

ICPC Notebook

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template

hash.sh

```
# 使い方: sh hash.sh -> コピペ -> Ctrl + D
# コメント・空白・改行を削除して md5 でハッシュする
g++ -dD -E -fpreprocessed - | tr -d '[:space:]' | md5sum | cut
-c-6
```

settings.sh

```
# CLion の設定
Settings -> Build -> CMake -> Reload CMake Project
add_compile_options(-D_GLIBCXX_DEBUG)
# Caps Lock を Ctrl に変更
setxkbmap -option ctrl:nocaps
```

template.hpp

md5: 365d7f

```
#include <bits/stdc++.h>
using namespace std;
using ll = long long;
const ll INF = LLONG_MAX / 4;
#define rep(i, a, b) for(ll i = a; i < (b); i++)
#define all(a) begin(a), end(a)
ll sz(const auto& a) { return size(a); }
bool chmin(auto& a, auto b) {
    if(a <= b) return 0;
    a = b;
    return 1;
}
bool chmax(auto& a, auto b) {
    if(a >= b) return 0;
    a = b;
    return 1;
}

int main() {
    cin.tie(0)->sync_with_stdio(0);
    // your code here...
}
```

data-structure

BIT.hpp

md5: d8ec49

```
struct BIT {
    vector<ll> a;
    BIT(ll n) : a(n + 1) {}
    void add(ll p, ll x) { // A[p] += x
        p++;
        while(p < sz(a)) {
            a[p] += x;
            p += p & -p;
        }
    }
}
```

```
ll sum(ll r) {
    ll s = 0;
    while(r > 0) {
        s += a[r];
        r -= r & -r;
    }
    return s;
}
ll sum(ll l, ll r) { // sum of A[l, r)
    return sum(r) - sum(l);
}
};
```

math

modint

BarrettReduction.hpp

md5: b61c28

```
// using u64 = uint64_t;
struct Barrett { // mod < 2^32
    u64 m, im;
    Barrett(u64 mod) : m(mod), im(-1ULL / m + 1) {}
    // input: a * b < 2^64, output: a * b % mod
    u64 mul(u64 a, u64 b) const {
        a *= b;
        u64 x = ((_uint128_t)a * im) >> 64;
        a -= x * m;
        if((ll)a < 0) a += m;
        return a;
    }
};
```

modint.hpp

md5: ade70b

```
const ll mod = 998244353;
struct mm {
    ll x;
    mm(ll x_ = 0) : x(x_ % mod) {
        if(x < 0) x += mod;
    }
    friend mm operator+(mm a, mm b) { return a.x + b.x; }
    friend mm operator-(mm a, mm b) { return a.x - b.x; }
    friend mm operator*(mm a, mm b) { return a.x * b.x; }
    friend mm operator/(mm a, mm b) { return a * b.inv(); }
    // 4 行コピペ Alt + Shift + クリックで複数カーソル
    friend mm& operator+=(mm& a, mm b) { return a = a.x + b.x; }
    friend mm& operator-=(mm& a, mm b) { return a = a.x - b.x; }
    friend mm& operator*=(mm& a, mm b) { return a = a.x * b.x; }
    friend mm& operator/=(mm& a, mm b) { return a = a * b.inv(); }
}

mm inv() const { return pow(mod - 2); }
mm pow(ll b) const {
    mm a = *this, c = 1;
    while(b) {
        if(b & 1) c *= a;
        a *= a;
        b >>= 1;
    }
    return c;
}
};
```

FPS

FFT.hpp

md5: cec0a2

```
// {998244353, 3}, {2013265921, 31}, {2113929217, 5}
mm g = 3; // 原始根
void fft(vector<mm>& a) {
    ll n = sz(a), lg = __lg(n);
    static auto z = [] {
        vector<mm> z(30);
        mm s = 1;
        rep(i, 2, 32) {
            z[i - 2] = s * g.pow((mod - 1) >> i);
            s *= g.inv().pow((mod - 1) >> i);
        }
        return z;
    }();
}
```

```
rep(l, 0, lg) {
    ll w = 1 << (lg - l - 1);
    mm s = 1;
    rep(k, 0, 1 << l) {
        ll o = k << (lg - l);
        rep(i, o, o + w) {
            mm x = a[i], y = a[i + w] * s;
            a[i] = x + y;
            a[i + w] = x - y;
        }
        s *= z[__builtin_ctzll(~k)];
    }
}

// コピー
void ifft(vector<mm>& a) {
    ll n = sz(a), lg = __lg(n);
    static auto z = [] {
        vector<mm> z(30);
        mm s = 1;
        rep(i, 2, 32) { // g を逆数に
            z[i - 2] = s * g.inv().pow((mod - 1) >> i);
            s *= g.pow((mod - 1) >> i);
        }
        return z;
    }();
    for(ll l = lg; l--;) { // 逆順に
        ll w = 1 << (lg - l - 1);
        mm s = 1;
        rep(k, 0, 1 << l) {
            ll o = k << (lg - l);
            rep(i, o, o + w) {
                mm x = a[i], y = a[i + w]; // *s を移動
                a[i] = x + y;
                a[i + w] = (x - y) * s;
            }
            s *= z[__builtin_ctzll(~k)];
        }
    }
}

vector<mm> conv(vector<mm> a, vector<mm> b) {
    if(a.empty() || b.empty()) return {};
    size_t n_ = sz(a) + sz(b) - 1, n = bit_ceil(n_);
    // if(min(sz(a), sz(b)) <= 60) 愚直に掛け算
```

```
    a.resize(n);
    b.resize(n);
    fft(a);
    fft(b);
    mm x = mm(n).inv();
    rep(i, 0, n) a[i] *= b[i] * x;
    ifft(a);
    a.resize(n_);
    return a;
}
```

graph
graph/tree
flow

燃やす埋める.md

変形前の制約	変形後の制約
x が 0 のとき z 失う	(x, T, z)
x が 0 のとき z 得る	無条件で z 得る; (S, x, z)
x が 1 のとき z 失う	(S, x, z)
x が 1 のとき z 得る	無条件で z 得る; (x, T, z)
x, y, \dots がすべて 0 のとき z 得る	無条件で z 得る; $(S, w, z), (w, x, \infty), (w, y, \infty)$
x, y, \dots がすべて 1 のとき z 得る	無条件で z 得る; $(w, T, z), (x, w, \infty), (y, w, \infty)$

string
algorithm
geometry