

# 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;

typedef long long ll;
typedef pair<int, int> pii;
typedef pair<ll, ll> pll;

#define all(x) x.begin(), x.end()
#define print(x) {for (auto xxxxx : x) cout << xxxxx << '␣'; cout << '\n';}

// #define int ll

const int maxn = 2e5 + 5, intf = 2e9;
const ll inf = 2e18;

void solve() {
    ll k; cin >> k;
    if (k > 10) {
        k--;
        k = k % 9;
        if (k != 0)
            k++;
        cout << k << '\n';
    } else {
        cout << (k + ((k - 1) / 10)) % 10 << '\n';
    }
}

signed main() {
#ifdef HERE
    freopen("input.txt", "r", stdin);
#else
    ios_base::sync_with_stdio(false); cin.tie(0); cout.precision(20);
#endif

    int t = 1;
    // cin >> t;
    while (t --> 0) {
        solve();
    }

    return 0;
}
```

## Task B ()

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

using namespace std;

typedef long long ll;
typedef pair<int, int> pii;
typedef pair<ll, ll> pll;

#define all(x) x.begin(), x.end()
#define print(x) {for (auto xxxxx : x) cout << xxxxx << ' '; cout << '\n';}

// #define int ll

const int maxn = 2e5 + 5, intf = 2e9;
const ll inf = 2e18;

vector<int> pr[26];
int N = 1;
vector<int> tree;

int get_sum(int t, int l, int r) {
    int ans = pr[t][r];
    if (l > 0)
        ans -= pr[t][l - 1];
    return ans;
}

bool check(int l, int r) {
    int sum = 0;
    for (int t = 0; t < 26; t++) {
        sum += (get_sum(t, l, r) > 0);
    }
    return (sum <= 3);
}

void update(int i, int x) {
    i += N;
    tree[i] = x;
    i /= 2;
    while (i) {
        tree[i] = min(tree[i*2], tree[i*2 + 1]);
        i /= 2;
    }
}

int get_min(int l, int r) {
    l += N, r += N;
    int ans = intf;
    while (l <= r) {
        if (l % 2 == 1)
            ans = min(ans, tree[l++]);
        if (r % 2 == 0)
            ans = min(ans, tree[r--]);
        l /= 2, r /= 2;
    }
    return ans;
}

void solve() {
    int n, k; string s;
    cin >> n >> k >> s;

    while (N < n)
        N *= 2;
    tree.resize(2*N, intf);

    for (int t = 0; t < 26; t++) {
        pr[t].resize(n, 0);
    }
    for (int i = 0; i < n; i++) {
        pr[s[i] - 'a'][i]++;
    }
}
```

```

    }
    for (int t = 0; t < 26; t++) {
        for (int i = 1; i < n; i++) {
            pr[t][i] += pr[t][i - 1];
        }
    }

    vector<int> dp(n, intf);
    for (int i = 0; i < n; i++) {
        int l = 0, r = i;
        while (r - l > 1) {
            int mid = (l + r) / 2;
            if (check(mid, i))
                r = mid;
            else
                l = mid;
        }
        int j = 1;
        for (; j <= r; j++) {
            if (check(j, i)) {
                break;
            }
        }
        j = max(j, 0);
        j = max(j, i - k + 1);
        if (j == 0) {
            dp[i] = 1;
        }
        else {
            dp[i] = get_min(j - 1, i - 1) + 1;
        }

        update(i, dp[i]);
    }
    cout << dp[n - 1] << '\n';
}

signed main() {
#ifdef HERE
    freopen("input.txt", "r", stdin);
#else
    ios_base::sync_with_stdio(false); cin.tie(0); cout.precision(20);
#endif

    int t = 1;
    // cin >> t;
    while (t --> 0) {
        solve();
    }

    return 0;
}

```

## Task C ()

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

using namespace std;

typedef long long ll;
typedef pair<int, int> pii;
typedef pair<ll, ll> pll;

#define all(x) x.begin(), x.end()
#define print(x) {for (auto xxxxx : x) cout << xxxxx << '␣'; cout << '\n';}

// #define int ll

const int maxn = 2e5 + 5, intf = 1e9 + 10;
const ll inf = 2e18;

void solve() {
    int n, x, y;
    cin >> n >> x >> y;
    vector<int> v(n), w(n);
    for (auto &x : v)
        cin >> x;
    for (auto &x : w)
        cin >> x;

    vector<vector<int>> dp(n, vector<int>(x + 1, intf));
    dp[0][0] = w[0];
    if (v[0] <= x)
        dp[0][v[0]] = 0;
    for (int i = 1; i < n; i++) {
        for (int j = x; j >= 0; j--) {
            if (j - v[i] >= 0) {
                dp[i][j] = min(dp[i - 1][j] + w[i], dp[i - 1][j - v[i]]);
            }
            else {
                dp[i][j] = dp[i - 1][j] + w[i];
            }
        }
    }
    int st = -1;
    for (int j = 0; j <= x; j++) {
        if (dp[n - 1][j] <= y) {
            st = j;
        }
    }
    if (st == -1) {
        cout << "-1\n";
        return;
    }

    int i = n - 1;
    string ans(n, 'x');
    while (i >= 0) {
        if (i == 0) {
            if (st == 0)
                ans[i] = 'y';
            break;
        }
        if (st - v[i] >= 0) {
            if (dp[i - 1][st] + w[i] < dp[i - 1][st - v[i]]) {
                ans[i] = 'y';
            }
            else {
                st -= v[i];
            }
        }
        else {
            ans[i] = 'y';
        }
        i--;
    }
    cout << ans << '\n';
}
```

```

signed main() {
    #ifdef HERE
        freopen("input.txt", "r", stdin);
    #else
        ios_base::sync_with_stdio(false); cin.tie(0); cout.precision(20);
    #endif

    int t = 1;
    // cin >> t;
    while (t --> 0) {
        solve();
    }

    return 0;
}

```

## Task D ()

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

using namespace std;

typedef long long ll;
typedef pair<int, int> pii;
typedef pair<ll, ll> pll;

#define all(x) x.begin(), x.end()
#define print(x) {for (auto xxxxx : x) cout << xxxxx << '␣'; cout << '\n';}

// #define int ll

const int maxn = 2e5 + 5, intf = 1e9 + 10;
const ll inf = 2e18;

void solve() {
    int n; cin >> n;
    n *= 2;
    vector<int> a(n);
    for (int i = 0; i < n; i++) {
        char c; cin >> c;
        if (c == '(' || c == ')')
            a[i] = 0;
        else
            a[i] = 1;
    }
    vector<int> st;
    for (int i = 0; i < n; i++) {
        if (st.empty() || st.back() != a[i]) {
            st.push_back(a[i]);
        } else {
            st.pop_back();
        }
    }
    int ans = 0;
    for (int i = 0; i < int(st.size()) / 2; i++) {
        ans += st[i] != st[int(st.size()) - i - 1];
    }
    cout << ans << '\n';
}

signed main() {
#ifdef HERE
    freopen("input.txt", "r", stdin);
#else
    ios_base::sync_with_stdio(false); cin.tie(0); cout.precision(20);
#endif

    int t = 1;
    // cin >> t;
    while (t --> 0) {
        solve();
    }

    return 0;
}
```

## Task E ()

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

using namespace std;

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

#define all(x) x.begin(), x.end()
#define print(x) {for (auto xxxxx : x) cout << xxxxx << ' '; cout << '\n';}

// #define int ll

const int maxn = 2e5 + 5, intf = 1e9 + 10;
const ll inf = 2e18;

int dist(int x, int y, int n) {
    if (x > y)
        y += n;
    return y - x;
}

ll X = 1e9 + 7;

int to(vector<int> a, int n) {
    int k = a.size();
    set<int> b;
    ll ans = 0;
    for (int i = 0; i < k; i++) {
        b.insert(a[i]);
        ans = (ans*X + a[i]) % n;
    }
    ans++;
    while (b.count(ans))
        ans++;

    return ans;
}

int N, K;
vector<vector<int>>> g;
vector<int> mt;
vector<char> used;
bool try_kuhn (int v) {
    if (used[v])
        return false;
    used[v] = true;
    for (size_t i=0; i<g[v].size(); ++i) {
        int to = g[v][i];
        if (mt[to] == -1 || try_kuhn (mt[to])) {
            mt[to] = v;
            return true;
        }
    }
    return false;
}

void solve() {
    N = K = 1;
    for (int i = 0; i < 3; i++)
        N *= 10;
    for (int i = 0; i < 4; i++)
        K *= 10;

    g.resize(N);

    for (int x = 0; x < K; x++) {
        vector<int> a = {x % 10, (x / 10) % 10, (x / 100) % 10, (x / 1000) % 10};
        if (!(a[0] < a[1] && a[1] < a[2] && a[2] < a[3]))
            continue;
    }
}
```

```

    //print(a);
    for (int i = 0; i < 4; i++) {
        vector<int> b = a;
        b.erase(b.begin() + i);
        //print(b);
        g[b[0] + b[1]*10 + b[2]*100].push_back(x);
    }
}
mt.assign (K, -1);
for (int v=0; v<N; ++v) {
    used.assign(N, false);
    try_kuhn(v);
}

string s; cin >> s;
int t; cin >> t;
while (t --> 0) {
    int n, k; cin >> n >> k;
    if (n > 10) {
        if (s == "add") {
            vector<int> a(k);
            for (auto &x : a)
                cin >> x;
            sort(all(a));
            cout << to(a, n) << '\n';
        } else {
            vector<int> a(k + 1);
            for (auto &x : a)
                cin >> x;
            sort(all(a));
            for (int i = 0; i <= k; i++) {
                vector<int> b = a;
                int x = b[i];
                b.erase(b.begin() + i);
                if (to(b, n) == x) {
                    print(b);
                    break;
                }
            }
        }
    }
} else {
    if (s == "add") {
        vector<int> a(k);
        for (auto &x : a) {
            cin >> x;
            x--;
        }
        sort(all(a));
        set<int> sa;
        for (auto x : a)
            sa.insert(x);

        for (int i = 0; i < K; i++) {
            if (mt[i] == a[0] + a[1]*10 + a[2]*100) {
                vector<int> b = {i % 10, (i / 10) % 10, (i / 100) % 10, (i / 1000) % 10};
                for (auto x : b) {
                    if (!sa.count(x)) {
                        cout << x + 1 << '\n';
                        break;
                    }
                }
                break;
            }
        }
    } else {
        vector<int> a(k + 1);
        for (auto &x : a) {
            cin >> x;
            x--;
        }
        sort(all(a));
        int x = a[0] + a[1]*10 + a[2]*100 + a[3]*1000;
        x = mt[x];
    }
}

```



```

        cout << (x % 10) + 1 << '␣' << ((x / 10) % 10) + 1 << '␣' << ((x / 100) % 10) + 1
        << '\n';
    }
}

signed main() {
#ifdef HERE
    freopen("input.txt", "r", stdin);
#else
    ios_base::sync_with_stdio(false); cin.tie(0); cout.precision(20);
#endif

    int t = 1;
    // cin >> t;
    while (t --> 0) {
        solve();
    }

    return 0;
}

```

## Task F ()

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

using namespace std;

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

#define all(x) x.begin(), x.end()
#define print(x) {for (auto xxxxx : x) cout << xxxxx << '␣'; cout << '\n';}

// #define int ll

const int maxn = 2e5 + 5, intf = 1e9 + 10;
const ll inf = 2e18;

void solve() {
    int n; cin >> n;
    vector<pii> pol = {{0, 0}, {1, 0}, {1, 1}, {0, 1}};
    vector<pii> del = {{0, 1}, {1, 0}, {-1, 0}, {0, -1}, {1, 1}, {1, -1}, {-1, 1}, {-1, -1}};
    cout << pol.size() << '\n';
    for (auto x : pol) {
        cout << x.first << '␣' << x.second << '\n';
    }
    for (int i = 0; i < n; i++) {
        cout << del[i].first << '␣' << del[i].second << '\n';
    }
}

signed main() {
    #ifdef HERE
        freopen("input.txt", "r", stdin);
    #else
        ios_base::sync_with_stdio(false); cin.tie(0); cout.precision(20);
    #endif

    int t = 1;
    // cin >> t;
    while (t --> 0) {
        solve();
    }

    return 0;
}
```