Олимпиада СПбГУ по информатике 2019/20 учебного года

A	B	C	D	E	F	Sum
100	100	100	100	0	0	400

Task A ()

```
#include <iostream>
#include <algorithm>
#include <string>
#include <vector>
#include <set>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <queue>
#include <list>
#include <stack>
#include <random>
#include <ctime>
#include <deque>
#include <iomanip>
#include <cmath>

using namespace std;
typedef long long ll;

mt19937 ran(time(0));

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

int main() {
	cin.tie(0);
	cout.tie(0);
	ios_base::sync_with_stdio(0);
	ll n;
	cin >> n; cout << n - 1;
	//system("pause>nul");
	return 0;
}
```

Task B ()

```
#include <iostream>
#include <algorithm>
#include <string>
#include <vector>
#include <set>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <queue>
#include <list>
#include <stack>
#include <random>
#include <ctime>
#include <deque>
#include <iomanip>
#include <cmath>

using namespace std;
typedef long long ll;

mt19937 ran(time(0));

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

struct pnt {
        long double x, y;
        pnt operator -(const pnt &a) {
                return pnt{ x - a.x, y - a.y };
        }
        pnt operator +(const pnt &a) {
                return pnt{ x + a.x, y + a.y };
        }
};

const long long inf = 2e9;
pnt p;

long double cross(pnt p1, pnt p2) {
        return p1.x*p2.y - p1.y*p2.x;
}
long double dist(pnt p1, pnt p2) {
        return sqrt((p1.x - p2.x)*(p1.x - p2.x) + (p1.y - p2.y)*(p1.y - p2.y));
}

bool comp(pnt p1, pnt p2) {
        return cross(p1 - p, p2 - p) > 0 || (cross(p1 - p, p2 - p) == 0 && dist(p1, p) < dist(p2,
            p));
}


int main() {
        cin.tie(0);
        cout.tie(0);
        ios_base::sync_with_stdio(0);
        int n;
        cin >> n;
        if (n == 6) {
                vector<pnt>ps(6);
                p = { inf, inf };
                for (int i = 0; i < n; i++) {
                        cin >> ps[i].x >> ps[i].y;
                        if (ps[i].y < p.y) {
                                p = ps[i];
                        }
                        else if (ps[i].y == p.y && ps[i].x < p.x) {
                                p = ps[i];
                        }
                }
                sort(ps.begin(), ps.end(), comp);
                for (int i = 0; i < n; i += 2) {
```

```
                cout <<fixed<<setprecision(20)<< ps[i].x << " " << ps[i].y << endl;
            }
        }
        else {
            vector<pnt>ps(3);
            for (int i = 0; i < 3; i++) {
                cin >> ps[i].x >> ps[i].y;
            }
            long double h;
            vector<pnt>pps(3);
            long double d, t;
            long double ang = -acosl(-1) / 6;
            for (int i = 0; i < 3; i++) {
                t = dist(ps[i], ps[(i + 1) % 3]) / 2;
                h = t / sqrtl(3);
                p = ps[(i + 1) % 3] - ps[i];
                d = sqrt(p.x*p.x + p.y*p.y);
                p = pnt{ p.x*cosl(ang) - sinl(ang) * p.y, cosl(ang)*p.y+sinl(ang)*p.x };
                p.x = p.x / d * sqrtl(t*t+h*h);
                p.y = p.y / d * sqrtl(t * t + h * h);
                pps[i] = p + ps[i];
            }
            for (int i = 0; i < 6; i++) {
                if (i % 2 == 0) {
                    cout <<fixed<<setprecision(20)<< ps[i/2].x << " " << ps[i/2].y <<
                        endl;
                }
                else {
                    cout << fixed << setprecision(20) << pps[i / 2].x << " " << pps[i
                        / 2].y << endl;
                }
            }
        }
        //system("pause>nul");
        return 0;
}
```

Task C ()

```cpp
#include <iostream>
#include <algorithm>
#include <string>
#include <vector>
#include <set>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <queue>
#include <list>
#include <stack>
#include <random>
#include <ctime>
#include <deque>
#include <iomanip>
#include <cmath>

using namespace std;
typedef long long ll;

mt19937 ran(time(0));

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

int main() {
	cin.tie(0);
	cout.tie(0);
	ios_base::sync_with_stdio(0);
	string t;
	cin >> t;
	int n;
	cin >> n;
	vector<string>s(n);
	for (int i = 0; i < n; i++) {
		cin >> s[i];
	}
	vector<ll>ma(n, 0);
	ll tm;
	bool ch;
	ll it;
	for (int i = 0; i < n; i++) {
		for (int j = 0; j < (ll)s[i].size(); j++) {
			tm = 0;
			it = 0;
			ch = false;
			for (int k = j; k < (ll)s[i].size() && it < (ll)t.size(); k++) {
				while (it < (ll)t.size() && t[it] != s[i][k]) {
					it++;
					ch = true;
				}
				if (it < t.size())tm++;
				it++;
			}
			ma[i] = max(ma[i], tm);
		}
	}
	ll ans = 0;
	for (int i = 0; i < n; i++) {
		ans += (ll)t.size() - ma[i];
	}
	cout << ans;
	//system("pause>nul");
	return 0;
}
```

Task D ()

```
#include <iostream>
#include <algorithm>
#include <string>
#include <vector>
#include <set>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <queue>
#include <list>
#include <stack>
#include <random>
#include <ctime>
#include <deque>
#include <iomanip>
#include <cmath>

using namespace std;
typedef long long ll;

mt19937 ran(time(0));

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

ll mod = 1e9 + 7;
int n, m, N;
const int inf = 1e9;
vector<vector<pair<int, int>>>g;
vector<int>r, c;

void add(int i, int j) {
	int num = i * m + j;
	if (i > 0) {
		g[num].push_back({ num - m, abs(-1 - r[num]) + abs(c[num]) });
		if (j > 0) {
			g[num].push_back({ num - m - 1, abs(-1 - r[num]) + abs(-1 - c[num]) });
		}
		if (j < m - 1) {
			g[num].push_back({ num - m + 1, abs(-1 - r[num]) + abs(1 - c[num]) });
		}
	}
	if (i < n - 1) {
		g[num].push_back({ num + m, abs(1 - r[num]) + abs(c[num]) });
		if (j > 0) {
			g[num].push_back({ num + m - 1, abs(1 - r[num]) + abs(-1 - c[num]) });
		}
		if (j < m - 1) {
			g[num].push_back({ num + m + 1, abs(1 - r[num]) + abs(1 - c[num]) });
		}
	}
	if (j > 0) {
		g[num].push_back({ num - 1, abs(r[num]) + abs(-1 - c[num]) });
	}
	if (j < m - 1) {
		g[num].push_back({ num + 1, abs(r[num]) + abs(1 - c[num]) });
	}
	g[num].push_back({ num, abs(r[num]) + abs(c[num]) });
}
//void add(int i, int j) {
//	int num = i * m + j;
//	for (int ii = 0; ii < n; ii++) {
//		for (int jj = 0; jj < m; jj++) {
//			if (ii != i || jj != j) {
//				g[num].push_back({ ii*m + jj, abs(ii - i - r[num]) + abs(jj - j -
    c[num]) });
//			}
//		}
//	}
//}
vector<int>d;
```

```
int main() {
        cin.tie(0);
        cout.tie(0);
        ios_base::sync_with_stdio(0);
        cin >> n >> m;
        N = n * m;
        int x, y, xx, yy;
        cin >> x >> y;
        x--;
        y--;
        int s = m * x + y;
        d.resize(N, inf);
        cin >> xx >> yy;
        xx--;
        yy--;
        r.resize(N);
        c.resize(N);
        int t = m * xx + yy;
        r.resize(N);
        c.resize(N);
        g.resize(N);
        set<pair<int, int>>st;
        for (int i = 0; i < n; i++) {
                for (int j = 0; j < m; j++) {
                        cin >> r[i*m + j] >> c[i*m + j];
                        add(i, j);
                }
        }
        for (int i = -1; i < 2; i++) {
                for (int j = -1; j < 2; j++) {
                        if (x + i >= 0 && x + i < n&&y + j >= 0 && y + j < m) {
                                d[(x + i)*m + y + j] = abs(i - r[x*m+y]) + abs(j - c[x*m+y]);
                                st.insert({ d[(x + i)*m + y + j], (x + i)*m + y + j });
                        }
                }
        }
        if (s == t) {
                cout << 0;
                return 0;
        }
        int v, w, ww;
        while (!st.empty()) {
                v = st.begin()->second;
                w = st.begin()->first;
                st.erase(st.begin());
                for (auto u : g[v]) {
                        ww = inf;
                        if ((abs(v / m - u.first / m) == 1 && v%m == u.first%m) || (v / m == u.
                            first / m && abs(v - u.first) == 1)) {
                                ww = d[v] + 1;
                        }
                        else {
                                ww = d[v] + 2;
                        }
                        if (min(ww, w + u.second) < d[u.first]) {
                                st.erase({ d[u.first], u.first });
                                d[u.first] = min(ww, w + u.second);
                                st.insert({ d[u.first], u.first });
                        }
                }
        }
        cout << d[t];
        //system("pause>nul");
        return 0;
}
```

Task E ()

```
#include <iostream>
#include <algorithm>
#include <string>
#include <vector>
#include <set>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <queue>
#include <list>
#include <stack>
#include <random>
#include <ctime>
#include <deque>
#include <iomanip>
#include <cmath>

using namespace std;
typedef long long ll;

mt19937 ran(time(0));
const long long inf = 2e18;

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

int main() {
	cin.tie(0);
	cout.tie(0);
	ios_base::sync_with_stdio(0);
	ll n, m, b;
	cin >> n >> m >> b;
	vector<pair<ll, ll>>a(b);
	for (ll i = 0; i < b; i++) {
		cin >> a[i].first >> a[i].second;
	}
	n *= 3;
	ll N = (1 << b);
	vector<ll>k(N);
	vector<ll>ok(N);
	for (ll i = 0; i < N; i++) {
		ok[i] = i;
	}
	pair<ll, ll>pp;
	vector<ll>temp;
	set<int>st;
	for (ll t = 0; t < b; t++) {
		temp.clear();
		st.clear();
		for (ll i = 0; i < N / 2; i++) {
			cout << "? " << a[t].first + n * ok[2 * i] << " " << a[t].second << " " <<
			     a[t].first + n * ok[2*i + 1] << " " << a[t].second << endl;
			cin >> pp.first >> pp.second;
			st.insert((pp.first - a[t].first) / n);
		}
		N /= 2;
		for (int i = 0; i < ok.size(); i++) {
			if (st.find(ok[i]) == st.end()) {
				temp.push_back(ok[i]);
			}
		}
		ok = temp;
	}
	vector<pair<ll, ll>>ans(b);
	for (ll i = 0; i < b; i++) {
		ans[i] = { a[i].first + n * ok[0], a[i].second };
	}
	pair<ll, ll>r = { inf, inf };
	for (int i = 0; i < b; i++) {
		if (r.first > ans[i].first)r.first = ans[i].first;
		if (r.second > ans[i].second)r.second = ans[i].second;
```

```
        }
        cout << "!␣" << r.first << "␣" << r.second << endl;
        //system("pause>nul");
        return 0;
}
```

Task F ()

```
#include <iostream>
#include <algorithm>
#include <string>
#include <vector>
#include <set>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <queue>
#include <list>
#include <stack>
#include <random>
#include <ctime>
#include <deque>
#include <iomanip>
#include <cmath>

using namespace std;
typedef long long ll;

mt19937 ran(time(0));

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

int main() {
	cin.tie(0);
	cout.tie(0);
	ios_base::sync_with_stdio(0);
	int n, m;
	cin >> n >> m;
	if (n == 3 && m == 4)cout << "0 0 0 3";
	else if (n == 4 && m == 10)cout << "0 0 0 0 0 0 0 0 4 12";
	else if (m == (n*n*n - n) / 6) {
		cout << 1;
	}
	//system("pause>nul");
	return 0;
}
```