

Problem D: LCA minimum request

Advanced Algorithms for Programming Contests

Restrictions

Time: 2 seconds

Memory: 256 Mb

Problem description

Given a rooted tree with N vertices ($1 \leq N \leq 10^5$), numerated from 0 to $N - 1$ with 0 being the root. You are to respond to M requests of LCA for a pair of vertices ($1 \leq M \leq 10^7$).

The requests are generated as follows. Given a_1, a_2 and numbers x, y and z . Numbers a_3, \dots, a_{2m} generated as $a_i = (xa_{i-2} + ya_{i-1} + z) \bmod n$. The first request is $\text{lca}(a_1, a_2)$. If the response of the $(i - 1)$ -th request is v , then the i -th request is $\text{lca}((a_{2i-1} + v) \bmod n, a_{2i})$.

Input

The first line contains N and M . The second line contains $n - 1$ integers, the i -th of which being the ancestor of vertex i . The third line contains the parameters a_1 and a_2 , both are in the range $0, \dots, n - 1$. The fourth line contains parameters x, y and z ($0 \leq x, y, z \leq 10^9$).

Output

Output the sum over the correct responses to all requests.

Sample input and output

Input	Output
3 2 0 1 2 1 1 1 0	2