

Олимпиада СПбГУ по информатике 2020/21 учебного года

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

Task A ()

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

using namespace std;

#define fi first
#define se second
#define all(x) (x).begin(), (x).end()
#define pb emplace_back
#define ll long long
#define pii pair<int, int>
#define ld long double

const int INF = 1e9 + 1;
const ll INFLL = 1e18 + 1;

int solve(int k) {
    ll p = 0;
    for (int i = 1; i <= k; i++) {
        if (i == k) {
            return (k + p) % 10;
        }
        int c = (i + p) % 10;
        ll p1 = (i + p - c) / 10;
        p = p1;
    }
}

int main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    int k;
    cin >> k;
    if (k <= 1000000) cout << solve(k);
    else {
        string block = "023456789";
        k--;
        k %= 9;
        cout << block[k];
    }
    return 0;
}
```

Task B ()

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

using namespace std;

#define fi first
#define se second
#define all(x) (x).begin(), (x).end()
#define pb emplace_back
#define ll long long
#define pii pair<int, int>
#define ld long double

const int INF = 1e9 + 1;
const ll INFLL = 1e18 + 1;

int main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    int n, k;
    cin >> n >> k;
    string s;
    cin >> s;
    vector<int> left(n);
    int l = n;
    int now = 0;
    vector<int> cnt(26);
    for (int r = n - 1; r >= 0; r--) {
        while (l - 1 >= 0 && (r - (l - 1) + 1) <= k && now + (cnt[s[l - 1] - 'a'] == 0) <= 3) {
            l--;
            cnt[s[l] - 'a']++;
            if (cnt[s[l] - 'a'] == 1) now++;
        }
        left[r] = l;
        cnt[s[r] - 'a']--;
        if (cnt[s[r] - 'a'] == 0) now--;
    }
    vector<int> dp(n + 1);
    for (int i = 0; i < n; i++) dp[i + 1] = 1 + dp[left[i]];
    cout << dp.back();
    return 0;
}
```

Task C ()

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

using namespace std;

#define fi first
#define se second
#define all(x) (x).begin(), (x).end()
#define pb emplace_back
#define ll long long
#define pii pair<int, int>
#define ld long double

const int INF = 1e9 + 1;
const ll INFLL = 1e18 + 1;

const int MAXV = 250005;
const int MAXN = 505;

int dp[MAXN][MAXV];

int main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    int n, x, y;
    cin >> n >> x >> y;
    vector<int> v(n), w(n);
    for (auto &c : v) cin >> c;
    for (auto &c : w) cin >> c;
    for (int j = 1; j <= x; j++) dp[0][j] = INF;
    for (int i = 1; i <= n; i++) {
        for (int j = 0; j <= x; j++) {
            dp[i][j] = INF;
            if (j >= v[i - 1]) dp[i][j] = min(dp[i][j], dp[i - 1][j - v[i - 1]]);
            dp[i][j] = min(dp[i][j], dp[i - 1][j] + w[i - 1]);
        }
    }
    for (int j = 0; j <= x; j++) {
        if (dp[n][j] > y) continue;
        string ans = "";
        int i = n;
        while (i > 0) {
            if (dp[i][j] == dp[i - 1][j] + w[i - 1]) {
                ans += 'y';
                i--;
            } else {
                ans += 'x';
                j -= v[i - 1];
                i--;
            }
        }
        reverse(all(ans));
        cout << ans;
        return 0;
    }
    cout << -1;
    return 0;
}
```

Task D ()

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

using namespace std;

#define fi first
#define se second
#define all(x) (x).begin(), (x).end()
#define pb emplace_back
#define ll long long
#define pii pair<int, int>
#define ld long double

const int INF = 1e9 + 1;
const ll INFL = 1e18 + 1;

int main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    int n;
    cin >> n;
    string s;
    cin >> s;
    stack<int> st;
    int ans = 0;
    for (int i = 0; i < (int)s.size(); i++) {
        auto c = s[i];
        int type = 1;
        if (c == '[' || c == ']') type = 2;
        if (st.size() && st.top() == type) {
            st.pop();
            continue;
        }
        if ((int)st.size() + 1 <= 2 * n - i - 1) st.push(type);
        else {
            ans++;
            st.pop();
        }
    }
    cout << ans;
    return 0;
}
```

Task E ()

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

using namespace std;

#define fi first
#define se second
#define all(x) (x).begin(), (x).end()
#define pb emplace_back
#define ll long long
#define pii pair<int, int>
#define ld long double

const int INF = 1e9 + 1;
const ll INFLL = 1e18 + 1;

mt19937 rnd(time(0));

map<vector<int>, int> ma;

vector<vector<int>> p;

void gen(vector<int> &now) {
    if ((int)now.size() == 3) {
        p.pb(now);
        return;
    }
    int s = 1;
    if (now.size()) s = now.back() + 1;
    for (int i = s; i <= 10; i++) {
        now.pb(i);
        gen(now);
        now.pop_back();
    }
}

vector<int> d;

bool check(vector<int> &now, int d) {
    bool ok = 1;
    for (int i = 0; i < 3 && ok; i++) {
        if (now[i] == d) {
            ok = 0;
            break;
        }
        int c = now[i];
        vector<int> now1 = now;
        now1.erase(now1.begin() + i);
        now1.pb(d);
        sort(all(now1));
        if (ma[now1] == c) ok = 0;
    }
    return ok;
}

bool OK = 0;

void solve(int i) {
    if (i == (int)p.size()) {
        OK = 1;
        return;
    }
    //shuffle(all(d), rnd);
    for (auto &c : d) {
        if (OK) return;
        if (check(p[i], c)) {
            ma[p[i]] = c;
            solve(i + 1);
            if (OK) return;
            ma.erase(p[i]);
        }
    }
}
```

```

}

void print(vector<int> &a) {
    for (auto &c : a) cout << c << " ";
    cout << "\n";
}

int main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    vector<int> now;
    gen(now);
    d.resize(10);
    iota(all(d), 1);
    solve(0);
    string s;
    cin >> s;
    if (s == "add") {
        int t;
        cin >> t;
        while (t--) {
            int n, k;
            cin >> n >> k;
            if (n == 10 && k == 3) {
                vector<int> a(k);
                for (auto &c : a) cin >> c;
                sort(all(a));
                cout << ma[a] << "\n";
                continue;
            }
            vector<int> a(k), usd(n);
            int sum = 0;
            for (auto &c : a) {
                cin >> c;
                c--;
                sum += c;
                sum %= n;
                usd[c] = 1;
            }
            int ans = sum;
            while (usd[ans]) {
                ans++;
                ans %= n;
            }
            cout << ans + 1 << "\n";
        }
    } else {
        int t;
        cin >> t;
        while (t--) {
            int n, k;
            cin >> n >> k;
            if (n == 10 && k == 3) {
                vector<int> a(k + 1);
                for (auto &c : a) cin >> c;
                for (int i = 0; i < 4; i++) {
                    vector<int> b = a;
                    b.erase(b.begin() + i);
                    sort(all(b));
                    if (ma[b] == a[i]) {
                        print(b);
                        break;
                    }
                }
                continue;
            }
            k++;
            int sum = 0;
            vector<int> a(k);
            vector<int> usd(n);
            for (auto &c : a) {
                cin >> c;
                c--;
            }
        }
    }
}

```

```

        usd[c] = 1;
        sum += c;
        sum %= n;
    }
    vector<int> pr(n + 1);
    for (int i = 1; i <= n; i++) pr[i] = pr[i - 1] + usd[i - 1];
    vector<int> can;
    for (auto &c : a) {
        bool ok = 0;
        int sum1 = sum - c;
        if (sum1 < 0) sum1 += n;
        if (c >= sum1) {
            if (pr[c] - pr[sum1] == c - sum1) ok = 1;
        } else {
            if (pr[c] == c && pr[n] - pr[sum1] == n - sum1) ok = 1;
        }
        if (ok) can.pb(c);
    }
    if (can.empty()) return 0;
    for (auto &c : a) {
        if (c != can[0]) cout << c + 1 << " ";
    }
    cout << "\n";
}
}
return 0;
}

```

Task F ()

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

using namespace std;

#define fi first
#define se second
#define all(x) (x).begin(), (x).end()
#define pb emplace_back
#define ll long long
#define pii pair<int, int>
#define ld long double

const int INF = 1e9 + 1;
const ll INFLL = 1e18 + 1;

vector<int> dx = {0, 1, -1};
vector<int> dy = {0, 1, -1};

int main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    int n;
    cin >> n;
    if (n <= 8) {
        cout << 4 << "\n";
        cout << 0 << "┐" << 0 << "\n" << 1 << "┐" << 0 << "\n" << 1 << "┐" << 1 << "\n" << 0 << "┐" << 1 << "\n";
        int cnt = 0;
        for (int i = 0; i < 3; i++) {
            for (int j = 0; j < 3; j++) {
                if (i == 0 && j == 0) continue;
                if (cnt == n) break;
                cout << dx[i] << "┐" << dy[j] << "\n";
                cnt++;
            }
        }
        return 0;
    }
    return 0;
}
```