define y second

#define FOR(i, a, b) for (int i = (a); i <= (b); ++i)
#define F0R(i, a) FOR(i, 0, a)
#define ROF(i, a, b) for (int i = (b); i >= (a); --i)
#define R0F(i, a) ROF(i, 0, a)
#define trav(a, x) for each (auto x in a)

const int INT_INF = 2e9;
const ll LL_INF = 1e18;
const ld PI = acos(ld(-1));

template<class T> bool ckmin(T &a, const T &b) {
        return a > b ? a = b, 1 : 0;
}
template<class T> bool ckmax(T &a, const T &b) {
        return a < b ? a = b, 1 : 0;
}

namespace io {
        void setIO(){
#ifdef _DEBUG
                freopen("input.txt","r",stdin);
```

```
#endif
                ios::sync_with_stdio(0);
                cin.tie(0);
                cout.setf(ios::fixed);
                cout.precision(20);
        }
}

using namespace io;

const int N = 1500;
pi mat[N][N];
int n,m,a,b,c,f,ans,used[N][N],d[N][N];

int dist(int a,int b,int c,int d){
        return abs(c-a-mat[a][b].x)+abs(d-b-mat[a][b].y);
}

int main(){
        setIO();
        cin>>n>>m>>a>>b>>c>>f;
        --a,--b,--c,--f;
        FOR(i,0,n-1) FOR(j,0,m-1) cin>>mat[i][j].first>>mat[i][j].second;
        fill(&d[0][0], &d[0][0]+N*N,INT_INF);
        d[a][b]=0;
        set<pair<int,pi>> q;
        q.insert(mp(0, mp(a,b)));
        while(sz(q)){
                pair<int,pi> me=*q.begin();
                q.erase(me);
                FOR(i,0,n-1){
                        FOR(j,0,m-1){
                                if(d[i][j]>d[me.y.x][me.y.y]+dist(me.y.x,me.y.y,i,j)){
                                        if (q.count(mp(d[i][j], mp(i, j)))) q.erase(mp(d[i][j], mp
                                            (i,j)));
                                        d[i][j]=d[me.y.x][me.y.y]+dist(me.y.x,me.y.y,i,j);
                                        q.insert(mp(d[i][j], mp(i,j)));
                                }
                        }
                }
        }
        cout<<d[c][f];
        return 0;
}
```

Task E ()

```cpp
#include <iostream>
#include <cstdio>
#include <cstring>
#include <cmath>
#include <cctype>
#include <cassert>
#include <algorithm>
#include <iostream>
#include <sstream>
#include <string>
#include <vector>
#include <deque>
#include <stack>
#include <queue>
#include <set>
#include <map>
#include <bitset>
#include <iterator>
#include <functional>
#include <numeric>
#include <unordered_set>
#include <unordered_map>
#include <random>
#include <utility>
using namespace std;
#define int long long

pair<int,int> ask(int x, int y, int z, int v){
        cout << "?_" << x << "_" << y << "_" << z << "_"<< v<< endl;
        pair<int,int> t;
        cin>>t.first>>t.second;
        return t;
}

int lie(int x1, int y1, int x2, int y2, int l, int t){
        return (x1 <= l && l <= x2) && (y1 <= t && t <= y2);
}

int ans(int x, int y){
        cout << "!_" << x << "_" << y << endl;
        exit(0);
}

signed main(){
        int n,m,b;
        cin>>n>>m>>b;

        vector<pair<int, int>> s;
        vector<pair<int,int>> t(b);

        for (int i = 0; i < b; ++i){
                cin>>t[i].first>>t[i].second;
                t[i].first -=1;
                t[i].second -=1;
        }

        vector<vector<pair<int,int>>> h;

        int x=1,y=1;
        for (int i = 0; i < 750; ++i){
                s.push_back(make_pair(x,y));
                vector<pair<int,int>> now;
                for (int j = 0; j < b; ++j)
                        now.push_back(make_pair(x+t[j].first,y+t[j].second));
                h.push_back(now);
                x+=n;
                y+=m;
        }

        int f = h.size();
        vector<int> kill(f);
```

10

```cpp
        while (true){
                vector<pair<int,int>> d;
                int pos=-1;
                for (int i = 0; i < f; ++i){
                        if (kill[i]) continue;
                        if (pos==-1 || h[i].size()>h[pos].size()){
                                pos=i;
                        }
                }
                pair<int, int> fir = h[pos].back();
                h[pos].pop_back();
                pos=-1;
                for (int i = 0; i < f; ++i){
                        if (kill[i]) continue;
                        if (pos==-1 || h[i].size()>h[pos].size()){
                                pos=i;
                        }
                }
                pair<int, int> sec = h[pos].back();
                h[pos].pop_back();
                pair<int, int> x = ask(fir.first, fir.second, sec.first, sec.second);
                for (int i = 0; i < f; ++i){
                        if (lie(s[i].first, s[i].second, s[i].first+n-1, s[i].second+m-1, x.first,
                            x.second))
                                kill[i] = 1;
                }
                for (int i = 0; i < f; ++i){
                        if (h[i].size()==0 && !kill[i]){
                                ans(s[i].first, s[i].second);
                        }
                }
        }

        return 0;
}
```

Task F ()