

Олимпиада СПбГУ по информатике 2020/21 учебного года

A	B	C	D	E	F	Sum
100	100	60	47	100	25	432

Task A ()

```
#pragma("Ofast")
#include <iostream>
#include <iomanip>
#include <cstdlib>
#include <cstdio>
#include <cmath>
#include <algorithm>
#include <vector>
#include <string>
#include <map>
#include <set>
#include <cassert>
#include <random>
#include <ctime>
#include <bitset>
#include <chrono>

using namespace std;

typedef long long ll;
typedef pair<ll, ll> pll;
typedef vector<ll> vi;
typedef vector<vi> vvi;

const ll inff = 1e18, mx1 = 2e5, MOD = 1e9 + 7, P1 = 37;

#define ff first
#define ss second
#define pb push_back
#define vec vector
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend()
#define fopen(a, b) freopen(a, "r", stdin); freopen(b, "w", stdout)

std::mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

void run(ll kk) {
    ll k;
    cin >> k;
    if (k <= 10) {
        cout << k%10;
    }
    else {
        cout << ((k - 11)%9 + 2)%10;
    }
}

signed main() {
    // fopen("input.txt", "output.txt");
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    ll kk = 1;
    // cin >> kk;
    while (kk--) {
        run(kk);
    }
}
```

```
        cout << '\n';  
    }  
    return 0;  
}
```

Task B ()

```
#pragma("Ofast")
#include <iostream>
#include <iomanip>
#include <cstdlib>
#include <cstdio>
#include <cmath>
#include <algorithm>
#include <vector>
#include <string>
#include <map>
#include <set>
#include <cassert>
#include <random>
#include <ctime>
#include <bitset>
#include <chrono>
#include <queue>
using namespace std;

typedef long long ll;
typedef pair<ll, ll> pll;
typedef vector<ll> vi;
typedef vector<vi> vvi;

const ll inff = 1e18, mx1 = 2e5, MOD = 1e9 + 7, P1 = 37;

#define ff first
#define ss second
#define pb push_back
#define vec vector
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend()
#define fopen(a, b) freopen(a, "r", stdin); freopen(b, "w", stdout)

std::mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

ll tree[mx1 * 4];

void update(ll v, ll tl, ll tr, ll pos, ll val) {
    if (pos < tl || tr < pos)
        return;
    if (pos == tl && pos == tr) {
        tree[v] = val;
        return;
    }
    ll mid = (tl + tr) / 2;
    if (pos <= mid)
        update(v * 2 + 1, tl, mid, pos, val);
    else
        update(v * 2 + 2, mid + 1, tr, pos, val);
    tree[v] = min(tree[v * 2 + 1], tree[v * 2 + 2]);
}

ll query(ll v, ll tl, ll tr, ll l, ll r) {
    if (tr < l || r < tl)
        return inff;
    if (l <= tl && tr <= r)
        return tree[v];
    ll mid = (tl + tr) / 2;
    return
        min(query(v * 2 + 1, tl, mid, l, r),
            query(v * 2 + 2, mid + 1, tr, l, r));
}

void run(ll kk) {
    ll n, k;
    string s;
    cin >> n >> k >> s;
    vi to(n, -1);
    ll pnt = -1;
    pnt = 0;
    map<ll, queue<ll>> mp;
```

```

    for (ll i = 0; i < n; ++i) {
        mp[s[i] - 'a'].push(i);
        while (mp.size() > 3) {
            mp[s[pnt] - 'a'].pop();
            if (mp[s[pnt] - 'a'].empty())
                mp.erase(s[pnt] - 'a');
            pnt++;
        }
        to[i] = pnt;
        ll val = pnt == 0 && i - pnt < k ? 0 : query(0, 0, n - 1, max(i - k, to[i] - 1), i - 1);
        val++;
        update(0, 0, n - 1, i, val);
        if (i == n - 1) {
            cout << val;
        }
    }
}

signed main() {
    // fopen("input.txt", "output.txt");
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    ll kk = 1;
    // cin >> kk;
    while (kk--) {
        run(kk);
        cout << '\n';
    }
    return 0;
}

```

Task C ()

```
#pragma("Ofast")
#include <iostream>
#include <iomanip>
#include <cstdlib>
#include <cstdio>
#include <cmath>
#include <algorithm>
#include <vector>
#include <string>
#include <map>
#include <set>
#include <cassert>
#include <random>
#include <ctime>
#include <bitset>
#include <chrono>
#include <queue>
using namespace std;

typedef int ll;
typedef pair<ll, ll> pll;
typedef vector<ll> vi;
typedef vector<vi> vvi;

const ll inff = 1e9, mx1 = 2e4 + 5e4, mx2 = 500, MOD = 1e9 + 7, P1 = 37;

#define ff first
#define ss second
#define pb push_back
#define vec vector
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend()
#define fopen(a, b) freopen(a, "r", stdin); freopen(b, "w", stdout)

std::mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

ll dp[mx2 + 1][mx1 + 1];
ll par[mx2 + 1][mx1 + 1];

void run(ll kk) {
    ll n, x, y;
    cin >> n >> x >> y;
    vi a(n), b(n);
    for (ll i = 0; i <= mx2; ++i)
        for (ll j = 0; j <= mx1; ++j)
            dp[i][j] = par[i][j] = -1;

    // vi id(n, 1);
    for (auto &v : a)
        cin >> v;
    for (auto &v : b)
        cin >> v;

    vi t;
    for (ll i = 0; i < n; ++i)
        t.pb(i);
    sort(all(t), [&](ll p1, ll p2) {
        return b[p1] > b[p2];
    });
    dp[0][0] = 0;
    for (ll i = 0, j; i < n; ++i) {
        for (j = 0; j <= x; ++j) {
            dp[i + 1][j] = dp[i][j];
            par[i + 1][j] = j;
        }
        for (j = 0; j + a[t[i]] <= x; ++j) {
            if (dp[i][j] == -1)
                continue;
            if (dp[i + 1][j + a[t[i]]] < dp[i][j] + b[t[i]]) {
                dp[i + 1][j + a[t[i]]] = dp[i][j] + b[t[i]];
                par[i + 1][j + a[t[i]]] = j;
            }
        }
    }
}
```

```

        }
    }
}
ll p = -1;
ll suma = 0, sumb = 0;
for (ll i = 0; i < n; ++i) {
    suma += a[i];
    sumb += b[i];
}
for (ll i = 0; i <= x; ++i) {
    if (dp[n][i] != -1 && sumb - dp[n][i] <= y) {
        p = i;
        break;
    }
}
if (p == -1) {
    cout << -1;
    return;
}
string ans(n, 'y');
for (ll i = n; i > 0; --i) {
    if (par[i][p] != p)
        ans[t[i - 1]] = 'x';
    p = par[i][p];
}
cout << ans;
}

signed main() {
    // fopen("input.txt", "output.txt");
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    ll tkk = 1, kk = 0;
    // cin >> tkk;
    while (kk++ < tkk) {
        run(kk);
        cout << '\n';
    }
    return 0;
}

```

Task D ()

```
#pragma("Ofast")
#include <iostream>
#include <iomanip>
#include <cstdlib>
#include <cstdio>
#include <cmath>
#include <algorithm>
#include <vector>
#include <string>
#include <map>
#include <set>
#include <cassert>
#include <random>
#include <ctime>
#include <bitset>
#include <chrono>
#include <queue>
using namespace std;

typedef long long ll;
typedef pair<ll, ll> pll;
typedef vector<ll> vi;
typedef vector<vi> vvi;

const ll inff = 1e18, mx1 = 2e5, MOD = 1e9 + 7, P1 = 37;

#define ff first
#define ss second
#define pb push_back
#define vec vector
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend()
#define fopen(a, b) freopen(a, "r", stdin); freopen(b, "w", stdout)

std::mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

void run(ll kk) {
    ll n;
    cin >> n;
    string s;
    cin >> s;
    for (ll i = 0; i < 2*n; ++i) {
        if (s[i] == ')')
            s[i] = '(';
        if (s[i] == '[')
            s[i] = ']';
    }
    vvi dp(2*n, vi(2*n, inff));
    for (ll i = 0; i + 1 < 2*n; i++) {
        dp[i][i + 1] = s[i] != s[i + 1];
    }
    ll i, j, k;
    for (ll len = 3; len < 2*n; len += 2) {
        for (i = 0; i + len < 2*n; ++i) {
            for (j = i + len; j <= i + len; ++j) {
                dp[i][j] = dp[i + 1][j - 1] + (s[i] != s[j]);
                for (k = i + 1; k < j - 1; k += 2)
                    dp[i][j] = min(dp[i][j], dp[i][k] + dp[k + 1][j]);
            }
        }
    }
    cout << dp[0][2*n - 1];
}

signed main() {
    // fopen("input.txt", "output.txt");
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    ll tkk = 1, kk = 0;
```

```
    // cin >> tkk;
    while (kk++ < tkk) {
        run(kk);
        cout << '\n';
    }
    return 0;
}
```


Task E ()

```
#pragma("Ofast")
#include <iostream>
#include <iomanip>
#include <cstdlib>
#include <cstdio>
#include <cmath>
#include <algorithm>
#include <vector>
#include <string>
#include <map>
#include <set>
#include <cassert>
#include <random>
#include <ctime>
#include <bitset>
#include <chrono>
#include <queue>
using namespace std;

typedef long long ll;
typedef pair<ll, ll> pll;
typedef vector<ll> vi;
typedef vector<vi> vvi;

const ll inff = 1e18, mx1 = 2e5, MOD = 1e9 + 7, P1 = 37;

#define ff first
#define ss second
#define pb push_back
#define vec vector
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend()
#define fopen(a, b) freopen(a, "r", stdin); freopen(b, "w", stdout)

std::mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

void run(ll kk, ll fl) {
    ll n, k;
    cin >> n >> k;
    vi a(k + fl);
    for (auto &v : a)
        cin >> v;
    if (n == 1000000) {
        if (!fl) {
            cout << 123654;
        }
        else {
            for (auto v : a)
                if (v != 123654)
                    cout << v << ' ';
        }
        return;
    }
    if (n == 10) {
        vi t;
        t = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10};
        set<ll> s;
        for (auto v : a)
            s.insert(v);
        ll id = 0;
        for (ll i = 0; i < 10; ++i) {
            if (s.count(t[i]))
                id += 1<<i;
        }
        vec<pll> used(1<<10, {-1, -1}), to(1<<10, {-1, -1});
        for (ll msk = 0; msk < (1<<10); ++msk) {
            for (ll i = 0; i < 10; ++i) {
                if (!(msk & (1<<i)) && used[msk|(1<<i)].ff == -1) {
                    used[msk|(1<<i)] = {msk, i};
                    to[msk] = {(msk|(1<<i)), i};
                }
            }
        }
    }
}
```

```

        break;
    }
}
}
if (!fl) {
    cout << t[to[id].ss];
}
else {
    ll tmp = t[used[id].ss];
    for (auto v : a)
        if (v != tmp)
            cout << v << ' ';
}
return;
}
if (n == 100000) {
    vi t;
    ll m = 23;
    // for (ll i = 0; i < m; ++i) {
    //     t.pb(rnd()%100000 + 1);
    // }
    // for (auto v : t)
    //     cout << v << " ";
    // return;
    t = {21713, 37699, 60085, 256, 84183, 12, 46984, 84775, 2341, 52495, 63892, 88431,
        67492, 54634, 70681, 3215, 54497, 47041, 22578, 26399, 3345, 2345, 9995};
    set<ll> s;
    for (auto v : a)
        s.insert(v);
    ll id = 0;
    for (ll i = 0; i < 19; ++i) {
        if (s.count(t[i]))
            id += 1<<i;
    }
    vec<p11> used(1<<m, {-1, -1}), to(1<<m, {-1, -1});
    for (ll msk = 0; msk < (1<<19); ++msk) {
        for (ll i = 0; i < m; ++i) {
            if (!(msk & (1<<i)) && used[msk|(1<<i)].ff == -1) {
                used[msk|(1<<i)] = {msk, i};
                to[msk] = {(msk|(1<<i)), i};
                break;
            }
        }
    }
    if (!fl) {
        cout << t[to[id].ss];
    }
    else {
        ll tmp = t[used[id].ss];
        for (auto v : a)
            if (v != tmp)
                cout << v << ' ';
    }
    return;
}
return;
}
}

signed main() {
    // fopen("input.txt", "output.txt");
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    ll kk = 1;
    string skk;
    cin >> skk >> kk;
    while (kk--) {
        run(kk, skk != "add");
        cout << '\n';
    }
    return 0;
}

```

Task F ()

```
#pragma("Ofast")
#include <iostream>
#include <iomanip>
#include <cstdlib>
#include <cstdio>
#include <cmath>
#include <algorithm>
#include <vector>
#include <string>
#include <map>
#include <set>
#include <cassert>
#include <random>
#include <ctime>
#include <bitset>
#include <chrono>
#include <queue>
using namespace std;

typedef long long ll;
typedef pair<ll, ll> pll;
typedef vector<ll> vi;
typedef vector<vi> vvi;

const ll inff = 1e18, mx1 = 2e5, MOD = 1e9 + 7, P1 = 37;

#define ff first
#define ss second
#define pb push_back
#define vec vector
#define all(a) a.begin(), a.end()
#define rall(a) a.rbegin(), a.rend()
#define fopen(a, b) freopen(a, "r", stdin); freopen(b, "w", stdout)

std::mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

void run(ll kk) {
    ll n;
    cin >> n;
    vec<pll> a, b;
    a = {{0, 0}, {1, 0}, {1, 1}, {0, 1}};
    cout << a.size() << '\n';
    for (auto v : a)
        cout << v.ff << ' ' << v.ss << '\n';
    for (ll i = -1; i <= 1; ++i)
        for (ll j = -1; j <= 1; ++j) {
            if (i == 0 && j == 0)
                continue;
            cout << i << ' ' << j << '\n';
            n--;
            if (!n)
                return;
        }
}

signed main() {
    // fopen("input.txt", "output.txt");
    ios_base::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    ll tkk = 1, kk = 0;
    // cin >> tkk;
    while (kk++ < tkk) {
        run(kk);
        cout << '\n';
    }
    return 0;
}
```