# Олимпиада СПбГУ по информатике 2021/22 учебного года

| A | B | C | D | E | F | Sum |
|---|---|---|---|---|---|---|
| 100 | 100 | 100 | 80 | 100 | 98 | 578 |

## Task A ()

```
#include <iostream>
#include <vector>
#include <map>
#include <set>
#include <string>
#define int long long
using namespace std;
signed main() {
    cin.tie(0);
    cout.tie(0);
    ios_base::sync_with_stdio(0);
    int n;
    cin >> n;
    map <int, int> e;
    set <int> c;
    for (int i = 0; i < n; ++i) {
        int a, b;
        cin >> a >> b;
        string s = to_string(a);
        for (int j = b; j < b + s.size(); ++j) {
            e[j] += s[s.size()-1-(j - b)] - '0';
            c.insert(j);
        }
    }
    for (auto x : c) {
        if (e[x] % 10 != 0) {
            cout << x;
            return 0;
        }
        else {
            e[x + 1] += e[x] / 10;
            c.insert(x + 1);
        }
    }




}
```

## Task B ()

```
#include <iostream>
#include <vector>
#include <map>
#include <set>
#include <string>
#define int long long
using namespace std;
signed main() {
    cin.tie(0);
    cout.tie(0);
    ios_base::sync_with_stdio(0);
    int n;
    cin >> n;
    vector <int> k(n);
    for (int i = 0; i < n; ++i) {
        cin >> k[i];
    }
    for (int i = n - 1; i >= 0; --i) {
        while (k[i] > 0) {
            int e = 0;
            cout << "Flip␣and␣wait"<<endl;
            while (e <= i) {
                string s;
                cin >> s;
                int cnt = 0;
                for (int j = 0; j < s.size(); ++j) {
                    if (s[j] == 'e') {
                        cnt++;
                    }
                }
                e += cnt / 2;
                if (e > i) {
                    break;
                }
                else {
                    cout << "Wait" << endl;
                }
            }
            k[i]--;
        }
    }
    cout << "Stop" << endl;

}
```

## Task C ()

```
#include <iostream>
#include <vector>
#include <map>
#include <set>
#include <string>
#define int long long
using namespace std;
signed main() {
    cin.tie(0);
    cout.tie(0);
    ios_base::sync_with_stdio(0);
    int n;
    cin >> n;
    for (int i = 0; i < n; ++i) {
        string s;
        cin >> s;
        bool e = 0;
        for (int i = 0; i < s.size(); ++i) {
            if (s[i] == '?') {
                e = 1;
            }
        }
        if (!e) {
            int cnt1 = 0;
            int cnt2 = 0;
            for (int i = 0; i < s.size(); ++i) {
                if (s[i] == '0') {
                    cnt1++;
                }
                else {
                    cnt2++;
                }
            }
            if (cnt1 == s.size()) {
                string ans;
                for (int i = 0; i < s.size(); ++i) {
                    ans += '?';
                }
                cout << ans << endl;
            }
            else {
                if (cnt2 == s.size()) {
                    int v = cnt2 / 2;
                    for (int i = 0; i < v; ++i) {
                        s[i] = '?';
                    }
                    cout << s << endl;
                }
                else {
                    if (cnt1 > cnt2) {
                        for (int i = 0; i < s.size(); ++i) {
                            if (s[i] == '0') {
                                s[i] = '?';
                            }
                        }
                    }
                    else {
                        for (int i = 0; i < s.size(); ++i) {
                            if (s[i] == '1') {
                                s[i] = '?';
                            }
                        }
                    }
                    cout << s << endl;
                }
            }
        }
        else {
            char t = '0';
            int cnt1 = 0;
            int cnt2 = 0;
            for (int i = 0; i < s.size(); ++i) {
                if (s[i] == '?') {
                    cnt1++;
                }
                else {
                    cnt2++;
                    t = s[i];
                }
            }
            if (cnt1 == s.size()) {
                for (int i = 0; i < s.size(); ++i) {
                    cout << "0";
                }
                cout << endl;
            }
            else {
                if (t == '1' && cnt1 <= cnt2) {
                    for (int i = 0; i < s.size(); ++i) {
                        cout << "1";
                    }
                    cout << endl;
                }
                else {
                    for (int i = 0; i < s.size(); ++i) {
                        if (s[i] == '?') {
                            if (t == '1') {
                                s[i] = '0';
                            }
                            else {
                                s[i] = '1';
                            }
                        }
                    }
                    cout << s << endl;
                }
            }
        }
    }

}
```

## Task D ()

```
#include <iostream>
#include <vector>
#include <map>
#include <set>
#include <string>
#define int long long
using namespace std;
int md = 998244353;
signed main() {
    cin.tie(0);
    cout.tie(0);
    ios_base::sync_with_stdio(0);
    int n;
    cin >> n;
    n++;
    vector <int> pr = {1,
        808258749,117153405,761699708,573994984,62402409,511621808,242726978,887890124,875880304
        };
    for (int j = 9; j >= 0; --j) {
        if (j * 1e8 <= n) {
            int ans = pr[j];
            for (int z = j * 1e8 + 1; z <= n; ++z) {
                ans *= z;
                ans %= md;
            }

            cout << "0␣" << ans;
            return 0;
        }
    }

}
```

## Task E ()

```cpp
#include <iostream>
#include <vector>
#include <map>
#include <set>
#include <string>
#include <unordered_map>
using namespace std;
int cnt[121][1000001];
signed main() {
    cin.tie(0);
    cout.tie(0);
    ios_base::sync_with_stdio(0);
    int n;
    cin >> n;
    int sz_block = 2500;
    vector <int> a(n);
    for (int i = 0; i < n; ++i) {
        cin >> a[i];
    }
    vector <unordered_map <int, int> > usd((n - 1) / sz_block + 1);
    for (int i = 0; i < n; ++i) {
        usd[i / sz_block][a[i]]++;
    }
    for (int i = 0; i < usd.size(); ++i) {
        for (auto u : usd[i]) {
            int k = u.second;
            int v = u.first;
            for (int j = 1; j < 1e6 + 1; j += v) {
                cnt[i][j] += k;
            }
        }
        int sm = 0;
        for (int j = 1; j < 1e6 + 1; ++j) {
            sm += cnt[i][j];
            cnt[i][j] = sm;
        }
    }
    int q;
    cin >> q;
    for (int t = 0; t < q; ++t) {
        int st, b, d;
        cin >> st >> b >> d;
        b--;
        long long ans = 0;
        while (st <= b && st % sz_block != 0) {
            ans += (d + a[st] - 1) / a[st];
            st++;
        }
        while (st / sz_block < b / sz_block) {
            ans += cnt[st / sz_block][d];
            st += sz_block;
        }
        while (st <= b) {
            ans += (d + a[st] - 1) / a[st];
            st++;
        }
        cout << ans << "\n";
    }



}
```

## Task F ()

```
#include <iostream>
#include <vector>
#include <map>
#include <set>
#include <string>
#include <unordered_map>
#include <algorithm>
#include <random>
using namespace std;
mt19937 rnd(2103213);
signed main() {
    cin.tie(0);
    cout.tie(0);
    ios_base::sync_with_stdio(0);
    int n;
    cin >> n;
    vector <vector <int> > d;
    for (int i = 0; i < n; ++i) {
        int l, r;
        cin >> l >> r;
        d.push_back({ l,r });
    }
    vector <int> mx(n + 1, 0);
    vector <long long> pref1(n + 1);
    vector <long long> pref2(n + 1);
    int rr = 400;
    if (n > 2e5) {
        rr = 300;
    } else {
        rr = 500;
    }
    for (int i = 0; i < n; ++i) {
        pref1[i + 1] = pref1[i] + d[i][0];
        pref2[i + 1] = pref2[i] + d[i][1];
    }
    if (n <= 1e4) {
        mx[0] = 1;
        int ans = 1;
        for (int j = 1; j <= n; ++j) {
            long long l = 0, r = 0;
            mx[j] = 1;
            for (int z = j - 1; z >= 0; --z) {
                l -= d[z][1];
                r -= d[z][0];
                if (l <= 0 && 0 <= r) {
                    mx[j] = max(mx[z] + 1, mx[j]);
                }
            }
            ans = max(ans, mx[j]);
        }
        cout << ans;
        return 0;
    } else {
        mx[0] = 1;
        int ans = 1;
        set <vector <int> > pr;
        for (int j = 1; j <= n; ++j) {
            long long l = 0, r = 0;
            mx[j] = 1;
            for (int z = j - 1; z >= 0 && j - z <= 100; --z) {
                l -= d[z][1];
                r -= d[z][0];
                if (l <= 0 && 0 <= r) {
                    mx[j] = max(mx[z] + 1, mx[j]);
                }
            }
            for (int z = 0; z < 10 && z < j; ++z) {
                long long sm1 = pref2[j] - pref2[z];
                long long sm2 = pref1[j] - pref1[z];
                long long l = -sm1;
                long long r = -sm2;
                if (l <= 0 && 0 <= r) {
                    mx[j] = max(mx[z] + 1, mx[j]);
                }
            }
            auto it = pr.end();

            for (int z = 0; z < rr; ++z) {
                if (it == pr.begin()) {
                    break;
                }
                it--;
                int ind = (*it)[1];
                long long sm1 = pref2[j] - pref2[ind];
                long long sm2 = pref1[j] - pref1[ind];
                long long l = -sm1;
                long long r = -sm2;
                if (l <= 0 && 0 <= r) {
                    mx[j] = max(mx[ind] + 1, mx[j]);
                }

            }
            ans = max(ans, mx[j]);
            pr.insert({ mx[j],j });

        }
        cout << ans;
        return 0;
    }
}
```