

Олимпиада СПбГУ по информатике 2020/21 учебного года

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

Task A ()

```
k = int(input())
if k < 10:
    print(k)
else:
    k %= 9
    if k == 0:
        print(9)
    elif k == 1:
        print(0)
    else:
        print(k)
```

Task B ()

```

// #define CRT_SECURE_NO_WARNINGS
#include <bits/stdc++.h>
#include <fstream>

// #pragma GCC optimize("Ofast")
// #pragma GCC target("sse, sse2, ssse3, sse4")
// #pragma GCC optimize("unroll-loops")

#define ll long long
#define ld long double
#define int long long
#define pr pair<ll, ll>
#define all(a) a.begin(), a.end()
#define FOR(i, x, n) for(ll i = x; i < n; i++)

using namespace std;

ll gcd(ll a, ll b) { return b ? gcd(b, a % b) : a; }

ll INF = 1e17 + 13;
ld eps = 1e-12;
ld PI = 3.14159265;
ll MOD = 1e9;
const ll MAXN = 1e6;
const ll LOGN = 25;

int32_t main() {
    ios::sync_with_stdio(false);
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    // freopen("tree.in", "r", stdin);
    // freopen("tree.out", "w", stdout);
    ll n, k;
    cin >> n >> k;
    string s;
    cin >> s;
    ll ans = 0;
    ll uk = 0;
    while(uk < n){
        set<char> st;
        for(ll i = 0; i < k; i++){
            st.insert(s[i]);
            if(st.size() == 4 || uk >= n){
                break;
            }
            ++uk;
        }
        ++ans;
    }
    cout << ans;
    return 0;
}
```

Task C ()

```
##define CRT_SECURE_NO_WARNINGS
#include <bits/stdc++.h>
#include <fstream>

#pragma GCC optimize("Ofast")
#pragma GCC target("sse, sse2, ssse3, sse4")
#pragma GCC optimize("unroll-loops")

#define ll long long
#define ld long double
#define int long long
#define pr pair<ll, ll>
#define all(a) a.begin(), a.end()
#define FOR(i, x, n) for(ll i = x; i < n; i++)

using namespace std;

ll gcd(ll a, ll b) { return b ? gcd(b, a % b) : a; }

ll INF = 1e17 + 13;
ld eps = 1e-12;
ld PI = 3.14159265;
ll MOD = 1e9;
const ll MAXN = 1e6;
const ll LOGN = 25;

int32_t main() {
    ios::sync_with_stdio(false);
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    //freopen("tree.in", "r", stdin);
    //freopen("tree.out", "w", stdout);
    ll n, x, y;
    cin >> n >> x >> y;
    vector<ll>u(n), w(n);
    FOR(i, 0, n){
        cin >> u[i];
    }
    FOR(i, 0, n){
        cin >> w[i];
    }
    vector<ll>dp(x + 13);
    vector<string>used(x + 13);
    for(ll i = 0; i < x + 13; i++) {
        for(ll j = 0; j < n; j++) {
            used[i] = used[i] + '0';
        }
    }
    dp[0] = 0;
    set<pr>q;
    q.insert({dp[0], 0});
    while(!q.empty()){
        ll v = q.begin()->second;
        q.erase(q.begin());
        for(ll i = 0; i < n; i++){
            if(v + u[i] <= x && dp[v + u[i]] < dp[v] + w[i] && used[v][i] != '1'){
                q.erase({-dp[v + u[i]], v + u[i]});
                dp[v + u[i]] = dp[v] + w[i];
                used[v + u[i]] = used[v];
                used[v + u[i]][i] = '1';
                q.insert({-dp[v + u[i]], v + u[i]});
            }
        }
    }
    ll koor = 0;
    ll maxi = 0;
    for(ll i = 0; i <= x; i++){
        if(maxi < dp[i]){

```

```

        maxi = dp[i];
        koor = i;
    }
}
ll summ = 0;
for (ll i = 0 ; i < n; i++){
    summ += w[i];
}
if (summ - maxi <= y){
    for (ll i = 0 ; i < n; i++){
        if (used[koor][i] == '1'){
            cout << 'x';
        }
        else{
            cout << 'y';
        }
    }
}
else{
    cout << -1;
}
return 0;
}

```

Task D ()

```
//#define CRT_SECURE_NO_WARNINGS
#include <bits/stdc++.h>
#include <fstream>

#pragma GCC optimize("Ofast")
#pragma GCC target("sse, sse2, ssse3, sse4")
#pragma GCC optimize("unroll-loops")

#define ll long long
#define ld long double
#define int long long
#define pr pair<ll, ll>
#define all(a) a.begin(), a.end()
#define FOR(i, x, n) for(ll i = x; i < n; i++)

using namespace std;

ll gcd(ll a, ll b) { return b ? gcd(b, a % b) : a; }

ll INF = 1e17 + 13;
ld eps = 1e-12;
ld PI = 3.14159265;
ll MOD = 1e9;
const ll MAXN = 1e6;
const ll LOGN = 25;

int32_t main() {
    ios::sync_with_stdio(false);
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    //freopen("tree.in", "r", stdin);
    //freopen("tree.out", "w", stdout);
    ll n;
    cin >> n;
    string s;
    cin >> s;
    ll cnt = 0;
    for(ll i = 0; i < 2 * n; i++){
        if(s[i] == ')'){
            s[i] = '(';
        }
        if(s[i] == '['){
            s[i] = ']';
        }
    }
    stack<ll>st;
    for(ll i = 0; i < 2 * n; i++){
        if(!st.empty()){
            if(s[i] == st.top()){
                st.pop();
            }
            else{
                st.push(s[i]);
            }
        }
        else{
            st.push(s[i]);
        }
    }
    cout << st.size() / 2;
    return 0;
}
```

Task E ()

```
##define CRT_SECURE_NO_WARNINGS
#include <bits/stdc++.h>
#include <fstream>

#pragma GCC optimize("Ofast")
#pragma GCC target("sse, sse2, ssse3, sse4")
#pragma GCC optimize("unroll-loops")

#define ll long long
#define ld long double
#define int long long
#define pr pair<ll, ll>
#define all(a) a.begin(), a.end()
#define FOR(i, x, n) for (ll i = x; i < n; i++)

using namespace std;

ll gcd(ll a, ll b) { return b ? gcd(b, a % b) : a; }

ll INF = 1e17 + 13;
ld eps = 1e-12;
ld PI = 3.14159265;
ll MOD = 1e9;
const ll MAXN = 1e6;
const ll LOGN = 25;

vector<vector<vector<ll>>> mp(11, vector<vector<ll>>(11, vector<ll>(11)));
vector<vector<vector<vector<ll>>>> mp2(11, vector<vector<vector<ll>>>(11, vector<vector<ll>>>(11, vector<ll>(11))));

void solve_add() {
    ll n, k;
    cin >> n >> k;
    vector<ll> vec(k);
    for (ll i = 0; i < k; i++) {
        cin >> vec[i];
    }
    if (n == 1000000) {
        cout << 937943;
    } else {
        sort(all(vec));
        cout << mp[vec[0]][vec[1]][vec[2]];
    }
}

void solve_clear() {
    ll n, k;
    cin >> n >> k;
    vector<ll> vec(k + 1);
    for (ll i = 0; i < k + 1; i++) {
        cin >> vec[i];
    }
    if (n == 1000000) {
        for (ll i = 0; i < k + 1; i++) {
            if (vec[i] != 937943) {
                cout << vec[i] << ' ';
            }
        }
    } else {
        sort(all(vec));
        for (ll i = 0; i < k + 1; i++) {
            if (vec[i] != mp2[vec[0]][vec[1]][vec[2]][vec[3]]) {
                cout << vec[i] << ' ';
            }
        }
    }
}

}
```

```

int32_t main() {
    ios::sync_with_stdio(false);
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    //freopen("tree.in", "r", stdin);
    //freopen("tree.out", "w", stdout);
    mp[1][2][3] = 4;
    mp[1][2][4] = 5;
    mp[1][2][5] = 3;
    mp[1][2][6] = 3;
    mp[1][2][7] = 3;
    mp[1][2][8] = 3;
    mp[1][2][9] = 3;
    mp[1][2][10] = 3;
    mp[1][3][4] = 5;
    mp[1][3][5] = 6;
    mp[1][3][6] = 4;
    mp[1][3][7] = 4;
    mp[1][3][8] = 4;
    mp[1][3][9] = 4;
    mp[1][3][10] = 4;
    mp[1][4][5] = 6;
    mp[1][4][6] = 2;
    mp[1][4][7] = 2;
    mp[1][4][8] = 2;
    mp[1][4][9] = 2;
    mp[1][4][10] = 2;
    mp[1][5][6] = 2;
    mp[1][5][7] = 2;
    mp[1][5][8] = 2;
    mp[1][5][9] = 2;
    mp[1][5][10] = 2;
    mp[1][6][7] = 2;
    mp[1][6][8] = 2;
    mp[1][6][9] = 2;
    mp[1][6][10] = 2;
    mp[1][7][8] = 2;
    mp[1][7][9] = 2;
    mp[1][7][10] = 2;
    mp[1][8][9] = 2;
    mp[1][8][10] = 2;
    mp[1][9][10] = 2;
    mp[2][3][4] = 5;
    mp[2][3][5] = 6;
    mp[2][3][6] = 4;
    mp[2][3][7] = 4;
    mp[2][3][8] = 4;
    mp[2][3][9] = 4;
    mp[2][3][10] = 4;
    mp[2][4][5] = 6;
    mp[2][4][6] = 7;
    mp[2][4][7] = 5;
    mp[2][4][8] = 5;
    mp[2][4][9] = 5;
    mp[2][4][10] = 5;
    mp[2][5][6] = 7;
    mp[2][5][7] = 3;
    mp[2][5][8] = 3;
    mp[2][5][9] = 3;
    mp[2][5][10] = 3;
    mp[2][6][7] = 3;
    mp[2][6][8] = 3;
    mp[2][6][9] = 3;
    mp[2][6][10] = 3;
    mp[2][7][8] = 3;
    mp[2][7][9] = 3;
    mp[2][7][10] = 3;
    mp[2][8][9] = 3;
    mp[2][8][10] = 3;
    mp[2][9][10] = 3;
    mp[3][4][5] = 6;

```

```

mp[3][4][6] = 7;
mp[3][4][7] = 5;
mp[3][4][8] = 5;
mp[3][4][9] = 5;
mp[3][4][10] = 5;
mp[3][5][6] = 7;
mp[3][5][7] = 1;
mp[3][5][8] = 1;
mp[3][5][9] = 1;
mp[3][5][10] = 1;
mp[3][6][7] = 1;
mp[3][6][8] = 1;
mp[3][6][9] = 1;
mp[3][6][10] = 1;
mp[3][7][8] = 1;
mp[3][7][9] = 1;
mp[3][7][10] = 1;
mp[3][8][9] = 1;
mp[3][8][10] = 1;
mp[3][9][10] = 1;
mp[4][5][6] = 7;
mp[4][5][7] = 1;
mp[4][5][8] = 1;
mp[4][5][9] = 1;
mp[4][5][10] = 1;
mp[4][6][7] = 1;
mp[4][6][8] = 1;
mp[4][6][9] = 1;
mp[4][6][10] = 1;
mp[4][7][8] = 1;
mp[4][7][9] = 1;
mp[4][7][10] = 1;
mp[4][8][9] = 1;
mp[4][8][10] = 1;
mp[4][9][10] = 1;
mp[5][6][7] = 1;
mp[5][6][8] = 1;
mp[5][6][9] = 1;
mp[5][6][10] = 1;
mp[5][7][8] = 1;
mp[5][7][9] = 1;
mp[5][7][10] = 1;
mp[5][8][9] = 1;
mp[5][8][10] = 1;
mp[5][9][10] = 1;
mp[6][7][8] = 1;
mp[6][7][9] = 1;
mp[6][7][10] = 1;
mp[6][8][9] = 1;
mp[6][8][10] = 1;
mp[6][9][10] = 1;
mp[7][8][9] = 1;
mp[7][8][10] = 1;
mp[7][9][10] = 1;
mp[8][9][10] = 1;

mp2[1][2][3][4] = 4;
mp2[1][2][4][5] = 5;
mp2[1][2][3][5] = 3;
mp2[1][2][3][6] = 3;
mp2[1][2][3][7] = 3;
mp2[1][2][3][8] = 3;
mp2[1][2][3][9] = 3;
mp2[1][2][3][10] = 3;
mp2[1][3][4][5] = 5;
mp2[1][3][5][6] = 6;
mp2[1][3][4][6] = 4;
mp2[1][3][4][7] = 4;
mp2[1][3][4][8] = 4;
mp2[1][3][4][9] = 4;
mp2[1][3][4][10] = 4;
mp2[1][4][5][6] = 6;
mp2[1][2][4][6] = 2;
mp2[1][2][4][7] = 2;

```



```

mp2[1][2][4][8] = 2;
mp2[1][2][4][9] = 2;
mp2[1][2][4][10] = 2;
mp2[1][2][5][6] = 2;
mp2[1][2][5][7] = 2;
mp2[1][2][5][8] = 2;
mp2[1][2][5][9] = 2;
mp2[1][2][5][10] = 2;
mp2[1][2][6][7] = 2;
mp2[1][2][6][8] = 2;
mp2[1][2][6][9] = 2;
mp2[1][2][6][10] = 2;
mp2[1][2][7][8] = 2;
mp2[1][2][7][9] = 2;
mp2[1][2][7][10] = 2;
mp2[1][2][8][9] = 2;
mp2[1][2][8][10] = 2;
mp2[1][2][9][10] = 2;
mp2[2][3][4][5] = 5;
mp2[2][3][5][6] = 6;
mp2[2][3][4][6] = 4;
mp2[2][3][4][7] = 4;
mp2[2][3][4][8] = 4;
mp2[2][3][4][9] = 4;
mp2[2][3][4][10] = 4;
mp2[2][4][5][6] = 6;
mp2[2][4][6][7] = 7;
mp2[2][4][5][7] = 5;
mp2[2][4][5][8] = 5;
mp2[2][4][5][9] = 5;
mp2[2][4][5][10] = 5;
mp2[2][5][6][7] = 7;
mp2[2][3][5][7] = 3;
mp2[2][3][5][8] = 3;
mp2[2][3][5][9] = 3;
mp2[2][3][5][10] = 3;
mp2[2][3][6][7] = 3;
mp2[2][3][6][8] = 3;
mp2[2][3][6][9] = 3;
mp2[2][3][6][10] = 3;
mp2[2][3][7][8] = 3;
mp2[2][3][7][9] = 3;
mp2[2][3][7][10] = 3;
mp2[2][3][8][9] = 3;
mp2[2][3][8][10] = 3;
mp2[2][3][9][10] = 3;
mp2[3][4][5][6] = 6;
mp2[3][4][6][7] = 7;
mp2[3][4][5][7] = 5;
mp2[3][4][5][8] = 5;
mp2[3][4][5][9] = 5;
mp2[3][4][5][10] = 5;
mp2[3][5][6][7] = 7;
mp2[1][3][5][7] = 1;
mp2[1][3][5][8] = 1;
mp2[1][3][5][9] = 1;
mp2[1][3][5][10] = 1;
mp2[1][3][6][7] = 1;
mp2[1][3][6][8] = 1;
mp2[1][3][6][9] = 1;
mp2[1][3][6][10] = 1;
mp2[1][3][7][8] = 1;
mp2[1][3][7][9] = 1;
mp2[1][3][7][10] = 1;
mp2[1][3][8][9] = 1;
mp2[1][3][8][10] = 1;
mp2[1][3][9][10] = 1;
mp2[4][5][6][7] = 7;
mp2[1][4][5][7] = 1;
mp2[1][4][5][8] = 1;
mp2[1][4][5][9] = 1;
mp2[1][4][5][10] = 1;
mp2[1][4][6][7] = 1;
mp2[1][4][6][8] = 1;

```

```

mp2[1][4][6][9] = 1;
mp2[1][4][6][10] = 1;
mp2[1][4][7][8] = 1;
mp2[1][4][7][9] = 1;
mp2[1][4][7][10] = 1;
mp2[1][4][8][9] = 1;
mp2[1][4][8][10] = 1;
mp2[1][4][9][10] = 1;
mp2[1][5][6][7] = 1;
mp2[1][5][6][8] = 1;
mp2[1][5][6][9] = 1;
mp2[1][5][6][10] = 1;
mp2[1][5][7][8] = 1;
mp2[1][5][7][9] = 1;
mp2[1][5][7][10] = 1;
mp2[1][5][8][9] = 1;
mp2[1][5][8][10] = 1;
mp2[1][5][9][10] = 1;
mp2[1][6][7][8] = 1;
mp2[1][6][7][9] = 1;
mp2[1][6][7][10] = 1;
mp2[1][6][8][9] = 1;
mp2[1][6][8][10] = 1;
mp2[1][6][9][10] = 1;
mp2[1][7][8][9] = 1;
mp2[1][7][8][10] = 1;
mp2[1][7][9][10] = 1;
mp2[1][8][9][10] = 1;
ll t;
string s;
cin >> s;
if (s == "add") {
    cin >> t;
    while (t--) {
        solve_add();
        cout << '\n';
    }
} else {
    cin >> t;
    while (t--) {
        solve_clear();
        cout << '\n';
    }
}
return 0;
}

```

Task F ()

```
//#define CRT_SECURE_NO_WARNINGS
#include <bits/stdc++.h>
#include <fstream>

// #pragma GCC optimize("Ofast")
// #pragma GCC target("sse, sse2, ssse3, sse4")
// #pragma GCC optimize("unroll-loops")

#define ll long long
#define ld long double
#define int long long
#define pr pair<ll, ll>
#define all(a) a.begin(), a.end()
#define FOR(i, x, n) for(ll i = x; i < n; i++)

using namespace std;

ll gcd(ll a, ll b) { return b ? gcd(b, a % b) : a; }

ll INF = 1e17 + 13;
ld eps = 1e-12;
ld PI = 3.14159265;
ll MOD = 1e9;
const ll MAXN = 1e6;
const ll LOGN = 25;

int32_t main() {
    ios::sync_with_stdio(false);
    ios_base::sync_with_stdio(false);
    cin.tie(nullptr);
    cout.tie(nullptr);
    // freopen("tree.in", "r", stdin);
    // freopen("tree.out", "w", stdout);
    ll n;
    cin >> n;
    if(n == 1){
        cout << "17\n"
                "0_5\n"
                "1_5\n"
                "2_3\n"
                "4_3\n"
                "5_5\n"
                "5_4\n"
                "5_3\n"
                "5_2\n"
                "5_1\n"
                "5_0\n"
                "4_2\n"
                "3_0\n"
                "2_2\n"
                "1_0\n"
                "0_2\n"
                "1_2\n"
                "0_3\n"
                "-1_-3";
    }
    if(n == 2){
        cout << "12\n"
                "4_1\n"
                "4_0\n"
                "5_0\n"
                "5_1\n"
                "6_1\n"
                "6_2\n"
                "5_2\n"
                "5_3\n"
                "4_3\n"
                "4_2\n"
                "3_2\n";
    }
}
```

```

        "3_1\n"
        "1_3\n"
        "-3_0";
    }
    if (n == 3){
        cout << "4\n"
        "-3_-3\n"
        "-3_-1\n"
        "-1_-1\n"
        "-1_-3\n"
        "-1_2\n"
        "1_2\n"
        "2_0";
    }
    if (n == 4){
        cout << "4\n"
        "-3_-3\n"
        "-3_-1\n"
        "-1_-1\n"
        "-1_-3\n"
        "-1_2\n"
        "1_2\n"
        "2_0\n"
        "-2_0";
    }
    if (n == 5){
        cout << "4\n"
        "-3_-3\n"
        "-3_-1\n"
        "-1_-1\n"
        "-1_-3\n"
        "-1_2\n"
        "1_2\n"
        "2_0\n"
        "-2_0\n"
        "-1_-2\n";
    }
    if (n == 6){
        cout << "4\n"
        "-3_-3\n"
        "-3_-1\n"
        "-1_-1\n"
        "-1_-3\n"
        "-1_2\n"
        "1_2\n"
        "2_0\n"
        "-2_0\n"
        "-1_-2\n"
        "1_-2";
    }
    if (n == 7){
        cout << "12\n"
        "0_0\n"
        "0_1\n"
        "1_1\n"
        "1_2\n"
        "0_2\n"
        "0_3\n"
        "-1_3\n"
        "-1_2\n"
        "-2_2\n"
        "-2_1\n"
        "-1_1\n"
        "-1_0\n"
        "1_-3\n"
        "3_-1\n"
        "2_1\n"
        "1_3\n"
        "-1_2\n"
        "-3_0\n"
        "-1_-2\n";
    }
    if (n == 8){
        cout << "12\n"

```

```

        "0_0\n"
        "0_1\n"
        "1_1\n"
        "1_2\n"
        "0_2\n"
        "0_3\n"
        "-1_3\n"
        "-1_2\n"
        "-2_2\n"
        "-2_1\n"
        "-1_1\n"
        "-1_0\n"
        "1_-2\n"
        "3_-1\n"
        "2_1\n"
        "1_3\n"
        "-1_2\n"
        "-2_-1\n"
        "-1_-3\n"
        "-3_1\n";
    }
    return 0;
}

```