

# Олимпиада СПбГУ по информатике 2022/23 учебного года

A	B	C	D	E	F	Sum
100	100	100	100	16	65	481

## Task A ()

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

using namespace std;

int main() {
    vector<int> a(6);
    for (int i = 0; i < 6; i++) {
        cin >> a[i];
    }
    vector<int> pos(6);
    for (int i = 0; i < 6; i++) {
        for (int j = 5; j >= a[i]; j--) {
            pos[j] = pos[j - 1];
        }
        pos[a[i] - 1] = i + 1;
    }
    vector<int> where(6);
    for (int i = 0; i < 6; i++) {
        where[pos[i] - 1] = i + 1;
    }
    for (auto x: where) cout << x << " ";
    return 0;
}
```



## Task B ()

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

using namespace std;

#define int long long

signed main() {
    string s;
    cin >> s;
    int n;
    cin >> n;
    int mod = 1e9 + 7;
    int sm = 0;
    vector<int> a(n);
    for (int i = 0; i < n; i++) {
        cin >> a[i];
    }
    if (s == "first") {
        for (auto x : a) sm += x;
        cout << sm / n + mod * (sm % n);
    } else {
        int rem = a[0] / mod;
        for (int i = 0; i < n; i++) sm += (a[i] % mod);
        cout << sm + rem;
    }
    return 0;
}
```



## Task C ()

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

using namespace std;

set <pair<int, int>> ans;
vector < pair <int, int>> a;

void calc() {
    if (a[0].first < a[1].first || a[0].second < a[1].second) return;
    int dx = a[0].first - a[1].first;
    int dy = a[0].second - a[1].second;
    if (a[1].first + a[2].first <= a[0].first && a[2].second <= a[0].second &&
        a[2].second > a[0].second - a[1].second) {
        ans.insert({min(a[1].first, a[0].second - a[1].second),
                    max(a[1].first, a[0].second - a[1].second)});
    }
    if (a[1].second + a[2].second <= a[0].second && a[2].first <= a[0].first &&
        a[2].first > a[0].first - a[1].first) {
        ans.insert({min(a[1].second, a[0].first - a[1].first),
                    max(a[1].second, a[0].first - a[1].first)});
    }
    if (a[2].first == a[1].first && a[0].first != a[1].first
        && a[2].second + a[1].second == a[0].second) {
        ans.insert({min(a[0].second, a[0].first - a[1].first),
                    max(a[0].second, a[0].first - a[1].first)});
    }
    if (a[2].second == a[1].second && a[0].second != a[1].second
        && a[2].first + a[1].first == a[0].first) {
        ans.insert({min(a[0].first, a[0].second - a[1].second),
                    max(a[0].first, a[0].second - a[1].second)});
    }
    if (a[1].first + a[2].first == a[0].first && a[1].second + a[2].second == a[0].second) {
        ans.insert({min(a[2].first, a[1].second),
                    max(a[2].first, a[1].second)});
        ans.insert({min(a[1].first, a[2].second),
                    max(a[1].first, a[2].second)});
    }
    if (a[0].first == a[1].first && a[0].second > a[1].second) {
        ans.insert({min(a[0].first, a[0].second - a[1].second),
                    max(a[0].first, a[0].second - a[1].second)});
    }
    if (a[0].second == a[1].second && a[0].first > a[1].first) {
        ans.insert({min(a[0].second, a[0].first - a[1].first),
                    max(a[0].second, a[0].first - a[1].first)});
    }
    if (a[0].first == a[1].first && a[0].first == a[2].first &&
        a[0].second > a[1].second + a[2].second) {
        ans.insert({min(a[0].first, a[0].second - a[1].second - a[2].second),
                    max(a[0].first, a[0].second - a[1].second - a[2].second)});
    }
    if (a[0].second == a[1].second && a[0].second == a[2].second &&
        a[0].first > a[1].first + a[2].first) {
        ans.insert({min(a[0].second, a[0].first - a[1].first - a[2].first),
                    max(a[0].second, a[0].first - a[1].first - a[2].first)});
    }
    if (a[2].first == a[0].first && a[1].second + a[2].second < a[0].second) {
        ans.insert({min(a[0].first, a[0].second - a[1].second - a[2].second),
                    max(a[0].second - a[1].second - a[2].second, a[0].first)});
    }
}

int main() {
    // #ifndef ONLINE_JUDGE
    //     freopen("C:\\Users\\Pboro\\Documents\\programming\\inout\\input.txt", "r", stdin);
    //     freopen("C:\\Users\\Pboro\\Documents\\programming\\inout\\output.txt", "w", stdout);
    // #endif
    a.resize(3);
    for (int i = 0; i < 3; i++) {
        cin >> a[i].first >> a[i].second;
        if (a[i].first > a[i].second) {
            swap(a[i].first, a[i].second);
        }
    }
}
```



```

}
sort(a.rbegin(), a.rend());
ans.insert(a[0]);
ans.insert(a[1]);
ans.insert(a[2]);
vector<pair<int, int>> b = a;
vector<int> p = {0, 1, 2};
do {
    a[0] = b[p[0]];
    a[1] = b[p[1]];
    a[2] = b[p[2]];
    for (int i = 0; i < 2; i++) {
        swap(a[0].first, a[0].second);
        for (int j = 0; j < 2; j++) {
            swap(a[1].first, a[1].second);
            for (int k = 0; k < 2; k++) {
                swap(a[2].first, a[2].second);
                calc();
            }
        }
    }
} while (next_permutation(p.begin(), p.end()));

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

```



## Task D ()

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

using namespace std;

int main() {

    int n;
    cin >> n;
    vector<int> a(n);
    for (int i = 0; i < n; i++) {
        cin >> a[i];
    }
    vector<int> used(n);
    int left = n;
    vector<int> start = a;
    while (true) {
        int x = 0;
        bool ok = false;
        for (auto y : a) x ^= y;
        if (left > 0) {
            if (left % 2 == 0) {
                int mx = -1;
                for (int i = 0; i < n; i++) {
                    if (used[i] == 0) {
                        if (mx == -1 || start[mx] < start[i]) {
                            mx = i;
                        }
                    }
                }
                cout << mx + 1 << " " << 0 << endl;
                used[mx] = 1;
                a[mx] = start[mx];
                left--;
                continue;
            }
        }

        for (int i = n - 1; i >= 0; i--) {
            for (int j = 0; j < a[i]; j++) {
                if ((x ^ a[i] ^ j) == 0) {
                    cout << i + 1 << " " << a[i] - j << endl;
                    a[i] = j;
                    ok = true;
                    break;
                }
            }
            if (ok) break;
        }
        if (!ok) {
            for (int i = 0; i < n; i++) {
                if (!used[i]) {
                    if (x ^ a[i] ^ start[i] == 0) {
                        cout << i + 1 << " " << 0 << endl;
                        used[i] = 1;
                        a[i] = start[i];
                        left--;
                        ok = true;
                        break;
                    }
                }
            }
        }
        if (!ok) {
            cout << "-1 -1" << endl;
            return 0;
        }
        int v, u;
        cin >> v >> u;
        if (v == -1 && u == -1) {
            break;
        }
        if (u == 0) {
```



```
        a[v - 1] = start[v - 1];
        left--;
        used[v - 1] = 1;
    } else {
        a[v - 1] -= u;
    }
}

return 0;
}
```



## Task E ()

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

using namespace std;

int main() {
    // #ifndef ONLINE_JUDGE
    //     freopen("C:\\Users\\Pboro\\Documents\\programming\\inout\\input.txt", "r", stdin);
    //     freopen("C:\\Users\\Pboro\\Documents\\programming\\inout\\output.txt", "w", stdout);
    // #endif

    int t;
    cin >> t;
    string s;
    cin >> s;
    while (t--) {
        if (s == "transmit") {
            int n;
            cin >> n;
            vector<vector<int>> > res(10, vector<int>(10));
            int cnt = 0;
            vector<int> used(10);
            int pos = -1;
            for (int i = 0; i < 10; i++) {
                if ((n >> i) & 1) {
                    for (int j = 0; j < i; j++) {
                        res[i][j] = 1;
                    }
                    pos = i;
                    used[i] = 1;
                    cnt++;
                }
            }
            if (n % 2 == 0) {
                for (int i = 0; i < 10; i++) {
                    if (!used[i]) {
                        for (int j = 0; j < pos; j++) {
                            res[i][j] = 1;
                        }
                    }
                }
            }
            for (int i = 0; i < 10; i++) {
                for (int j = 0; j < 10; j++) {
                    cout << res[i][j];
                } cout << endl;
            } cout << endl;
        } else {
            vector<vector<int>> > a(10, vector<int>(10));
            vector<int> val;
            vector<int> used(10);
            for (int i = 0; i < 10; i++) {
                string t;
                cin >> t;
                int cnt = 0;
                for (int j = 0; j < 10; j++) {
                    if (t[j] == '1') {
                        cnt++;
                        a[i][j] = 1;
                    }
                }
                used[cnt]++;
            }
            int res = 0;
            for (int i = 0; i < 10; i++) {
                if (used[i] > 0) {
                    res += (1 << i);
                }
            }
            cout << res << endl;
        }
    }
    return 0;
}
```



}



## Task F ()

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

using namespace std;

int main() {
// #ifndef ONLINE_JUDGE
//     freopen("C:\\Users\\Pboro\\Documents\\programming\\inout\\input.txt", "r", stdin);
//     freopen("C:\\Users\\Pboro\\Documents\\programming\\inout\\output.txt", "w", stdout);
// #endif
    string s;
    cin >> s;
    string t;
    cin >> t;
    vector < pair <int, int> > a;
    vector < pair <int, int> > b;
    int s1 = 0, s2 = 0;
    for (int i = 0; i < s.size(); i++) {
        if (s[i] == '(') {
            i++;
            int x = s[i] - '0';
            int y = 0;
            i += 2;
            while (s[i] != ')') {
                y = y * 10 + (s[i] - '0');
                i++;
            }
            a.push_back({x, y});
            s1 += y;
        } else {
            a.push_back({s[i] - '0', 1});
            s1 += 1;
        }
    }
    for (int i = 0; i < t.size(); i++) {
        if (t[i] == '(') {
            i++;
            int x = t[i] - '0';
            int y = 0;
            i += 2;
            while (t[i] != ')') {
                y = y * 10 + (t[i] - '0');
                i++;
            }
            b.push_back({x, y});
            s2 += y;
        } else {
            b.push_back({t[i] - '0', 1});
            s2 += 1;
        }
    }
    vector < pair <int, int> > c;
    reverse(a.begin(), a.end());
    reverse(b.begin(), b.end());
    int i = 0, j = 0;
    int r = 0;
    while (true) {
        if (i >= a.size() && j >= b.size()) {
            break;
        } else if (i >= a.size()) {
            auto y = b[j];
            pair <int, int> x = {0, y.second};
            int s = r + x.first + y.first;
            if (s >= 10) {
                if (r == 0) {
                    c.push_back({1, s % 10});
                    b[j].second--;
                } else {
                    if (x.second > y.second) {
                        c.push_back({y.second, s % 10});
                        j++;
                    } else if (x.second == y.second) {
                        c.push_back({y.second, s % 10});
                    }
                }
            }
        } else {
            auto x = a[i];
            pair <int, int> y = {0, x.second};
            int s = r + y.first + x.first;
            if (s >= 10) {
                if (r == 0) {
                    c.push_back({1, s % 10});
                    a[i].second--;
                } else {
                    if (y.second > x.second) {
                        c.push_back({x.second, s % 10});
                        i++;
                    } else if (y.second == x.second) {
                        c.push_back({x.second, s % 10});
                    }
                }
            }
        }
        r = s % 10;
        i++;
        j++;
    }
    for (int i = 0; i < c.size(); i++) {
        cout << c[i].first << " ";
        if (i % 10 == 9) {
            cout << "\n";
        }
    }
    cout << "\n";
}
```



```

        i++;
        j++;
    } else {
        c.push_back({x.second, s % 10});
        b[j].second -= x.second;
        i++;
    }
}

    if (b[j].second == 0) j++;
} else {
    if (r == 0) {
        if (x.second > y.second) {
            c.push_back({y.second, s});
            j++;
        } else if (x.second == y.second) {
            c.push_back({y.second, s});
            i++;
            j++;
        } else {
            c.push_back({x.second, s});
            b[j].second -= x.second;
            i++;
        }
    } else {
        c.push_back({1, s % 10});
        b[j].second--;
        if (b[j].second == 0) j++;
    }
    if (b[j].second == 0) j++;
}
r = s / 10;
} else if (j >= b.size()) {
    auto x = a[i];
    pair<int, int> y = {0, x.second};
    int s = r + x.first + y.first;
    if (s >= 10) {
        if (r == 0) {
            c.push_back({1, s % 10});
            a[i].second--;
        } else {
            if (x.second > y.second) {
                c.push_back({y.second, s % 10});
                a[i].second -= y.second;
                j++;
            } else if (x.second == y.second) {
                c.push_back({y.second, s % 10});
                i++;
                j++;
            } else {
                c.push_back({x.second, s % 10});
                i++;
            }
        }
    }
    if (a[i].second == 0) i++;
} else {
    if (r == 0) {
        if (x.second > y.second) {
            c.push_back({y.second, s});
            a[i].second -= y.second;
            j++;
        } else if (x.second == y.second) {
            c.push_back({y.second, s});
            i++;
            j++;
        } else {
            c.push_back({x.second, s});
            i++;
        }
    } else {
        c.push_back({1, s % 10});
        a[i].second--;
        if (a[i].second == 0) i++;
    }
}
}

```



```

        if (a[i].second == 0) i++;
    }
    r = s / 10;
} else {
    auto x = a[i];
    auto y = b[j];
    int s = r + x.first + y.first;
    if (s >= 10) {
        if (r == 0) {
            c.push_back({1, s % 10});
            a[i].second--;
            b[j].second--;
        } else {
            if (x.second > y.second) {
                c.push_back({y.second, s % 10});
                a[i].second -= y.second;
                j++;
            } else if (x.second == y.second) {
                c.push_back({y.second, s % 10});
                i++;
                j++;
            } else {
                c.push_back({x.second, s % 10});
                b[j].second -= x.second;
                i++;
            }
        }
    }

    if (a[i].second == 0) i++;
    if (b[j].second == 0) j++;
} else {
    if (r == 0) {
        if (x.second > y.second) {
            c.push_back({y.second, s});
            a[i].second -= y.second;
            j++;
        } else if (x.second == y.second) {
            c.push_back({y.second, s});
            i++;
            j++;
        } else {
            c.push_back({x.second, s});
            b[j].second -= x.second;
            i++;
        }
    }
    if (a[i].second == 0) i++;
    if (b[j].second == 0) j++;
}
r = s / 10;
}
}
if (r != 0) {
    c.push_back({1, 1});
}
reverse(c.begin(), c.end());
for (auto x : c) {
    cout << "(" << x.second << "|" << x.first << ")";
}
return 0;
}

```