

Олимпиада СПбГУ по информатике 2020/21 учебного года

A	B	C	D	E	F	Sum
100	100	100	47	100	25	472

Task A ()

```
#include <bits/stdc++.h>
using namespace std;

#define FOR(i, a, b) for(__typeof(b) i = (a); i < (b); ++i)
#define dbg(x) cout << #x << " = " << x << '\n';
#define SOLVE int t; cin >> t; while(t--) solve()
#define all(x) begin(x), end(x)
#define sz(x) (int)(x).size()

typedef long long ll;
typedef long double ld;
typedef pair<int, int> pii;
typedef vector<int> vi;

mt19937 rng(chrono::steady_clock::now().time_since_epoch().count());

void solve(){
    int k; cin >> k;
    int ans = (k - 1) % 9 + 1;
    if(k > 9 && ans == 1) ans = 0;
    cout << ans << '\n';
}

int main(){
    ios::sync_with_stdio(false); cin.tie(nullptr);
    // SOLVE;
    solve();
}
```

Task B ()

```
#include <bits/stdc++.h>
using namespace std;

#define FOR(i, a, b) for( __typeof(b) i = (a); i < (b); ++i)
#define dbg(x) cout << #x << " _=" << x << '\n';
#define SOLVE int t; cin >> t; while(t--) solve()
#define all(x) begin(x), end(x)
#define sz(x) (int)(x).size()

typedef long long ll;
typedef long double ld;
typedef pair<int, int> pii;
typedef vector<int> vi;

mt19937 rng(chrono::steady_clock::now().time_since_epoch().count());

void solve(){
    int n, k; cin >> n >> k;
    string s; cin >> s;
    vector<int> cnt(26, 0), dp(n+1);
    dp[0] = 0;
    deque<int> mn;
    mn.push_back(0);
    int l = 0, cur = 0;
    FOR(i, 1, n+1){
        int c = s[i-1] - 'a';
        if(cnt[c] == 0){
            cur++;
        }
        cnt[c]++;
        while(cur > 3 || i - l > k){
            c = s[l] - 'a';
            cnt[c]--;
            if(cnt[c] == 0){
                cur--;
            }
            if(mn.front() == dp[l]){
                mn.pop_front();
            }
            l++;
        }
        dp[i] = mn.front() + 1;
        while(!mn.empty() && dp[i] < mn.back()){
            mn.pop_back();
        }
        mn.push_back(dp[i]);
    }
    cout << dp[n] << '\n';
}

int main(){
    ios::sync_with_stdio(false); cin.tie(nullptr);
    // SOLVE;
    solve();
}
```

Task C ()

```
#include <iostream>
#include <vector>
#include <algorithm>
using namespace std;

#define FOR(i, a, b) for(decltype(b) i = (a); i < (b); ++i)
#define dbg(x) cout << #x << " _=" << x << '\n';
#define SOLVE int t; cin >> t; while(t--) solve()
#define all(x) begin(x), end(x)
#define sz(x) (int)(x).size()

typedef long long ll;
typedef long double ld;
typedef pair<int, int> pii;
typedef vector<int> vi;

// mt19937 rng(chrono::steady_clock::now().time_since_epoch().count());

void solve(){
    int n, x, y; cin >> n >> x >> y;
    vi v(n), w(n);
    FOR(i, 0, n){
        cin >> v[i];
    }
    int w_sum = 0;
    FOR(i, 0, n){
        cin >> w[i];
        w_sum += w[i];
    }
    vector<vi> par(n+1, vi(x+1, -1));
    vi dp_last(x+1, -1e9), dp_cur(x+1, 0);
    dp_last[0] = 0;
    FOR(i, 0, n){
        for(int j = x; j >= 0; j--){
            if(v[i] <= j && dp_last[j - v[i]] + w[i] > dp_last[j]){
                dp_cur[j] = dp_last[j - v[i]] + w[i];
                par[i+1][j] = i;
            } else {
                dp_cur[j] = dp_last[j];
            }
        }
        dp_last = dp_cur;
        dp_cur.assign(x+1, 0);
    }
    int mx = max_element(all(dp_last)) - dp_last.begin();
    if(w_sum - dp_last[mx] > y){
        cout << "-1\n";
        return;
    }
    vector<int> ans;
    int cur = mx;
    for(int i = n; i > 0; i--){
        if(par[i][cur] == -1) continue;
        ans.push_back(par[i][cur]);
        cur -= v[par[i][cur]];
    }
    reverse(all(ans));
    cur = 0;
    FOR(i, 0, n){
        if(cur < sz(ans) && ans[cur] == i){
            cout << 'x';
            cur++;
        } else {
            cout << 'y';
        }
    }
    cout << '\n';
}

int main(){
    ios::sync_with_stdio(false); cin.tie(nullptr);
    // SOLVE;
```

```
} solve();
```

Task D ()

```
#include <bits/stdc++.h>
using namespace std;

#define FOR(i, a, b) for( __typeof(b) i = (a); i < (b); ++i)
#define dbg(x) cout << #x << " _=_ " << x << '\n';
#define SOLVE int t; cin >> t; while(t--) solve()
#define all(x) begin(x), end(x)
#define sz(x) (int)(x).size()

typedef long long ll;
typedef long double ld;
typedef pair<int, int> pii;
typedef vector<int> vi;

mt19937 rng(chrono::steady_clock::now().time_since_epoch().count());

int n;
vector<int> a, cache;

int find_ans(int l, int r){
    if(l == r){
        return 0;
    }
    int ind = l * n + r - 1;
    if(cache[ind] != -1){
        return cache[ind];
    }
    int mn = 1e9;
    for(int m = l + 2; m <= r; m += 2){
        mn = min(mn, (a[l] != a[m - 1]) + find_ans(l + 1, m - 1) + find_ans(m, r));
    }
    cache[ind] = mn;
    return mn;
}

void solve(){
    cin >> n;
    n = 2 * n;
    a.resize(n);
    cache.assign(n * n, -1);
    string s;
    cin >> s;
    FOR(i, 0, n){
        if(s[i] == '(' || s[i] == '){
            a[i] = 0;
        } else {
            a[i] = 1;
        }
    }
    cout << find_ans(0, n) << '\n';
}

int main(){
    ios::sync_with_stdio(false); cin.tie(nullptr);
    // SOLVE;
    solve();
}
```

Task E ()

```
#include <bits/stdc++.h>
using namespace std;

#define FOR(i, a, b) for( __typeof(b) i = (a); i < (b); ++i)
#define dbg(x) cout << #x << " _ _ " << x << '\n';
#define SOLVE int t; cin >> t; while(t--) solve()
#define all(x) begin(x), end(x)
#define sz(x) (int)(x).size()

typedef long long ll;
typedef long double ld;
typedef pair<int, int> pii;
typedef vector<int> vi;

mt19937 rng(chrono::steady_clock::now().time_since_epoch().count());

// int binpow(int a, int b, int MOD){
//     int x = a, res = 1;
//     while(b){
//         if(b & 1){
//             res = (1ll * res * x) % MOD;
//         }
//         x = (1ll * x * x) % MOD;
//         b >>= 1;
//     }
//     cout << res << '\n';
//     return res;
// }

void add(){
    int n, k; cin >> n >> k;
    vi a(k);
    int h = 0;
    FOR(i, 0, k){
        cin >> a[i];
        h = (h + a[i]) % (k+1);
    }
    // cout << h << '\n';
    sort(all(a));
    int cur = 0;
    FOR(i, 1, n+1){
        if(cur < k && a[cur] == i){
            cur++;
            continue;
        }
        if((h+i) % (k+1) == cur){
            cout << i << '\n';
            return;
        }
    }
}

void clear(){
    int n, k; cin >> n >> k;
    vi a(k+1);
    int h = 0;
    FOR(i, 0, k+1){
        cin >> a[i];
        h = (h + a[i]) % (k+1);
    }
    sort(all(a));
    FOR(i, 0, k+1){
        if(i == h) continue;
        cout << a[i] << ' _ ';
    }
    cout << '\n';
}

int main(){
    ios::sync_with_stdio(false); cin.tie(nullptr);
    string s; cin >> s;
    if(s == "add"){
```

```
        int t; cin >> t;
        while(t-->0) add();
    }else{
        int t; cin >> t;
        while(t-->0) clear();
    }
}
```

Task F ()

```
#include <bits/stdc++.h>
using namespace std;

#define FOR(i, a, b) for(__typeof(b) i = (a); i < (b); ++i)
#define dbg(x) cout << #x << " = " << x << '\n';
#define SOLVE int t; cin >> t; while(t--) solve()
#define all(x) begin(x), end(x)
#define sz(x) (int)(x).size()

typedef long long ll;
typedef long double ld;
typedef pair<int, int> pii;
typedef vector<int> vi;

mt19937 rng(chrono::steady_clock::now().time_since_epoch().count());

void solve(){
    int n; cin >> n;
    cout << "4\n";
    cout << "0_0\n";
    cout << "0_1\n";
    cout << "1_1\n";
    cout << "1_0\n";
    if(n >= 1){
        cout << "-1_-1\n";
    }
    if(n >= 2){
        cout << "-1_0\n";
    }
    if(n >= 3){
        cout << "-1_1\n";
    }
    if(n >= 4){
        cout << "0_1\n";
    }
    if(n >= 5){
        cout << "1_1\n";
    }
    if(n >= 6){
        cout << "1_0\n";
    }
    if(n >= 7){
        cout << "1_-1\n";
    }
    if(n >= 8){
        cout << "0_-1\n";
    }
}

int main(){
    ios::sync_with_stdio(false); cin.tie(nullptr);
    // SOLVE;
    solve();
}
```