

Олимпиада СПбГУ по информатике 2022/23 учебного года

A	B	C	D	E	F	Sum
100	100	100	10	52	10	372

Task A ()

```
#define _CRT_SECURE_NO_WARNINGS
#include <iostream>
#include <vector>
#include <iostream>
#include <cmath>
#include <algorithm>
#define endl '\n'

using namespace std;
using ll = long long;
using ld = long double;
const int n = 6;
vector<int> g[n], o;
int us[n];

void dfs(int v) {
    us[v] = 1;
    for (auto u : g[v]) {
        if (!us[u])
            dfs(u);
    }
    o.push_back(v);
}

int main() {
#ifdef _DEBUG
    freopen("input.txt", "r", stdin);
#else
    ios_base::sync_with_stdio(0);
    cin.tie(0);
#endif
    vector<int> x(n);
    vector<int> o;
    for (int t = 0; t < n; t++) {
        cin >> x[t];
        x[t]--;
        vector<int> d;
        for (int i = 0; i < min((int)o.size(), x[t]); i++) {
            d.push_back(o[i]);
        }
        d.push_back(t);
        for (int i = x[t]; i < o.size(); i++)
            d.push_back(o[i]);
        o = d;
    }
    vector<int> ans(n);
    for (int i = 0; i < n; i++) {
        ans[o[i]] = i + 1;
    }
    for (auto& r : ans)
        cout << r << ' ';
}
```

Task B ()

```
#define _CRT_SECURE_NO_WARNINGS
#include <iostream>
#include <vector>
#include <iostream>
#include <cmath>
#include <algorithm>
#define endl '\n'

using namespace std;
using ll = long long;
using ld = long double;

int main() {
#ifdef _DEBUG
    freopen("input.txt", "r", stdin);
#else
    ios_base::sync_with_stdio(0);
    cin.tie(0);
#endif
    string s;
    cin >> s;
    if (s == "first") {
        ll n;
        cin >> n;
        vector<ll> x(n);
        ll s = 0;
        for (auto& r : x) {
            cin >> r;
            s += r;
        }
        cout << s / n + s % n * 1000001;
    }
    else {
        int n;
        cin >> n;
        vector<ll> x(n);
        ll k = 0;
        for (auto& r : x) {
            cin >> r;
            k = r / 1000001;
            r %= 1000001;
        }
        sort(x.begin(), x.end());
        ll ans = 0;
        for (int i = 1; i < n; i++) {
            ans += x[i] - x[0];
        }
        cout << ans + x[0] * n + k;
    }
}
```

Task C ()

```
#define _CRT_SECURE_NO_WARNINGS
#include <iostream>
#include <vector>
#include <iostream>
#include <cmath>
#include <algorithm>
#include <cassert>
#define endl '\n'

using namespace std;
using ll = long long;
using ld = long double;
vector <pair <ll, ll>> x(3), answ;

void f(vector <pair <ll, ll>> x) {
    if (x[1].first + x[2].first == x[0].first && x[1].second == x[2].second) {
        ll a = x[0].first, b = x[0].second - x[1].second;
        if (b < a)
            swap(a, b);
        if (a > 0)
            answ.push_back({ a, b });
    }

    if (x[1].first + x[2].first < x[0].first && x[1].second == x[2].second && x[1].second == x[0].second) {
        ll a = x[0].first - x[1].first - x[2].first, b = x[0].second;
        if (b < a)
            swap(a, b);
        if (a > 0)
            answ.push_back({ a, b });
    }

    if (x[1].second + x[2].second <= x[0].second && x[2].first > x[0].first - x[1].first) {
        ll a = x[0].first - x[1].first;
        ll b = x[1].second;
        if (b < a)
            swap(a, b);

        if (a > 0)
            answ.push_back({ a, b });
    }

    if (x[1].second + x[2].second == x[0].second && x[2].first >= x[0].first - x[1].first) {
        ll a = x[0].first - x[1].first;
        ll b = x[1].second;
        if (b < a)
            swap(a, b);

        if (a > 0)
            answ.push_back({ a, b });
    }

    if (x[1].first == x[0].first && x[1].second < x[0].second) {
        ll a = x[0].first;
        ll b = x[0].second - x[1].second;
        if (b < a)
            swap(a, b);
        if (a > 0)
            answ.push_back({ a, b });
    }

    if (x[1].first == x[0].first && x[2].first <= x[0].first) {
        ll a = x[0].first;
        ll b = x[0].second - x[2].second - x[1].second;
        if (b < a)
            swap(a, b);
        if (a > 0)
            answ.push_back({ a, b });
    }

    /*if (x[1].first + x[2].first == x[0].first && x[1].second > x[2].second) {
        ll a = x[2].first;
        ll b = x[1].second - x[2].second;
        if (b < a)
            swap(a, b);
        if (a > 0)
            answ.push_back({ a, b });
    }
}
```

```

    }*/
}

void rec(ll gl) {
    if (gl == 3) {
        auto q = x;
        for (ll i = 0; i < 30; i++) {
            f(q);
            next_permutation(q.begin(), q.end());
        }
        return;
    }
    rec(gl + 1);
    swap(x[gl].first, x[gl].second);
    rec(gl + 1);
    swap(x[gl].first, x[gl].second);
}

int main() {
#ifdef _DEBUG
    freopen("input.txt", "r", stdin);
#else
    ios_base::sync_with_stdio(0);
    cin.tie(0);
#endif
    for (auto& r : x) {
        cin >> r.first >> r.second;
        if (r.first > r.second)
            swap(r.first, r.second);
    }
    sort(x.begin(), x.end());
    reverse(x.begin(), x.end());
    answ.push_back(x[0]);
    answ.push_back(x[1]);
    answ.push_back(x[2]);
    rec(0);
    sort(answ.begin(), answ.end());
    answ.erase(unique(answ.begin(), answ.end()), answ.end());
    for (auto& r : answ)
        cout << r.first << ' ' << r.second << endl;
}

```

Task D ()

```

#pragma GCC optimize ("Ofast")
#define _CRT_SECURE_NO_WARNINGS
#include <iostream>
#include <vector>
#include <iostream>
#include <cmath>
#include <cassert>
#include <map>
#include <algorithm>
// #define endl '\n'

using namespace std;
using ll = long long;
using ld = long double;

bool operator < (vector <int> a, vector <int> b) {
    if (a.size() != b.size())
        return a.size() < b.size();
    for (int i = 0; i < a.size(); i++)
        if (a[i] != b[i])
            return a[i] < b[i];
    return 0;
}

int n, T = 0;
vector <int> a, b;
pair <int, int> go[51][51][51][2][2][2];
pair <int, int> rec(vector <int>& x, vector <int>& f) {
    if (go[x[0]][x[1]][x[2]][f[0]][f[1]][f[2]].first != 0)
        return go[x[0]][x[1]][x[2]][f[0]][f[1]][f[2]];
    pair <int, int> res = { -1, -1 };
    for (int i = 0; i < n; i++) {
        for (int j = 1; j <= x[i]; j++) {
            x[i] -= j;
            if (rec(x, f).first == -1) {
                res = { i + 1, j };
            }
            x[i] += j;
        }
        if (f[i]) {
            int k = x[i];
            x[i] = b[i];
            f[i] = 0;
            if (rec(x, f).first == -1) {
                res = { i + 1, 0 };
            }
            f[i] = 1;
            x[i] = k;
        }
    }
    go[x[0]][x[1]][x[2]][f[0]][f[1]][f[2]] = res;
    return res;
}

int main() {
#ifdef _DEBUG
    // freopen("input.txt", "r", stdin);
#else
    ios_base::sync_with_stdio(0);
    cin.tie(0);
#endif
    cin >> n;
    vector <int> ff(3);
    a.resize(3);
    for (int i = 0; i < n; i++)
        cin >> a[i], ff[i] = 1;
    b = a;
    while (1) {
        auto q = rec(a, ff);
        q.first--;
        if (q.first == -2) {
            cout << q.first + 1 << ' ' << q.second << endl;
        }
    }
}

```

```

        return 0;
    }
    cout << q.first + 1 << ' ' << q.second << endl;
    if (q.second)
        a[q.first] -= q.second;
    else {
        ff[q.first] = 0;
        a[q.first] = b[q.first];
    }
    int z1, z2;
    cin >> z1 >> z2;
    if (z1 == -1) {
        return 0;
    }
    else {
        if (z2)
            a[z1 - 1] -= z2;
        else {
            ff[z1 - 1] = 0;
            a[z1 - 1] = b[z1 - 1];
        }
    }
}
}

```

Task E ()

```
#define _CRT_SECURE_NO_WARNINGS
#include <iostream>
#include <vector>
#include <iostream>
#include <cmath>
#include <algorithm>
#define endl '\n'

using namespace std;
using ll = long long;
using ld = long double;

void solve1() {
    int n, T = 0;
    cin >> n;
    vector<int> k(10);
    for (int i = 0; i < 10; i++) {
        if ((n >> i) & 1) {
            k[T] = i + 1;
            T++;
        }
    }
    for (int i = 0; i < 10; i++) {
        for (int j = 0; j < 10; j++) {
            cout << (j < k[i]);
        }
        cout << endl;
    }
}

void solve2() {
    ll ans = 0;
    for (int i = 0; i < 10; i++) {
        int k = 0;
        for (int j = 0; j < 10; j++) {
            char a;
            cin >> a;
            k += a - '0';
        }
        if (k != 0)
            ans += (1ll << (k - 1));
    }
    cout << ans;
}

int main() {
#ifdef _DEBUG
    freopen("input.txt", "r", stdin);
#else
    ios_base::sync_with_stdio(0);
    cin.tie(0);
#endif
    int t;
    string s;
    cin >> t >> s;
    while (t--) {
        if (s == "transmit")
            solve1();
        else
            solve2();
        cout << endl;
    }
}
```

Task F ()

```
#define _CRT_SECURE_NO_WARNINGS
#include <iostream>
#include <vector>
#include <iostream>
#include <cmath>
#include <algorithm>
#define endl '\n'

using namespace std;
using ll = long long;
using ld = long double;

int main() {
#ifdef _DEBUG
    freopen("input.txt", "r", stdin);
#else
    ios_base::sync_with_stdio(0);
    cin.tie(0);
#endif
    string a, b;
    cin >> a >> b;
    reverse(a.begin(), a.end());
    reverse(b.begin(), b.end());
    while (a.size() < b.size())
        a.push_back('0');
    while (a.size() > b.size())
        b.push_back('0');

    int m = max(a.size(), b.size());
    vector<int> res(m + 1, 0);
    for (int i = 0; i < m; i++) {
        res[i] += a[i] - '0' + b[i] - '0';
        res[i + 1] += res[i] / 10;
        res[i] %= 10;
    }
    while (res.back() == 0)
        res.pop_back();
    reverse(res.begin(), res.end());
    for (auto& r : res)
        cout << r;
}
```