

# Олимпиада СПбГУ по информатике 2018/19 учебного года

Ибраев Дмитрий Александрович

A	B	C	D	E	F	Sum
100	100	100	60	100	72	532

## Task A (100)

```
#include <iostream>

using namespace std;

int main() {
    int n, m;
    cin >> n >> m;
    if (n == m) {
        cout << "Yes" << endl;
        return 0;
    }
    for (int i = 0; i < 10; ++i) {
        n *= 2;
        if (n == m) {
            cout << "Yes" << endl;
            return 0;
        }
    }
    cout << "No" << endl;
    return 0;
}
```

## Task B (100)

```
#include <iostream>

using namespace std;

void solve(){
    string str;
    int n;
    cin >> n >> str;
    for (int i = 0; i + 1 < n; ++i){
        if (str[i] == 'r' && str[i + 1] == 'o'){
            cout << "Yes" << endl;
            return;
        }
        if (str[i] == 'o' && str[i + 1] == 'r'){
            cout << "Yes" << endl;
            return;
        }
        if (i + 2 < n && str[i] == 'o' && str[i + 2] == 'r'){
            cout << "Yes" << endl;
            return;
        }
    }
    cout << "No" << endl;
}

int main(){
    solve();
    return 0;
}
```

## Task C (100)

```
#include <iostream>
#include <vector>

using namespace std;

#define vi vector<int>
#define vvi vector<vi>
#define vb vector<bool>
#define pb push_back

void dfs(int v, vvi &g, vb &used, vi &dp){
    used[v] = 1;
    dp[v] = 1;
    for (int u: g[v]){
        if (!used[u]){
            dfs(u, g, used, dp);
            dp[v] += dp[u];
        }
    }
}

int main(){
    int n;
    cin >> n;
    vvi g(n);
    vi dp(n);
    vb used(n);
    for (int i = 1; i < n; ++i){
        int v, u;
        cin >> v >> u;
        v--, u--;
        g[v].pb(u), g[u].pb(v);
    }
    dfs(0, g, used, dp);
    for (int i = 0; i < n; ++i){
        int ans = n - dp[i];
        for (int j: g[i]){
            if (dp[j] < dp[i]) ans = max(ans, dp[j]);
        }
        cout << ans + 1 << "␣";
    }
    cout << endl;
    return 0;
}
```

## Task D (60)

```
#include <iostream>
#include <vector>

using namespace std;

#define vi vector<int>
#define vvi vector<vi>
#define vb vector<bool>
#define pb push_back

void f(string str0, string &str){
    if (str0[0] == 'a'){
        str[0] = str0[1];
        str[1] = str0[2];
        str[2] = str0[3];
        str[3] = str0[4];
        str[4] = str0[5];
        str[5] = str0[6];
    }
    if (str0[0] == 'b'){
        str[0] = str0[1];
        str[1] = str0[2];
        str[2] = str0[3];
        str[6] = str0[4];
        str[7] = str0[5];
        str[8] = str0[6];
    }
    if (str0[0] == 'c'){
        str[3] = str0[1];
        str[4] = str0[2];
        str[5] = str0[3];
        str[6] = str0[4];
        str[7] = str0[5];
        str[8] = str0[6];
    }
}

void solve3m(){
    string str1, str2;
    cin >> str1 >> str2;
    string ans = "000000000";
    f(str1, ans);
    f(str2, ans);
    cout << ans << endl;
}

void solve3s(){
    string str;
    cin >> str;
    cout << "a" << str[0] << str[1] << str[2] << str[3] << str[4] << str[5] << "␣";
    cout << "b" << str[0] << str[1] << str[2] << str[6] << str[7] << str[8] << "␣";
    cout << "c" << str[3] << str[4] << str[5] << str[6] << str[7] << str[8] << "␣";
    cout << endl;
}

void solve5s(){
    string str;
    cin >> str;
    cout << "a" << str[0] << str[1] << str[2] << str[3] << str[4] << str[5] << "␣";
    cout << "b" << str[2] << str[3] << str[4] << str[5] << str[6] << str[7] << "␣";
    cout << "c" << str[4] << str[5] << str[6] << str[7] << str[8] << str[0] << "␣";
    cout << "d" << str[6] << str[7] << str[8] << str[0] << str[1] << str[2] << "␣";
    cout << "e" << str[8] << str[0] << str[1] << str[2] << str[3] << str[4] << "␣";
    cout << endl;
}

void f2(string str0, string &str){
    if (str0[0] == 'a'){
        str[0] = str0[1];
    }
}
```

```

        str[1] = str0[2];
        str[2] = str0[3];
        str[3] = str0[4];
        str[4] = str0[5];
        str[5] = str0[6];
    }
    if (str0[0] == 'b'){
        str[2] = str0[1];
        str[3] = str0[2];
        str[4] = str0[3];
        str[5] = str0[4];
        str[6] = str0[5];
        str[7] = str0[6];
    }
    if (str0[0] == 'c'){
        str[4] = str0[1];
        str[5] = str0[2];
        str[6] = str0[3];
        str[7] = str0[4];
        str[8] = str0[5];
        str[0] = str0[6];
    }
    if (str0[0] == 'd'){
        str[6] = str0[1];
        str[7] = str0[2];
        str[8] = str0[3];
        str[0] = str0[4];
        str[1] = str0[5];
        str[2] = str0[6];
    }
    if (str0[0] == 'e'){
        str[8] = str0[1];
        str[0] = str0[2];
        str[1] = str0[3];
        str[2] = str0[4];
        str[3] = str0[5];
        str[4] = str0[6];
    }
}
void solve5m(){
    string str1, str2, str3;
    cin >> str1 >> str2 >> str3;
    string ans = "000000000";
    f2(str1, ans);
    f2(str2, ans);
    f2(str3, ans);
    cout << ans << endl;
}

int main(){
    string str0;
    cin >> str0;
    if (str0[0] == 'm'){
        int t, n, p;
        cin >> t >> n >> p;
        if (n == 3){
            for (int i = 0; i < t; ++i) solve3m();
        }
        if (n == 5){
            for (int i = 0; i < t; ++i) solve5m();
        }
    } else {
        int t, n, p;
        cin >> t >> n >> p;
        if (n == 3){
            for (int i = 0; i < t; ++i) solve3s();
        }
        if (n == 5){
            for (int i = 0; i < t; ++i) solve5s();
        }
    }
    return 0;
}

```

### Task E (100)

```

import java.io.*;
import java.math.BigInteger;

public class Main {

    public static StreamTokenizer st = new StreamTokenizer(new BufferedReader(new
        InputStreamReader(System.in)));

    public static int read() throws IOException{
        st.nextToken();
        return (int) st.nval;
    }

    public static BigInteger dist(BigInteger x1, BigInteger y1, int x2, int y2) {
        BigInteger X2 = new BigInteger(Integer.toString(x2));
        BigInteger Y2 = new BigInteger(Integer.toString(y2));
        BigInteger dx = x1.subtract(X2);
        BigInteger dy = y1.subtract(Y2);
        dx = dx.multiply(dx);
        dy = dy.multiply(dy);
        return dx.add(dy);
    }

    public static void main(String[] args) throws IOException {
        // TODO Auto-generated method stub
        int n = read();
        int [][] xy = new int[n][2];
        for (int i = 0; i < n; ++i) {
            xy[i][0] = read();
            xy[i][1] = read();
        }
        int x1, y1, x2, y2;
        x1 = read();
        y1 = read();
        x2 = read();
        y2 = read();
        BigInteger X1 = new BigInteger(Integer.toString(x1));
        BigInteger Y1 = new BigInteger(Integer.toString(y1));
        BigInteger X2 = new BigInteger(Integer.toString(x2));
        BigInteger Y2 = new BigInteger(Integer.toString(y2));
        BigInteger DX = X2.subtract(X1);
        BigInteger DY = Y2.subtract(Y1);
        BigInteger INF = new BigInteger("1000000000000000000000000");
        DX = DX.multiply(INF);
        DY = DY.multiply(INF);
        X1 = X1.add(DX);
        Y1 = Y1.add(DY);
        int ans = 0;
        BigInteger d = dist(X1, Y1, xy[0][0], xy[0][1]);
        for (int i = 1; i < n; ++i) {
            BigInteger d1 = dist(X1, Y1, xy[i][0], xy[i][1]);
            if (d1.compareTo(d) == 0) ans = -2;
            if (d1.compareTo(d) == -1) {
                d = d1;
                ans = i;
            }
        }
        System.out.println(ans + 1);
    }
}

```

## Task F (72)

```
#include <iostream>
#include <vector>

using namespace std;

#define ll long long
#define vll vector<ll>
#define vvll vector<vll>
#define vi vector<int>
#define pii pair<int, int>
#define vpil vector<pii>
#define f first
#define s second
#define vvi vector<vi>
#define vvvi vector<vvi>
#define pb push_back

const int maxn = 1e5 + 5;

vi merge(vi &a1, vi &a2){
    vi ans;
    int n = a1.size(), m = a2.size();
    int i = 0, j = 0;
    while(i < n || j < m){
        if (i == n){
            ans.pb(a2[j]);
            j++;
        } else if (j == m){
            ans.pb(a1[i]);
            i++;
        } else {
            if (a1[i] < a2[j]){
                ans.pb(a1[i]);
                i++;
            } else if (a1[i] > a2[j]){
                ans.pb(a2[j]);
                j++;
            } else {
                ans.pb(a1[i]);
                ans.pb(a2[j]);
                i++; j++;
            }
        }
    }
    return ans;
}

int main(){
    int n, k;
    cin >> n >> k;
    int ans = 0;
    vpil rb(n);
    for (int i = 0; i < n; ++i) cin >> rb[i].f >> rb[i].s;
    vi dp(maxn, -1);
    dp[0] = 0;
    vi idx;
    idx.pb(0);
    for (int i = 0; i < n; ++i){
        vi idx1;
        for (int j: idx){
            if (j + k >= maxn) break;
            if (dp[j + k] == -1) idx1.pb(j + k);
            dp[j + k] = max(dp[j + k], dp[j]);
        }
        idx = merge(idx, idx1);
        idx1.clear();
        for (int j: idx){
            int rd = j, bl = (i + 1) * k - dp[j] - j;
            int a = min(rd, rb[i].f);
        }
    }
}
```

```

        int b = min(bl, rb[i].s);
        if (dp[j - a] == -1) idx1.pb(j - a);
        dp[j - a] = max(dp[j - a], dp[j] + a + b);
    }
    idx = merge(idx, idx1);
}
for (int x: dp) ans = max(ans, x);
cout << ans << endl;
return 0;
}

```