

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 <iostream>
#include <algorithm>
#include <vector>
#include <set>
#include <map>
#include <string>

using namespace std;
using ll = long long;

ll n, m, k, q;

int main() {
    cin >> n;
    if (n <= 9) {
        cout << n << '\n';
        return 0;
    }
    else {
        n -= 9;
        if (n % 9 == 0) {
            cout << 9 << '\n';
        }
        else if (n % 9 == 1) {
            cout << 0 << '\n';
        }
        else {
            cout << n % 9 << '\n';
        }
    }
    return 0;
}
```

Task B ()

```
#include <iostream>
#include <algorithm>
#include <vector>
#include <set>
#include <map>
#include <string>

using namespace std;
using ll = long long;

ll n, m, k, q;

int main() {
    cin >> n >> k;
    string s;
    cin >> s;
    ll ans = 0;
    ll i = 0;
    ll last = -1;
    while (i < n) {
        ++ans;
        set <char> cur;
        while (i < n && cur.size() + (cur.find(s[i]) == cur.end()) <= 3 && i - last <= k)
        {
            cur.insert(s[i]);
            ++i;
        }
        last = i - 1;
    }
    cout << ans << '\n';
    return 0;
}
```

Task C ()

```
#include <iostream>
#include <algorithm>
#include <vector>
#include <set>
#include <map>
#include <string>

using namespace std;
using ll = long long;

const ll INF = 1e15;

ll mmin(ll a, ll b) {
    if (a < b) return a;
    return b;
}

bool mini(ll &a, ll b) {
    if (b < a) {
        a = b;
        return true;
    }
    return false;
}

ll n, m, k, q;

ll tty(char c) {
    return ll(c == ')') || c == '(';
}

vector<ll> dp(250001), nextt(250001);
bool p[501][250001];

int main() {
    ios::sync_with_stdio(false);
    cin.tie(nullptr);

    cin >> n;
    ll x, y;
    cin >> x >> y;
    vector<ll> w(n), v(n);
    for (int i = 0; i < n; ++i) {
        cin >> v[i];
    }
    for (int i = 0; i < n; ++i) {
        cin >> w[i];
    }
    for (auto &x : dp) {
        x = INF;
    }
    dp[0] = 0;
    for (int i = 0; i < n; ++i) {
        for (int j = 0; j <= x; ++j) {
            nextt[j] = INF;
        }
        for (int j = x; j >= 0; --j) {
            if (dp[j] != INF) {
                if (mini(nextt[j], dp[j] + w[i])) {
                    p[i + 1][j] = true;
                }
                if (j + v[i] <= x && mini(nextt[j + v[i]], dp[j])) {
                    p[i + 1][j + v[i]] = false;
                }
            }
        }
        dp = nextt;
    }

    string ans(n, 'x');
    ll ff = n, ss = -1;
    for (int i = 0; i <= x; ++i) {
```

```

        if (dp[i] <= y) {
            ss = i;
            break;
        }
    }
    if (ss == -1) {
        cout << -1 << '\n';
        return 0;
    }
    while (ff) {
        if (p[ff][ss] == false) {
            ss = v[ff - 1];
            --ff;
        }
        else {
            ans[ff - 1] = 'y';
            --ff;
        }
    }
    cout << ans << '\n';
    return 0;
}

```

Task D ()

```
#include <iostream>
#include <algorithm>
#include <vector>
#include <set>
#include <map>
#include <string>

using namespace std;
using ll = long long;

ll mmmin(ll a, ll b) {
    if (a < b) return a;
    return b;
}

ll n, m, k, q;

ll tty(char c) {
    return ll(c == ')') || c == '(';
}

int main() {
    ios::sync_with_stdio(false);
    cin.tie(nullptr);

    cin >> n;
    string s;
    cin >> s;
    string t;
    for (int i = 0; i < 2 * n; ++i) {
        char c = s[i];
        if (t.empty()) {
            t += c;
            continue;
        }
        if (tty(t.back()) == tty(c)) {
            t.pop_back();
        }
        else {
            t += c;
        }
    }
    cout << t.size() / 2 << '\n';

    return 0;
}
```

Task E ()

```
#include <iostream>
#include <algorithm>
#include <vector>
#include <set>
#include <map>
#include <string>

using namespace std;
using ll = long long;

const ll INF = 1e15;

ll mmin(ll a, ll b) {
    if (a < b) return a;
    return b;
}

bool mini(ll &a, ll b) {
    if (b < a) {
        a = b;
        return true;
    }
    return false;
}

ll n, m, k, q;

int main() {
    ios::sync_with_stdio(false);
    cin.tie(nullptr);

    map<set<ll>, ll> h;
    for (int i = 1; i <= 10; ++i) {
        for (int j = i + 1; j <= 10; ++j) {
            for (int k = j + 1; k <= 10; ++k) {
                for (int l = 1; l <= 10; ++l) {
                    if (i == 1 || j == 1 || k == 1) continue;
                    set<ll> t { i, j, k, l };
                    set<ll> cur = t;
                    bool bad = false;
                    cur.erase(k);
                    if (h.find(cur) != h.end()) {
                        if (h[cur] == k) {
                            bad = true;
                            continue;
                        }
                    }
                    cur.insert(k);
                    cur.erase(j);
                    if (h.find(cur) != h.end()) {
                        if (h[cur] == j) {
                            bad = true;
                            continue;
                        }
                    }
                    cur.insert(j);
                    cur.erase(i);
                    if (h.find(cur) != h.end()) {
                        if (h[cur] == i) {
                            bad = true;
                            continue;
                        }
                    }
                    cur.insert(i);
                    if (!bad) {
                        h[set<ll> {i, j, k}] = l;
                        break;
                    }
                }
            }
        }
    }
}
```

```

/*      for (auto &x : h) {
            cout << "{ ";
            for (auto &y : x.first) {
                cout << y << ' ';
            }
            cout << " } —> ";
            cout << x.second << '\n';
        }*/
string act;
cin >> act;
ll t;
cin >> t;
while (t--) {
    if (act == "add") {
        cin >> n >> k;
        if (n == 10 && k == 3) {
            ll a, b, c;
            cin >> a >> b >> c;
            cout << h[set <ll> {a, b, c}] << endl;
        }
        else {
            cout << 437136 << endl;
        }
    }
    else if (act == "clear") {
        cin >> n >> k;
        if (n == 10 && k == 3) {
            ll a, b, c, d;
            cin >> a >> b >> c >> d;
            if (h[set <ll> {a, b, c}] == d) {
                cout << a << '␣' << b << '␣' << c << '\n';
            }
            else if (h[set <ll> {a, b, d}] == c) {
                cout << a << '␣' << b << '␣' << d << '\n';
            }
            else if (h[set <ll> {a, c, d}] == b) {
                cout << a << '␣' << c << '␣' << d << '\n';
            }
            else if (h[set <ll> {b, c, d}] == a) {
                cout << b << '␣' << c << '␣' << d << '\n';
            }
        }
        else {
            set <ll> a;
            for (int i = 0; i < k + 1; ++i) {
                ll x;
                cin >> x;
                a.insert(x);
            }
            a.erase(437136);
            for (auto &x : a) {
                cout << x << '␣';
            }
            cout << endl;
        }
    }
}

return 0;
}

```

Task F ()

```
#include <iostream>
#include <algorithm>
#include <vector>
#include <set>
#include <map>
#include <string>

using namespace std;
using ll = long long;

const ll INF = 1e15;

ll mmin(ll a, ll b) {
    if (a < b) return a;
    return b;
}

bool mini(ll &a, ll b) {
    if (b < a) {
        a = b;
        return true;
    }
    return false;
}

ll n, m, k, q;

int main() {
    ios::sync_with_stdio(false);
    cin.tie(nullptr);

    cin >> n;
    cout << 4 << '\n';
    cout << "0_0\n";
    cout << "1_0\n";
    cout << "1_1\n";
    cout << "0_1\n";
    vector<pair<ll, ll>> a{
        { 1, 0 }, { 1, 1 }, { 0, 1 }, { -1, 1 }, { -1, 0 }, { -1, -1 }, { 0, -1 }, { 1, -1
    };
    for (int i = 0; i < n; ++i) {
        cout << a[i].first << ' ' << a[i].second << '\n';
    }
    return 0;
}
```