Олимпиада СПбГУ по информатике 2018/19 учебного года

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A	B	C	D	E	F	Sum
100	100	100	60	44	24	428

Task A (100)

```cpp
#pragma GCC optimize("Ofast")
#include <bits/stdc++.h>

using namespace std;

typedef long long ll;
typedef long double ld;
typedef double dd;
typedef unsigned long long ull;

#define pb push_back;
#define ff first
#define ss second
#define all(x) x.begin(), x.end()
#define db cout << "DEBUG"
//#define io

const double eps = 1e-9;
const int maxn = 1e6;
const int mod = 1e9 + 7;
const int inf = 1e9;

int main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    srand(2281337);
    #ifdef io
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
    #endif

    int n, m;
    cin >> n >> m;
    while(n < m) {
        n *= 2;
    }
    if (n == m) {
        cout << "Yes";

    }
    else {
        cout << "No";
    }

    return 0;
}
```

1

Task B (100)

```cpp
#pragma GCC optimize("Ofast")
#include <bits/stdc++.h>

using namespace std;

typedef long long ll;
typedef long double ld;
typedef double dd;
typedef unsigned long long ull;

#define pb push_back;
#define ff first
#define ss second
#define all(x) x.begin(), x.end()
#define db cout << "DEBUG"
//#define io

const double eps = 1e-9;
const int maxn = 1e6;
const int mod = 1e9 + 7;
const int inf = 1e9;

int main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    srand(2281337);
    #ifdef io
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
    #endif

    int n;
    string s;
    cin >> n >> s;
    for (int i = 0; i < n - 1; i++) {
        if (s[i] == 'o' && s[i + 1] == 'r') {
            cout << "Yes";
            return 0;
        }
        else if (s[i] == 'r' && s[i + 1] == 'o') {
            cout << "Yes";
            return 0;
        }
        else if (i > 0 && s[i - 1] == 'o' && s[i + 1] == 'r') {
            cout << "Yes";
            return 0;
        }
    }
    cout << "No";
    return 0;
}
```

Task C (100)

```cpp
#pragma GCC optimize("Ofast")
#include <bits/stdc++.h>

using namespace std;

typedef long long ll;
typedef long double ld;
typedef double dd;
typedef unsigned long long ull;

#define pb push_back;
#define ff first
#define ss second
#define all(x) x.begin(), x.end()
#define db cout << "DEBUG"
//#define io

const double eps = 1e-9;
const int maxn = 1e5 + 7;
const int mod = 1e9 + 7;
const int inf = 1e9;

vector<int> g[maxn];
int dist[maxn];

int dfs(int v, int p = -1) {
    int res = 1;
    for (int to : g[v]) {
        if (to != p) {
            res += dfs(to, v);
        }
    }
    dist[v] = res;
    return res;
}

int ans[maxn];

void get(int v, int sum = 0, int p = -1) {
    int cnt = 0, out = sum;
    for (int to : g[v]) {
        if (to != p) {
            cnt += dist[to];
            out = max(out, dist[to]);
        }
    }
    ans[v] = out;
    for (int to : g[v]) {
        if (to != p) {
            get(to, sum + cnt - dist[to] + 1, v);
        }
    }

}

int main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    srand(2281337);
    #ifdef io
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
    #endif
    int n;
    cin >> n;
    for (int i = 0; i < n - 1; i++) {
        int a, b;
        cin >> a >> b;
```

```
        g[a].push_back(b);
        g[b].push_back(a);
    }

    dfs(1);
    get(1);
    for (int i = 1; i <= n; i++) {
        cout << ans[i] + 1 << "␣";
    }

    return 0;
}
```

Task D (60)

```cpp
#pragma GCC optimize("Ofast")
#include <bits/stdc++.h>

using namespace std;

typedef unsigned long long ll;
typedef long double ld;
typedef double dd;
typedef unsigned long long ull;

#define pb push_back;
#define ff first
#define ss second
#define all(x) x.begin(), x.end()
#define db cout << "DEBUG"
//#define io

const ld eps = 1e-12;
const int maxn = 1e5 + 7;
const int mod = 1e9 + 7;
const int inf = 1e9;

int main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    srand(2281337);
    #ifdef io
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
    #endif

    string s;
    cin >> s;
    if (s == "split") {
        int t, n, p;
        cin >> t >> n >> p;
        if (n == 3) {
            while (t--) {
                string a, b(p, '.'), c(p, '.');
                cin >> s;
                a = "a" + s;
                a.pop_back(), a.pop_back(), a.pop_back();
                b[0] = 'b', b[1] = s[3], b[2] = s[4], b[3] = s[5], b[4] = s[6], b[5] = s[7], b[6]
                    = s[8];
                c[0] = 'c', c[1] = s[0], c[2] = s[1], c[3] = s[2], c[4] = s[6], c[5] = s[7], c[6]
                    = s[8];
                cout << a << '_' << b << '_' << c << "\n";
            }
        }
        else {
            while (t--) {
                string a, b(p, '.'), c(p, '.');
                cin >> s;
                a = "a" + s;
                a.pop_back(), a.pop_back(), a.pop_back();
                b[0] = 'b', b[1] = s[3], b[2] = s[4], b[3] = s[5], b[4] = s[6], b[5] = s[7], b[6]
                    = s[8];
                c[0] = 'c', c[1] = s[0], c[2] = s[1], c[3] = s[2], c[4] = s[6], c[5] = s[7], c[6]
                    = s[8];
                cout << a << "_" << a << "_" << b << "_" << b << "_" << c << "\n";
            }
        }
    }
    else {
        int t, n, p;
        cin >> t >> n >> p;
        if (n == 3) {
            while (t--) {
```

```cpp
                string a, b, c;
                cin >> a >> b;
                if (a[0] > b[0]) swap(a, b);
                if (a[0] == 'a') {
                    for (int i = 1; i < 7; i++) cout << a[i];
                    cout << b[4] << b[5] << b[6];
                    cout << "\n";
                }
                else {
                    for (int i = 1; i <= 3; i++) cout << b[i];
                    for (int i = 1; i < 7; i++) cout << a[i];
                    cout << '\n';
                }
            }
        }
        else {
            while (t--) {
                string a, b, c;
                cin >> a >> b >> c;
                if (a[0] == b[0]) swap(b, c);

                if (a[0] > b[0]) swap(a, b);
                if (a[0] == 'a') {
                    for (int i = 1; i < 7; i++) cout << a[i];
                    cout << b[4] << b[5] << b[6];
                    cout << "\n";
                }
                else {
                    for (int i = 1; i <= 3; i++) cout << b[i];
                    for (int i = 1; i < 7; i++) cout << a[i];
                    cout << '\n';
                }
            }
        }
    }
    return 0;
}

/*split
4 5 7
passwords
uhaaaaaaa
aaaaaaaaa
plainword

merge
1 5 7
apasswo apasswo bswords bswords cpasrds
auhaaaa auhaaaa baaaaaa baaaaaa cuhaaaa
aaaaaaa aaaaaaa baaaaaa baaaaaa caaaaaa
aplainw aplainw binword binword cplaord
*/
```

Task E (44)

```cpp
#pragma GCC optimize("Ofast")
#include <bits/stdc++.h>

using namespace std;

typedef long long ll;
typedef long double ld;
typedef double dd;
typedef unsigned long long ull;

#define pb push_back;
#define ff first
#define ss second
#define all(x) x.begin(), x.end()
#define db cout << "DEBUG"
//#define io

const ld eps = 1e-12;
const int maxn = 1e5 + 7;
const int mod = 1e9 + 7;
const int inf = 1e9;

ld dist(ld x1, ld y1, ld x2, ld y2) {
    return sqrt((x1 - x2) * (x1 - x2) + (y1 - y2) * (y1 - y2));
}


int main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    srand(2281337);
    #ifdef io
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
    #endif
    int n;
    cin >> n;
    vector<pair<ld, ld>> v(n);
    for (int i = 0; i < n; i++) {
        ld x, y;
        cin >> x >> y;
        v[i] = {x, y};
    }

    ld px, py, qx, qy;
    cin >> px >> py >> qx >> qy;
    if (n > 2 && px == 0 && py == 0 && qy == 0 && qx > 0) {
        int ind = 0;
        for (int i = 1; i < n; i++) {
            if (v[i].ff > v[ind].ff || (v[i].ff == v[ind].ff && abs(v[i].ss) < abs(v[ind].ss)))
                ind = i;
        }
        cout << ind + 1;
        return 0;
    }
    ld k = 2e4;
    ld lx = (qx - px) * k + px, ly = (qy - py) * k + py;
    ld ans = (ld)inf * (ld)inf + 7;
    int ind = -1;
    for (int i = 0; i < n; i++) {
        ld res = dist(lx, ly, v[i].ff, v[i].ss);
        if (res < ans) {
            ans = res;
            ind = i;
        }
    }
    for (int i = 0; i < n; i++) {
```

```cpp
            ld res = dist(lx, ly, v[i].ff, v[i].ss);
            if (ind != i && abs(res - ans) < eps) {
                cout << -1;
                return 0;
            }
        }
    }
    cout << ind + 1;
    return 0;
}
```

Task F (24)

```cpp
#pragma GCC optimize("Ofast")
#include <bits/stdc++.h>

const int FAST_ALLOCATOR_MEMORY = 4e8;
        int allocator_pos = 0;
        char allocator_memory[(int)FAST_ALLOCATOR_MEMORY];
        inline void * operator new ( size_t n ) {
                char *res = allocator_memory + allocator_pos;
                allocator_pos += n;
                assert(allocator_pos <= (int)FAST_ALLOCATOR_MEMORY);
                return (void *)res;
        }
        inline void operator delete ( void * ) noexcept { }

using namespace std;

typedef unsigned long long ll;
typedef long double ld;
typedef double dd;
typedef unsigned long long ull;

#define pb push_back;
#define ff first
#define ss second
#define all(x) x.begin(), x.end()
#define db cout << "DEBUG"
//#define io

const ld eps = 1e-12;
const int maxn = 1e5 + 7;
const int mod = 1e9 + 7;
const int inf = 1e9;

int main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    srand(2281337);
    #ifdef io
    freopen("input.txt", "r", stdin);
    freopen("output.txt", "w", stdout);
    #endif
    int n, k;
    cin >> n >> k;
    map<pair<int, int>, int> dp1, dp2;
    dp1[{0, 0}] = 0;

    for (int i = 0; i < n; i++) {
        int x, y;
        cin >> x >> y;
        for (auto it : dp1) {
            int j = it.ff.ff, t = it.ff.ss;
            dp2[{j + k - min(j + k, x), t - min(t, y)}] = max(dp2[{j + k - min(j + k, x), t - min(
                t, y)}], it.ss + min(j + k, x) + min(t, y));
            dp2[{j - min(j, x), t + k - min(t + k, y)}] = max(dp2[{j - min(j, x), t + k - min(t +
                k, y)}], it.ss + min(j, x) + min(t + k, y));
        }
        dp1 = dp2;
        dp2.clear();
    }
    int ans = 0;
    for (auto it : dp1) {
        ans = max(it.ss, ans);
    }
    cout << ans;
    return 0;
}
```