

Олимпиада СПбГУ по информатике 2021/22 учебного года

A	B	C	D	E	F	Sum
100	100	100	80	58	31	469

Task A ()

```
#include <bits/stdc++.h>

#define ff first
#define ss second
#define _ << " " <<

#define int long long

using namespace std;

typedef long long ll;
typedef long double ld;
typedef pair<int, int> pii;
typedef pair<ll, ll> pll;
typedef pair<ld, ld> pld;

const int MXN = 300111;

pll sum(pll x, pll y) {
    //cout << "sum" _ x.ff _ x.ss _ y.ff _ y.ss << endl;
    assert(x.ff == y.ff);
    ll a = x.ss + y.ss;
    //cout << "a=" << a << endl;
    ll b = x.ff;
    //cout << "b=" << b << endl;
    while (a % 10 == 0) {
        a /= 10;
        ++b;
    }
    //cout << "b a =" _ b _ a << endl;
    return make_pair(b, a);
}

void solve() {
    int n;
    cin >> n;
    multiset<pll> st;
    for (int i = 0; i < n; ++i) {
        ll a, b;
        cin >> a >> b;
        while (a % 10 == 0) {
            a /= 10;
            ++b;
        }
        //cout << "!" _ b _ a << endl;
        st.insert(make_pair(b, a));
    }
    while (st.size() >= 2) {
        pll x = (*st.begin());
        st.erase(st.find(x));
        pll y = (*st.begin());
        st.erase(st.find(y));
        //cout << "x=" << x.ff << " " << x.ss << endl;
        //cout << "y=" << y.ff << " " << y.ss << endl;
        if (x.ff != y.ff) {
            st.insert(x);
        }
    }
}
```

```

        st.insert(y);
        //cout << "BREAK" << endl;
        break;
    } else {
        pll z = sum(x, y);
        //cout << "z=" << z.ff << " " << z.ss << endl;
        st.insert(z);
    }
    //cout << "---" << endl;
}
pll x = (*st.begin());
cout << x.ff << endl;
}

int32_t main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0); cout.tie(0);
    int tests = 1;
    //cin >> tests;
    while (tests--) {
        solve();
    }
    return 0;
}

```

Task B ()

```
#include <bits/stdc++.h>

using namespace std;

typedef long long ll;
typedef long double ld;
typedef pair<int, int> pii;
typedef pair<ld, ld> pld;

const int MXN = 111;

int n;

int k[MXN];

int get() {
    string s;
    cin >> s;
    if (s == "Burn") exit(0);
    if (s == "Fail") exit(0);
    if (s == "Tired") exit(0);
    int x = s.size() - 3;
    return (x / 2);
}

void waitall() {
    cout << "Flip_and_wait" << endl;
    int res = 0;
    while (res < n) {
        res += get();
        if (res == n) break;
        cout << "Wait" << endl;
    }
    //cout << "Flip and wait" << endl;
}

void solve() {
    cin >> n;
    for (int i = 0; i < n; ++i) cin >> k[i];
    //cout << "Flip and wait" << endl;
    for (int i = 0; i < n; ++i) {
        while (k[i] >= 2) {
            cout << "Flip_and_wait" << endl;
            k[i] -= 2;
            int res = 0;
            while (res <= i) {
                res += get();
                if (res <= i) {
                    cout << "Wait" << endl;
                } else {
                    break;
                }
            }
            waitall();
        }
    }
    //cout << "OK!" << endl;
    for (int i = n - 1; i >= 0; --i) {
        if (k[i] > 0) {
            cout << "Flip_and_wait" << endl;
            int res = 0;
            while (res <= i) {
                res += get();
                if (res <= i) {
                    cout << "Wait" << endl;
                } else {
                    break;
                }
            }
            //cout << "Flip and wait" << endl;
        }
    }
}
```

```

        cout << "Stop" << endl;
    }

int32_t main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0); cout.tie(0);
    int tests = 1;
    //cin >> tests;
    while (tests--) {
        solve();
    }
    return 0;
}

```

Task C ()

```
#include <bits/stdc++.h>

using namespace std;

typedef long long ll;
typedef long double ld;
typedef pair<int, int> pii;
typedef pair<ld, ld> pld;

void solve() {
    string s;
    cin >> s;
    bool fl = true;
    for (auto to: s) {
        if (to == '?') fl = false;
    }
    if (fl) {
        for (int i = 0; i < s.size(); i += 2) {
            if ((i + 1) >= s.size()) continue;
            if (s[i] == '0' && s[i + 1] == '0') {
                s[i + 1] = '?';
            }
            if (s[i] == '0' && s[i + 1] == '1') {
                s[i] = '?';
            }
            if (s[i] == '1' && s[i + 1] == '0') {
                s[i + 1] = '?';
            }
            if (s[i] == '1' && s[i + 1] == '1') {
                s[i] = '?';
                s[i + 1] = '?';
            }
        }
        cout << s << "\n";
    } else {
        for (int i = 0; i < s.size(); i += 2) {
            if ((i + 1) >= s.size()) continue;
            if (s[i] == '0' && s[i + 1] == '?') {
                s[i + 1] = '0';
            }
            if (s[i] == '?' && s[i + 1] == '1') {
                s[i] = '0';
            }
            if (s[i] == '1' && s[i + 1] == '?') {
                s[i + 1] = '0';
            }
            if (s[i] == '?' && s[i + 1] == '?') {
                s[i] = '1';
                s[i + 1] = '1';
            }
        }
        cout << s << "\n";
    }
}

int32_t main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0); cout.tie(0);
    int tests = 1;
    cin >> tests;
    while (tests--) {
        solve();
    }
    return 0;
}
```

Task D ()

```
#include <bits/stdc++.h>

#define int long long

using namespace std;

#define _ << " " <<

typedef long long ll;
typedef long double ld;
typedef pair<int, int> pii;
typedef pair<ld, ld> pld;

const int MXN = 2e6;
const ll MOD = 998244353;

int n;

ll dp[MXN];
ll cnt[MXN];

/*
9
100000000
v.push_back({100000000, 464016596, 808258749, 980201571})
0 980201571
200000000
v.push_back({200000000, 63299249, 117153405, 468660588})
0 468660588
300000000
v.push_back({300000000, 434731971, 761699708, 478389955})
0 478389955
400000000
v.push_back({400000000, 55395755, 573994984, 137136996})
0 137136996
500000000
v.push_back({500000000, 15814281, 62402409, 203730522})
0 203730522
600000000
v.push_back({600000000, 565294571, 511621808, 533107751})
0 533107751
700000000
v.push_back({700000000, 293833759, 242726978, 496409701})
0 496409701
800000000
v.push_back({800000000, 851627080, 887890124, 637333574})
0 637333574
900000000
v.push_back({900000000, 130777589, 875880304, 465585441})
*/

ll get(ll n) {
    if (n == 0) return 1;
    if (n == 1) return 2;
    ll a = 0;
    ll b = 1;
    ll c = 2;
    ll start = 2;
    vector<vector<int>> v;
    v.push_back({100000000, 464016596, 808258749, 980201571});
    v.push_back({200000000, 63299249, 117153405, 468660588});
    v.push_back({300000000, 434731971, 761699708, 478389955});
    v.push_back({400000000, 55395755, 573994984, 137136996});
    v.push_back({500000000, 15814281, 62402409, 203730522});
    v.push_back({600000000, 565294571, 511621808, 533107751});
    v.push_back({700000000, 293833759, 242726978, 496409701});
    v.push_back({800000000, 851627080, 887890124, 637333574});
    v.push_back({900000000, 130777589, 875880304, 465585441});
    for (auto to: v) {
        if (n > to[0]) {
            start = to[0] + 1;
        }
    }
}
```

```

        a = to[1];
        b = to[2];
        c = to[3];
    }
}
for (ll i = start; i <= n; ++i) {
    a = b;
    b = c;
    ll x = ((i * i) % MOD);
    c = ((a * x) % MOD + b) % MOD;
}
//cout << "!" _ a _ b _ c << endl;
return c;
}

int32_t main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0); cout.tie(0);
    ll n;
    cin >> n;
    cout << 4 * (n / MOD) << "┘" << get(n % MOD) << endl;
    return 0;
}

```

Task E ()

```
#include <bits/stdc++.h>

using namespace std;

typedef long long ll;
typedef long double ld;
typedef pair<int, int> pii;
typedef pair<ld, ld> pld;

const int MXN = 300111;

int n, q;

int t[MXN];

void solve() {
    cin >> n;
    for (int i = 0; i < n; ++i) {
        cin >> t[i];
    }
    cin >> q;
    while (q--) {
        int a, b, d;
        cin >> a >> b >> d;
        ll res = 0;
        for (int i = a; i < b; ++i) {
            res += ((d + t[i] - 1) / t[i]);
        }
        cout << res << "\n";
    }
}

int32_t main() {
    ios_base::sync_with_stdio(0);
    cin.tie(0); cout.tie(0);
    int tests = 1;
    //cin >> tests;
    while (tests--) {
        solve();
    }
    return 0;
}
```


Task F ()

```
#include <bits/stdc++.h>

#pragma GCC optimize("O3")

#define ff first
#define ss second
#define _ << "_" <<
#define now() ((ld)clock() / CLOCKS_PER_SEC)

using namespace std;

typedef long long ll;
typedef long double ld;
typedef pair<int, int> pii;
typedef pair<ll, ll> pll;
typedef pair<ld, ld> pld;

const int MXN = 1e6 + 111;

mt19937 rnd(time(0));

const ll MXX = 8e14 + 111;
const ll DELTA = 4e14 + 10;

ll di = 0;
ll dj = 0;

map<pll, int> t;

void inc(ll ii, ll jj, int x) {
    ii += DELTA - di;
    jj += DELTA - dj;
    for (ll i = ii; i < MXX; i |= (i + 1)) {
        for (ll j = jj; j < MXX; j |= (j + 1)) {
            t[make_pair(i, j)] = max(t[make_pair(i, j)], x);
        }
    }
}

int get(ll ii, ll jj) {
    ii += DELTA - di;
    jj += DELTA - dj;
    int res = 0;
    for (ll i = ii; i >= 0; i = (i & (i + 1)) - 1) {
        for (ll j = jj; j >= 0; j = (j & (j + 1)) - 1) {
            if (t.count(make_pair(i, j))) res = max(res, t[make_pair(i, j)]);
        }
    }
    return res;
}

int n;
int l[MXN];
int r[MXN];

int dp[MXN];

void solve() {
    cin >> n;
    for (int i = 1; i <= n; ++i) {
        cin >> l[i] >> r[i];
    }
    int ans = 1;
    dp[0] = 1;
    inc(0, 0, 1);
    for (int i = 1; i <= n; ++i) {
        di += l[i];
        dj -= r[i];
        dp[i] = get(0, 0) + 1;
        //cout << "dp[" << i << "]=" << dp[i] << endl;
        ans = max(ans, dp[i]);
        inc(0, 0, dp[i]);
    }
    cout << ans << endl;
}
```

```
}  
  
int32_t main() {  
    ios_base::sync_with_stdio(0);  
    cin.tie(0); cout.tie(0);  
    int tests = 1;  
    //cin >> tests;  
    while (tests--) {  
        solve();  
    }  
    return 0;  
}
```