

# Олимпиада СПбГУ по информатике 2022/23 учебного года

A	B	C	D	E	F	Sum
100	100	100	60	16	10	386

## Task A ()

```
#include <bits/stdc++.h>

using namespace std;
typedef long long ll;

void solve() {
    vector<int> a, ans(6);
    for (int i = 0; i < 6; ++i) {
        int di;
        cin >> di;
        a.insert(a.begin() + di - 1, i);
    }
    for (int i = 0; i < 6; ++i) {
        ans[a[i]] = i + 1;
    }
    for (int x : ans) {
        cout << x << " ";
    }
    cout << "\n";
}

int main() {
#ifdef NEKSTAS
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
#endif
    int t = 1;
    // cin >> t;
    for (int i = 0; i < t; ++i) {
        solve();
    }
}
```

## Task B ()

```
#include <bits/stdc++.h>

using namespace std;
typedef long long ll;

void solve1() {
    int n, s = 0;
    cin >> n;

    vector<int> a(n);
    for (int i = 0; i < n; ++i) {
        cin >> a[i];
        s += a[i];
    }

    cout << s * 101 << "\n";
}

void solve2() {
    int n, s = 0;
    cin >> n;

    vector<int> b(n);
    for (int i = 0; i < n; ++i) {
        cin >> b[i];
        s += b[i] % 101;
    }
    s += b[0] / 101;

    cout << s << "\n";
}

void solve() {
    string t;
    cin >> t;

    if (t == "first") {
        solve1();
    } else {
        solve2();
    }
}

int main() {
#ifdef NEKSTAS
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
#endif
    int t = 1;
    // cin >> t;
    for (int i = 0; i < t; ++i) {
        solve();
    }
}
```

## Task C ()

```
#include <bits/stdc++.h>

using namespace std;
typedef long long ll;

pair<int, int> sort(pair<int, int> a) {
    if (a.second < a.first) swap(a.first, a.second);
    return a;
}

void solve() {
    vector<int> a(3), b(3);
    for (int i = 0; i < 3; ++i) {
        cin >> a[i] >> b[i];
        if (b[i] < a[i]) swap(a[i], b[i]);
    }

    set<pair<int, int>> ans;
    for (int i = 0; i < 3; ++i) {
        ans.insert({a[i], b[i]});
    }

    for (int i = 0; i < 3; ++i) {
        for (int j = 0; j < 3; ++j) {
            if (i == j) continue;
            for (int z1 = 0; z1 < 2; ++z1) {
                for (int z2 = 0; z2 < 2; ++z2) {
                    if (a[i] == a[j]) {
                        ans.insert(sort({a[i], abs(b[i] - b[j])}));
                    }
                    swap(a[j], b[j]);
                }
                swap(a[i], b[i]);
            }
        }
    }

    for (int i = 0; i < 3; ++i) {
        for (int j = 0; j < 3; ++j) {
            for (int k = 0; k < 3; ++k) {
                if (i == j || i == k || j == k) continue;
                for (int z1 = 0; z1 < 2; ++z1) {
                    for (int z2 = 0; z2 < 2; ++z2) {
                        for (int z3 = 0; z3 < 2; ++z3) {
                            if (a[i] == a[j] && a[j] == a[k] && b[i] + b[j] <= b[k]) {
                                ans.insert(sort({a[i], b[k] - b[i] - b[j]}));
                            }
                            if (a[i] + a[j] == a[k] && b[i] == b[j] && b[k] > b[i]) {
                                ans.insert(sort({a[k], b[k] - b[i]}));
                            }
                            if (a[i] <= a[k] && a[k] - a[j] > 0 && a[k] - a[j] < a[i] && b[j] + b[i] <= b[k]) {
                                ans.insert(sort({a[k] - a[j], b[j]}));
                            }
                            if (a[i] + a[j] == a[k] && b[i] + b[j] == a[k]) {
                                ans.insert(sort({b[j], a[i]}));
                                ans.insert(sort({b[i], a[j]}));
                            }
                            if (a[i] + a[j] < a[k] && b[i] <= b[k] && b[j] == b[k]) {
                                if (b[i] < b[k]) {
                                    ans.insert(sort({a[i], b[k] - b[i]}));
                                }
                                ans.insert(sort({a[k] - a[i] - a[j], b[k]}));
                            }
                        }
                        swap(a[k], b[k]);
                    }
                    swap(a[j], b[j]);
                }
                swap(a[i], b[i]);
            }
        }
    }
}
```

```

        }
    }

    for (auto x : ans) {
        if (x.first <= 0 || x.second <= 0) continue;
        cout << x.first << " " << x.second << "\n";
    }
}

int main() {
#ifdef NEKSTAS
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
#endif
    int t = 1;
    //    cin >> t;
    for (int i = 0; i < t; ++i) {
        solve();
    }
}

```

## Task D ()

```
#pragma GCC optimize("O3")
#include <bits/stdc++.h>

using namespace std;
typedef long long ll;

int n;
vector<int> a(3);

typedef array<int, 3> state;
map<state, bool> g;
map<state, state> gt;

bool game(state s) {
    if (!g.count(s)) {
        bool ok = false;

        for (int i = 0; i < n; ++i) {
            int x = abs(s[i]) - 1, xs = s[i] / abs(s[i]);

            state ns = s;
            ns[i] = -(a[i] + 1);
            if (xs == 1 && !game(ns)) {
                ok = true;
                gt[s] = ns;
            }

            for (int j = 1; !ok && j <= x; ++j) {
                ns[i] = s[i] - j * xs;
                if (!game(ns)) {
                    ok = true;
                    gt[s] = ns;
                }
            }
        }

        g[s] = ok;
    }
    return g[s];
}

void solve() {
    cin >> n;
    for (int i = 0; i < n; ++i) {
        cin >> a[i];
    }

    state s;
    if (n == 1) {
        s = {a[0] + 1, -1, -1};
    } else if (n == 2) {
        s = {a[0] + 1, a[1] + 1, -1};
    } else if (n == 3) {
        s = {a[0] + 1, a[1] + 1, a[2] + 1};
    }

    if (!game(s)) {
        cout << "-1_1" << endl;
        return;
    }

    while (true) {
        state ns = gt[s];
        for (int i = 0; i < n; ++i) {
            if (s[i] > 0 && ns[i] < 0) {
                cout << i + 1 << "┘" << 0 << endl;
            } else if (abs(ns[i]) < abs(s[i])) {
                cout << i + 1 << "┘" << abs(ns[i] - s[i]) << endl;
            }
        }
    }
}
```

```

        s = ns;
        assert(!game(s));

        int m1, m2;
        cin >> m1 >> m2;
        if (m1 == -1 && m2 == -1) break;
        m1--;

        if (m2 == 0) {
            s[m1] = -(a[m1] + 1);
        } else {
            s[m1] -= m2 * (s[m1] / abs(s[m1]));
        }
        assert(game(s));
    }
}

int main() {
#ifdef NEKSTAS
    // ios_base::sync_with_stdio(false);
    // cin.tie(nullptr);
#endif
    int t = 1;
    // cin >> t;
    for (int i = 0; i < t; ++i) {
        solve();
    }
}

```

## Task E ()

```
#include <bits/stdc++.h>

using namespace std;
typedef long long ll;

void solve1() {
    int n;
    cin >> n;

    for (int i = 0; i < 10; ++i) {
        int d = 0;
        if ((n >> i) & 1) d = i + 1;
        for (int j = 0; j < d; ++j) {
            cout << "1";
        }
        for (int j = d; j < 10; ++j) {
            cout << "0";
        }
        cout << "\n";
    }
}

void solve2() {
    int n = 0;

    vector<string> a(10);
    for (int i = 0; i < 10; ++i) {
        cin >> a[i];
        int k = (int) count(a[i].begin(), a[i].end(), '1');
        if (k != 0) {
            n += (1 << (k - 1));
        }
    }

    cout << n << "\n";
}

void solve() {
    int t;
    string s;
    cin >> t >> s;

    for (int i = 0; i < t; ++i) {
        if (s == "transmit") {
            solve1();
        } else {
            solve2();
        }
    }
}

int main() {
#ifdef NEKSTAS
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
#endif
    int t = 1;
    // cin >> t;
    for (int i = 0; i < t; ++i) {
        solve();
    }
}
```

## Task F ()

```
#pragma GCC optimize("O3")
#include <bits/stdc++.h>

using namespace std;
typedef long long ll;

vector<pair<ll, ll>> str2w(string s) {
    vector<pair<ll, ll>> w;

    for (ll i = 0; i < (ll) s.size(); ++i) {
        if (s[i] != '(') {
            w.push_back({s[i] - '0', 1});
        } else {
            ll d = 0;
            for (i++; s[i] != '|'; ++i) {
                d = 10 * d + (s[i] - '0');
            }
            ll c = 0;
            for (i++; s[i] != ')'; ++i) {
                c = 10 * c + (s[i] - '0');
            }
            w.push_back({d, c});
        }
    }

    reverse(w.begin(), w.end());
    return w;
}

void solve() {
    string a, b;
    cin >> a >> b;

    auto wa = str2w(a), wb = str2w(b);
    ll n = 0, m = 0;
    for (auto x : wa) {
        n += x.second;
    }
    for (auto x : wb) {
        m += x.second;
    }

    if (n < m) {
        wa.push_back({0, m - n + 1});
        wb.push_back({0, 1});
        n = m;
    } else {
        wb.push_back({0, n - m + 1});
        wa.push_back({0, 1});
        m = n;
    }

    vector<pair<ll, ll>> ans;
    ll i = 0, j = 0, pa = -1, pb = -1, d = 0;
    ll si = 0, sj = 0, k = 0;
    while (k <= n && i < wa.size() && j < wb.size()) {
        while (k >= si + wa[i].second) {
            si += wa[i].second;
            ++i;
        }
        while (k >= sj + wb[j].second) {
            sj += wb[j].second;
            ++j;
        }

        // cerr << wa[i].first << " " << wb[j].first << "\n";
        if (pa == wa[i].first && pb == wb[j].first && d == (wa[i].first + wb[j].first + d) / 10) {
            // cerr << k << " -> 1\n";
            ll z = min(si + wa[i].second, sj + wb[j].second);
            ans.push_back({(wa[i].first + wb[j].first + d) % 10, z - k});
        }
    }
}
```



```

        k = z;
    } else {
//      cerr << k << " -> 2: " << (wa[i].first + wb[j].first + d) % 10 << " \n";
      ans.push_back({(wa[i].first + wb[j].first + d) % 10, 1});
      k++;
      d = (wa[i].first + wb[j].first + d) / 10;
      pa = wa[i].first;
      pb = wb[j].first;
    }
  }

  reverse(ans.begin(), ans.end());
  for (auto x : ans) {
    if (x.second == 1) cout << x.first;
    else cout << "(" << x.first << "|" << x.second << ")";
  }
  cout << " \n";

//      cerr << "k, n, m: " << k << " " << n << " " << m << " \n";
//      for (auto x : wa) {
//          cerr << x.first << "," << x.second << " ";
//      }
//      cerr << " \n";
//      for (auto x : wb) {
//          cerr << x.first << "," << x.second << " ";
//      }
//      cerr << " \n";
//  }

int main() {
#ifdef NEKSTAS
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
#endif
    ll t = 1;
//    cin >> t;
    for (ll i = 0; i < t; ++i) {
        solve();
    }
}

```