

Олимпиада СПбГУ по информатике 2021/22 учебного года

A	B	C	D	E	F	Sum
100	100	100	100	100	31	531

Task A ()

```
//#pragma GCC target("avx2")
//#pragma GCC optimize("O3")
//#pragma GCC optimize("unroll-loops,no-stack-protector,fast-math")
#define _CRT_SECURE_NO_WARNINGS
#include <functional>
#include <bitset>
#include <algorithm>
#include <iostream>
#include <iomanip>
#include <cassert>
#include <cstdlib>
#include <cstring>
#include <sstream>
#include <utility>
#include <random>
#include <string>
#include <vector>
#include <cstdio>
#include <cmath>
#include <ctime>
#include <set>
#include <map>
#include <deque>
#include <queue>
#include <tuple>
#include <unordered_set>
#include <list>
#include <array>
#include <ctime>
#include <numeric>
#include "omp.h"

using namespace std;

#define int long long
// #define double long double
typedef vector<int> vi;
typedef vector<vector<int>> vvi;
typedef pair<int, int> pi;
typedef vector<pair<int, int>> vpi;
#define rep(i, n) for (int i = 0; i < (n); ++i)
#define repl(i, n) for (int i = 1; i < (n); ++i)
#define repln(i, n) for (int i = 1; i <= (n); ++i)
#define repr(i, n) for (int i = (n) - 1; i >= 0; --i)
#define pb push_back
#define eb emplace_back
#define all(a) (a).begin(), (a).end()
#define rall(a) (a).rbegin(), (a).rend()
#define sz(a) (int)(a.size())
constexpr int INF = 1e9 + 30;
constexpr long long INFll = 1e18 + 30;
constexpr double INFd = 1e60;
constexpr int N = 303;
constexpr int MOD = 998244353;
//constexpr int al = 'z' - 'a' + 1;
constexpr int MAXA = 103;
```

```

constexpr int LOG = 18;

void solve() {
    int n;
    cin >> n;
    vpi ba(n);
    for (int i = 0; i < n; ++i) {
        cin >> ba[i].second >> ba[i].first;
        while (ba[i].second % 10 == 0) {
            ba[i].first++;
            ba[i].second /= 10;
        }
    }
    sort(all(ba));
    int nowb = ba[0].first;
    int nowa = ba[0].second;
    for (int i = 1; i < n; ++i) {
        while (nowa % 10 == 0 && nowb < ba[i].first) {
            nowa /= 10;
            nowb++;
        }
        if (ba[i].first == nowb) {
            nowa += ba[i].second;
        }
        else {
            assert(ba[i].first > nowb && nowa % 10 != 0);
            cout << nowb << "\n";
            return;
        }
    }
    while (nowa % 10 == 0) {
        nowa /= 10;
        nowb++;
    }
    cout << nowb;
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    //freopen("c2.txt", "r", stdin);
    //freopen("c2out.txt", "w", stdout);
    int t = 1;
    //cin >> t;
    while (t--) {
        solve();
    }
}

```

Task B ()

```
///pragma GCC target("avx2")
///pragma GCC optimize("O3")
///pragma GCC optimize("unroll-loops,no-stack-protector,fast-math")
#define _CRT_SECURE_NO_WARNINGS
#include <functional>
#include <bitset>
#include <algorithm>
#include <iostream>
#include <iomanip>
#include <cassert>
#include <cstdlib>
#include <cstring>
#include <sstream>
#include <utility>
#include <random>
#include <string>
#include <vector>
#include <cstdio>
#include <cmath>
#include <ctime>
#include <set>
#include <map>
#include <deque>
#include <queue>
#include <tuple>
#include <unordered_set>
#include <list>
#include <array>
#include <ctime>
#include <numeric>
#include "omp.h"

using namespace std;

#define int long long
///#define double long double
typedef vector<int> vi;
typedef vector<vector<int>> vvi;
typedef pair<int, int> pi;
typedef vector<pair<int, int>> vpi;
#define rep(i, n) for (int i = 0; i < (n); ++i)
#define repl(i, n) for (int i = 1; i < (n); ++i)
#define repln(i, n) for (int i = 1; i <= (n); ++i)
#define repr(i, n) for (int i = (n) - 1; i >= 0; --i)
#define pb push_back
#define eb emplace_back
#define all(a) (a).begin(), (a).end()
#define rall(a) (a).rbegin(), (a).rend()
#define sz(a) (int)(a.size())
constexpr int INF = 1e9 + 30;
constexpr long long INFll = 1e18 + 30;
constexpr double INFd = 1e60;
constexpr int N = 303;
constexpr int MOD = 998244353;
///constexpr int al = 'z' - 'a' + 1;
constexpr int MAXA = 103;
constexpr int LOG = 18;

void solve() {
    int n;
    cin >> n;
    vi k(n);
    for (int i = 0; i < n; ++i) {
        cin >> k[i];
    }
    int now = 0;
    for (int i = n - 1; i >= 0; --i) {
        while (k[i] > 0) {
            cout << "Flip_and_wait" << endl;
            int cnt = i + 1;
            while (cnt > 0) {
                string s;
```

```

        cin >> s;
        cnt -= (((int)s.size() - 3) / 2);
        if (cnt > 0) {
            cout << "Wait" << endl;
        }
        --k[i];
    }
}
cout << "Stop" << endl;
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    //freopen("c2.txt", "r", stdin);
    //freopen("c2out.txt", "w", stdout);
    int t = 1;
    //cin >> t;
    while (t--) {
        solve();
    }
}

```

Task C ()

```
///pragma GCC target("avx2")
///pragma GCC optimize("O3")
///pragma GCC optimize("unroll-loops,no-stack-protector,fast-math")
#define _CRT_SECURE_NO_WARNINGS
#include <functional>
#include <bitset>
#include <algorithm>
#include <iostream>
#include <iomanip>
#include <cassert>
#include <cstdlib>
#include <cstring>
#include <sstream>
#include <utility>
#include <random>
#include <string>
#include <vector>
#include <cstdio>
#include <cmath>
#include <ctime>
#include <set>
#include <map>
#include <deque>
#include <queue>
#include <tuple>
#include <unordered_set>
#include <list>
#include <array>
#include <ctime>
#include <numeric>
#include "omp.h"

using namespace std;

#define int long long
///#define double long double
typedef vector<int> vi;
typedef vector<vector<int>> vvi;
typedef pair<int, int> pi;
typedef vector<pair<int, int>> vpi;
#define rep(i, n) for (int i = 0; i < (n); ++i)
#define repl(i, n) for (int i = 1; i < (n); ++i)
#define repln(i, n) for (int i = 1; i <= (n); ++i)
#define repr(i, n) for (int i = (n) - 1; i >= 0; --i)
#define pb push_back
#define eb emplace_back
#define all(a) (a).begin(), (a).end()
#define rall(a) (a).rbegin(), (a).rend()
#define sz(a) (int)(a.size())
constexpr int INF = 1e9 + 30;
constexpr long long INFll = 1e18 + 30;
constexpr double INFd = 1e60;
constexpr int N = 303;
constexpr int MOD = 998244353;
///constexpr int al = 'z' - 'a' + 1;
constexpr int MAXA = 103;
constexpr int LOG = 18;

void solve() {
    string s;
    cin >> s;
    int n = s.size();
    int cnt0 = 0;
    int cnt1 = 0;
    int cntq = 0;
    for (int i = 0; i < n; ++i) {
        if (s[i] == '0') ++cnt0;
        if (s[i] == '1') ++cnt1;
        if (s[i] == '?') ++cntq;
    }
    if (cntq > 0) {
        if (cnt0 == 0) {
```

```

        if (cnt1 * 2 >= n) {
            for (int i = 0; i < n; ++i) {
                cout << '1';
            }
        }
        else {
            for (int i = 0; i < n; ++i) {
                if (s[i] == '?') {
                    cout << '0';
                }
                else {
                    assert(s[i] == '1');
                    cout << '1';
                }
            }
        }
    }
    else {
        assert(cnt1 == 0);
        for (int i = 0; i < n; ++i) {
            if (s[i] == '?') {
                cout << '1';
            }
            else {
                assert(s[i] == '0');
                cout << '0';
            }
        }
    }
}
else {
    if (cnt0 > 0) {
        if (cnt0 > cnt1) {
            for (int i = 0; i < n; ++i) {
                if (s[i] == '0') {
                    cout << '?';
                }
                else {
                    assert(s[i] == '1');
                    cout << '1';
                }
            }
        }
        else {
            for (int i = 0; i < n; ++i) {
                if (s[i] == '1') {
                    cout << '?';
                }
                else {
                    assert(s[i] == '0');
                    cout << '0';
                }
            }
        }
    }
    else {
        for (int i = 0; i < (n + 1) / 2; ++i) {
            cout << '1';
        }
        for (int i = (n + 1) / 2; i < n; ++i) {
            cout << '?';
        }
    }
}
cout << "\n";
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    //freopen("c2.txt", "r", stdin);
    //freopen("c2out.txt", "w", stdout);
    int t = 1;
    cin >> t;
}

```

```
    while (t--) {  
        solve();  
    }  
}
```

Task D ()

```
///#pragma GCC target("avx2")
///#pragma GCC optimize("O3")
///#pragma GCC optimize("unroll-loops,no-stack-protector,fast-math")
#define _CRT_SECURE_NO_WARNINGS
#include <functional>
#include <bitset>
#include <algorithm>
#include <iostream>
#include <iomanip>
#include <cassert>
#include <cstdlib>
#include <cstring>
#include <sstream>
#include <utility>
#include <random>
#include <string>
#include <vector>
#include <cstdio>
#include <cmath>
#include <ctime>
#include <set>
#include <map>
#include <deque>
#include <queue>
#include <tuple>
#include <unordered_set>
#include <list>
#include <array>
#include <ctime>
#include <numeric>
#include "omp.h"

using namespace std;

#define int long long
///#define double long double
typedef vector<int> vi;
typedef vector<vector<int>> vvi;
typedef pair<int, int> pi;
typedef vector<pair<int, int>> vpi;
#define rep(i, n) for (int i = 0; i < (n); ++i)
#define repl(i, n) for (int i = 1; i < (n); ++i)
#define repln(i, n) for (int i = 1; i <= (n); ++i)
#define repr(i, n) for (int i = (n) - 1; i >= 0; --i)
#define pb push_back
#define eb emplace_back
#define all(a) (a).begin(), (a).end()
#define rall(a) (a).rbegin(), (a).rend()
#define sz(a) (int)(a.size())
constexpr int INF = 1e9 + 30;
constexpr long long INFll = 1e18 + 30;
constexpr double INFd = 1e60;
constexpr int N = 303;
constexpr int MOD = 998244353;
///constexpr int al = 'z' - 'a' + 1;
constexpr int MAXA = 103;
constexpr int LOG = 18;

int add(int x, int y) {
    x += y;
    if (x >= MOD) x -= MOD;
    return x;
}

int mult(int x, int y) {
    return (x * y) % MOD;
}

vi fac8 = {
    1,808258749,117153405,761699708,573994984,62402409,511621808,242726978,887890124,875880304 };

void solve() {
```



```

int n;
cin >> n;
++n;
int cnta = n / MOD + n / (MOD * MOD);
if (n % MOD == 0) {
    if ((n / MOD) & 1) {
        cout << cnta << "␣" << 998244352 << "\n";
    }
    else {
        cout << cnta << "␣" << 1 << "\n";
    }
}
else {
    int ans = fac8[(n % MOD) / 100000000];
    for (int i = ((n % MOD) / 100000000) * 100000000 + 1; i <= n % MOD; ++i) {
        ans = mult(ans, i);
    }
    if (((n + MOD - 1) / MOD) % 2 == 0) {
        ans = mult(ans, 99824435211);
    }
    cout << cnta << "␣" << ans;
}
}
signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    //freopen("c2.txt", "r", stdin);
    //freopen("out.txt", "w", stdout);
    *cout << "1";
    int ans = 1;
    for (int i = 2; i < MOD; ++i) {
        ans = mult(ans, i);
        if (i % 100000000 == 0) {
            cout << "," << ans;
        }
    }
    cout << "}";
    return 0;*/
    int t = 1;
    //cin >> t;
    while (t--) {
        solve();
    }
}

```

Task E ()

```
#pragma GCC target("avx2")
#pragma GCC optimize("O3")
#pragma GCC optimize("unroll-loops,no-stack-protector,fast-math")
#define _CRT_SECURE_NO_WARNINGS
#include <functional>
#include <bitset>
#include <algorithm>
#include <iostream>
#include <iomanip>
#include <cassert>
#include <cstdlib>
#include <cstring>
#include <sstream>
#include <utility>
#include <random>
#include <string>
#include <vector>
#include <cstdio>
#include <cmath>
#include <ctime>
#include <set>
#include <map>
#include <deque>
#include <queue>
#include <tuple>
#include <unordered_set>
#include <list>
#include <array>
#include <ctime>
#include <numeric>
#include "omp.h"

using namespace std;

// #define int long long
// #define double long double
typedef vector<int> vi;
typedef vector<vector<int>> vvi;
typedef pair<int, int> pi;
typedef vector<pair<int, int>> vpi;
#define rep(i, n) for (int i = 0; i < (n); ++i)
#define repl(i, n) for (int i = 1; i < (n); ++i)
#define repln(i, n) for (int i = 1; i <= (n); ++i)
#define repr(i, n) for (int i = (n) - 1; i >= 0; --i)
#define pb push_back
#define eb emplace_back
#define all(a) (a).begin(), (a).end()
#define rall(a) (a).rbegin(), (a).rend()
#define sz(a) (int)(a.size())
constexpr int INF = 1e9 + 30;
constexpr long long INFll = 1e18 + 30;
constexpr double INFd = 1e60;
constexpr int N = 3e5 + 228;
constexpr int MOD = 998244353;
//constexpr int al = 'z' - 'a' + 1;
constexpr int MAXA = 103;
constexpr int LOG = 18;

int tree[N];

void inc(int pos, int d) {
    for (; pos < N; pos = (pos | (pos + 1))) tree[pos] += d;
}

int sum(int r) {
    r = min(r, N - 1);
    int ans = 0;
    for (; r >= 0; r = (r & (r + 1)) - 1) ans += tree[r];
    return ans;
}

int sum(int l, int r) { // [l, r)
```

```

    return sum(r - 1) - sum(l - 1);
}

int v[N];
const int K = 2500;
int cntSmall[K];

void add(int pos) {
    if (v[pos] < K) {
        cntSmall[v[pos]]++;
    }
    else {
        inc(v[pos], 1);
    }
}

void del(int pos) {
    if (v[pos] < K) {
        cntSmall[v[pos]]--;
    }
    else {
        inc(v[pos], -1);
    }
}

long long getAns(int d) {
    long long ans = 0;
    for (int i = 1; i < K; ++i) {
        ans += (long long)((d + i - 1) / i) * cntSmall[i];
    }
    for (int c = (d + K - 1) / K; c >= 2; --c) {
        ans += c * (long long)sum((d + c - 1) / c, (d + c - 2) / (c - 1));
    }
    ans += sum(d, N);
    return ans;
}

long long vans[N];

void solve() {
    int n;
    cin >> n;
    rep(i, n) cin >> v[i];
    int q;
    cin >> q;
    vector<pair<pi, pi>> req(q);
    for (int i = 0; i < q; ++i) {
        cin >> req[i].first.first >> req[i].first.second >> req[i].second.first;
        req[i].second.second = i;
    }
    const int ksort = 700;
    sort(all(req), [ksort](const pair<pi, pi>& a, const pair<pi, pi>& b) {
        if (a.first.first / ksort == b.first.first / ksort) return a.first.second < b.first.second;
        return a.first.first < b.first.first;
    });
    int nowl = 0;
    int nowr = 0;
    for (int i = 0; i < q; ++i) {
        int l, r, d;
        l = req[i].first.first;
        r = req[i].first.second;
        d = req[i].second.first;
        int id = req[i].second.second;
        while (nowr < r) {
            add(nowr++);
        }
        while (nowl > l) {
            add(--nowl);
        }
        while (nowl < l) {
            del(nowl++);
        }
        while (nowr > r) {

```

```

        del(--nowr);
    }
    vans[id] = getAns(d);
}
for (int i = 0; i < q; ++i) {
    cout << vans[i] << "\n";
}
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    //freopen("c2.txt", "r", stdin);
    //freopen("c2out.txt", "w", stdout);
    /*int ans = 1;
    for (int i = 2; i < MOD; ++i) {
        ans = mult(ans, i);
    }
    cout << ans;
    return 0;*/
    int t = 1;
    //cin >> t;
    while (t--) {
        solve();
    }
}

```

Task F ()

```
///pragma GCC target("avx2")
///pragma GCC optimize("O3")
///pragma GCC optimize("unroll-loops,no-stack-protector,fast-math")
#define _CRT_SECURE_NO_WARNINGS
#include <functional>
#include <bitset>
#include <algorithm>
#include <iostream>
#include <iomanip>
#include <cassert>
#include <cstdlib>
#include <cstring>
#include <sstream>
#include <utility>
#include <random>
#include <string>
#include <vector>
#include <cstdio>
#include <cmath>
#include <ctime>
#include <set>
#include <map>
#include <deque>
#include <queue>
#include <tuple>
#include <unordered_set>
#include <list>
#include <array>
#include <ctime>
#include <numeric>
#include "omp.h"

using namespace std;

#define int long long
///define double long double
typedef vector<int> vi;
typedef vector<vector<int>> vvi;
typedef pair<int, int> pi;
typedef vector<pair<int, int>> vpi;
#define rep(i, n) for (int i = 0; i < (n); ++i)
#define repl(i, n) for (int i = 1; i < (n); ++i)
#define repln(i, n) for (int i = 1; i <= (n); ++i)
#define repr(i, n) for (int i = (n) - 1; i >= 0; --i)
#define pb push_back
#define eb emplace_back
#define all(a) (a).begin(), (a).end()
#define rall(a) (a).rbegin(), (a).rend()
#define sz(a) (int)(a.size())
constexpr int INF = 1e9 + 30;
constexpr long long INFll = 1e18 + 30;
constexpr double INFd = 1e60;
constexpr int N = 3e5 + 228;
constexpr int MOD = 998244353;
///constexpr int al = 'z' - 'a' + 1;
constexpr int MAXA = 103;
constexpr int LOG = 18;

void solve() {
    int n;
    cin >> n;
    vpi lr(n);
    for (int i = 0; i < n; ++i) {
        cin >> lr[i].first >> lr[i].second;
        swap(lr[i].first, lr[i].second);
        swap(lr[i].first, lr[i].second);
    }
    int ans = 1;
    vi dp(n + 2);
    dp[n] = 1;
    for (int i = n - 1; i >= 0; --i) {
        dp[i] = 1;
```

```

    int nowl = 0;
    int nowr = 0;
    for (int j = i + 1; j <= n; ++j) {
        nowl += lr[j - 1].first;
        nowr += lr[j - 1].second;
        if (nowl <= 0 && 0 <= nowr) {
            dp[i] = max(dp[i], dp[j] + 1);
        }
    }
    ans = max(ans, dp[i]);
}
cout << ans;
//
}

signed main() {
    ios_base::sync_with_stdio(false);
    cin.tie(0);
    //freopen("c2.txt", "r", stdin);
    //freopen("c2out.txt", "w", stdout);
    /*int ans = 1;
    for (int i = 2; i < MOD; ++i) {
        ans = mult(ans, i);
    }
    cout << ans;
    return 0;*/
    int t = 1;
    //cin >> t;
    while (t--) {
        solve();
    }
}

```