

Олимпиада СПбГУ по информатике 2022/23 учебного года

A	B	C	D	E	F	Sum
100	100	100	30	52	65	447

Task A ()

```
/* Optimizations */
// #pragma GCC optimize("Ofast,unroll-loops")
// #pragma GCC target("avx,avx2,fma")
/* Includes */
#include <bits/stdc++.h>
using namespace std;
/* Bindings */
using ll = long long;
using ull = unsigned long long;
using ld = long double;
using pi = pair<int, int>;
using pll = pair<ll, ll>;
using vi = vector<int>;
using vll = vector<ll>;
using vpi = vector<pi>;
using vpll = vector<pll>;
/* Debug */
template <typename A, typename B>
ostream &operator<<(ostream &os, const pair<A, B> &p) {
    return os << '(' << p.first << ", " << p.second << ')';
}
template <typename T_container, typename T = typename enable_if<
    !is_same<T_container, string>::value,
    typename T_container::value_type>::type>
ostream &operator<<(ostream &os, const T_container &v) {
    os << '{';
    string sep;
    for (const T &x : v)
        os << sep << x, sep = ", ";
    return os << '}';
}
void dbg_out() { cerr << endl; }
template <typename Head, typename... Tail> void dbg_out(Head H, Tail... T) {
    cerr << ' ' << H;
    dbg_out(T...);
}
#define dbg(...) cerr << "(" << #__VA_ARGS__ << "):", dbg_out(__VA_ARGS__)

/* Solution */
void solve() {
    //23fin0278 andfumeth
    vi res;
    for (int i = 0; i < 6; ++i) {
        int d;
        cin >> d;
        res.insert(res.begin() + d - 1, i);
    }
    vi rres(6);
    for (int i = 0; i < 6; ++i) {
        rres[res[i]] = i;
    }
    for (int i = 0; i < 6; ++i) {
        cout << rres[i] + 1 << " ";
    }
}
```

```
int main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
    int t = 1;
    // freopen("test", "r", stdin);
    // cin >> t;
    while (t--) {
        solve();
    }
    return 0;
}
```

Task B ()

```
/* Optimizations */
// #pragma GCC optimize("Ofast,unroll-loops")
// #pragma GCC target("avx,avx2,fma")
/* Includes */
#include <bits/stdc++.h>
using namespace std;
/* Bindings */
using ll = long long;
using ull = unsigned long long;
using ld = long double;
using pi = pair<int, int>;
using pll = pair<ll, ll>;
using vi = vector<int>;
using vll = vector<ll>;
using vpi = vector<pi>;
using vpll = vector<pll>;
/* Debug */
template <typename A, typename B>
ostream &operator<<(ostream &os, const pair<A, B> &p) {
    return os << '(' << p.first << ",_" << p.second << ')';
}
template <typename T_container, typename T = typename enable_if<
    !is_same<T_container, string>::value,
    typename T_container::value_type>::type>
ostream &operator<<(ostream &os, const T_container &v) {
    os << '{';
    string sep;
    for (const T &x : v)
        os << sep << x, sep = ",_";
    return os << '}';
}
void dbg_out() { cerr << endl; }
template <typename Head, typename... Tail> void dbg_out(Head H, Tail... T) {
    cerr << '{' << H;
    dbg_out(T...);
}
#define dbg(...) cerr << "(" << #__VA_ARGS__ << "):", dbg_out(__VA_ARGS__)

/* Solution */
void solve() {
    //23fin0278 andfumeth
    string s;
    getline(cin, s);
    ll n;
    cin >> n;
    vi a(n);
    ll sum = 0;
    for (auto &x : a) cin >> x, sum += x;
    if (s[0] == 'f') {
        cout << sum * 100000ll;
    } else {
        ll sb = sum % 100000ll;
        ll sa = (sum / 100000ll) / n;
        cout << sb + sa;
    }
}

int main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
    int t = 1;
    // freopen("test", "r", stdin);
    // cin >> t;
    while (t--) {
        solve();
    }
    return 0;
}
```

Task C ()

```

/* Optimizations */
// #pragma GCC optimize("Ofast,unroll-loops")
// #pragma GCC target("avx,avx2,fma")
/* Includes */
#include <bits/stdc++.h>
using namespace std;
/* Bindings */
using ll = long long;
using ull = unsigned long long;
using ld = long double;
using pi = pair<int, int>;
using pll = pair<ll, ll>;
using vi = vector<int>;
using vll = vector<ll>;
using vpi = vector<pi>;
using vpll = vector<pll>;
/* Debug */
template <typename A, typename B>
ostream &operator<<(ostream &os, const pair<A, B> &p) {
    return os << '(' << p.first << ",_" << p.second << ')';
}
template <typename T_container, typename T = typename enable_if<
    !is_same<T_container, string>::value,
    typename T_container::value_type>::type>
ostream &operator<<(ostream &os, const T_container &v) {
    os << '{';
    string sep;
    for (const T &x : v)
        os << sep << x, sep = ",_";
    return os << '}';
}
void dbg_out() { cerr << endl; }
template <typename Head, typename... Tail> void dbg_out(Head H, Tail... T) {
    cerr << ' _ ' << H;
    dbg_out(T...);
}
#define dbg(...) cerr << "(" << #__VA_ARGS__ << "):", dbg_out(__VA_ARGS__)

/* Solution */
void solve() {
    //23fin0278 andfumeth
    array<array<int, 2>, 3> b;
    vector<array<int, 2>> res;
    for (int i = 0; i < 3; ++i) {
        cin >> b[i][0] >> b[i][1];
    }
    for (int i = 0; i < 3; ++i) {
        res.push_back({b[i][0], b[i][1]});
    }
    for (int i = 0; i < 3; ++i) {
        for (int j = 0; j < 3; ++j) {
            if (i == j) continue;
            for (int m = 0; m < (1 << 2); ++m) {
                array<int, 2> sp;
                for (int mm = 0; mm < 2; ++mm) {
                    if (m & (1 << mm)) sp[mm] = 1;
                    else sp[mm] = 0;
                }
                if (b[i][0] ^ sp[0] == b[j][0] ^ sp[1]) {
                    res.push_back({b[i][0] ^ sp[0], b[i][1] ^ sp[0] - b[j][1] ^ sp[1]});
                }
            }
        }
    }
    for (int i = 0; i < 3; ++i) {
        for (int j = 0; j < 3; ++j) {
            if (i == j) continue;
            int k = 3 - i - j;
            for (int m = 0; m < (1 << 3); ++m) {
                array<int, 3> sp;
                for (int mm = 0; mm < 3; ++mm) {
                    if (m & (1 << mm)) sp[mm] = 1;

```

```

        else sp[nm] = 0;
    }
    if (b[i][0 ^ sp[0]] == b[j][0 ^ sp[1]] + b[k][0 ^ sp[2]] and b[j][1 ^ sp[1]] == b[
        k][1 ^ sp[2]]) {
        res.push_back({b[i][0 ^ sp[0]], b[i][1 ^ sp[0]] - b[j][1 ^ sp[1]]});
    }
    if (b[i][0 ^ sp[0]] >= b[j][0 ^ sp[1]] + b[k][0 ^ sp[2]] and max(b[j][1 ^ sp[1]],
        b[k][1 ^ sp[2]]) <= b[i][1 ^ sp[0]]) {
        res.push_back({b[j][0 ^ sp[1]], b[i][1 ^ sp[0]] - b[j][1 ^ sp[1]]});
    }
    if (b[i][1 ^ sp[0]] >= b[j][1 ^ sp[1]] + b[k][1 ^ sp[2]] and max(b[j][0 ^ sp[1]],
        b[k][0 ^ sp[2]]) <= b[i][0 ^ sp[0]]) {
        res.push_back({b[j][1 ^ sp[1]], b[i][0 ^ sp[0]] - b[j][0 ^ sp[1]]});
    }
    if (b[i][0 ^ sp[0]] == b[j][0 ^ sp[1]] and b[i][0 ^ sp[0]] == b[k][0 ^ sp[2]]) {
        res.push_back({b[i][0 ^ sp[0]], b[i][1 ^ sp[0]] - b[j][1 ^ sp[1]] - b[k][1 ^
            sp[2]]});
    }
}
}
}
for (auto &[x, y] : res) {
    if (x > y) swap(x, y);
}
sort(res.begin(), res.end());
res.resize(unique(res.begin(), res.end()) - res.begin());
for (auto &[x, y] : res) {
    if (x < 1 or y < 1) continue;
    cout << x << " " << y << "\n";
}
}

int main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
    int t = 1;
    // freopen("test", "r", stdin);
    // cin >> t;
    while (t--) {
        solve();
    }
    return 0;
}

```

Task D ()

```
/* Optimizations */
// #pragma GCC optimize("Ofast,unroll-loops")
// #pragma GCC target("avx,avx2,fma")
/* Includes */
#include <bits/stdc++.h>
using namespace std;
/* Bindings */
using ll = long long;
using ull = unsigned long long;
using ld = long double;
using pi = pair<int, int>;
using pll = pair<ll, ll>;
using vi = vector<int>;
using vll = vector<ll>;
using vpi = vector<pi>;
using vpll = vector<pll>;
/* Debug */
template <typename A, typename B>
ostream &operator<<(ostream &os, const pair<A, B> &p) {
    return os << '(' << p.first << ", " << p.second << ')';
}
template <typename T_container, typename T = typename enable_if<
    !is_same<T_container, string>::value,
    typename T_container::value_type>::type>
ostream &operator<<(ostream &os, const T_container &v) {
    os << '{';
    string sep;
    for (const T &x : v)
        os << sep << x, sep = ", ";
    return os << '}';
}
void dbg_out() { cerr << endl; }
template <typename Head, typename... Tail> void dbg_out(Head H, Tail... T) {
    cerr << ' ' << H;
    dbg_out(T...);
}
#define dbg(...) cerr << "(" << #__VA_ARGS__ << "):", dbg_out(__VA_ARGS__)

int dp[51][51][51][2][2][2];
array<vi, 2> p[51][51][51][2][2][2];
vi now;
int calc(vi a, vi u) {
    auto &cur = dp[a[0]][a[1]][a[2]][u[0]][u[1]][u[2]];
    auto &l = p[a[0]][a[1]][a[2]][u[0]][u[1]][u[2]];
    if (cur != -1) {
        return cur;
    }
    vi uc = u, ac = a;
    for (int i = 0; i < 3; ++i) {
        uc[i] = 0;
        ac[i] = now[i];
        if (u[i]) {
            if (!calc(ac, uc)) {
                l = {ac, uc}, (cur = 1);
                return 1;
            }
        }
        ac[i] = a[i];
        uc[i] = u[i];
    }
    for (int i = 0; i < 3; ++i) {
        for (int j = 1; j <= ac[i]; ++j) {
            ac[i] -= j;
            if (!calc(ac, u)) {
                l = {ac, u}, (cur = 1);
                return 1;
            }
            ac[i] = a[i];
        }
    }
    cur = 0;
    return 0;
}
```

```

}

/* Solution */
void solve() {
    //23fin0278 andfumeth
    int n;
    cin >> n;
    vi a(n), used(n);
    for (auto &x : a) cin >> x;
    now = a;
    for (int i = 0; i < 51; ++i) {
        for (int j = 0; j < 51; ++j) {
            for (int k = 0; k < 51; ++k) {
                for (int l : {0, 1}) {
                    for (int d : {0, 1}) {
                        for (int p : {0, 1}) {
                            dp[i][j][k][l][d][p] = -1;
                        }
                    }
                }
            }
        }
    }

    dp[0][0][0][0][0][0] = 0;
    if (n == 1) {
        while (true) {
            cout << 1 << "\u" << a[0] << endl;
            int x, y; cin >> x >> y;
            if (x == -1) return;
        }
    } else if (n <= 3) {
        //memset(dp, 0, sizeof dp);
        if (n == 2) a.push_back(0);
        vi u = {1, 1, 0};
        if (n == 3) u.back() = 1;
        if (calc(a, u)) {
            while (true) {
                assert(calc(a, u));
                auto &l = p[a[0]][a[1]][a[2]][u[0]][u[1]][u[2]];
                if (l[1] == u) {
                    for (int i = 0; i < 3; ++i) {
                        if (a[i] != l[0][i]) {
                            cout << i + 1 << "\u" << a[i] - l[0][i] << endl;
                        }
                    }
                } else {
                    for (int i = 0; i < 3; ++i) {
                        if (u[i] != l[1][i]) {
                            cout << i + 1 << "\u" << 0 << endl;
                        }
                    }
                }
            }
            a = l[0];
            u = l[1];
            int x, y; cin >> x >> y;
            if (x == -1) return;
            --x;
            if (y == 0) {
                u[x] = 0;
                a[x] = now[x];
            } else {
                a[x] -= y;
            }
        }
    } else {
        cout << -1 << "\u" << -1 << endl;
    }
    } else {
        assert(1 == 0);
    }
}

int main() {

```

```
// ios_base::sync_with_stdio(false);  
// cin.tie(0);  
// cout.tie(0);  
int t = 1;  
// freopen("test", "r", stdin);  
// cin >> t;  
while (t--) {  
    solve();  
}  
return 0;  
}
```


Task E ()

```

/* Optimizations */
// #pragma GCC optimize("Ofast,unroll-loops")
// #pragma GCC target("avx,avx2,fma")
/* Includes */
#include <bits/stdc++.h>
using namespace std;
/* Bindings */
using ll = long long;
using ull = unsigned long long;
using ld = long double;
using pi = pair<int, int>;
using pll = pair<ll, ll>;
using vi = vector<int>;
using vll = vector<ll>;
using vpi = vector<pi>;
using vpll = vector<pll>;
/* Debug */
template <typename A, typename B>
ostream &operator<<(ostream &os, const pair<A, B> &p) {
    return os << '(' << p.first << ",_" << p.second << ')';
}
template <typename T_container, typename T = typename enable_if<
    !is_same<T_container, string>::value,
    typename T_container::value_type>::type>
ostream &operator<<(ostream &os, const T_container &v) {
    os << '{';
    string sep;
    for (const T &x : v)
        os << sep << x, sep = ",_";
    return os << '}';
}
void dbg_out() { cerr << endl; }
template <typename Head, typename... Tail> void dbg_out(Head H, Tail... T) {
    cerr << ' _ ' << H;
    dbg_out(T...);
}
#define dbg(...) cerr << "(" << #__VA_ARGS__ << "):", dbg_out(__VA_ARGS__)

map<array<vi, 2>, int> res;
map<int, vi> rr;
vi v;
void precalc(int i = 0) {
    if (i == 10) {
        rr[res.size()] = v;
        res[{v, v}] = res.size();
        return;
    }
    if (!i) {
        for (int j = 0; j <= 10; ++j) {
            v[i] = j;
            precalc(i + 1);
        }
    } else {
        for (int j = v[i - 1]; j <= 10; ++j) {
            v[i] = j;
            precalc(i + 1);
        }
    }
}

/* Solution */
void solve() {
    //23fin0278 andfumeth
    v.resize(10);
    precalc();
    dbg(res.size());
    int n;
    cin >> n;
    string s;
    getline(cin, s);
    getline(cin, s);
    if (s[0] == 't') {

```

```

    for (int t = 0; t < n; ++t) {
        int x; cin >> x;
        vector<vi> r(10, vi(10));
        vi z = rr[x];
        for (int i = 0; i < 10; ++i) {
            for (int j = 0; j < z[i]; ++j) {
                r[i][j] = 1;
            }
        }
        for (int i = 0; i < 10; ++i) {
            for (int j = 0; j < 10; ++j) cout << r[i][j];
            cout << "\n";
        }
        cout << "\n";
    }
} else {
    for (int t = 0; t < n; ++t) {
        vector<vi> r(10, vi(10));
        vi z;
        for (int i = 0; i < 10; ++i) {
            int ss = 0;
            for (int j = 0; j < 10; ++j) {
                char c; cin >> c;
                if (c == '1') ss++;
            }
            z.push_back(ss);
        }
        sort(z.begin(), z.end());
        cout << res[{z, z}] << "\n";
    }
}

}

int main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
    int t = 1;
    // freopen("test", "r", stdin);
    // cin >> t;
    while (t--) {
        solve();
    }
    return 0;
}

```

Task F ()

```
/* Optimizations */
// #pragma GCC optimize("Ofast,unroll-loops")
// #pragma GCC target("avx,avx2,fma")
/* Includes */
#include <bits/stdc++.h>
using namespace std;
/* Bindings */
using ll = long long;
using ull = unsigned long long;
using ld = long double;
using pi = pair<int, int>;
using pll = pair<ll, ll>;
using vi = vector<int>;
using vll = vector<ll>;
using vpi = vector<pi>;
using vpll = vector<pll>;
/* Debug */
template <typename A, typename B>
ostream &operator<<(ostream &os, const pair<A, B> &p) {
    return os << '(' << p.first << ",_" << p.second << ')';
}
template <typename T_container, typename T = typename enable_if<
    !is_same<T_container, string>::value,
    typename T_container::value_type>::type>
ostream &operator<<(ostream &os, const T_container &v) {
    os << '{';
    string sep;
    for (const T &x : v)
        os << sep << x, sep = ",_";
    return os << '}';
}
void dbg_out() { cerr << endl; }
template <typename Head, typename... Tail> void dbg_out(Head H, Tail... T) {
    cerr << '{' << H;
    dbg_out(T...);
}
#define dbg(...) cerr << "(" << #__VA_ARGS__ << "):", dbg_out(__VA_ARGS__)

/* Solution */
void solve() {
    //23fin0278 andfumeth
    string a, b;
    cin >> a >> b;
    vi res(1000);
    int i = 0;
    for (int i = 0; i < a.size(); ++i) {
        res[i] += a[i] - '0';
    }
    for (int i = 0; i < b.size(); ++i) {
        res[i] += b[i] - '0';
    }
    for (int i = 0; i < res.size() - 1; ++i) {
        res[i + 1] += res[i] / 10;
        res[i] %= 10;
    }
    i = res.size() - 1;
    while (!res[i]) --i;
    for (int j = i; j >= 0; --j) {
        cout << res[j];
    }
}

int main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
    int t = 1;
    // freopen("test", "r", stdin);
    // cin >> t;
    while (t--) {
        solve();
    }
}
```

```
}    return 0;
```