Олимпиада СПбГУ по информатике 2018/19 учебного года

Давыдов Артём Вадимович

A	B	C	D	E	F	Sum
100	100	100	60	35	7	402

Task A (100)

```
#include<iostream>
#include<math.h>
#include<vector>
#include<algorithm>
#include<string>
#include<set>
#include<map>

using namespace std;

typedef long long ll;
typedef pair<int, int>pii;
typedef pair<ll, ll>pll;

#define mp make_pair;
#define ff first
#define ss second

int main(){
        int n, m;

        cin >> n >> m;

        while (n < m)
                n *= 2;

        if (n == m)
                cout << "Yes";
        else
                cout << "No";

        return 0;
}
```

Task B (100)

```cpp
#include<iostream>
#include<math.h>
#include<vector>
#include<algorithm>
#include<string>
#include<set>
#include<map>

using namespace std;

typedef long long ll;
typedef pair<int, int>pii;
typedef pair<ll, ll>pll;

#define mp make_pair;
#define ff first
#define ss second

int main(){
        int n;

        cin >> n;

        vector<char>vec(n);

        for (int i = 0; i < n; i++)
                cin >> vec[i];

        bool win = false;

        for (int i = 1; i < n; i++){
                if ((vec[i - 1] == 'o' &&vec[i] == 'r') || (vec[i - 1] == 'r' && vec[i] == 'o'))
                        win = true;
        }

        for (int i = 2; i < n; i++){
                if (vec[i - 2] == 'o' && vec[i] == 'r')
                        win = true;
        }
        if (win)
                cout << "Yes";
        else
                cout << "No";

        return 0;
}
```

Task C (100)

```
#include<iostream>
#include<math.h>
#include<vector>
#include<algorithm>
#include<string>
#include<set>
#include<map>

using namespace std;

typedef long long ll;
typedef pair<int, int>pii;
typedef pair<ll, ll>pll;

#define mp make_pair;
#define ff first
#define ss second

vector<vector<int>>g;
vector<bool>used;
vector<int>p;
vector<int>ans;

int dfs(int v){
        used[v] = true;
        p[v] = 1;

        for (int i = 0; i < g[v].size(); i++){
                if (!used[g[v][i]])
                        p[v] += dfs(g[v][i]);
        }
        return(p[v]);
}

void sol(int v, int anc, int za){
        int k = -1;
        int lza = za;

        for (int i = 0; i < g[v].size(); i++){
                if (g[v][i] != anc)
                        za += p[g[v][i]];
        }

        for (int i = 0; i < g[v].size(); i++){
                if (g[v][i] != anc){
                        k = max(k, p[g[v][i]]);
                        sol(g[v][i], v, za - p[g[v][i]] + 1);
                }
                else
                        k = max(k, lza);
        }

        ans[v] = k + 1;
}

int main(){
        ios_base::sync_with_stdio(false);

        int n;

        cin >> n;

        g.resize(n);
        used.resize(n);
        p.resize(n);
        ans.resize(n);

        for (int i = 1; i < n; i++){
                int u, v;
                cin >> u >> v;
                u--;
                v--;

                g[u].push_back(v);
                g[v].push_back(u);
        }

        if (n == 1){
                cout << 1;
                return 0;
        }

        dfs(0);

        ans[0] = -1;

        for (int i = 0; i < g[0].size(); i++){
                ans[0] = max(p[g[0][i]] + 1, ans[0]);
                sol(g[0][i], 0, p[0] - p[g[0][i]]);
        }

        for (int i = 0; i < n; i++)
                cout << ans[i] << '␣';
        return 0;
}
```

Task D (60)

```
#include<iostream>
#include<math.h>
#include<vector>
#include<algorithm>
#include<string>
#include<set>
#include<map>

using namespace std;

typedef long long ll;
typedef pair<int, int>pii;
typedef pair<ll, ll>pll;

#define mp make_pair;
#define ff first
#define ss second

int main(){
        ios_base::sync_with_stdio(false);

        string type;
        vector<char>pass(9);

        int t, n, p;

        cin >> type >> t >> n >> p;

        if (type == "split"){
                for (int sc = 0; sc < t; sc++){
                        for (int i = 0; i < 9; i++)
                                cin >> pass[i];


                        if (n == 3){
                                vector<vector<char>>vec(3, vector<char>(7));
                                vec[0][0] = 'a';
                                vec[1][0] = 'b';
                                vec[2][0] = 'c';

                                for (int i = 0; i < 3; i++){
                                        vec[0][i + 1] = pass[i];
                                        vec[1][i + 1] = pass[i];
                                }
                                for (int i = 3; i < 6; i++){
                                        vec[0][i + 1] = pass[i];
                                        vec[2][i - 2] = pass[i];
                                }
                                for (int i = 6; i < 9; i++){
                                        vec[1][i - 2] = pass[i];
                                        vec[2][i - 2] = pass[i];
                                }

                                for (int i = 0; i < 3; i++){
                                        for (int j = 0; j < 7; j++)
                                                cout << vec[i][j];
                                        cout << '␣';
                                }
                                cout << '\n';
                        }
                        else{
                                vector<vector<char>>vec(5, vector<char>(7));
                                vec[0][0] = 'a';
                                vec[1][0] = 'a';
                                vec[2][0] = 'b';
                                vec[3][0] = 'c';
                                vec[4][0] = 'c';

                                for (int i = 0; i < 3; i++){
```

```
                    vec[0][i + 1] = pass[i];
                    vec[1][i + 1] = pass[i];
                    vec[2][i + 1] = pass[i];
                }
                for (int i = 3; i < 6; i++){
                    vec[0][i + 1] = pass[i];
                    vec[1][i + 1] = pass[i];
                    vec[3][i - 2] = pass[i];
                    vec[4][i - 2] = pass[i];
                }
                for (int i = 6; i < 9; i++){
                    vec[2][i - 2] = pass[i];
                    vec[3][i - 2] = pass[i];
                    vec[4][i - 2] = pass[i];
                }

                for (int i = 0; i < 5; i++){
                    for (int j = 0; j < 7; j++)
                        cout << vec[i][j];
                    cout << '␣';
                }
                cout << '\n';
            }
        }
    }
    else{
        for (int sc = 0; sc < t; sc++){
            if (n == 3){
                vector<vector<char>>vec(2, vector<char>(7));

                for (int i = 0; i < 2; i++){
                    for (int j = 0; j < 7; j++)
                        cin >> vec[i][j];
                }

                char ans[9];

                for (int i = 0; i < 2; i++){
                    if (vec[i][0] == 'a'){
                        for (int j = 0; j < 6; j++)
                            ans[j] = vec[i][j + 1];
                    }
                    else if (vec[i][0] == 'b'){
                        for (int j = 0; j < 3; j++)
                            ans[j] = vec[i][j + 1];
                        for (int j = 6; j < 9; j++)
                            ans[j] = vec[i][j - 2];
                    }
                    else{
                        for (int j = 3; j < 9; j++)
                            ans[j] = vec[i][j - 2];
                    }
                }

                for (int i = 0; i < 9; i++)
                    cout << ans[i];
                cout << '\n';
            }
            else{
                vector<vector<char>>vec(3, vector<char>(7));

                for (int i = 0; i < 3; i++){
                    for (int j = 0; j < 7; j++)
                        cin >> vec[i][j];
                }

                char ans[9];

                for (int i = 0; i < 3; i++){
                    if (vec[i][0] == 'a'){
                        for (int j = 0; j < 6; j++)
                            ans[j] = vec[i][j + 1];
                    }
                    else if (vec[i][0] == 'b'){
                        for (int j = 0; j < 3; j++)
                            ans[j] = vec[i][j + 1];
                        for (int j = 6; j < 9; j++)
                            ans[j] = vec[i][j - 2];
                    }
                    else{
                        for (int j = 3; j < 9; j++)
                            ans[j] = vec[i][j - 2];
                    }
                }

                for (int i = 0; i < 9; i++)
                    cout << ans[i];
                cout << '\n';
            }

        }
    }

    return 0;
}
```

Task E (35)

```
#include<iostream>
#include<math.h>
#include<vector>
#include<algorithm>
#include<string>
#include<set>
#include<map>

using namespace std;

typedef long long ll;
typedef pair<int, int>pii;
typedef pair<ll, ll>pll;

#define mp make_pair
#define ff first
#define ss second

int main(){
        ios_base::sync_with_stdio(false);

        int n;

        cin >> n;

        vector<pll>vec(n);

        for (int i = 0; i < n; i++)
                cin >> vec[i].ff >> vec[i].ss;

        pii p, q;

        cin >> p.ff >> p.ss >> q.ff >> q.ss;

        if (n == 1){
                cout << 1;
                return 0;
        }

        bool bad = false;
        if (q.ss - p.ss == 0){
                if (q.ff > p.ff){
                        pii mx = mp(vec[0].ff, 0);

                        for (int i = 1; i < n; i++){
                                if (mx.ff < vec[i].ff){
                                        mx.ff = vec[i].ff;
                                        mx.ss = i;
                                        bad = false;
                                }
                                else if (mx.ff == vec[i].ff){
                                        int ab = abs(vec[i].ss - p.ss) - abs(vec[mx.ss].ss - p.ss)
                                            ;

                                        if (ab == 0)
                                                bad = true;
                                        else if (ab < 0){
                                                mx.ff = vec[i].ff;
                                                mx.ss = i;
                                        }
                                }
                        }

                        if (bad)
                                cout << -1;
                        else
                                cout << mx.ss + 1;
                }
                else{
                        pii mx = mp(vec[0].ff, 0);

                        for (int i = 1; i < n; i++){
                                if (mx.ff > vec[i].ff){
                                        mx.ff = vec[i].ff;
                                        mx.ss = i;
                                        bad = false;
                                }
                                else if (mx.ff == vec[i].ff){
                                        int ab = abs(vec[i].ss - p.ss) - abs(vec[mx.ss].ss - p.ss)
                                            ;

                                        if (ab == 0)
                                                bad = true;
                                        else if (ab < 0){
                                                mx.ff = vec[i].ff;
                                                mx.ss = i;
                                        }
                                }
                        }

                        if (bad)
                                cout << -1;
                        else
                                cout << mx.ss + 1;
                }
                return 0;
        }
        long double tg = (p.ss - q.ss) / (p.ss - q.ff);
        long double sv = p.ss - p.ff*tg;

        if (q.ff > p.ff){
                long double x = 10000000;
                long double y = x*tg + sv;

                if (pow(y - vec[0].ss, 2) + pow(x - vec[0].ff, 2) < pow(y - vec[1].ss, 2) + pow(x
                    - vec[1].ff, 2))
                        cout << 1;
                else if (pow(y - vec[0].ss, 2) + pow(x - vec[0].ff, 2) > pow(y - vec[1].ss, 2) +
                    pow(x - vec[1].ff, 2))
                        cout << 2;
                else
                        cout << -1;
        }
        else{
                long double x = -10000000;
                long double y = x*tg + sv;

                if (pow(y - vec[0].ss, 2) + pow(x - vec[0].ff, 2) < pow(y - vec[1].ss, 2) + pow(x
                    - vec[1].ff, 2))
                        cout << 1;
                else if (pow(y - vec[0].ss, 2) + pow(x - vec[0].ff, 2) > pow(y - vec[1].ss, 2) +
                    pow(x - vec[1].ff, 2))
                        cout << 2;
                else
                        cout << -1;
        }






        return 0;
}
```

Task F (7)

```cpp
#include<iostream>
#include<math.h>
#include<vector>
#include<algorithm>
#include<string>
#include<set>
#include<map>

using namespace std;

typedef long long ll;
typedef pair<int, int>pii;
typedef pair<ll, ll>pll;

#define mp make_pair
#define ff first
#define ss second

int n, k;
vector<pii>vec;

int fun(int red, int blue, int day){
        int dov = min(vec[day].ff, red) + min(vec[day].ss, blue);

        if (day == n - 1)
                return dov;

        red = max(0, red - vec[day].ff);
        blue = max(0, blue - vec[day].ss);

        dov += max(fun(red + k, blue, day + 1), fun(red, blue + k, day + 1));
        return dov;
}

int main(){
        ios_base::sync_with_stdio(false);

        cin >> n >> k;

        vec.resize(n);

        for (int i = 0; i < n; i++)
                cin >> vec[i].ff >> vec[i].ss;

        cout << max(fun(k, 0, 0), fun(0, k, 0));

        return 0;
}
```