# 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)

```cpp
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <cstdio>

typedef long long ll;

using namespace std;

int main() {
#ifdef _DEBUG
        freopen("input.txt", "r", stdin);
        freopen("output.txt", "w", stdout);
#endif

#ifndef _DEBUG
        //
#endif

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

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

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

}
```

# Task B (100)

```cpp
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <cstdio>
#include <string>

typedef long long ll;

using namespace std;

int main() {
#ifdef _DEBUG
        freopen("input.txt", "r", stdin);
        freopen("output.txt", "w", stdout);
#endif

#ifndef _DEBUG
        //
#endif

        int n;
        cin >> n;

        string s;
        cin >> s;

        for (int i = 0; i < n - 1; i++) {
                if ((s[i] == 'r' && s[i + 1] == 'o') ||
                        (s[i] == 'o' && s[i + 1] == 'r')) {
                        cout << "Yes";
                        return 0;
                }
        }

        for (int i = 0; i < n; i++) {
                if (s[i] == 'o') {
                        if (i + 2 < n && s[i + 2] == 'r') {
                                cout << "Yes";
                                return 0;
                        }
                }
        }

        cout << "No";

}
```

## Task C (100)

```cpp
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <cstdio>
#include <vector>
#include <climits>

typedef long long ll;

using namespace std;

const ll MAX_N = 400004;

vector<ll> graph[MAX_N];
bool used[MAX_N];
bool tused[MAX_N];
ll sz[MAX_N];
ll path[MAX_N];
ll it = 0;
ll result[MAX_N];

ll dfs(ll v) {
        used[v] = true;
        ll vsz = 1;
        for (ll i = 0; i < graph[v].size(); i++) {
                if (!used[graph[v][i]]) {
                        vsz += dfs(graph[v][i]);
                }
        }
        sz[v] = vsz;
        return vsz;
}

void tdfs(ll v) {
        tused[v] = true;
        path[it++] = v;
        for (ll i = 0; i < graph[v].size(); i++) {
                if (!tused[graph[v][i]]) {
                        tdfs(graph[v][i]);
                        path[it++] = v;
                }
        }
}

int main() {
#ifdef _DEBUG
        freopen("input.txt", "r", stdin);
        freopen("output.txt", "w", stdout);
#endif

#ifndef _DEBUG
        //
#endif

        ll n;
        cin >> n;

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

        for (ll i = 0; i < n - 1; i++) {
                ll s, e;
                cin >> s >> e;
                s--; e--;

                graph[s].push_back(e);
                graph[e].push_back(s);
```

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```cpp
                result[i] = -1;
        }
        result[n - 1] = -1;

        tdfs(0);

        /*for (ll i = 0; i < it; i++) {
                cout << path[i] << ' ';
        }
        cout << endl << endl;
        for (ll i = 0; i < n; i++) {
                cout << result[i] << ' ';
        }
        cout << endl << endl;*/

        ll prev = 0;
        dfs(0);
        ll mx = -1;
        for (ll i = 0; i < graph[0].size(); i++) {
                if (sz[graph[0][i]] > mx) {
                        mx = sz[graph[0][i]];
                }
        }
        result[0] = mx + 1;



        for (ll k = 1; k < it; k++) {
                ll start = path[k];

                if (prev == start) continue;

                /*cout << start << ' ';
                cout << result[start] << ' ';*/

                mx = -1;

                if (result[start] != -1) {
                        sz[prev] = sz[prev] - sz[start];
                        sz[start] = n;
                        prev = start;
                }
                else {
                        sz[prev] = sz[prev] - sz[start];
                        sz[start] = n;

                        for (ll i = 0; i < graph[start].size(); i++) {
                                if (sz[graph[start][i]] > mx) {
                                        mx = sz[graph[start][i]];
                                }
                        }
                        result[start] = mx + 1;

                        prev = start;
                }

                /*for (ll i = 0; i < n; i++) {
                        cout << sz[i] << ' ';
                }
                cout << "    " << result[start];

                cout << endl;*/
        }

        for (ll i = 0; i < n; i++) {
                cout << result[i] << ' ';
        }
}



}
```

**Task D (60)**

```cpp
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <cstdio>
#include <vector>
#include <climits>
#include <string>

typedef long long ll;

using namespace std;

int main() {
#ifdef _DEBUG
        freopen("input.txt", "r", stdin);
        freopen("output.txt", "w", stdout);
#endif

#ifndef _DEBUG
        //
#endif

        string s;
        cin >> s;
        if (s == "split") {
                int t, n, p;
                cin >> t >> n >> p;
                if (n == 3 && p == 7) {
                        for (int i = 0; i < t; i++) {
                                string pw;
                                cin >> pw;
                                cout << 'a';
                                for (int j = 0; j < 6; j++) {
                                        cout << pw[j];
                                }
                                cout << "_b";
                                for (int j = 3; j < 9; j++) cout << pw[j];
                                cout << "_c";
                                cout << pw[6] << pw[7] << pw[8] << pw[0] << pw[1] << pw[2];
                                cout << endl;
                        }

                }
                if (n == 5 && p == 7) {
                        for (int i = 0; i < t; i++) {
                                string pw;
                                cin >> pw;

                                cout << "a";
                                for (int j = 0; j < 6; j++) {
                                        cout << pw[j];
                                }
                                cout << "_a";
                                for (int j = 0; j < 6; j++) {
                                        cout << pw[j];
                                }
                                cout << "_b";
                                for (int j = 3; j < 9; j++) {
                                        cout << pw[j];
                                }
                                cout << "_b";
                                for (int j = 3; j < 9; j++) {
                                        cout << pw[j];
                                }
                                cout << "_c";
                                for (int j = 0; j < 3; j++) {
                                        cout << pw[j];
                                }
                                for (int j = 6; j < 9; j++) {
```

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```cpp
                                cout << pw[j];
                        }
                        cout << endl;
                }
        }
}
else {
        int t, n, p;
        cin >> t >> n >> p;
        if (n == 3 && p == 7) {
                for (int i = 0; i < t; i++) {
                        string a, b;
                        cin >> a >> b;
                        string ans = "xxxxxxxxx";
                        if (a[0] == 'a') {
                                for (int j = 0; j < 6; j++) {
                                        ans[j] = a[j + 1];
                                }
                        }
                        else if (a[0] == 'b') {
                                for (int j = 3; j < 9; j++) {
                                        ans[j] = a[j - 2];
                                }
                        }
                        else {
                                for (int j = 6; j < 9; j++) {
                                        ans[j] = a[j - 5];
                                }
                                for (int j = 0; j < 3; j++) {
                                        ans[j] = a[j + 4];
                                }
                        }

                        if (b[0] == 'a') {
                                for (int j = 0; j < 6; j++) {
                                        ans[j] = b[j + 1];
                                }
                        }
                        else if (b[0] == 'b') {
                                for (int j = 3; j < 9; j++) {
                                        ans[j] = b[j - 2];
                                }
                        }
                        else {
                                for (int j = 6; j < 9; j++) {
                                        ans[j] = b[j - 5];
                                }
                                for (int j = 0; j < 3; j++) {
                                        ans[j] = b[j + 4];
                                }
                        }

                        cout << ans << endl;
                }
        }
        if (n == 5 && p == 7) {
                for (int i = 0; i < t; i++) {
                        string a, b, c;
                        cin >> a >> b >> c;
                        if ((a[0] == 'a' && b[0] == 'a') ||
                                (b[0] == 'a' && c[0] == 'a') ||
                                (c[0] == 'a' && a[0] == 'a')) {
                                if (a[0] == 'c') {
                                        cout << b[1] << b[2] << b[3] << b[4] << b[5] << b
                                                [6] << a[4] << a[5] << a[6];
                                }
                                else if (b[0] == 'c') {
                                        cout << a[1] << a[2] << a[3] << a[4] << a[5] << a
                                                [6] << b[4] << b[5] << b[6];
                                }
                                else if (c[0] == 'c') {
                                        cout << a[1] << a[2] << a[3] << a[4] << a[5] << a
                                                [6] << c[4] << c[5] << c[6];
                                }
```

```cpp
                else {
                        if (a[0] == 'b') {
                                cout << b[1] << b[2] << b[3] << b[4] << b
                                        [5] << b[6] << a[4] << a[5] << a[6];
                        }
                        else if (b[0] == 'b') {
                                cout << a[1] << a[2] << a[3] << a[4] << a
                                        [5] << a[6] << b[4] << b[5] << b[6];
                        }
                        else if (c[0] == 'b') {
                                cout << a[1] << a[2] << a[3] << a[4] << a
                                        [5] << a[6] << c[4] << c[5] << c[6];
                        }
                }
        }
        else if ((a[0] == 'b' && b[0] == 'b') ||
                (b[0] == 'b' && c[0] == 'b') ||
                (c[0] == 'b' && a[0] == 'b')) {
                if (a[0] == 'c') {
                        cout << a[1] << a[2] << a[3] << b[1] << b[2] << b
                                [3] << b[4] << b[5] << b[6];
                }
                else if (b[0] == 'c') {
                        cout << b[1] << b[2] << b[3] << a[1] << a[2] << a
                                [3] << a[4] << a[5] << a[6];
                }
                else if (c[0] == 'c') {
                        cout << c[1] << c[2] << c[3] << a[1] << a[2] << a
                                [3] << a[4] << a[5] << a[6];
                }
                else {
                        if (a[0] == 'a') {
                                cout << a[1] << a[2] << a[3] << b[1] << b
                                        [2] << b[3] << b[4] << b[5] << b[6];
                        }
                        else if (b[0] == 'a') {
                                cout << b[1] << b[2] << b[3] << a[1] << a
                                        [2] << a[3] << a[4] << a[5] << a[6];
                        }
                        else if (c[0] == 'a') {
                                cout << c[1] << c[2] << c[3] << a[1] << a
                                        [2] << a[3] << a[4] << a[5] << a[6];
                        }
                }
        }
        else {
                if (a[0] == 'a') {
                        cout << a[1] << a[2] << a[3] << a[4] << a[5] << a
                                [6];
                }
                else if (b[0] == 'a') {
                        cout << b[1] << b[2] << b[3] << b[4] << b[5] << b
                                [6];
                }
                else if (c[0] == 'a') {
                        cout << c[1] << c[2] << c[3] << c[4] << c[5] << c
                                [6];
                }

                if (a[0] == 'b') {
                        cout << a[4] << a[5] << a[6];
                }
                else if (b[0] == 'b') {
                        cout << b[4] << b[5] << b[6];
                }
                else if (c[0] == 'b') {
                        cout << c[4] << c[5] << c[6];
                }
        }

        cout << endl;
        }
    }
}
```

}

**Task E (12)**

```cpp
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <cstdio>
#include <vector>
#include <climits>
#include <algorithm>
#include <cmath>

typedef long long ll;

using namespace std;



int main() {
#ifdef _DEBUG
        freopen("input.txt", "r", stdin);
        freopen("output.txt", "w", stdout);
#endif

#ifndef _DEBUG
        //
#endif

        ll n;
        cin >> n;

        if (n != 2) return 0;

        ll x1, x2, y1, y2;
        cin >> x1 >> y1 >> x2 >> y2;

        ll px, py, qx, qy;
        cin >> px >> py >> qx >> qy;

        if (x1 >= 0 && x2 >= 0 && y1 >= 0 && y2 >= 0) {
                qx *= 100000;
                qy *= 100000;

                if (x2 > x1) {
                        cout << 2;
                }
                else if (x1 > x2) {
                        cout << 1;
                }
                else {
                        if (y1 > y2) {
                                cout << 2;
                        }
                        else {
                                cout << 1;
                        }
                }
        }
        else {

                qx *= 100000;
                qy *= 100000;

                ll dx1 = abs(qx - x1);
                ll dx2 = abs(qx - x2);

                ll dy1 = abs(qy - y1);
                ll dy2 = abs(qy - y2);

                ll z1 = dx1 * dx1 + dy1 * dy1;
                ll z2 = dx2 * dx2 + dy2 * dy2;
```

```cpp
        if (z1 > z2) {
                cout << 2;
        }
        else if (z1 < z2) {
                cout << 1;
        }
        else {
                cout << -1;
        }
    }


}
```

```cpp
        if (z1 > z2) {
                cout << 2;
        }
        else if (z1 < z2) {
                cout << 1;
        }
        else {
```

## Task F (7)

```cpp
#define _CRT_SECURE_NO_WARNINGS

#include <iostream>
#include <cstdio>
#include <vector>
#include <climits>
#include <string>
#include <algorithm>

typedef long long ll;

using namespace std;

bool get_bit(int x, int pos) {
        return (x & (1 << pos));
}



int main() {
#ifdef _DEBUG
        freopen("input.txt", "r", stdin);
        freopen("output.txt", "w", stdout);
#endif

#ifndef _DEBUG
        //
#endif

        int n, k;
        cin >> n >> k;

        vector<pair<int, int> > a(n);

        for (int i = 0; i < n; i++) {
                cin >> a[i].first >> a[i].second;
        }

        int x = (1 << 15);

        int mx = -1;

        for (int i = 0; i < x; i++) {
                int now_red = 0;
                int now_blue = 0;
                int hap = 0;
                for (int j = 0; j < n; j++) {
                        if (get_bit(i, j)) {
                                now_red += k;
                        }
                        else {
                                now_blue += k;
                        }
                        hap += min(now_red, a[j].first);
                        hap += min(now_blue, a[j].second);
                        now_red = max(0, now_red - a[j].first);
                        now_blue = max(0, now_blue - a[j].second);
                }
                if (hap > mx) mx = hap;
        }
        cout << mx;

}
```