

Олимпиада СПбГУ по информатике 2018/19 учебного года

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A	B	C	D	E	F	Sum
100	100	100	60	100	100	560

Task A (100)

```
#define _CRT_SECURE_NO_WARNINGS
#include <iostream>

using namespace std;

int main() {
    ios::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);

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

    int a, b;
    cin >> a >> b;
    while (a < b) {
        a *= 2;
    }
    if (a == b) {
        cout << "Yes";
    }
    else {
        cout << "No";
    }
}
```

Task B (100)

```
#define _CRT_SECURE_NO_WARNINGS
#include<iostream>
#include<string>

using namespace std;
string s;
int ch(int i) {
    if (i < 0 || i + 1 >= s.size()) return 0;
    if (s[i] == 'o' && s[i + 1] == 'r') {
        return 1;
    }
    return 0;
}

int sw(int i) {
    swap(s[i], s[i + 1]);
    if (ch(i - 1) || ch(i) || ch(i + 1)) {
        return 1;
    }

    swap(s[i], s[i + 1]);
    return 0;
}

int main() {
    ios::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);

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

    int n;
    cin >> n;
    cin >> s;
    for (int i = 0; i + 1 < n; ++i) {
        if (sw(i) || ch(i)) {
            cout << "Yes";
            return 0;
        }
    }
    cout << "No";
    return 0;
}
```

Task C (100)

```
#define _CRT_SECURE_NO_WARNINGS
#include<iostream>
#include<string>
#include<vector>
#include<algorithm>

using namespace std;
const int MN = 1e5 + 1111;
vector<int> g[MN];

int sz[MN], upsz[MN], ans[MN];

void dfs(int u, int p) {
    sz[u] = 1;
    for (int v : g[u]) {
        if (v == p) continue;
        dfs(v, u);
        sz[u] += sz[v];
    }
}

void dfs2(int u, int p, int szup) {
    upsz[u] = szup;
    int ca = szup;

    szup += sz[u];
    for (int v : g[u]) {
        if (v == p) continue;
        dfs2(v, u, szup - sz[v]);
        ca = max(ca, sz[v]);
    }
    ans[u] = ca + 1;
}

int main() {
    ios::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);

#ifdef _DEBUG
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
#endif // _DEBUG
    int n;
    cin >> n;
    for (int i = 0; i < n - 1; ++i) {
        int u, v;
        cin >> u >> v;
        u--; v--;
        g[u].push_back(v);
        g[v].push_back(u);
    }

    dfs(0, -1);
    dfs2(0, -1, 0);

    for (int i = 0; i < n; ++i) {
        cout << ans[i] << "\n";
    }
}
```

Task D (60)

```
#define _CRT_SECURE_NO_WARNINGS
#include<iostream>
#include<string>

using namespace std;

void ps() {
    int t, n, p;
    cin >> t >> n >> p;
    for (int i = 0; i < t; ++i) {
        string s;
        cin >> s;
        if (n == 3) {
            cout << 'a';
            for (int i = 0; i < 6; ++i) {
                cout << s[i];
            }
            cout << "_";

            cout << 'b';
            for (int i = 3; i < 9; ++i) {
                cout << s[i];
            }
            cout << "_";

            cout << 'c';
            for (int i = 0; i < 3; ++i) {
                cout << s[i];
            }
            for (int i = 6; i < 9; ++i) {
                cout << s[i];
            }
            cout << "_";
        }
        else if (n == 5) {
            cout << 'a';
            for (int i = 0; i < 6; ++i) {
                cout << s[i];
            }
            cout << "_";

            cout << 'b';
            for (int i = 3; i < 9; ++i) {
                cout << s[i];
            }
            cout << "_";

            cout << 'c';
            for (int i = 0; i < 3; ++i) {
                cout << s[i];
            }
            for (int i = 6; i < 9; ++i) {
                cout << s[i];
            }
            cout << "_";

            cout << 'd';
            for (int i = 0; i < 6; ++i) {
                cout << s[i];
            }
            cout << "_";

            cout << 'e';
            for (int i = 3; i < 9; ++i) {
                cout << s[i];
            }
            cout << "_";
        }
    }
}
```

```

        } else
        {
        }
        cout << '\n';
    }

}

void pp(string &ans, string &t, int n) {
    if (n == 3) {
        if (t[0] == 'a') {
            for (int i = 0; i < 6; ++i) {
                ans[i] = t[1 + i];
            }
        }
        else if (t[0] == 'b') {
            for (int i = 3; i < 9; ++i) {
                ans[i] = t[1 + i - 3];
            }
        }
        else if (t[0] == 'c')
        {
            for (int i = 0; i < 3; ++i) {
                ans[i] = t[1 + i];
            }
            for (int i = 6; i < 9; ++i) {
                ans[i] = t[1 + i - 3];
            }
        }
    }
    else if (n == 5) {
        if (t[0] == 'a' || t[0] == 'd') {
            for (int i = 0; i < 6; ++i) {
                ans[i] = t[1 + i];
            }
        }
        else if (t[0] == 'b' || t[0] == 'e') {
            for (int i = 3; i < 9; ++i) {
                ans[i] = t[1 + i - 3];
            }
        }
        else if (t[0] == 'c')
        {
            for (int i = 0; i < 3; ++i) {
                ans[i] = t[1 + i];
            }
            for (int i = 6; i < 9; ++i) {
                ans[i] = t[1 + i - 3];
            }
        }
    }
    else {
    }
}

void pm() {
    int t, n, p;
    cin >> t >> n >> p;
    for (int i = 0; i < t; ++i) {
        string ans(9, 'a');
        if (n == 3) {
            string f, s;
            cin >> f >> s;
            pp(ans, f, n);
            pp(ans, s, n);
        }
        else if (n == 5) {
            for (int j = 0; j < 3; ++j) {
                string s;
                cin >> s;
                pp(ans, s, n);
            }
        }
    }
}

```

```

        }
        else {

        }
        cout << ans << '\n';
    }

}

int main() {
    ios::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);

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

    string t;
    cin >> t;
    if (t == "split") {
        ps();
    }
    else {
        pm();
    }
}

```

Task E (100)

```
def dist(a, b):
    return (a[0] - b[0]) ** 2 + (a[1] - b[1]) ** 2

n = int(input())
arr = [[0, 0] for i in range(n)]
for i in range(n):
    arr[i] = list(map(int, input().split()))
p = list(map(int, input().split()))
q = list(map(int, input().split()))

v = [q[0] - p[0], q[1] - p[1]]
k = 10 ** 24
q = [p[0] + v[0] * k, p[1] + v[1] * k]

m1 = -1
m2 = -1
for i in range(n):
    if m1 == -1 or dist(q, arr[m1]) > dist(q, arr[i]):
        m2 = m1;
        m1 = i;
    elif m2 == -1 or dist(q, arr[m2]) > dist(q, arr[i]):
        m2 = i;

if m2 != -1 and dist(q, arr[m1]) == dist(q, arr[m2]):
    print(-1);
else:
    print(m1 + 1)
```

Task F (100)

```
#define _CRT_SECURE_NO_WARNINGS
#include<iostream>
#include<string>
#include<vector>
#include<algorithm>
#include<cassert>
#include<random>

using namespace std;
#define ll long long
#define pii pair<ll, ll>
#define x first
#define y second
#define ld long double
const int MN = 1e5 + 111;
ll r[MN], b[MN];

ll tp(int n, int k, int s) {
    mt19937 rnd(s);
    ll ur = 0, ub = 0;
    ll ans = 0;
    for (int i = n - 1; i >= 0; --i) {
        ur += r[i];
        ub += b[i];

        if (ur > k) {
            ans += k;
            ur -= k;
            continue;
        }
        if (ub > k) {
            ans += k;
            ub -= k;
            continue;
        }

        if (rnd() & 1) {
            ans += ub;
            ub = 0;
            continue;
        }
        else {
            ans += ur;
            ur = 0;
            continue;
        }
    }
    return ans;
}

ll tpr(int n, int k) {
    ll ur = 0, ub = 0, upx = 0;
    ll ans = 0;
    for (int i = n - 1; i >= 0; --i) {
        ur += r[i];
        ub += b[i];

        if (ur > k) {
            ans += k;
            ur -= k;
            ans += upx;
            ub -= upx;
            upx = 0;
            continue;
        }
        if (ub > k) {
            ans += k;
            ub -= k;
        }
    }
}
```



```

        ans += upx;
        ur -= upx;
        upx = 0;

        continue;
    }
    if (ub > ur) {
        ans += ub;
        ub = 0;
        ans += upx;
        ur -= upx;
        upx = 0;
        continue;
    }
    else if (ub < ur) {
        ans += ur;
        ur = 0;
        ans += upx;
        ub -= upx;
        upx = 0;
        continue;
    }
    else {
        upx = ur;
    }
}
return ans;
}

int main() {
    ios::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);

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

    int n, k;
    cin >> n >> k;
    for (int i = 0; i < n; ++i) {
        cin >> r[i] >> b[i];
    }
    ll ans = tpr(n, k);
    for (int i = 0; i < 1000; ++i) {
        ans = max(ans, tp(n, k, i + 13));
    }

    cout << ans;
}

```