Олимпиада СПбГУ по информатике 2020/21 учебного года

A	B	C	D	E	F	Sum
100	100	100	100	55	25	480

Task A ()

```cpp
#pragma GCC optimize("Ofast")
// #pragma GCC target("avx,avx2,fma")

#include <bits/stdc++.h>

#define F first
#define S second
#define vec vector
#define pb push_back
#define cld complex<ld>
#define pll pair<ll, ll>
#define pdd pair<ld, ld>
#define umap unordered_map
#define uset unordered_set
#define pii pair<int, int>
#define pnn pair<Node*, Node*>
#define all(m) m.begin(), m.end()
#define uid uniform_int_distribution
#define init(m, x) memset(m, x, sizeof(m));
#define pripii(p) cout << "{" << p.F << ",_" << p.S << "}_"
#define FILE ifstream in("input.txt"); ofstream out("output.txt");
#define fast cin.tie(0); cout.tie(0); cin.sync_with_stdio(0); cout.sync_with_stdio(0);
using namespace std;
typedef string str;
typedef long long ll;
typedef long double ld;
typedef unsigned int uint;
typedef unsigned long long ull;
mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

int main() {
    fast;
    str t = "123456789", u = "023456789";
    int a; cin>>a;
    int st = a;
    a--;
    a %= u.size();
    cout<<(st==1 ? '1' : u[a]);
}
```

Task B ()

```cpp
#pragma GCC optimize("Ofast")
// #pragma GCC target("avx,avx2,fma")

#include <bits/stdc++.h>

#define F first
#define S second
#define vec vector
#define pb push_back
#define cld complex<ld>
#define pll pair<ll, ll>
#define pdd pair<ld, ld>
#define umap unordered_map
#define uset unordered_set
#define pii pair<int, int>
#define pnn pair<Node*, Node*>
#define all(m) m.begin(), m.end()
#define uid uniform_int_distribution
#define init(m, x) memset(m, x, sizeof(m));
#define pripii(p) cout << "{" << p.F << ", " << p.S << "} "
#define FILE ifstream in("input.txt"); ofstream out("output.txt");
#define fast cin.tie(0); cout.tie(0); cin.sync_with_stdio(0); cout.sync_with_stdio(0);
using namespace std;
typedef string str;
typedef long long ll;
typedef long double ld;
typedef unsigned int uint;
typedef unsigned long long ull;
mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

int main() {
    fast;
    ll a, k; cin>>a>>k;
    str t; cin>>t;
    int o = 0;
    set<int> s;
    for(int l=0; l<a; ){
        int r = l;
        s.clear();
        for(; r<a; r++){
            if(s.size()==3 && !s.count(t[r])) break;
            if(r-l+1>k) break;
            s.insert(t[r]);
        }
        r--;
        o++;
        l = r+1;
    }
    cout<<o;
}
```

Task C ()

```cpp
#pragma GCC optimize("Ofast")
// #pragma GCC target("avx,avx2,fma")

#include <bits/stdc++.h>

#define F first
#define S second
#define vec vector
#define pb push_back
#define cld complex<ld>
#define pll pair<ll, ll>
#define pdd pair<ld, ld>
#define umap unordered_map
#define uset unordered_set
#define pii pair<int, int>
#define pnn pair<Node*, Node*>
#define all(m) m.begin(), m.end()
#define uid uniform_int_distribution
#define init(m, x) memset(m, x, sizeof(m));
#define pripii(p) cout << "{" << p.F << ",_" << p.S << "}_"
#define FILE ifstream in("input.txt"); ofstream out("output.txt");
#define fast cin.tie(0); cout.tie(0); cin.sync_with_stdio(0); cout.sync_with_stdio(0);
using namespace std;
typedef string str;
typedef long long ll;
typedef long double ld;
typedef unsigned int uint;
typedef unsigned long long ull;
mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

int main() {
    fast;
    int a, X, Y; cin >> a >> X >> Y;
    pii m[a];
    for (int q = 0; q < a; q++) cin >> m[q].F;
    for (int q = 0; q < a; q++) cin >> m[q].S;
    const int inf = 1e9;
    int dp[2][X + 1];
    bitset<250005> pr[a];
    fill(dp[0], dp[0] + X + 1, inf);
    dp[0][0] = m[0].S;
    pr[0][0] = 1;
    if (m[0].F <= X) {
        dp[0][m[0].F] = 0;
        pr[0][m[0].F] = 0;
    }
    for (int q = 1; q < a; q++) {
        int i = q & 1;
        dp[i][0] = dp[i ^ 1][0] + m[q].S;
        pr[q][0] = 1;
        for (int w = 1; w <= X; w++) {
            int v0 = w - m[q].F >= 0 ? dp[i ^ 1][w - m[q].F] : inf;
            int v1 = dp[i ^ 1][w] + m[q].S;
            dp[i][w] = min(v0, v1);
            pr[q][w] = v0 == dp[i][w] ? 0 : 1;
        }
    }
    int x = -1;
    for (int w = 0; w <= X; w++) {
        if (dp[(a - 1) & 1][w] <= Y) {
            x = w;
        }
    }
    //cout << dp[a - 1][X] << endl;
    if (x == -1) {
        cout << "-1";
        return 0;
    }
    int ans[a], i = a - 1;
    for (; i >= 0; ) {
        //cout<<i+1<<" "<<x<<": "<<dp[i][x]<<endl;
```

3

```cpp
            //cout<<"PR: "<<pr[i][x]<<endl;
            if (pr[i][x] == 0) {
                ans[i] = 0;
                x -= m[i].F;
                i--;
            }
            else if (pr[i][x] == 1) {
                ans[i] = 1;
                i--;
            }
            else {
                assert(pr[i][x] == 2);
                x--;
            }
        }
    }
    for (int i : ans) cout << (i == 0 ? 'x' : 'y');
}
```

Task D ()

```cpp
#pragma GCC optimize("Ofast")
// #pragma GCC target("avx,avx2,fma")

#include <bits/stdc++.h>

#define F first
#define S second
#define vec vector
#define pb push_back
#define cld complex<ld>
#define pll pair<ll, ll>
#define pdd pair<ld, ld>
#define umap unordered_map
#define uset unordered_set
#define pii pair<int, int>
#define pnn pair<Node*, Node*>
#define all(m) m.begin(), m.end()
#define uid uniform_int_distribution
#define init(m, x) memset(m, x, sizeof(m));
#define pripii(p) cout << "{" << p.F << ", " << p.S << "} "
#define FILE ifstream in("input.txt"); ofstream out("output.txt");
#define fast cin.tie(0); cout.tie(0); cin.sync_with_stdio(0); cout.sync_with_stdio(0);
using namespace std;
typedef string str;
typedef long long ll;
typedef long double ld;
typedef unsigned int uint;
typedef unsigned long long ull;
mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

int a;
vec<int> m;

int main() {
    fast;
    cin >> a; a *= 2;
    str t; cin >> t;
    m = vec<int>(a);
    for (int q = 0; q < a; q++) {
        m[q] = t[q] == '(' || t[q] == ')' ? 0 : 1;
    }
    vec<int> n;
    for (int q = 0; q < a; q++) {
        if (n.empty() || m[q] != n.back()) n.pb(m[q]);
        else n.pop_back();
    }
    cout<<n.size()/2;
}
```

Task E ()

```cpp
#pragma GCC optimize("Ofast")
// #pragma GCC target("avx,avx2,fma")

#include <bits/stdc++.h>

#define F first
#define S second
#define vec vector
#define pb push_back
#define cld complex<ld>
#define pll pair<ll, ll>
#define pdd pair<ld, ld>
#define umap unordered_map
#define uset unordered_set
#define pii pair<int, int>
#define pnn pair<Node*, Node*>
#define all(m) m.begin(), m.end()
#define uid uniform_int_distribution
#define init(m, x) memset(m, x, sizeof(m));
#define pripii(p) cout << "{" << p.F << ",_" << p.S << "}_"
#define FILE ifstream in("input.txt"); ofstream out("output.txt");
#define fast cin.tie(0); cout.tie(0); cin.sync_with_stdio(0); cout.sync_with_stdio(0);
using namespace std;
typedef string str;
typedef long long ll;
typedef long double ld;
typedef unsigned int uint;
typedef unsigned long long ull;
//mt19937 rnd(228);

int a, k;
map<vec<int>, int> mp;
int cv = 0;
int ans[] = {7, 5, 7, 3, 8, 5, 6, 6, 6, 2, 5, 5, 4, 4, 4, 3, 2, 2, 2, 2, 2, 2, 4, 3, 2, 2, 2, 2,
    3, 3, 3, 2, 2, 2, 2, 2, 1, 4, 4, 4, 1, 1, 1, 6, 7, 5, 3, 5, 5, 3, 6, 4, 3, 3, 3, 3, 4, 4, 4,
    3, 3, 3, 3, 3, 6, 7, 1, 5, 2, 2, 7, 2, 2, 1, 1, 1, 1, 2, 2, 2, 1, 1, 1, 1, 1, 1, 3, 1, 1, 1,
    1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1};

void clear() {
    cin >> a >> k;
    if(a==1000000){
        for(int q=0; q<k+1; q++){
            int x; cin>>x;
            if(x==666666) continue;
            cout<<x<<"_";
        }
        cout<<"\n";
        return;
    }
    cv = 0;
    for (int q = 0; q < a; q++) {
        for (int w = q + 1; w < a; w++) {
            for (int e = w + 1; e < a; e++) {
                mp[{q+1, w+1, e+1}] = cv++;
            }
        }
    }
    vec<int> n(k+1);
    for (int q = 0; q < k+1; q++) {
        cin >> n[q];
    }
    sort(all(n));
    //for(int i : n) cout<<i<<" "; cout<<endl;
    for(int q=0; q<4; q++){
        vec<int> tyt;
        int lox = n[q];
        for(int w=0; w<4; w++){
            if(q!=w) tyt.pb(n[w]);
        }
        //cout<<"TYT: "; for(int i : tyt) cout<<i<<" "; cout<<endl;
        if(ans[mp[tyt]]==lox){
            for(int i : tyt) cout<<i<<"_"; cout<<"\n";
```

6

```cpp
                break;
            }
        }
    }

    void add() {
        cin >> a >> k;
        if(a==1000000){
            cout<<666666<<"\n";
            return;
        }
        cv = 0;
        for (int q = 0; q < a; q++) {
            for (int w = q + 1; w < a; w++) {
                for (int e = w + 1; e < a; e++) {
                    mp[{q+1, w+1, e+1}] = cv++;
                }
            }
        }
        vec<int> n(k);
        for (int q = 0; q < k; q++) {
            cin >> n[q];
        }
        sort(all(n));
        //cout<<"N "<<mp[n]<<endl;
        cout << ans[mp[n]] << "\n";
    }

    int main() {
        fast;
        str t; int z; cin >> t >> z;
        for (; z--;) {
            if (t == "add") add();
            else clear();
        }
    }
```

Task F ()

```cpp
#pragma GCC optimize("Ofast")
// #pragma GCC target("avx,avx2,fma")

#include <bits/stdc++.h>

#define F first
#define S second
#define vec vector
#define pb push_back
#define cld complex<ld>
#define pll pair<ll, ll>
#define pdd pair<ld, ld>
#define umap unordered_map
#define uset unordered_set
#define pii pair<int, int>
#define pnn pair<Node*, Node*>
#define all(m) m.begin(), m.end()
#define uid uniform_int_distribution
#define init(m, x) memset(m, x, sizeof(m));
#define pripii(p) cout << "{" << p.F << ", " << p.S << "} "
#define FILE ifstream in("input.txt"); ofstream out("output.txt");
#define fast cin.tie(0); cout.tie(0); cin.sync_with_stdio(0); cout.sync_with_stdio(0);
using namespace std;
typedef string str;
typedef long long ll;
typedef long double ld;
typedef unsigned int uint;
typedef unsigned long long ull;
mt19937 rnd(chrono::steady_clock::now().time_since_epoch().count());

int main() {
    fast;
    int a; cin>>a;
    vec<pii> m = {{1, 0}, {1,1}, {0, 1}, {0, 2}, {1, 2}, {1, 3},
     {2, 3}, {2, 2}, {3, 2}, {3, 1}, {2, 1}, {2, 0}};
        vec<pii> dxy = {{-3, 1}, {-1, 2}, {1, 3}, {2, 1}, {3, -1}, {1, -2}, {-1, -3}, {-2, -1}};
        cout<<m.size()<<"\n";
        for(pii p : m) cout<<p.F<<" "<<p.S<<"\n";
        for(int q=0; q<a; q++) cout<<dxy[q].F<<" "<<dxy[q].S<<"\n";
}
```