

Олимпиада СПбГУ по информатике 2018/19 учебного года

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A	B	C	D	E	F	Sum
100	100	100	60	12	7	379

Task A (100)

```
//#include <fstream>
#include <iostream>
#include <vector>
#include <queue>
#include <algorithm>
#include <set>
#include <map>

using namespace std;

//ifstream cin("input.txt"); ofstream cout("output.txt");

#define ll long long
#define db1 double
#define For(i, st, end) for(int i = st; i<end;i++)
#define Ford(i, st, end) for(int i = st; i>=end;i--)
#define vec(_type) vector<_type>

int main() {

    int n, m;
    cin >> n >> m;

    while (n < m) {
        n *= 2;
    }

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

    return 0;
}
```

Task B (100)

```
#include <fstream>
#include <iostream>
#include <vector>
#include <queue>
#include <algorithm>
#include <set>
#include <map>
#include <string>

using namespace std;

#define ll long long
#define db1 double
#define For(i, st, end) for(int i = st; i<end;i++)
#define Ford(i, st, end) for(int i = st; i>=end;i--)
#define vec(_type) vector<_type>

int main() {
    //ifstream cin("input.txt"); ofstream cout("output.txt");

    int n;
    string s;
    cin >> n >> s;

    bool can = false;
    for (int i = 0; !can && i < n - 1; i++) {
        can = can || s[i] == 'o' && s[i + 1] == 'r';
        swap(s[i], s[i + 1]);
        if (i > 0)
            can = can || s[i - 1] == 'o' && s[i] == 'r';
        can = can || (s[i] == 'o' && s[i + 1] == 'r') || (s[i + 1] == 'o' && s[i + 2] == 'r');
        swap(s[i], s[i + 1]);
    }

    if (can)
        cout << "Yes" << endl;
    else
        cout << "No" << endl;

    return 0;
}
```

Task C (100)

```
#include <fstream>
#include <iostream>
#include <vector>
#include <queue>
#include <algorithm>
#include <set>
#include <map>
#include <string>

using namespace std;

#define ll long long
#define dbl double
#define For(i, st, end) for(int i = st; i<end;i++)
#define Ford(i, st, end) for(int i = st; i>=end;i--)
#define vec(_type) vector<_type>
#define vec2(_type) vector<vector<_type>>

vec2(int) a;
vec(int) maxv,sumd,ans;
vec(bool) used;

void calc(int v) {
    used[v] = true;
    int curS = 1, max1 = 0;

    for (auto i : a[v]) {
        if (!used[i]) {
            calc(i);
            curS += sumd[i];
            if (sumd[i] > max1)
                max1 = sumd[i];
        }
    }

    sumd[v] = curS;
    maxv[v] = max1;

    return;
}

void dfs(int v, int par = -1) {
    ans[v] = maxv[v] + 1;
    for (auto i : a[v]) {
        if (i == par)
            continue;

        int csum = sumd[v], ssum = sumd[i],
            cmax1 = maxv[v], smax1 = maxv[i];

        sumd[v] -= sumd[i];
        sumd[i] += sumd[v];

        maxv[i] = max(maxv[i], sumd[v]);

        dfs(i, v);

        sumd[v] = csum; sumd[i] = ssum;
        maxv[v] = cmax1; maxv[i] = smax1;
    }
    return;
}

int main() {
    //ifstream cin("input.txt"); ofstream cout("output.txt");

    int n;
    cin >> n;
```

```

a.resize(n);
maxv.assign(n, 0);
sumd.assign(n, 0);
used.assign(n, false);
ans.assign(n, -1);

For(i, 0, n - 1) {
    int u, v;
    cin >> u >> v;
    u--; v--;

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

calc(0);

dfs(0);

For(i, 0, ans.size()) {
    cout << ans[i] << ' ';
}
cout << endl;

return 0;
}

```

Task D (60)

```
#include <fstream>
#include <iostream>
#include <vector>
#include <queue>
#include <algorithm>
#include <set>
#include <map>
#include <string>

using namespace std;

#define ll long long
#define dbl double
#define For(i, st, end) for(int i = st; i<end;i++)
#define Ford(i, st, end) for(int i = st; i>=end;i--)
#define vec(_type) vector<_type>
#define vec2(_type) vector<vector<_type>>

int main() {
    //ifstream cin("input.txt"); ofstream cout("output.txt");

    string cmd, tmp;
    cin >> cmd;

    int t, n, p;
    cin >> t >> n >> p;

    if (cmd == "split") {
        For(q, 0, t) {
            string pass;
            cin >> pass;
            if (n == 3 && p == 7) {
                string temp;

                temp = "a";
                For(i, 0, 6)
                    temp += pass[i];
                cout << temp << '\n';

                temp = "b";
                For(i, 3, 9)
                    temp += pass[i];
                cout << temp << '\n';

                temp = "c";
                For(i, 0, 3)
                    temp += pass[i];
                For(i, 6, 9)
                    temp += pass[i];
                cout << temp << endl;
            }

            if (n == 5 && p == 7) {
                string temp;

                temp = "a";
                For(i, 0, 6)
                    temp += pass[i];
                cout << temp << '\n' << temp << '\n';

                temp = "b";
                For(i, 3, 9)
                    temp += pass[i];
                cout << temp << '\n' << temp << '\n';

                temp = "c";
                For(i, 0, 3)
                    temp += pass[i];
                For(i, 6, 9)
```

```

        temp += pass[i];
        cout << temp << endl;
    }
}
else {
    For(q, 0, t) {
        string pass = "aaaaaaaaa";

        if ((n == 3 || n == 5) && p == 7) {
            For(i, 0, n/2 + n%2) {
                string temp;
                cin >> temp;
                if (temp[0] == 'a') {
                    For(i, 0, 6)
                        pass[i] = temp[i + 1];
                }

                if (temp[0] == 'b') {
                    For(i, 3, 9)
                        pass[i] = temp[i - 2];
                }

                if (temp[0] == 'c') {
                    For(i, 0, 3)
                        pass[i] = temp[i + 1];
                    For(i, 6, 9)
                        pass[i] = temp[i - 2];
                }
            }
            cout << pass << endl;
        }
    }
}

return 0;
}

```

Task E (12)

```
#include <fstream>
#include <iostream>
#include <vector>
#include <queue>
#include <algorithm>
#include <set>
#include <map>
#include <string>

using namespace std;

#define ll long long
#define dbl double
#define For(i, st, end) for(int i = st; i<end;i++)
#define Ford(i, st, end) for(int i = st; i>=end;i--)
#define vec(_type) vector<_type>
#define vec2(_type) vector<vector<_type>>
#define e 0.0000001

int main() {
    //ifstream cin("input.txt"); ofstream cout("output.txt");

    int n, x1, x2, y1, y2;
    cin >> n;
    vec(dbl) xs(n), ys(n);

    For(i, 0, n) {
        cin >> xs[i] >> ys[i];
    }
    cin >> x1 >> y1 >> x2 >> y2;

    dbl a = (y2 - y1),
        b = (x2 - x1),
        c = y1 * (x2 - x1) - x1 * (y2 - y1),

        testx = (dbl)10000,
        testy = (a*testx + c) / (-b);

    int bestT = -1;
    dbl bestDist = (dbl)1000000 * (dbl)1000000 * (dbl)1000000 * (dbl)1000000;

    For(i, 0, n) {
        dbl curDist = sqrt((xs[i] - testx) * (xs[i] - testx) + (ys[i] - testy) * (ys[i] -
            testy));
        if (abs(curDist - bestDist) < e) {
            bestT = -1;
            break;
        }
        if (curDist < bestDist) {
            bestT = i;
            bestDist = curDist;
        }
    }

    if (bestT == -1)
        cout << -1 << endl;
    else
        cout << bestT + 1 << endl;

    return 0;
}
```

Task F (7)

```
#include <fstream>
#include <iostream>
#include <vector>
#include <queue>
#include <algorithm>
#include <set>
#include <map>
#include <string>

using namespace std;

#define ll long long
#define dbl double
#define For(i, st, end) for(int i = st; i<end;i++)
#define Ford(i, st, end) for(int i = st; i>=end;i--)
#define vec(_type) vector<_type>
#define vec2(_type) vector<vector<_type>>
#define e 0.0000001

vec(ll)r, b;
ll curR = 0, curB = 0, best = 0;
int n, k;
vector<pair<ll, ll>> dp;

void rec(int cur, ll curS) {
    if (cur == n) {
        best = max(best, curS);
    }
    else {
        ll saver = curR, saveb = curB, saves = curS;
        if (dp[cur].first > curR) {
            curR += k;
            curS += min(curR, r[cur]) + min(curB, b[cur]);
            curR = max(0ll, curR - r[cur]); curB = max(0ll, curB - b[cur]);
            rec(cur + 1, curS);
        }

        curR = saver; curB = saveb; curS = saves;
        curB += k;
        curS += min(curR, r[cur]) + min(curB, b[cur]);
        curR = max(0ll, curR - r[cur]); curB = max(0ll, curB - b[cur]);
        rec(cur + 1, curS);

        curR = saver; curB = saveb; curS = saves;
    }
}

int main() {
    //ifstream cin("input.txt"); ofstream cout("output.txt");

    cin >> n >> k;

    r.resize(n), b.resize(n);
    For(i, 0, n) {
        cin >> r[i] >> b[i];
    }
    dp.resize(n);
    dp[n - 1].first = r[n - 1];
    dp[n - 1].second = b[n - 1];

    Ford(i, n - 2, 0) {
        dp[i].first = dp[i + 1].first + r[i];
        dp[i].second = dp[i + 1].second + b[i];
    }
}
```



```
    rec(0, 0);  
    cout << best << endl;  
  
    return 0;  
}
```