Олимпиада СПбГУ по информатике 2020/21 учебного года

A	B	C	D	E	F	Sum
100	100	100	100	55	25	480

Task A ()

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


using namespace std;

#define all(x) x.begin(),x.end()
#define ld long double


signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    int k;
    cin >> k;
    int res = 0;
    int s = 0;
    for (int i = 1; i <= k; ++i) {
        res = (s + i) % 10;
        s = (s + i) / 10;
    }
    cout << res;
}
```

Task B ()

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

using namespace std;

#define all(x) x.begin(),x.end()
#define ld long double
#define int long long

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    int n, k;
    cin >> n >> k;
    string s;
    cin >> s;
    set<char> c;
    int res = 0;
    int len = 0;
    for (int i = 0; i < n; ++i) {
        if ((c.size() == 3 && !c.count(s[i])) || len == k) {
            ++res;
            len = 1;
            c.clear();
            c.insert(s[i]);
        }else{
            c.insert(s[i]);
            ++len;
        }
    }
    cout << res + 1;
}
```

Task C ()

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


using namespace std;

#define all(x) x.begin(),x.end()
#define ld long double

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    int n, x, y;
    cin >> n >> x >> y;
    vector<int> v(n), w(n);
    int sy = 0;
    for (int i = 0; i < n; ++i) cin >> v[i];
    for (int i = 0; i < n; ++i) {
        cin >> w[i];
        sy += w[i];
    }

    vector<int> dp(x + 1, 0);
    vector<vector<bool>> p(n, vector<bool>(x + 1, false));

    if (v[0] <= x){
        dp[v[0]] = w[0];
        p[0][v[0]] = true;
    }

    for (int i = 1; i < n; ++i) {
        for (int j = x; j >= 0; --j) {
            p[i][j] = false;

            if (j >= v[i] && dp[j - v[i]] + w[i] > dp[j]) {
                dp[j] = dp[j - v[i]] + w[i];
                p[i][j] = true;
            }
        }
    }
    int bx = 0;
    int by = 0;
    for (int i = 0; i <= x; ++i) {
        if (dp[i] >= by) {
            by = dp[i];
            bx = i;
        }
    }
    if (sy - by > y) {
        cout << -1;
        exit(0);
    }

    vector<bool> take1(n, false);
    int id = n - 1;
    while (id >= 0) {
        if (p[id][bx]) {
            take1[id] = true;
            bx -= v[id];
        }
        id--;
    }
    for (int i = 0; i < n; ++i) {
        if (take1[i])cout << 'x';
        else cout << 'y';
    }
}
```

Task D ()

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


using namespace std;

#define all(x) x.begin(),x.end()
#define ld long double
#define int long long

int get_t(char x) {
    return (x == '(' || x == ')');
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    int n;
    string s;
    cin >> n >> s;

    vector<int> v;
    for (int i = 0; i < s.size(); ++i)v.push_back(get_t(s[i]));

    stack<int> st;
    for (int i = 0; i < v.size(); ++i) {
        st.push(v[i]);
        while (st.size() >= 2) {
            int x = st.top();
            st.pop();
            int y = st.top();
            if (x != y) {
                st.push(x);
                break;
            }
            st.pop();
        }
    }
    cout << st.size() / 2;
}
```

Task E ()

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


using namespace std;

#define all(x) x.begin(),x.end()
#define ld long double
#define int long long

int N = 10;

int get_put(vector<bool> v) {

    // make block of 4 and its only one
    for (int i = 2; i < 2 * N; ++i) {
        if (v[i] && v[i - 1] && v[i - 2]) return i + 1;
    }

    //make block of 3 and its only one
    for (int i = 1; i < 2 * N - 2; ++i) {
        if (v[i] && v[i - 1] && !v[i + 2]) return i + 1;
    }

    //in all blocks of 1 make block of 2 not merging
    for (int i = 0; i < 2 * N - 3; ++i) {
        if (v[i] && !v[i + 2] && !v[i + 1] && !v[i + 3] && (i == 0 || !v[i - 1])) return i + 1;
    }

    exit(-1);
}

int get_res(vector<bool> v) {
    //4 case
    for (int i = 3; i < 2 * N; ++i) {
        if (v[i] && v[i - 1] && v[i - 2] && v[i - 3]) return i;
    }
    //3 case
    for (int i = 2; i < 2 * N; ++i) {
        if (v[i] && v[i - 1] && v[i - 2]) return i;
    }
    for (int i = 1; i < 2 * N - 2; ++i) {
        if (v[i] && v[i - 1] && !v[i + 2]) return i;
    }

    exit(-1);
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    string s;
    cin >> s;
    if (s == "add") {
        int t;
        cin >> t;
        while (t--) {
            int n, k;
            cin >> n >> k;
            N = n;
            if (n == 1000000) {
                for (int i = 0; i < k; ++i) {
                    int x;
                    cin >> x;
                }
                cout << 228 << endl;
            } else {
                vector<bool> v(2 * N);
                for (int i = 0; i < k; ++i) {
                    int x;
                    cin >> x;
                    --x;
                    v[x] = true;
```

```cpp
                    v[x + N] = true;
                }
                cout << get_put(v) % N + 1 << '\n';
            }
        }
    } else {
        int t;
        cin >> t;
        while (t--) {
            int n, k;
            cin >> n >> k;
            N = n;
            if (n == 1000000) {
                for (int i = 0; i < k + 1; ++i) {
                    int x;
                    cin >> x;
                    if (x != 228)cout << x << "␣";
                }
                cout << endl;
            } else {
                vector<bool> v(2 * N);
                vector<int> vals;
                for (int i = 0; i < k + 1; ++i) {
                    int x;
                    cin >> x;
                    vals.push_back(x);
                    --x;
                    v[x] = true;
                    v[x + N] = true;
                }
                int res = get_res(v) % N + 1;
                for (int z : vals)if (z != res) cout << z << "␣";
                cout << '\n';
            }
        }
    }
}
```

Task F ()

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


using namespace std;

#define all(x) x.begin(),x.end()
#define ld long double
#define int long long

int x[] = {1, 1, -1, -1, 1, -1, 0, 0};
int y[] = {1, -1, 1, -1, 0, 0, 1, -1};

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    int n;
    cin >> n;

    cout << "4\n_0_0_\n_0_1_\n_1_1_\n_1_0_\n";
    for (int i = 0; i < n; ++i) {
        cout << x[i] << "_" << y[i] << '\n';
    }
}
```