Олимпиада СПбГУ по информатике 2020/21 учебного года

A	B	C	D	E	F	Sum
100	100	60	100	55	25	440

Task A ()

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

#define int long long
#define pb push_back
#define all(x) (x).begin(), x.end()
#pragma comment(linker, "/STACK:66777216")

typedef long double ld;

using namespace std;

template<class A, class B> ostream& operator <<(ostream& out, const pair<A, B>& p) {
        return out << "(" << p.first << ",_" << p.second << ")";
}
template<class A> ostream& operator <<(ostream& out, const vector<A>& v) {
        out << "[";
        for (int i = 0; i < v.size(); i++) {
                if (i) out << ",_";
                out << v[i];
        }
        return out << "]";
}

const int N = 1e5, T = 1e5 + 1, INF = 1e12, MOD = 1e9 + 7;

signed main() {
        //ifstream cin("input.txt");
        //ofstream cout("output.txt");
        ios::sync_with_stdio(0);
        cin.tie(0);

        int k;
        cin >> k;
        if (k <= 9) {
                cout << k;
        }
        else {
                int ans = (k - 10) % 9;
                if (ans) ans++;
                cout << ans;
        }

}
```

Task B ()

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

#define int long long
#define pb push_back
#define all(x) (x).begin(), x.end()
#pragma comment(linker, "/STACK:66777216")

typedef long double ld;

using namespace std;

template<class A, class B> ostream& operator <<(ostream& out, const pair<A, B>& p) {
        return out << "(" << p.first << ", " << p.second << ")";
}
template<class A> ostream& operator <<(ostream& out, const vector<A>& v) {
        out << "[";
        for (int i = 0; i < v.size(); i++) {
                if (i) out << ", ";
                out << v[i];
        }
        return out << "]";
}

const int N = 1e5, T = 1e5 + 1, INF = 1e12, MOD = 1e9 + 7;

signed main() {
        //ifstream cin("input.txt");
        //ofstream cout("output.txt");
        ios::sync_with_stdio(0);
        cin.tie(0);

        int n, k;
        cin >> n >> k;
        string s;
        cin >> s;
        int ans = 0, len = 0;
        set<char> cur;
        for (int i = 0; i < n; i++) {
                len++;
                cur.insert(s[i]);

                if (len > k || cur.size() > 3) {
                        cur.clear();
                        ans++;
                        len = 1;
                        cur.insert(s[i]);
                }
        }
        if (len) ans++;
        cout << ans;
}
```

Task C ()

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

#define int long long
#define pb push_back
#define all(x) (x).begin(), x.end()
#pragma comment(linker, "/STACK:66777216")

typedef long double ld;

using namespace std;

template<class A, class B> ostream& operator <<(ostream& out, const pair<A, B>& p) {
        return out << "(" << p.first << "," << p.second << ")";
}
template<class A> ostream& operator <<(ostream& out, const vector<A>& v) {
        out << "[";
        for (int i = 0; i < v.size(); i++) {
                if (i) out << ",";
                out << v[i];
        }
        return out << "]";
}

const int N = 10, T = 1e5 + 1, INF = 1e12, MOD = 1e9 + 7;

signed main() {
        //ifstream cin("input.txt");
        //ofstream cout("output.txt");
        ios::sync_with_stdio(0);
        cin.tie(0);

        int n, x, y;
        cin >> n >> x >> y;
        vector<int> a(n+1), b(n+1);
        int s = 0;
        for (int i = 1; i <= n; i++) cin >> a[i];
        for (int i = 1; i <= n; i++) cin >> b[i], s += b[i];
        if (s <= y) {
                for (int i = 0; i < n; i++)
                        cout << 'y';
                return 0;
        }
        vector<vector<int>> dp(n+1, vector<int>(x + 1, s)), pr(n+1, vector<int>(x + 1));

        for (int i = 1; i <= n; i++) {
                for (int j = 0; j < i; j++) {
                        for (int k = a[i]; k <= x; k++) {
                                if (dp[i][k] > dp[j][k - a[i]] - b[i]) {
                                        dp[i][k] = dp[j][k - a[i]] - b[i];
                                        pr[i][k] = j;
                                }
                        }
                }
        }
        //for (int i = 1; i <= n; i++) {
        //        for (int j = 0; j <= x; j++) {
        //                cout << dp[i][j] << ' ';
        //        }cout << '\n';
        //}
        int p = -1, cur = -1;
        for (int i = 1; i <= n; i++) {
                for (int j = 0; j <= x; j++) {
                        if (dp[i][j] <= y) {
                                p = i;
                                cur = j;
                                break;
                        }
                }
                if (p != -1) break;
        }
        if (p == -1) {
                cout << -1;
```

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```cpp
                return 0;
        }
        vector<int> ans;
        while (cur) {
                ans.pb(p);

                int tp = p;
                p = pr[p][cur];
                cur = cur - a[tp];
        }
        vector<char> res(n+1, 'y');
        for (int i = 0; i < ans.size(); i++) {
                res[ans[i]] = 'x';
        }
        for (int i = 1; i <= n; i++)
                cout << res[i];
}
```

Task D ()

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

#define int long long
#define pb push_back
#define all(x) (x).begin(), x.end()
#pragma comment(linker, "/STACK:66777216")

typedef long double ld;

using namespace std;

template<class A, class B> ostream& operator <<(ostream& out, const pair<A, B>& p) {
        return out << "(" << p.first << ", " << p.second << ")";
}
template<class A> ostream& operator <<(ostream& out, const vector<A>& v) {
        out << "[";
        for (int i = 0; i < v.size(); i++) {
                if (i) out << ", ";
                out << v[i];
        }
        return out << "]";
}

const int N = 1e5, T = 1e5 + 1, INF = 1e12, MOD = 1e9 + 7;

signed main() {
        //ifstream cin("input.txt");
        //ofstream cout("output.txt");
        ios::sync_with_stdio(0);
        cin.tie(0);


        int n;
        string s;
        cin >> n >> s;
        int a = 0, b = 0;
        vector<int> t;
        for (int i = 0; i < 2 * n; i++) {
                if (s[i] == '(' || s[i] == ')') {
                        if (t.size() && !t.back()) {
                                t.pop_back();
                                a--;
                        }
                        else {
                                t.push_back(0);
                                a++;
                        }
                }
                else {
                        if (t.size() && t.back()) {
                                t.pop_back();
                                b--;
                        }
                        else {
                                t.push_back(1);
                                b++;
                        }
                }
        }
        cout << (a + b) / 2;
}
```

Task E ()

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

//#define int long long
#define pb push_back
#define all(x) (x).begin(), x.end()
#pragma comment(linker, "/STACK:66777216")

typedef long double ld;

using namespace std;

template<class A, class B> ostream& operator <<(ostream& out, const pair<A, B>& p) {
        return out << "(" << p.first << "," << p.second << ")";
}
template<class A> ostream& operator <<(ostream& out, const vector<A>& v) {
        out << "[";
        for (int i = 0; i < v.size(); i++) {
                if (i) out << ",";
                out << v[i];
        }
        return out << "]";
}

const int N = 10, T = 1e5 + 1, INF = 1e12, MOD = 1e9 + 7;

void del(map<vector<int>, vector<int>>& s, vector<int> x, int p) {
        auto it = find(all(s[x]), p);
        if (it != s[x].end())
                s[x].erase(it);
}
int find_first(vector<int> f, int a, int b, int c) {
        for (int i = 1; i <= 10; i++) {
                if (find(all(f), i) == f.end() && a != i && b != i && c != i) {
                        return i;
                }
        }
        return -1;
}
signed main() {
        //ifstream cin("input.txt");
        //ofstream cout("output.txt");
        ios::sync_with_stdio(0);
        cin.tie(0);

        string type;
        int t, n, k;
        cin >> type >> t;
        while (t--) {
                cin >> n >> k;
                if (n == 1000000) {
                        if (type == "add") {
                                int x;
                                vector<int> f(n + 1);
                                for (int i = 0; i < k; i++) {
                                        cin >> x;
                                        f[x] = 1;
                                }
                                bool ok = 0;
                                for (int i = 1; i < n - 1; i++) {
                                        if (!f[i] && !f[i + 1] && !f[i + 2]) {
                                                cout << i << '\n';
                                                ok = 1;
                                                break;
                                        }
                                }
                                if (!ok) n /= 0;
                        }
                        else {
                                int x;
                                vector<bool> f(n + 1);
                                for (int i = 0; i < k + 1; i++) {
                                        cin >> x;
```

```cpp
                    f[x] = 1;
                }
                int it = 0;
                for (int i = 1; i < n; i++) {
                    if (f[i] && !f[i + 1] && !f[i + 2]) {
                        it = i;
                        break;
                    }
                }
                for (int i = 1; i <= n; i++) {
                    if (f[i] && i != it) cout << i << '␣';
                }cout << '\n';
            }
    }
    else {
        map<vector<int>, vector<int>> s;

        for (int i = 1; i <= n; i++) {
            for (int j = i + 1; j <= n; j++) {
                for (int r = j + 1; r <= n; r++) {
                    vector<int> tmp = { i, j, r };
                    int p = find_first(s[tmp], i, j, r);

                    tmp = { i, j, p };
                    sort(all(tmp));
                    s[tmp].pb(r);

                    tmp = { i, r, p };
                    sort(all(tmp));
                    s[tmp].pb(j);

                    tmp = { r, j, p };
                    sort(all(tmp));
                    s[tmp].pb(i);
                }
            }
        }
        map<vector<int>, int> from, to;
        for (int i = 1; i <= n; i++) {
            for (int j = i + 1; j <= n; j++) {
                for (int r = j + 1; r <= n; r++) {
                    vector<int> tmp = { i, j, r };
                    int p = find_first(s[tmp], i, j, r);
                    to[tmp] = p;
                    vector<int> tmp2 = { i, j, r, p };
                    sort(all(tmp2));
                    from[tmp2] = p;
                }
            }
        }
        if (type == "add") {
            int x;
            vector<int> f;
            for (int i = 0; i < k; i++) {
                cin >> x;
                f.pb(x);
            }
            sort(all(f));
            cout << to[f] << '\n';
        }
        else {
            int x;
            vector<int> f;
            for (int i = 0; i < k + 1; i++) {
                cin >> x;
                f.pb(x);
            }
            sort(all(f));
            int it = from[f];
            //cout << it << '\n';
            for (int i = 0; i < f.size(); i++)
                if (f[i] != it)
                    cout << f[i] << '␣';
            cout << '\n';
```

```
                }
            }
        }
    }
```

Task F ()

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

#define int long long
#define pb push_back
#define all(x) (x).begin(), x.end()
#pragma comment(linker, "/STACK:66777216")

typedef long double ld;

using namespace std;

template<class A, class B> ostream& operator <<(ostream& out, const pair<A, B>& p) {
        return out << "(" << p.first << ", " << p.second << ")";
}
template<class A> ostream& operator <<(ostream& out, const vector<A>& v) {
        out << "[";
        for (int i = 0; i < v.size(); i++) {
                if (i) out << ", ";
                out << v[i];
        }
        return out << "]";
}

const int N = 10, T = 1e5 + 1, INF = 1e12, MOD = 1e9 + 7;

signed main() {
        //ifstream cin("input.txt");
        //ofstream cout("output.txt");
        ios::sync_with_stdio(0);
        cin.tie(0);

        int n;
        cin >> n;
        vector<pair<int,int>> f = {
                {-1, -1},
                {-1, 1},
                {1, 1},
                {1, -1}
        };
        vector<pair<int,int>> ans = {
                {2, 0},
                {-2, 0},
                {0, 2},
                {0, -2},
                {2, 2},
                {2, -2},
                {-2, 2},
                {-2, -2}
        };
        cout << f.size() << '\n';
        for (int i = 0; i < f.size(); i++)
                cout << f[i].first << ' ' << f[i].second << '\n';
        for (int i = 0; i < n; i++) {
                cout << ans[i].first << ' ' << ans[i].second << '\n';
        }
}
```