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
// #pragma GCC optimize("Ofast,unroll-all-loops")
// #pragma GCC optimize("O3")
#include <bits/stdc++.h>

#define ll long long
// #define int ll
// #define ld long double
#define pb push_back
#define ff first
#define ss second
#define files(in, out) freopen(in, "r", stdin); freopen(out, "w", stdout)
#define rep(i, n) for (int i = 0; i < n; ++i)
#define all(a) a.begin(), a.end()
#define pii pair<int, int>

using namespace std;

// const int p = 5;
const int mod = 1e9 + 7;
const int max_n = 4e3 + 5;
const int log_n = 21;
const int inf = 1e9 + 6;
// const long double pi = acos(-1);
// const int K = 400;

std::mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

void run() {
    int k;
    cin >> k;
    if (k <= 9) cout << k;
    else {
        k -= 10;
        k %= 9;
        if (k == 0) cout << 0;
        else cout << k + 1;
    }
}

signed main() {
#ifndef ONLINE_JUDGE
    // files("input.txt", "output.txt");
#endif
    // files("subsequences.in", "subsequences.out");
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
    int t = 1;
    // cin >> t;
    while (t--)
        run();
    return 0;
}
```

Task B ()

```cpp
#pragma GCC optimize("Ofast,unroll-all-loops")
// #pragma GCC optimize("O3")
#include <bits/stdc++.h>

#define ll long long
// #define int ll
// #define ld long double
#define pb push_back
#define ff first
#define ss second
#define files(in, out) freopen(in, "r", stdin); freopen(out, "w", stdout)
#define rep(i, n) for (int i = 0; i < n; ++i)
#define all(a) a.begin(), a.end()
#define pii pair<int, int>

using namespace std;

// const int p = 5;
const int mod = 1e9 + 7;
const int max_n = 4e3 + 5;
const int log_n = 21;
const int inf = 1e9 + 6;
// const long double pi = acos(-1);
// const int K = 400;

std::mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

void run() {
    int n, k;
    cin >> n >> k;
    string s;
    cin >> s;
    map<char, int> cnt;
    int cur_len = 0;
    int ans = 1;
    rep(i, n) {
        cnt[s[i]]++;
        cur_len++;
        if (cur_len > k || cnt.size() > 3) {
            ans++;
            cnt.clear();
            cur_len = 1;
            cnt[s[i]]++;
        }
    }
    cout << ans;
}

signed main() {
#ifndef ONLINE_JUDGE
    // files("input.txt", "output.txt");
#endif
    // files("subsequences.in", "subsequences.out");
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
    int t = 1;
    // cin >> t;
    while (t--)
        run();
    return 0;
}
```

Task C ()

```cpp
// #pragma GCC optimize("Ofast,unroll-all-loops")
// #pragma GCC optimize("O3")
#include <bits/stdc++.h>

#define ll long long
// #define int ll
// #define ld long double
#define pb push_back
#define ff first
#define ss second
#define files(in, out) freopen(in, "r", stdin); freopen(out, "w", stdout)
#define rep(i, n) for (int i = 0; i < n; ++i)
#define all(a) a.begin(), a.end()
#define pii pair<int, int>

using namespace std;

// const int p = 5;
const int mod = 1e9 + 7;
const int max_n = 4e3 + 5;
const int log_n = 21;
const int inf = 1e9 + 6;
// const long double pi = acos(-1);
// const int K = 400;

std::mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

void run() {
    int n, x, y;
    cin >> n >> x >> y;
    vector<int> v(n), w(n);
    int W = 0;
    rep(i, n) {
        cin >> v[i];
    }
    rep(i, n) {
        cin >> w[i];
        W += w[i];
    }
    vector<int> cur_dp(x + 5, -inf), prev_dp(x + 5, -inf);
    // vector<vector<int>> dp(n + 1, vector<int> (x + 5, -inf));
    vector<vector<int>> pr(n + 1, vector<int> (x + 5, -1));
    prev_dp[0] = 0;
    for (int i = 1; i <= n; ++i) {
        int id = i - 1;
        rep(s, x + 5) {
            cur_dp[s] = prev_dp[s];
            pr[i][s] = s;
            if (s >= v[id]) {
                if (prev_dp[s - v[id]] + w[id] > cur_dp[s]) {
                    cur_dp[s] = max(cur_dp[s], prev_dp[s - v[id]] + w[id]);
                    pr[i][s] = s - v[id];
                }
            }
        }
        prev_dp = cur_dp;
        cur_dp.assign(x + 5, -inf);
    }

    pii it = {-1, -1};
    rep(s, x + 1) {
        int cur = prev_dp[s];
        if (cur >= W - y) {
            it = {n, s};
            break;
        }
    }
    if (it.ff == -1) {
        cout << -1;
        return;
    }
```

3

```cpp
    vector<bool> ans(n, 0);
    while (it.ff != 0) {
        int id = it.ff - 1;
        int s = it.ss;
        int nxt = pr[id + 1][s];
        if (nxt != s) {
            ans[id] = 1;
        }
        it.ff--;
        it.ss = nxt;
    }
    rep(i, n) {
        if (ans[i]) cout << 'x';
        else cout << 'y';
    }
}

signed main() {
#ifndef ONLINE_JUDGE
    // files("input.txt", "output.txt");
#endif
    // files("subsequences.in", "subsequences.out");
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
    int t = 1;
    // cin >> t;
    while (t--)
        run();
    return 0;
}
```

Task D ()

```cpp
// #pragma GCC optimize("Ofast,unroll-all-loops")
// #pragma GCC optimize("O3")
#include <bits/stdc++.h>

#define ll long long
// #define int ll
// #define ld long double
#define pb push_back
#define ff first
#define ss second
#define files(in, out) freopen(in, "r", stdin); freopen(out, "w", stdout)
#define rep(i, n) for (int i = 0; i < n; ++i)
#define all(a) a.begin(), a.end()
#define pii pair<int, int>

using namespace std;

// const int p = 5;
const int mod = 1e9 + 7;
const int max_n = 4e3 + 5;
const int log_n = 21;
const int inf = 1e9 + 6;
// const long double pi = acos(-1);
// const int K = 400;

std::mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

//mbo
int type(char c) {
    if (c == '(' || c == ')') return 0;
    else return 1;
}

void run() {
    int n;
    cin >> n;
    string s;
    cin >> s;
    int m = 2 * n;
    while (true) {
        int id = -1;
        rep(i, s.size()) {
            if (i + 1 >= s.size()) continue;
            if (type(s[i]) == type(s[i + 1])) {
                id = i;
                break;
            }
        }
        if (id == -1) break;
        s.erase(s.begin() + id);
        s.erase(s.begin() + id);
    }
    cout << (int)s.size() / 2;
}

signed main() {
#ifndef ONLINE_JUDGE
    // files("input.txt", "output.txt");
#endif
    // files("subsequences.in", "subsequences.out");
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
    int t = 1;
    // cin >> t;
    while (t--)
        run();
    return 0;
}
```

Task E ()

```cpp
// #pragma GCC optimize("Ofast,unroll-all-loops")
// #pragma GCC optimize("O3")
#include <bits/stdc++.h>

#define ll long long
// #define int ll
// #define ld long double
#define pb push_back
#define ff first
#define ss second
#define files(in, out) freopen(in, "r", stdin); freopen(out, "w", stdout)
#define rep(i, n) for (int i = 0; i < n; ++i)
#define all(a) a.begin(), a.end()
#define pii pair<int, int>

using namespace std;

// const int p = 5;
const int mod = 1e9 + 7;
const int max_n = 4e3 + 5;
const int log_n = 21;
const int inf = 1e9 + 6;
// const long double pi = acos(-1);
// const int K = 400;

std::mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

// int n, k;
map<vector<int>, int> mbo;

// void gen(vector<int> a) {
//     if (a.size() == 3) {
//         vector<int> order;
//         rep(i, n) {
//             order.pb(i);
//         }
//         random_shuffle(all(order));
//         for (int i : order) {
//             auto b = a;
//             b.pb(i + 1);
//             sort(all(b));
//             b.erase(unique(all(b)), b.end());
//             if (b.size() != 4) continue;
//             bool ok = 1;
//             rep(j, b.size()) {
//                 int el = b[j];
//                 if (el == i + 1) continue;
//                 auto c = b;
//                 c.erase(c.begin() + j);
//                 if (mbo.count(c) && mbo[c] == el) {
//                     ok = 0;
//                     break;
//                 }
//             }
//             if (!ok) continue;
//             mbo[a] = i + 1;
//             return;
//         }
//         for (auto el : a) {
//             cerr << el << ' ';
//         }
//         cerr << '\n';
//     }
//     int last = (a.empty() ? 0 : a.back());
//     if (last == n) return;
//     for (int i = last + 1; i <= n; ++i) {
//         a.pb(i);
//         gen(a);
//         a.pop_back();
//     }
// }
```

```
void run() {
    mbo[{1, 2, 3, }] = 5;
    mbo[{1, 2, 4, }] = 5;
    mbo[{1, 2, 5, }] = 10;
    mbo[{1, 2, 6, }] = 3;
    mbo[{1, 2, 7, }] = 3;
    mbo[{1, 2, 8, }] = 10;
    mbo[{1, 2, 9, }] = 8;
    mbo[{1, 2, 10, }] = 9;
    mbo[{1, 3, 4, }] = 7;
    mbo[{1, 3, 5, }] = 7;
    mbo[{1, 3, 6, }] = 9;
    mbo[{1, 3, 7, }] = 8;
    mbo[{1, 3, 8, }] = 4;
    mbo[{1, 3, 9, }] = 5;
    mbo[{1, 3, 10, }] = 8;
    mbo[{1, 4, 5, }] = 7;
    mbo[{1, 4, 6, }] = 2;
    mbo[{1, 4, 7, }] = 9;
    mbo[{1, 4, 8, }] = 5;
    mbo[{1, 4, 9, }] = 3;
    mbo[{1, 4, 10, }] = 2;
    mbo[{1, 5, 6, }] = 10;
    mbo[{1, 5, 7, }] = 6;
    mbo[{1, 5, 8, }] = 6;
    mbo[{1, 5, 9, }] = 10;
    mbo[{1, 5, 10, }] = 8;
    mbo[{1, 6, 7, }] = 3;
    mbo[{1, 6, 8, }] = 10;
    mbo[{1, 6, 9, }] = 2;
    mbo[{1, 6, 10, }] = 7;
    mbo[{1, 7, 8, }] = 4;
    mbo[{1, 7, 9, }] = 3;
    mbo[{1, 7, 10, }] = 5;
    mbo[{1, 8, 9, }] = 5;
    mbo[{1, 8, 10, }] = 9;
    mbo[{1, 9, 10, }] = 7;
    mbo[{2, 3, 4, }] = 10;
    mbo[{2, 3, 5, }] = 9;
    mbo[{2, 3, 6, }] = 9;
    mbo[{2, 3, 7, }] = 6;
    mbo[{2, 3, 8, }] = 5;
    mbo[{2, 3, 9, }] = 8;
    mbo[{2, 3, 10, }] = 6;
    mbo[{2, 4, 5, }] = 7;
    mbo[{2, 4, 6, }] = 8;
    mbo[{2, 4, 7, }] = 9;
    mbo[{2, 4, 8, }] = 7;
    mbo[{2, 4, 9, }] = 1;
    mbo[{2, 4, 10, }] = 9;
    mbo[{2, 5, 6, }] = 4;
    mbo[{2, 5, 7, }] = 6;
    mbo[{2, 5, 8, }] = 6;
    mbo[{2, 5, 9, }] = 6;
    mbo[{2, 5, 10, }] = 7;
    mbo[{2, 6, 7, }] = 9;
    mbo[{2, 6, 8, }] = 7;
    mbo[{2, 6, 9, }] = 4;
    mbo[{2, 6, 10, }] = 9;
    mbo[{2, 7, 8, }] = 5;
    mbo[{2, 7, 9, }] = 8;
    mbo[{2, 7, 10, }] = 8;
    mbo[{2, 8, 9, }] = 10;
    mbo[{2, 8, 10, }] = 5;
    mbo[{2, 9, 10, }] = 5;
    mbo[{3, 4, 5, }] = 9;
    mbo[{3, 4, 6, }] = 5;
    mbo[{3, 4, 7, }] = 2;
    mbo[{3, 4, 8, }] = 2;
    mbo[{3, 4, 9, }] = 8;
    mbo[{3, 4, 10, }] = 6;
    mbo[{3, 5, 6, }] = 9;
    mbo[{3, 5, 7, }] = 4;
    mbo[{3, 5, 8, }] = 6;
```

```cpp
mbo[{3, 5, 9, }] = 10;
mbo[{3, 5, 10, }] = 4;
mbo[{3, 6, 7, }] = 4;
mbo[{3, 6, 8, }] = 1;
mbo[{3, 6, 9, }] = 4;
mbo[{3, 6, 10, }] = 9;
mbo[{3, 7, 8, }] = 5;
mbo[{3, 7, 9, }] = 6;
mbo[{3, 7, 10, }] = 1;
mbo[{3, 8, 9, }] = 1;
mbo[{3, 8, 10, }] = 9;
mbo[{3, 9, 10, }] = 7;
mbo[{4, 5, 6, }] = 9;
mbo[{4, 5, 7, }] = 6;
mbo[{4, 5, 8, }] = 7;
mbo[{4, 5, 9, }] = 7;
mbo[{4, 5, 10, }] = 2;
mbo[{4, 6, 7, }] = 1;
mbo[{4, 6, 8, }] = 9;
mbo[{4, 6, 9, }] = 1;
mbo[{4, 6, 10, }] = 5;
mbo[{4, 7, 8, }] = 10;
mbo[{4, 7, 9, }] = 10;
mbo[{4, 7, 10, }] = 1;
mbo[{4, 8, 9, }] = 10;
mbo[{4, 8, 10, }] = 1;
mbo[{4, 9, 10, }] = 3;
mbo[{5, 6, 7, }] = 9;
mbo[{5, 6, 8, }] = 10;
mbo[{5, 6, 9, }] = 1;
mbo[{5, 6, 10, }] = 2;
mbo[{5, 7, 8, }] = 6;
mbo[{5, 7, 9, }] = 3;
mbo[{5, 7, 10, }] = 8;
mbo[{5, 8, 9, }] = 2;
mbo[{5, 8, 10, }] = 3;
mbo[{5, 9, 10, }] = 4;
mbo[{6, 7, 8, }] = 9;
mbo[{6, 7, 9, }] = 1;
mbo[{6, 7, 10, }] = 2;
mbo[{6, 8, 9, }] = 1;
mbo[{6, 8, 10, }] = 2;
mbo[{6, 9, 10, }] = 8;
mbo[{7, 8, 9, }] = 5;
mbo[{7, 8, 10, }] = 6;
mbo[{7, 9, 10, }] = 5;
mbo[{8, 9, 10, }] = 5;

int olei = 711907;
// cout << rnd() % m;
string type;
cin >> type;
if (type == "add") {
    int t;
    cin >> t;
    while (t--) {
        int n, k;
        cin >> n >> k;
        vector<int> a(k);
        rep(i, k) {
            cin >> a[i];
        }
        sort(all(a));
        if (n == 10) {
            cout << mbo[a] << '\n';
        }
        else cout << olei << '\n';
    }
} else {
    int t;
    cin >> t;
    while (t--) {
        int n, k;
        cin >> n >> k;
```

```cpp
        vector<int> a(k + 1);
        rep(i, k + 1) {
            cin >> a[i];
        }
        sort(all(a));
        if (n <= 10) {
            rep(j, k + 1) {
                int el = a[j];
                auto b = a;
                b.erase(b.begin() + j);
                if (mbo[b] == el) {
                    for (auto el : b) {
                        cout << el << '␣';
                    }
                    break;
                }
            }
        } else {
            rep(i, k + 1) {
                if (a[i] != olei) cout << a[i] << '␣';
            }
        }
        cout << '\n';
    }
}
}

signed main() {
#ifndef ONLINE_JUDGE
    // files("input.txt", "output.txt");
#endif
    // files("subsequences.in", "subsequences.out");
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
    int t = 1;
    // cin >> t;
    while (t--)
        run();
    return 0;
}
```

Task F ()

```cpp
// #pragma GCC optimize("Ofast,unroll-all-loops")
// #pragma GCC optimize("O3")
#include <bits/stdc++.h>

#define ll long long
// #define int ll
// #define ld long double
#define pb push_back
#define ff first
#define ss second
#define files(in, out) freopen(in, "r", stdin); freopen(out, "w", stdout)
#define rep(i, n) for (int i = 0; i < n; ++i)
#define all(a) a.begin(), a.end()
#define pii pair<int, int>

using namespace std;

// const int p = 5;
const int mod = 1e9 + 7;
const int max_n = 4e3 + 5;
const int log_n = 21;
const int inf = 1e9 + 6;
// const long double pi = acos(-1);
// const int K = 400;

std::mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

vector<pii> p = {
    {0, 0},
    {0, 1},
    {1, 1},
    {1, 0}
};

vector<pii> v = {
    {1, 0},
    {-1, 0},
    {0, 1},
    {0, -1},
    {1, 1},
    {1, -1},
    {-1, 1},
    {-1, -1}
};

void run() {
    int n;
    cin >> n;
    cout << p.size() << '\n';
    for (auto el : p) {
        cout << el.ff << '_' << el.ss << '\n';
    }
    rep(i, n) {
        cout << v[i].ff << '_' << v[i].ss << '\n';
    }
}

signed main() {
#ifndef ONLINE_JUDGE
    // files("input.txt", "output.txt");
#endif
    // files("subsequences.in", "subsequences.out");
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
    int t = 1;
    // cin >> t;
    while (t--)
        run();
    return 0;
}
```