

# Олимпиада СПбГУ по информатике 2022/23 учебного года

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

## Task A ()

```
#pragma GCC optimize("O3")

#include <iostream>
#include <vector>
#include <string>
#include <algorithm>
#include <cmath>
#include <queue>
#include <set>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <cassert>
#include <chrono>
#include <random>
#include <fstream>
#include <iomanip>
#include <bitset>
#include <list>
#include <complex>

using namespace std;

#define endl '\n'
#define int long long
#define float long double

#ifdef LOCAL
ifstream input("input");
#define cin input
#endif

#define debug(x) cerr << #x << " = " << (x) << endl

random_device rd;
#ifdef int
mt19937_64
#else
mt19937
#endif
rng(rd());

template<class T> int ckmin(T &a, const T &b) {
    if (b < a) {
        a = b;
        return 1;
    }
    return 0;
}

template<class T> int ckmax(T &a, const T &b) {
    if (b > a) {
        a = b;
        return 1;
    }
    return 0;
}
```



```

}

int bit_i(int n, int i) {
    return (n >> i) & 1;
}

int mpow(int a, int n, int mod) {
    int ans = 1;
    while (n) {
        if (n & 1) {
            ans *= a;
            ans %= mod;
        }
        a *= a;
        a %= mod;
        n >>= 1;
    }
    return ans;
}

vector<int> mods{(int) 1e9 + 7, (int) 1e9 + 9, 998244353};

void solve() {
    int n = 6;
    vector<int> st;
    for (int i = 0; i < n; ++i) {
        int j;
        cin >> j;
        --j;
        st.insert(st.begin() + j, i);
    }
    vector<int> ans(n);
    for (int i = 0; i < n; ++i) {
        ans[st[i]] = i;
    }
    for (int i = 0; i < n; ++i) {
        cout << ans[i] + 1 << " ";
    }
    cout << endl;
}

int32_t main() {
    int T = 1;
#ifdef LOCAL
    cin >> T;
#else
    ios_base::sync_with_stdio(false);
    cout.tie(nullptr);
    cin.tie(nullptr);
#endif
    for (int i = 1; i <= T; ++i) {
        cerr << "TEST_#" << i << ": " << endl;
        int t = 1;
        //cin >> t;
        while (t--) {
            solve();
        }
    }
    return 0;
}

```



## Task B ()

```
#pragma GCC optimize("O3")

#include <iostream>
#include <vector>
#include <string>
#include <algorithm>
#include <cmath>
#include <queue>
#include <set>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <cassert>
#include <chrono>
#include <random>
#include <fstream>
#include <iomanip>
#include <bitset>
#include <list>
#include <complex>

using namespace std;

#define endl '\n'
#define int long long
#define float long double

// #ifdef LOCAL
// ifstream input("input");
// #define cin input
// #endif

#define debug(x) cerr << #x << " = " << (x) << endl

random_device rd;
#ifdef int
mt19937_64
#else
mt19937
#endif
rng(rd());

template<class T> int ckmin(T &a, const T &b) {
    if (b < a) {
        a = b;
        return 1;
    }
    return 0;
}

template<class T> int ckmax(T &a, const T &b) {
    if (b > a) {
        a = b;
        return 1;
    }
    return 0;
}

int bit_i(int n, int i) {
    return (n >> i) & 1;
}

int mpow(int a, int n, int mod) {
    int ans = 1;
    while (n) {
        if (n & 1) {
            ans *= a;
            ans %= mod;
        }
        a *= a;
        a %= mod;
        n >>= 1;
    }
}
```



```

    }
    return ans;
}

vector<int> mods{(int) 1e9 + 7, (int) 1e9 + 9, 998244353};

void solve_first(vector<int> a) {
    int n = (int) a.size();
    int sum = 0;
    for (int i = 0; i < n; ++i) {
        sum += a[i];
    }
    cout << sum * 256 << endl << flush;
}

void solve_second(vector<int> a) {
    int n = (int) a.size();
    int sum = a[0] / 256;
    for (int i = 0; i < n; ++i) {
        sum += a[i] % 256;
    }
    cout << sum << endl << flush;
}

void solve() {
    string s;
    cin >> s;
    int n;
    cin >> n;
    vector<int> a(n);
    for (int i = 0; i < n; ++i) {
        cin >> a[i];
    }
    if (s == "first") {
        solve_first(a);
    } else {
        solve_second(a);
    }
}

int32_t main() {
    int T = 1;
#ifdef LOCAL
    cin >> T;
#else
    ios_base::sync_with_stdio(false);
    cout.tie(nullptr);
    cin.tie(nullptr);
#endif
    for (int i = 1; i <= T; ++i) {
        cerr << "TEST_#" << i << ":" << endl;
        int t = 1;
        //cin >> t;
        while (t--) {
            solve();
        }
    }
    return 0;
}

```



## Task C ()

```
#pragma GCC optimize("O3")

#include <iostream>
#include <vector>
#include <string>
#include <algorithm>
#include <cmath>
#include <queue>
#include <set>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <cassert>
#include <chrono>
#include <random>
#include <fstream>
#include <iomanip>
#include <bitset>
#include <list>
#include <complex>

using namespace std;

#define endl '\n'
#define int long long
#define float long double

#ifdef LOCAL
ifstream input("input");
#define cin input
#endif

#define debug(x) cerr << #x << " = " << (x) << endl

random_device rd;
#ifdef int
mt19937_64
#else
mt19937
#endif
rng(rd());

template<class T> int ckmin(T &a, const T &b) {
    if (b < a) {
        a = b;
        return 1;
    }
    return 0;
}

template<class T> int ckmax(T &a, const T &b) {
    if (b > a) {
        a = b;
        return 1;
    }
    return 0;
}

int bit_i(int n, int i) {
    return (n >> i) & 1;
}

int mpow(int a, int n, int mod) {
    int ans = 1;
    while (n) {
        if (n & 1) {
            ans *= a;
            ans %= mod;
        }
        a *= a;
        a %= mod;
        n >>= 1;
    }
}
```



```

    }
    return ans;
}

vector<int> mods{(int) 1e9 + 7, (int) 1e9 + 9, 998244353};

vector<pair<int, int>> ans;
vector<pair<int, int>> b;
vector<pair<int, int>> c1, c2;
int used[10][10];

int diff(int x, int y) {
    return (x && !y) || (!x && y);
}

void solve(int num) {
    for (int i = 0; i + 1 < 10; ++i) {
        for (int j = 0; j + 1 < 10; ++j) {
            if (!used[i][j] || !used[i + 1][j]) {
                continue;
            }
            if (find(c1.begin(), c1.end(), make_pair(i, j)) == c1.end()) {
                continue;
            }
            for (int v = j + 1; v < 10; ++v) {
                if (!used[i][v] || !used[i + 1][v]) {
                    break;
                }
                if (find(c2.begin(), c2.end(), make_pair(i, v - 1)) == c2.end() || find(c2.begin(), c2.end(), make_pair(i + 1, v - 1)) == c2.end()) {
                    break;
                }
                if (find(c1.begin(), c1.end(), make_pair(i, v)) != c1.end()) {
                    ans.emplace_back(1, v - j);
                }
            }
        }
    }
}

for (int i = 1; i + 1 < 10; ++i) {
    for (int j = 1; j + 1 < 10; ++j) {
        if (used[i][j] || !used[i - 1][j] || !used[i][j - 1]) {
            continue;
        }
        int u = i, v = j;
        while (u + 2 < 10 && !used[u + 1][v]) {
            ++u;
        }
        while (v + 2 < 10 && !used[u][v + 1]) {
            ++v;
        }
        int ok = 1;
        for (int l = i; l <= u && ok; ++l) {
            for (int r = j; r <= v && ok; ++r) {
                if (used[l][r]) {
                    ok = 0;
                }
            }
        }
        if (!ok) {
            continue;
        }
        for (int l = i - 1; l <= u; ++l) {
            if (find(c1.begin(), c1.end(), make_pair(l, j - 1)) == c1.end() || find(c1.begin(), c1.end(), make_pair(l, v + 1)) == c1.end()) {
                ok = 0;
                break;
            }
        }
        if (!ok) {
            continue;
        }
        for (int r = j - 1; r <= v; ++r) {
            if (find(c2.begin(), c2.end(), make_pair(i - 1, r)) == c2.end() || find(c2.begin(), c2.end(), make_pair(u + 1, r)) == c2.end()) {

```



```

        ok = 0;
        break;
    }
}
if (!ok) {
    continue;
}
ans.emplace_back(u - i + 2, v - j + 2);
}
}
if (num == (int) b.size()) {
    return;
}
for (int i = 0; i + b[num].first < 10; ++i) {
    for (int j = 0; j + b[num].second < 10; ++j) {
        int ok = 1;
        for (int u = i + 1; u < i + b[num].first && ok; ++u) {
            for (int v = j + 1; v < j + b[num].second && ok; ++v) {
                if (used[u][v]) {
                    ok = 0;
                    break;
                }
            }
        }
        if (!ok) {
            continue;
        }
        for (int u = i + 1; u + 1 < i + b[num].first; ++u) {
            if (diff(used[u][j], used[u + 1][j]) || diff(used[u][j + b[num].second], used[u + 1][j + b
[num].second])) {
                ok = 0;
                break;
            }
        }
        for (int v = j + 1; v + 1 < j + b[num].second; ++v) {
            if (diff(used[i][v], used[i][v + 1]) || diff(used[i + b[num].first][v], used[i + b[num].
first][v + 1])) {
                ok = 0;
                break;
            }
        }
        if (!ok) {
            continue;
        }
        ok = num == 0;
        for (int u = i; u < i + b[num].first; ++u) {
            if (find(c1.begin(), c1.end(), make_pair(u, j)) != c1.end() || find(c1.begin(), c1.end(),
make_pair(u, j + b[num].second)) != c1.end()) {
                ok = 1;
                break;
            }
        }
        if (!ok) {
            continue;
        }
        ok = num == 0;
        for (int v = j; v < j + b[num].second; ++v) {
            if (find(c2.begin(), c2.end(), make_pair(i, v)) != c2.end() || find(c2.begin(), c2.end(),
make_pair(i + b[num].first, v)) != c2.end()) {
                ok = 1;
                break;
            }
        }
        if (!ok) {
            continue;
        }
        for (int u = i; u <= i + b[num].first; ++u) {
            ++used[u][j];
            ++used[u][j + b[num].second];
        }
        for (int v = j; v <= j + b[num].second; ++v) {
            ++used[i][v];
            ++used[i + b[num].first][v];
        }
    }
}

```



```

        for (int u = i; u < i + b[num].first; ++u) {
            c1.emplace_back(u, j);
            c1.emplace_back(u, j + b[num].second);
        }
        for (int v = j; v < j + b[num].second; ++v) {
            c2.emplace_back(i, v);
            c2.emplace_back(i + b[num].first, v);
        }
        solve(num + 1);
        for (int u = i; u <= i + b[num].first; ++u) {
            —used[u][j];
            —used[u][j + b[num].second];
        }
        for (int v = j; v <= j + b[num].second; ++v) {
            —used[i][v];
            —used[i + b[num].first][v];
        }
        for (int u = i; u < i + b[num].first; ++u) {
            c1.pop_back();
            c1.pop_back();
        }
        for (int v = j; v < j + b[num].second; ++v) {
            c2.pop_back();
            c2.pop_back();
        }
    }
}

void solve() {
    vector<pair<int, int>> a(3);
    for (int i = 0; i < 3; ++i) {
        cin >> a[i].first >> a[i].second;
    }
    ans = a;
    vector<int> p(3);
    for (int i = 0; i < 3; ++i) {
        p[i] = i;
    }
    do {
        for (int mask = 0; mask < 8; ++mask) {
            b.clear();
            for (int i = 0; i < 3; ++i) {
                if (bit_i(mask, i)) {
                    b.push_back(a[p[i]]);
                } else {
                    b.emplace_back(a[p[i]].second, a[p[i]].first);
                }
            }
            solve(0);
        }
    } while (next_permutation(p.begin(), p.end()));
    for (pair<int, int> &e : ans) {
        if (e.first > e.second) {
            swap(e.first, e.second);
        }
    }
    sort(ans.begin(), ans.end());
    ans.erase(unique(ans.begin(), ans.end()), ans.end());
    for (const pair<int, int> &e : ans) {
        cout << e.first << " " << e.second << endl;
    }
}

int32_t main() {
    int T = 1;
#ifdef LOCAL
    cin >> T;
#else
    ios_base::sync_with_stdio(false);
    cout.tie(nullptr);
    cin.tie(nullptr);
#endif
    for (int i = 1; i <= T; ++i) {

```



```
cerr << "TEST_#" << i << ":" << endl;
int t = 1;
//cin >> t;
while (t--) {
    solve();
}
return 0;
}
```



## Task D ()

```
#pragma GCC optimize("O3")

#include <iostream>
#include <vector>
#include <string>
#include <algorithm>
#include <cmath>
#include <queue>
#include <set>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <cassert>
#include <chrono>
#include <random>
#include <fstream>
#include <iomanip>
#include <bitset>
#include <list>
#include <complex>

using namespace std;

#define endl '\n'
#define int long long
#define float long double

// #ifdef LOCAL
// ifstream input("input");
// #define cin input
// #endif

#define debug(x) cerr << #x << " = " << (x) << endl

random_device rd;
#ifdef int
mt19937_64
#else
mt19937
#endif
rng(rd());

template<class T> int ckmin(T &a, const T &b) {
    if (b < a) {
        a = b;
        return 1;
    }
    return 0;
}

template<class T> int ckmax(T &a, const T &b) {
    if (b > a) {
        a = b;
        return 1;
    }
    return 0;
}

int bit_i(int n, int i) {
    return (n >> i) & 1;
}

int mpow(int a, int n, int mod) {
    int ans = 1;
    while (n) {
        if (n & 1) {
            ans *= a;
            ans %= mod;
        }
        a *= a;
        a %= mod;
        n >>= 1;
    }
}
```



```

    }
    return ans;
}

vector<int> mods{(int) 1e9 + 7, (int) 1e9 + 9, 998244353};

int n;
vector<int> A;
vector<int> a;

void ask(int i, int x) {
    if (i == -1) {
        cout << -1 << " " << -1 << endl << flush;
        exit(0);
    }
    if (x == 0) {
        assert(A[i] != -1);
        a[i] = A[i];
        A[i] = -1;
    } else {
        a[i] -= x;
    }
    cout << i + 1 << " " << x << endl << flush;
    int j, y;
    cin >> j >> y;
    if (j == -1) {
        exit(0);
    }
    --j;
    if (y == 0) {
        assert(A[j] != -1);
        a[j] = A[j];
        A[j] = -1;
    } else {
        a[j] -= y;
    }
}

void solve() {
    vector<vector<int>> dp(51, vector<int>(51));
    for (int i = 1; i <= 50; ++i) {
        dp[i][0] = 0;
        for (int j = 1; j <= 50; ++j) {
            vector<int> used(j + 2, 0);
            if (i < (int) used.size()) {
                used[i] = 1;
            }
            for (int l = 0; l < j; ++l) {
                if (dp[i][l] < (int) used.size()) {
                    used[dp[i][l]] = 1;
                }
            }
            for (int l = 0; l < (int) used.size(); ++l) {
                if (!used[l]) {
                    dp[i][j] = 1;
                    break;
                }
            }
        }
    }
    cin >> n;
    a.resize(n);
    for (int i = 0; i < n; ++i) {
        cin >> a[i];
    }
    A = a;
    int sum = 0;
    for (int i = 0; i < n; ++i) {
        sum ^= dp[A[i]][a[i]];
    }
    if (sum == 0) {
        ask(-1, -1);
        return;
    }
}

```



```

while (1) {
    int sum = 0;
    for (int i = 0; i < n; ++i) {
        if (A[i] == -1) {
            sum ^= a[i];
        } else {
            sum ^= dp[A[i]][a[i]];
        }
    }
    assert(sum != 0);
    for (int i = 0; i < n; ++i) {
        if (A[i] == -1) {
            sum ^= a[i];
            int ok = 0;
            for (int j = 0; j < a[i]; ++j) {
                if (sum == j) {
                    ask(i, a[i] - j);
                    ok = 1;
                    break;
                }
            }
            if (ok) {
                break;
            }
            sum ^= a[i];
        } else {
            sum ^= dp[A[i]][a[i]];
            if (sum == A[i]) {
                ask(i, 0);
                break;
            }
            int ok = 0;
            for (int j = 0; j < a[i]; ++j) {
                if (sum == dp[A[i]][j]) {
                    ask(i, a[i] - j);
                    ok = 1;
                    break;
                }
            }
            if (ok) {
                break;
            }
            sum ^= dp[A[i]][a[i]];
        }
    }
}

}

int32_t main() {
    int T = 1;
#ifdef LOCAL
    cin >> T;
#else
    ios_base::sync_with_stdio(false);
    cout.tie(nullptr);
    cin.tie(nullptr);
#endif
    for (int i = 1; i <= T; ++i) {
        cerr << "TEST_#" << i << ":" << endl;
        int t = 1;
        //cin >> t;
        while (t--) {
            solve();
        }
    }
    return 0;
}

```



## Task E ()



## Task F ()

```
#pragma GCC optimize("O3")

#include <iostream>
#include <vector>
#include <string>
#include <algorithm>
#include <cmath>
#include <queue>
#include <set>
#include <map>
#include <unordered_set>
#include <unordered_map>
#include <cassert>
#include <chrono>
#include <random>
#include <fstream>
#include <iomanip>
#include <bitset>
#include <list>
#include <complex>

using namespace std;

#define endl '\n'
#define int long long
#define float long double

#ifdef LOCAL
ifstream input("input");
#define cin input
#endif

#define debug(x) cerr << #x << " = " << (x) << endl

random_device rd;
#ifdef int
mt19937_64
#else
mt19937
#endif
rng(rd());

template<class T> int ckmin(T &a, const T &b) {
    if (b < a) {
        a = b;
        return 1;
    }
    return 0;
}

template<class T> int ckmax(T &a, const T &b) {
    if (b > a) {
        a = b;
        return 1;
    }
    return 0;
}

int bit_i(int n, int i) {
    return (n >> i) & 1;
}

int mpow(int a, int n, int mod) {
    int ans = 1;
    while (n) {
        if (n & 1) {
            ans *= a;
            ans %= mod;
        }
        a *= a;
        a %= mod;
        n >>= 1;
    }
}
```



```

    }
    return ans;
}

vector<int> mods{(int) 1e9 + 7, (int) 1e9 + 9, 998244353};

vector<pair<int, int>> solve(int x, int y, int &z, int len) {
    if (len == 0) {
        return {};
    }
    if (x + y + z < 10) {
        int z_ = z;
        z = 0;
        return {make_pair(x + y + z_, 1), make_pair(x + y, len - 1)};
    }
    if (z == 1) {
        return {make_pair((x + y + z) % 10, len)};
    }
    z = 1;
    return {make_pair((x + y) % 10, 1), make_pair((x + y + 1) % 10, len - 1)};
}

vector<pair<int, int>> norm(string s) {
    vector<pair<int, int>> ans;
    for (int i = 0; i < (int) s.size(); ++i) {
        if ('0' <= s[i] && s[i] <= '9') {
            ans.emplace_back(s[i] - '0', 1);
            continue;
        }
        assert(s[i] == '(');
        int x = 0, y = 0;
        for (++i; s[i] != '|'; ++i) {
            x = x * 10 + (s[i] - '0');
        }
        for (++i; s[i] != ')'; ++i) {
            y = y * 10 + (s[i] - '0');
        }
        ans.emplace_back(x, y);
    }
    return ans;
}

void solve() {
    string s, t;
    cin >> s >> t;
    vector<pair<int, int>> a = norm(s);
    vector<pair<int, int>> b = norm(t);
    reverse(a.begin(), a.end());
    reverse(b.begin(), b.end());
    map<int, pair<int, int>, greater<int>> mp;
    int sum = 0;
    for (const pair<int, int> &e : a) {
        //cout << e.first << " " << e.second << endl;
        sum += e.second;
        if (mp.find(sum) == mp.end()) {
            mp[sum] = make_pair(-1, -1);
        }
        mp[sum].first = e.first;
    }
    //cout << "OK" << endl;
    sum = 0;
    for (const pair<int, int> &e : b) {
        //cout << e.first << " " << e.second << endl;
        sum += e.second;
        if (mp.find(sum) == mp.end()) {
            mp[sum] = make_pair(-1, -1);
        }
        mp[sum].second = e.first;
    }
    sum = -1;
    int last_a = 0;
    int last_b = 0;
    vector<pair<int, int>> A, B;
    for (const pair<const int, pair<int, int>> &e : mp) {

```



```

    if (sum != -1) {
        A.emplace_back(last_a, sum - e.first);
        B.emplace_back(last_b, sum - e.first);
    }
    sum = e.first;
    if (e.second.first != -1) {
        last_a = e.second.first;
    }
    if (e.second.second != -1) {
        last_b = e.second.second;
    }
}
A.emplace_back(last_a, sum);
B.emplace_back(last_b, sum);
reverse(A.begin(), A.end());
reverse(B.begin(), B.end());
int z = 0;
vector<pair<int, int>> ans;
for (int i = 0; i < (int) A.size(); ++i) {
    //cout << A[i].first << " " << B[i].first << " " << A[i].second << endl;
    vector<pair<int, int>> lans = solve(A[i].first, B[i].first, z, A[i].second);
    for (const pair<int, int> &e : lans) {
        if (e.second > 0) {
            ans.push_back(e);
        }
    }
}
if (z) {
    ans.emplace_back(z, 1);
}
while (!ans.empty() && ans.back().first == 0) {
    ans.pop_back();
}
if (ans.empty()) {
    cout << 0 << endl;
    return;
}
reverse(ans.begin(), ans.end());
string sans;
for (const pair<int, int> &e : ans) {
    sans += "(" + to_string(e.first) + "|" + to_string(e.second) + ")";
}
cout << sans << endl;
}

int32_t main() {
    int T = 1;
#ifdef LOCAL
    cin >> T;
#else
    ios_base::sync_with_stdio(false);
    cout.tie(nullptr);
    cin.tie(nullptr);
#endif
    for (int i = 1; i <= T; ++i) {
        cerr << "TEST_#" << i << ":" << endl;
        int t = 1;
        //cin >> t;
        while (t--) {
            solve();
        }
    }
    return 0;
}

```