



# 1<sup>st</sup> North African Olympiad in Informatics 2025

## The Dripping Tap

**Time limit: 1 second**

**Memory limit: 256 MB**

Imfungwa/Abagororwa bari muni y' 1000 badashobora gufata mu mutwe bafungiwe muri prison. Umurinzi w' iyo prison yabahaye ikibazo, kandi bazafungurwa ari uko bagikoze:

umurinzi yateguye icyumba kirimo ikibaho. Ku ntagiro, ikibaho cyanditseho 0. Icyo bita cycle gishatse kuvuga ibi bikurikira: Abagororwa binjira muri kiriya cyumba umwe kur' umwe ku murongo udahinduka. Icyo bemerewe bamaze kwinjira mu cyumba ni ugusoma umubare wanditse ku kibaho, baragiza bakawusimbuza undi, cyangwa bakavuga igisubizo cy' ikibazo. Kubera ko badashobora gufata mu mutwe, ntago bashobora kwibuka uko ibintu byabanje byagenze, niyo mpamvu buriko basohotse mu cyumba, bandika umubare  $10^{18} \leq x \leq 10^{18}$  ku myenda yabo kugira ngo baze kuwibuka nibasubira mu cyumba (ntago bajya basiba imibare yanditswe mbere). Iyo imfungwa imwe irenze ku mategeko abujijwe haruguru, umukino uhita urangira kandi ntabandi bagororwa baba bakemerewe kwinjira mu cyumba.

Umukino ushobora gukinwa inshuro nyinshi. Buriko umwe uragiye, undi uhita utangira, kandi iyo umukino wagoye gutangira abagororwa bongera gusubira ku murongo wo kwinjira mu cyumba nkuko bari bameze mbere.

Ku bwizo mpamvu, umubare waragiriye muri cycle yambere, niwo imfungwa yambere itangiraho muri cycle ikurikira (igihe hari iyindi cycle)

Muri uyu mukino, abagororwa bafite intego zo kumenya umubare w' abagororwa bafunzwe, kandi uyu mubare barawubahishe kuva ku ntagiro z' uyu mukino. Umubare wonyine bababwira, ni umubare w' imfungwa zinjije mu cyumba muri cycle runaka.

Abagororwa nyuma yo kumva amategeko yashyizweho na gereza bahisemo guhamagara avoka wabo. Bose bafite umunyamategeko umwe, ariwe weho. Wemerewe kuganira na buri mfungwa ukababwira bese gukurikiza strategy imwe mugihe bakina uyu mukino. Kandi nabo biyemeje kukumvira.

Washobora gutegura strategy izatuma imfungwa zose zifungurwa kandi bigakorwa mu buryo burusha ubundi kuba efficient?

### Scoring

Hari imibare yatanze idufasha kubikora mu buryo buri efficient: Maximum absolute value y' umubare wanditswe ku kibaho n' imfungwa runaka:  $M$ , n' umubare wa cycles zabaye mbere yuko hagira imfungwa imwe ivuga igisubizo:  $C$ .

- Iyo strategy yawe hari test idashobora gupasinga, ubona amanota 0.
- Bitabaye ibyo ubona angana nka  $80 \times 1.02^{-\sqrt{\max(M^2C-40,0)}} + 20$  kuri iyo test case.
- Inota ryanyuma ringana n' amanota make wabonye muri test cases zose.

## Implementation

Ugomba gukora iyi function : `tuple<char, long long, long long> prisoner(long long W, vector<long long> notebook)` ifata parameter W ingana n' umubare uba wanditse ku kibaho icyo gihe, na notebook, urutonde rw' imibare yanditse ku myambaro y' imfungwa rukurikije ukuntu bagiye bayandika.

Function igomba kureturninga 'w', X, Y kugira ngo yandike X ku kibaho no kugira ngo yandike Y ku myenda, cyangwa 'a', X, 0 kugira ngo isubize X nk' igisubizo cy' ikibazo.

## Code Template

```
#include <bits/stdc++.h>
typedef long long ll;
using namespace std;

tuple<char, ll, ll> prisoner(ll W, vector<ll> notebook)
{
    return {'a', 1, 0};
}
```

## Constraints

- Umubare w' imfungwa  $< 1000$
- $-10^{18} \leq \text{umubare uwari wo wose wanditswe} \leq 10^{18}$