

Олимпиада СПбГУ по информатике 2020/21 учебного года

A	B	C	D	E	F	Sum
100	100	100	100	20	25	445

Task A ()

```
#include <bits/stdc++.h>
#include <ext/pb_ds/assoc_container.hpp>
#include <ext/pb_ds/tree_policy.hpp>
#include <ext/rope>

using namespace std;
using namespace __gnu_cxx;
using namespace __gnu_pbds;

#define all(x) x.begin(), x.end()
#define endl '\n'
#define fastIO ios::sync_with_stdio(0); cout.tie(0); cin.tie(0);
#define fi first
#define mp make_pair
#define pb emplace_back
#define re return
#define rep(i, n) for (int i = 0; i < (n); i++)
#define rrep(i, n) for (int i = (n) - 1; i >= 0; i--)
#define se second
#define sqr(x) ((x) * (x))
#define sqrt(x) sqrt(abs(x))
#define sz(x) int(x.size())
#define unq(x) (x.resize(unique(all(x)) - x.begin()))
typedef long double ld;
typedef long long ll;
typedef pair<int, int> ii;
typedef vector<bool> vb;
typedef vector<char> vc;
typedef vector<int> vi;
typedef vector<pair<int, int>> vii;
typedef vector<long long> vll;
typedef vector<string> vs;
typedef vector<vector<bool>> vvb;
typedef vector<vector<char>> vvc;
typedef vector<vector<int>> vvi;

mt19937 rnd(chrono::high_resolution_clock::now().time_since_epoch().count());
typedef tree<ll, null_type, less<ll>, rb_tree_tag, tree_order_statistics_node_update> ordered_set;

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

int main()
{
    fastIO;
    //freopen("d2.txt", "r", stdin);
    //freopen("output.txt", "w", stdout);
```

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

Task B ()

```
#include <bits/stdc++.h>
#include <ext/pb_ds/assoc_container.hpp>
#include <ext/pb_ds/tree_policy.hpp>
#include <ext/rope>

using namespace std;
using namespace __gnu_cxx;
using namespace __gnu_pbds;

#define all(x) x.begin(), x.end()
#define endl '\n'
#define fastIO ios::sync_with_stdio(0); cout.tie(0); cin.tie(0);
#define fi first
#define mp make_pair
#define pb emplace_back
#define re return
#define rep(i, n) for (int i = 0; i < (n); i++)
#define rrep(i, n) for (int i = (n) - 1; i >= 0; i--)
#define se second
#define sqr(x) ((x) * (x))
#define sqrt(x) sqrt(abs(x))
#define sz(x) int(x.size())
#define unq(x) (x.resize(unique(all(x)) - x.begin()))
typedef long double ld;
typedef long long ll;
typedef pair<int, int> ii;
typedef vector<bool> vb;
typedef vector<char> vc;
typedef vector<int> vi;
typedef vector<pair<int, int>> vii;
typedef vector<long long> vll;
typedef vector<string> vs;
typedef vector<vector<bool>> vvb;
typedef vector<vector<char>> vvc;
typedef vector<vector<int>> vvi;

mt19937 rnd(chrono::high_resolution_clock::now().time_since_epoch().count());
typedef tree<ll, null_type, less<ll>, rb_tree_tag, tree_order_statistics_node_update> ordered_set;

void solve()
{
    int n, k, ans = 0, cur = 0;
    string s;
    cin >> n >> k >> s;
    set<char> t;
    rep(i, n)
    {
        t.insert(s[i]);
        cur++;
        if (sz(t) == 4 || cur == k + 1) {
            t.clear();
            ans++;
            cur = 1;
            t.insert(s[i]);
        }
    }
    cout << ans + 1;
}

int main()
{
    fastIO;
    //freopen("d2.txt", "r", stdin);
    //freopen("output.txt", "w", stdout);
    int t = 1;
    //cin >> t;
    while (t--) solve();
    re 0;
}
```

Task C ()

```
#include <bits/stdc++.h>
#include <ext/pb_ds/assoc_container.hpp>
#include <ext/pb_ds/tree_policy.hpp>
#include <ext/rope>

using namespace std;
using namespace __gnu_cxx;
using namespace __gnu_pbds;

#define all(x) x.begin(), x.end()
#define endl '\n'
#define fastIO ios::sync_with_stdio(0); cout.tie(0); cin.tie(0);
#define fi first
#define mp make_pair
#define pb emplace_back
#define re return
#define rep(i, n) for (int i = 0; i < (n); i++)
#define rrep(i, n) for (int i = (n) - 1; i >= 0; i--)
#define se second
#define sqr(x) ((x) * (x))
#define sqrt(x) sqrt(abs(x))
#define sz(x) int(x.size())
#define unq(x) (x.resize(unique(all(x)) - x.begin()))
typedef long double ld;
typedef long long ll;
typedef pair<int, int> ii;
typedef vector<bool> vb;
typedef vector<char> vc;
typedef vector<int> vi;
typedef vector<pair<int, int>> vii;
typedef vector<long long> vll;
typedef vector<string> vs;
typedef vector<vector<bool>> vvb;
typedef vector<vector<char>> vvc;
typedef vector<vector<int>> vvi;

mt19937 rnd(chrono::high_resolution_clock::now().time_since_epoch().count());
typedef tree<ll, null_type, less<ll>, rb_tree_tag, tree_order_statistics_node_update> ordered_set;

bool check(string &ans, vi &v, vi &w, int x, int y)
{
    int izn_x = x, izn_y = y;
    rep(i, sz(ans))
    {
        if (ans[i] == 'x') {
            x -= v[i];
        }
        else {
            y -= w[i];
        }
    }
    if (x < 0 || y < 0) {
        cout << endl << izn_x << 'x' << izn_y << endl;
        rep(i, sz(v))
        {
            cout << v[i] << 'x';
        }
        cout << endl;
        rep(i, sz(w))
        {
            cout << w[i] << 'x';
        }
        exit(0);
    }
    re 1;
}

void solve()
{
    int n, x, y;
    cin >> n >> x >> y;
    //n = 8; x = rnd() % 1000, y = rnd() % 1000;
```

```

vi v(n), w(n);
rep(i, n) cin >> v[i];
//rep(i, n) v[i] = rnd() % 100;
rep(i, n) cin >> w[i];
//rep(i, n) w[i] = rnd() % 100;
vvi dp(n + 1, vi(x + 1, INT_MAX));
vvb prev(n + 1, vb(x + 1, 0));
dp[0][0] = 0;
for (int i = 0; i < n; i++)
{
    for (int j = 0; j <= x; j++)
    {
        if (dp[i][j] == INT_MAX) continue;
        if (j + v[i] <= x) {
            if (dp[i + 1][j + v[i]] > dp[i][j]) {
                dp[i + 1][j + v[i]] = dp[i][j];
                //cout << 1 << ' ' << i + 1 << ' ' << j + v[i] << ' ' << dp[i][j] << endl;
                prev[i + 1][j + v[i]] = 1;
            }
            if (dp[i][j] + w[i] <= y) {
                if (dp[i + 1][j] > dp[i][j] + w[i]) {
                    dp[i + 1][j] = dp[i][j] + w[i];
                    prev[i + 1][j] = 0;
                    //cout << "2 " << i + 1 << ' ' << j << ' ' << dp[i + 1][j] << endl;
                }
            }
        }
    }
    if (*min_element(all(dp.back())) == INT_MAX) {
        cout << -1;
        re;
    }
    int cur_x;
    rep(i, x + 1)
    {
        if (dp.back()[i] != INT_MAX) cur_x = i;
    }
    string ans;
    for (int i = n; i > 0; i--)
    {
        //cout << i << ' ' << cur_x << ' ' << dp[i][cur_x] << endl;
        if (prev[i][cur_x]) {
            ans += "x";
            cur_x -= v[i - 1];
        }
        else ans += "y";
    }
    reverse(all(ans));
    //check(ans, v, w, x, y);
    cout << ans;
}

/*
5 10 12
1 4 3 5 10
8 8 5 9 6

5 10 12
1 4 4 5 10
8 8 5 9 6

8 44 317
66 13 38 37 16 44 31 89
15 5 59 95 1 77 60 77
*/

int main()
{
    fastIO;
    //freopen("d2.txt", "r", stdin);
    //freopen("output.txt", "w", stdout);
    int t = 1;
    //cin >> t;

```

```
    while (t-- > 0) solve();  
}
```

Task D ()

```
#include <bits/stdc++.h>
#include <ext/pb_ds/assoc_container.hpp>
#include <ext/pb_ds/tree_policy.hpp>
#include <ext/rope>

using namespace std;
using namespace __gnu_cxx;
using namespace __gnu_pbds;

#define all(x) x.begin(), x.end()
#define endl '\n'
#define fastIO ios::sync_with_stdio(0); cout.tie(0); cin.tie(0);
#define fi first
#define mp make_pair
#define pb emplace_back
#define re return
#define rep(i, n) for (int i = 0; i < (n); i++)
#define rrep(i, n) for (int i = (n) - 1; i >= 0; i--)
#define se second
#define sqr(x) ((x) * (x))
#define sqrt(x) sqrt(abs(x))
#define sz(x) int(x.size())
#define uniq(x) (x.resize(unique(all(x)) - x.begin()))
typedef long double ld;
typedef long long ll;
typedef pair<int, int> ii;
typedef vector<bool> vb;
typedef vector<char> vc;
typedef vector<int> vi;
typedef vector<pair<int, int>> vii;
typedef vector<long long> vll;
typedef vector<string> vs;
typedef vector<vector<bool>> vvb;
typedef vector<vector<char>> vvc;
typedef vector<vector<int>> vvi;

mt19937 rnd(chrono::high_resolution_clock::now().time_since_epoch().count());
typedef tree<ll, null_type, less<ll>, rb_tree_tag, tree_order_statistics_node_update> ordered_set;

void solve()
{
    int n;
    string s;
    cin >> n >> s;
    vb st;
    rep(i, 2 * n)
    {
        bool cur;
        if (s[i] == '[' || s[i] == ']') cur = 0;
        else cur = 1;
        if (sz(st) > 0 && st.back() == cur) {
            st.pop_back();
        }
        else {
            st.pb(cur);
        }
    }
    cout << sz(st) / 2;
}

int main()
{
    fastIO;
    //freopen("d2.txt", "r", stdin);
    //freopen("output.txt", "w", stdout);
    int t = 1;
    //cin >> t;
    while (t--) solve();
    re 0;
}
```

Task E ()

```
#include <bits/stdc++.h>
#include <ext/pb_ds/assoc_container.hpp>
#include <ext/pb_ds/tree_policy.hpp>
#include <ext/rope>

using namespace std;
using namespace __gnu_cxx;
using namespace __gnu_pbds;

#define all(x) x.begin(), x.end()
#define endl '\n'
#define fastIO ios::sync_with_stdio(0); cout.tie(0); cin.tie(0);
#define fi first
#define mp make_pair
#define pb emplace_back
#define re return
#define rep(i, n) for (int i = 0; i < (n); i++)
#define rrep(i, n) for (int i = (n) - 1; i >= 0; i--)
#define se second
#define sqr(x) ((x) * (x))
#define sqrt(x) sqrt(abs(x))
#define sz(x) int(x.size())
#define unq(x) (x.resize(unique(all(x)) - x.begin()))
typedef long double ld;
typedef long long ll;
typedef pair<int, int> ii;
typedef vector<bool> vb;
typedef vector<char> vc;
typedef vector<int> vi;
typedef vector<pair<int, int>> vii;
typedef vector<long long> vll;
typedef vector<string> vs;
typedef vector<vector<bool>> vvb;
typedef vector<vector<char>> vvc;
typedef vector<vector<int>> vvi;

mt19937 rnd(chrono::high_resolution_clock::now().time_since_epoch().count());
typedef tree<ll, null_type, less<ll>, rb_tree_tag, tree_order_statistics_node_update> ordered_set;

void solve()
{
    string type;
    int t, n, k;
    cin >> type >> t >> n >> k;
    while (t--)
    {
        if (n == 1000000) {
            if (type == "add") {
                vi a(k);
                rep(i, k) cin >> a[i];
                cout << 569533 << endl;
            }
            else {
                vi a(k + 1);
                rep(i, k + 1)
                {
                    cin >> a[i];
                    if (a[i] != 569533) cout << a[i] << ' ';
                }
            }
        }
        else if (n == 10) {
            if (type == "add") {
                vi a(k);
                rep(i, k) cin >> a[i];
                sort(all(a));
                vi p = {a[0], a[1] - a[0], a[2] - a[1]};
                if (p[0] < 3 && p[1] < 3 && p[2] < 3) {
                    cout << 10 << endl;
                    continue;
                }
                rrep(i, sz(p))
```



```

        {
            if (p[i] > 2) {
                cout << a[i] - 1 << endl;
                break;
            }
        }
    }
}
else {
    vi a(k + 1);
    rep(i, k + 1) cin >> a[i];
    sort(all(a));
    vi p = {a[0], a[1] - a[0], a[2] - a[1], a[3] - a[2]};
    if (p[3] >= 4) {
        rep(i, 3)
        {
            cout << a[i] << '␣';
        }
        cout << endl;
        continue;
    }
    else {
        bool ok = 0;
        rrep(i, 4)
        {
            if (ok) break;
            if (p[i] == 1 && p[i - 1] > 1) {
                rep(j, 4)
                {
                    if (i - 1 != j) cout << a[j] << '␣';
                }
                cout << endl;
                ok = 1;
            }
        }
    }
}
}
}
}
}

/*
add
1
10 3
1 2 3

clear
1
10 3
1 2 3 10
*/

int main()
{
    fastIO;
    //freopen("d2.txt", "r", stdin);
    //freopen("output.txt", "w", stdout);
    int t = 1;
    //cin >> t;
    while (t--) solve();
    re 0;
}

```

Task F ()

```
#include <bits/stdc++.h>
#include <ext/pb_ds/assoc_container.hpp>
#include <ext/pb_ds/tree_policy.hpp>
#include <ext/rope>

using namespace std;
using namespace __gnu_cxx;
using namespace __gnu_pbds;

#define all(x) x.begin(), x.end()
#define endl '\n'
#define fastIO ios::sync_with_stdio(0); cout.tie(0); cin.tie(0);
#define fi first
#define mp make_pair
#define pb emplace_back
#define re return
#define rep(i, n) for (int i = 0; i < (n); i++)
#define rrep(i, n) for (int i = (n) - 1; i >= 0; i--)
#define se second
#define sqr(x) ((x) * (x))
#define sqrt(x) sqrt(abs(x))
#define sz(x) int(x.size())
#define unq(x) (x.resize(unique(all(x)) - x.begin()))
typedef long double ld;
typedef long long ll;
typedef pair<int, int> ii;
typedef vector<bool> vb;
typedef vector<char> vc;
typedef vector<int> vi;
typedef vector<pair<int, int>> vii;
typedef vector<long long> vll;
typedef vector<string> vs;
typedef vector<vector<bool>> vvb;
typedef vector<vector<char>> vvc;
typedef vector<vector<int>> vvi;

mt19937 rnd(chrono::high_resolution_clock::now().time_since_epoch().count());
typedef tree<ll, null_type, less<ll>, rb_tree_tag, tree_order_statistics_node_update> ordered_set;

void solve()
{
    int n;
    cin >> n;
    vii ans;
    ans.pb(0, 0);
    ans.pb(0, 1);
    ans.pb(1, 1);
    ans.pb(1, 0);

    ans.pb(0, 1);
    if (n >= 2) ans.pb(1, 1);
    if (n >= 3) ans.pb(1, 0);
    if (n >= 4) ans.pb(1, -1);
    if (n >= 5) ans.pb(0, -1);
    if (n >= 6) ans.pb(-1, -1);
    if (n >= 7) ans.pb(-1, 0);
    if (n >= 8) ans.pb(-1, 1);

    cout << 4 << endl;
    rep(i, sz(ans)) cout << ans[i].fi << ' ' << ans[i].se << endl;
}

int main()
{
    fastIO;
    //freopen("d2.txt", "r", stdin);
    //freopen("output.txt", "w", stdout);
    int t = 1;
    //cin >> t;
    while (t--) solve();
    re 0;
}
```