Notebook - Maratona de Programação

#include <confia>

Contents

1 Matematica

1.1 Miller-rabin

```cpp
// Miller-Rabin
//
// Testa se n eh primo, n <= 3 * 10^18
//
// O(log(n)), considerando multiplicacao
// e exponenciacao constantes

ll mul(ll a, ll b, ll m) {
    ll ret = a*b - ll((long double)1/m*a*b+0.5)*m;
    return ret < 0 ? ret+m : ret;
}

ll pow(ll x, ll y, ll m) {
    if (!y) return 1;
    ll ans = pow(mul(x, x, m), y/2, m);
    return y%2 ? mul(x, ans, m) : ans;
}

bool prime(ll n) {
    if (n < 2) return 0;
    if (n <= 3) return 1;
    if (n % 2 == 0) return 0;
    ll r = __builtin_ctzll(n - 1), d = n >> r;

    // com esses primos, o teste funciona garantido para n <= 2^64
    // funciona para n <= 3*10^24 com os primos ate 41
    for (int a : {2, 325, 9375, 28178, 450775, 9780504, 795265022}) {
        ll x = pow(a, d, n);
        if (x == 1 or x == n - 1 or a % n == 0) continue;

        for (int j = 0; j < r - 1; j++) {
            x = mul(x, x, n);
            if (x == n - 1) break;
        }
        if (x != n - 1) return 0;
    }
    return 1;
}
```

2 Template

2.1 Template

```cpp
#include <bits/stdc++.h>
using namespace std;
//alias comp='g++ -std=c++17 -g -O2 -Wall -Wconversion -Wshadow -fsanitize
    =address,undefined -fno-sanitize-recover -ggdb -o out'

#define sws std::ios::sync_with_stdio(false); cin.tie(NULL); cout.tie(NULL
    ); //Melhora o desempenho
#define int long long //Melhor linha de codigo ja escrita
#define endl "\n" //Evita flush
#define loop(i,a,n) for(int i=a; i < n; i++)
#define input(x) for (auto &it : x) cin >> it
#define pb push_back
#define all(x) x.begin(), x.end()
#define ff first
#define ss second
#define mp make_pair
#define TETO(a, b) ((a) + (b-1))/(b)
#define dbg(msg, x) cout << msg << " = " << x << endl
#define print(x,y) loop(i,0,y){cout << x[i] << " ";} cout << "\n";

typedef long long ll;
typedef long double ld;
typedef vector<int> vi;
typedef pair<int,int> pii;
typedef priority_queue<int, vector<int>, greater<int>> pqi;

const ll MOD = 1e9+7;
const int MAX = 1e4+5;
const ll LLINF = 0x3f3f3f3f3f3f3f3f;
const double PI = acos(-1);


int32_t main(){ sws;


    return 0;
}
```