

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>

using namespace std;

#define int long long
#define endl '\n'

int32_t main() {
    ios::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    int n;
    cin >> n;
    map<int, int> M;
    while (n--){
        int a, b;
        cin >> a >> b;
        while (a % 10 == 0){
            b++;
            a /= 10;
        }
        while (M.find(b) != M.end()){
            a += M[b];
            M.erase(b);
            while (a % 10 == 0){
                b++;
                a /= 10;
            }
        }
        M[b] = a;
    }
    int ans = 1000000000000;
    for (auto key: M){
        ans = min(ans, key.first);
    }
    cout << ans << endl;
}
```

Task B ()

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

using namespace std;

#define int long long
// #define endl '\n'
void f(vector<int> A){
    for (int i = 0; i < A.size(); ++i) {
        while (A[i] > 1){
            cout << "Flip_and_wait" << endl;
            int sum_z = 0;
            while (true){
                string s;
                cin >> s;
                if(s == "Fail" || s == "Tired" || s == "Burn") return;
                int z = (s.size() - 3) / 2;
                sum_z += z;
                if(sum_z > i){
                    cout << "Flip_and_wait" << endl;
                    while (sum_z > 0){
                        cin >> s;
                        if(s == "Fail" || s == "Tired" || s == "Burn") return;
                        z = (s.size() - 3) / 2;
                        sum_z -= z;
                        if(sum_z > 0)cout << "Wait" << endl;
                    }
                    break;
                } else{
                    cout << "Wait" << endl;
                }
            }
            A[i] -= 2;
        }
    }
}

for (int i = A.size() - 1; i >= 0; --i) {
    if(A[i] == 1){
        cout << "Flip_and_wait" << endl;
        int sum_z = 0;
        while (true){
            string s;
            cin >> s;
            if(s == "Fail" || s == "Tired" || s == "Burn") return;
            int z = (s.size() - 3) / 2;
            sum_z += z;
            if(sum_z > i){
                A[i] -= 1;
                break;
            } else{
                cout << "Wait" << endl;
            }
        }
    }
}

cout << "Stop" << endl;
}

int32_t main() {
    // ios::sync_with_stdio(0);
    // cin.tie(0);
    // cout.tie(0);
    int n;
    cin >> n;
    vector<int> A(n);
    for (int i = 0; i < n; ++i) {
        cin >> A[i];
    }
    f(A);
}
```

Task C ()

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

using namespace std;

#define int long long
#define endl '\n'
vector<bool> ZZZ;
vector<bool> F(int x, int m){
    vector<bool> ans;
    for (int i = 0; i < m; ++i) {
        ans.push_back(x % 2 == 1);
        x /= 2;
    }
    return ans;
}

string f(int x){
    string ans = "";
    int z1 = 0, z2 = 0;
    for (int i = 0; i < x; ++i) {
        if(ZZZ[i]) z1++;
        else z2++;
    }
    if(z1 >= z2) {
        for (int i = 0; i < x; ++i) {
            if (ZZZ[i]) ans += '?';
            else ans += '1';
        }
    } else {
        for (int i = 0; i < x; ++i) {
            if (!ZZZ[i]) ans += '?';
            else ans += '1';
        }
    }
    return ans;
}

int32_t main() {
    ios::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    for (int i = 0; i < 200000; ++i) {
        ZZZ.push_back(rand() % 2);
    }
    map<string, string> Ma;
    for (int m = 1; m <= 10; ++m) {
        int yiu = 0;
        set<string> Us;
        for (int i = 0; i < pow(2, m); ++i) {
            vector<bool> Bo = F(i, m);
            string S = "";
            for (int j = 0; j < m; ++j) {
                if(Bo[j]) S += '1';
                else S += '0';
            }
            for (int j = 0; j < pow(2, m); ++j) {
                vector<bool> Bo2 = F(j, m);
                int co = 0;
                for (int k = 0; k < m; ++k) {
                    if(Bo2[k]) co++;
                }
                if(co >= (m) / 2){
                    string SS = S;
                    for (int k = 0; k < m; ++k) {
                        if(Bo2[k]) SS[k] = '?';
                    }
                    if(Us.find(SS) == Us.end()){
                        Ma[S] = SS;
                        Ma[SS] = S;
                        yiu++;
                        Us.insert(SS);
                        break;
                    }
                }
            }
        }
    }
}
```

```

    }
    }
    //cout << yiu << endl;
}
int n;
cin >> n;
while (n--){
    string s;
    cin >> s;
    if(s.size() % 2 == 1){
        if(s.size() > 10){
            bool tr = false;
            int ze = 0;
            int on = 0;
            for (int i = 0; i < s.size(); ++i) {
                if (s[i] == '?') tr = true;
                else if (s[i] == '1') on++;
                else ze++;
            }
            if (tr) {
                if (ze == 0 && s != f(s.size())) {
                    for (int i = 0; i < s.size(); ++i) {
                        if (s[i] == '?') cout << 0;
                        else cout << s[i];
                    }
                    cout << endl;
                } else {
                    for (int i = 0; i < s.size(); ++i) {
                        if (s[i] == '?') cout << 1;
                        else cout << s[i];
                    }
                    cout << endl;
                }
            } else {
                if (ze <= on) {
                    if (ze == 0) cout << f(s.size()) << endl;
                    else {
                        for (int i = 0; i < s.size(); ++i) {
                            if (s[i] == '1') cout << '?';
                            else cout << 0;
                        }
                        cout << endl;
                    }
                } else {
                    for (int i = 0; i < s.size(); ++i) {
                        if (s[i] == '0') cout << '?';
                        else cout << 1;
                    }
                    cout << endl;
                }
            }
        } else {
            cout << Ma[s] << endl;
        }
    }
} else {
    bool tr = false;
    for (int i = 0; i < s.size(); ++i) {
        if(s[i] == '?') tr = true;
    }
    if(tr){
        //cout << "????\n";

        for (int i = 0; i < s.size(); i += 2) {
            if(s[i] == '?'){
                cout << s[i + 1] << s[i + 1];
            } else {
                if(s[i] == '0') cout << "01";
                else cout << "10";
            }
        }
        cout << endl;
    } else {
        //cout << "1011\n";
    }
}

```

```

    for (int i = 0; i < s.size(); i += 2) {
        if(s[i] == s[i + 1]){
            cout << '?' << s[i + 1];
        } else{
            cout << s[i] << '?';
        }
    }
    cout << endl;
}
}
}

```

Task D ()

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

using namespace std;

#define int long long
#define endl '\n'
const int mod = 998244353;
int32_t main() {
    ios::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    int n;
    cin >> n;
    // dp0 = 478389955, dp1 = 763803475 i = 300000002
    // dp0 = 533107751, dp1 = 732659078 i = 600000002
    int N = n / mod;
    n %= mod;
    if(N % 2 == 0){
        if (n == mod - 1) {
            cout << N + 1 << '␣' << mod - 1 << endl;
        }
        else if (n == 0) cout << N << '␣' << 1 << endl;
        else if (n <= 150000002) {
            int dp0 = 1, dp1 = 2;
            for (int i = 2; i <= n; ++i) {
                int dp = (((dp0 * i) % mod) * i + dp1) % mod;
                swap(dp0, dp1);
                dp1 = dp;
            }
            cout << N << '␣' << dp1 << endl;
        } else if (n <= 300000002) {
            int dp0 = 725081129, dp1 = 604816996;
            for (int i = 150000002; i <= n; ++i) {
                int dp = (((dp0 * i) % mod) * i + dp1) % mod;
                swap(dp0, dp1);
                dp1 = dp;
            }
            cout << N << '␣' << dp1 << endl;
        }
        else if (n <= 450000002) {
            int dp0 = 478389955, dp1 = 763803475;
            for (int i = 300000002; i <= n; ++i) {
                int dp = (((dp0 * i) % mod) * i + dp1) % mod;
                swap(dp0, dp1);
                dp1 = dp;
            }
            cout << N << '␣' << dp1 << endl;
        }
        else if (n <= 600000002) {
            int dp0 = 31562832, dp1 = 254576002;
            for (int i = 450000002; i <= n; ++i) {
                int dp = (((dp0 * i) % mod) * i + dp1) % mod;
                swap(dp0, dp1);
                dp1 = dp;
            }
            cout << N << '␣' << dp1 << endl;
        }
        else if (n <= 700000002) {
            int dp0 = 533107751, dp1 = 732659078;
            for (int i = 600000002; i <= n; ++i) {
                int dp = (((dp0 * i) % mod) * i + dp1) % mod;
                swap(dp0, dp1);
                dp1 = dp;
            }
            cout << N << '␣' << dp1 << endl;
        }
        else if (n <= 800000002) {
            int dp0 = 496409701, dp1 = 775818818;
            for (int i = 700000002; i <= n; ++i) {
                int dp = (((dp0 * i) % mod) * i + dp1) % mod;
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        swap(dp0, dp1);
        dp1 = dp;
    }
    cout << N << '␣' << dp1 << endl;
} else if (n <= 9000000002) {
    int dp0 = 637333574, dp1 = 23359055;
    for (int i = 800000002; i <= n; ++i) {
        int dp = (((dp0 * i) % mod) * i + dp1) % mod;
        swap(dp0, dp1);
        dp1 = dp;
    }
    cout << N << '␣' << dp1 << endl;
} else {
    int dp0 = 465585441, dp1 = 982154420;
    for (int i = 900000002; i <= n; ++i) {
        int dp = (((dp0 * i) % mod) * i + dp1) % mod;
        swap(dp0, dp1);
        dp1 = dp;
    }
    cout << N << '␣' << dp1 << endl;
}
} else {
    if (n == mod - 1) {
        cout << N + 1 << '␣' << 1 << endl;
    }
    else if (n == 0) cout << N << '␣' << mod - 1 << endl;
    else if (n <= 1500000002) {
        int dp0 = 1, dp1 = 2;
        for (int i = 2; i <= n; ++i) {
            int dp = (((dp0 * i) % mod) * i + dp1) % mod;
            swap(dp0, dp1);
            dp1 = dp;
        }
        cout << N << '␣' << mod - dp1 << endl;
    } else if (n <= 3000000002) {
        int dp0 = 725081129, dp1 = 604816996;
        for (int i = 1500000002; i <= n; ++i) {
            int dp = (((dp0 * i) % mod) * i + dp1) % mod;
            swap(dp0, dp1);
            dp1 = dp;
        }
        cout << N << '␣' << mod - dp1 << endl;
    }
    else if (n <= 4500000002) {
        int dp0 = 478389955, dp1 = 763803475;
        for (int i = 3000000002; i <= n; ++i) {
            int dp = (((dp0 * i) % mod) * i + dp1) % mod;
            swap(dp0, dp1);
            dp1 = dp;
        }
        cout << N << '␣' << mod - dp1 << endl;
    }
    else if (n <= 6000000002) {
        int dp0 = 31562832, dp1 = 254576002;
        for (int i = 4500000002; i <= n; ++i) {
            int dp = (((dp0 * i) % mod) * i + dp1) % mod;
            swap(dp0, dp1);
            dp1 = dp;
        }
        cout << N << '␣' << mod - dp1 << endl;
    }
    else if (n <= 7000000002) {
        int dp0 = 533107751, dp1 = 732659078;
        for (int i = 6000000002; i <= n; ++i) {
            int dp = (((dp0 * i) % mod) * i + dp1) % mod;
            swap(dp0, dp1);
            dp1 = dp;
        }
        cout << N << '␣' << mod - dp1 << endl;
    } else if (n <= 8000000002) {
        int dp0 = 496409701, dp1 = 775818818;
        for (int i = 7000000002; i <= n; ++i) {
            int dp = (((dp0 * i) % mod) * i + dp1) % mod;
            swap(dp0, dp1);

```

```

        dp1 = dp;
    }
    cout << N << ' ' << mod - dp1 << endl;
} else if(n <= 9000000002){
    int dp0 = 637333574, dp1 = 23359055;
    for (int i = 800000002; i <= n; ++i) {
        int dp = (((dp0 * i) % mod) * i + dp1) % mod;
        swap(dp0, dp1);
        dp1 = dp;
    }
    cout << N << ' ' << mod - dp1 << endl;
} else{
    int dp0 = 465585441, dp1 = 982154420;
    for (int i = 9000000002; i <= n; ++i) {
        int dp = (((dp0 * i) % mod) * i + dp1) % mod;
        swap(dp0, dp1);
        dp1 = dp;
    }
    cout << N << ' ' << mod - dp1 << endl;
}
}
}
}

```


Task E ()

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

using namespace std;

#define int long long
#define endl '\n'

int32_t main() {
    ios::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    int n;
    cin >> n;
    vector<int> A(n);
    for (int i = 0; i < n; ++i) {
        cin >> A[i];
    }
    int m;
    cin >> m;
    while (m--){
        int a, b, c;
        cin >> a >> b >> c;
        int ans = 0;
        for (int i = a; i < b; ++i) {
            ans += (c + A[i] - 1) / A[i];
        }
        cout << ans << endl;
    }
}
```

Task F ()

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

using namespace std;

#define int long long
#define endl '\n'

int32_t main() {
    ios::sync_with_stdio(0);
    cin.tie(0);
    cout.tie(0);
    int n;
    cin >> n;
    vector<pair<int, int>> A(n);
    for (int i = 0; i < n; ++i) {
        cin >> A[i].first >> A[i].second;
    }
    vector<int> dp(n + 1, 1);
    for (int i = n - 1; i >= 0; --i) {
        int l = 0, r = 0;
        for (int j = i; j < n; ++j) {
            l += A[j].first;
            r += A[j].second;
            if (r >= 0 && l <= 0) dp[i] = max(dp[i], dp[j + 1] + 1);
        }
    }
    int mx = 0;
    for (int d: dp) mx = max(mx, d);
    cout << mx << endl;
}
```