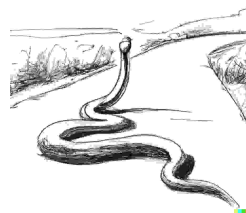




Task Slučajna Cesta

Vito lives in a city with n parks labeled from 1 to n . The parks are connected with $n - 1$ roads such that there is a path between any two pairs of parks. Every park has some beauty value, beauty value of i -th park is v_i .

Last night Vito decided to wander around the city in such a way that after he visits a park he chooses a random road with equal probability and visits a park to which that road leads. But before he started his journey he looked through the window of his skyscraper and saw that on every road there is either a blue or a red snake. Blue snakes attack all people traveling from the park with a lower label to a park with a higher one, a red snakes attack everyone traveling from a park with higher label to lower. As Vito doesn't want to get attacked by a snake he decided to change his plans by considering only roads on which he will not get attacked by a snake when choosing a random road. Since he likes long walks he will not stop on his journey until there is at least one road he can safely pass.



And while Vito walks down the stairs of his skyscraper he completely forgot on which road is red or blue snake so he wonders: *If on every road there is an equal probability of a blue or a red snake, what is the expected beauty of my journey which starts in the i -th park?*

Beauty of path is the sum of beauties of parks visited on that journey. Expected beauty of journey is defined as the sum of product of beauty of a path and probability Vito takes that path, for every possible path.

Input

In the first line there is an integer n ($2 \leq n \leq 10^6$), which denotes the number of parks.

In the second line there are $n - 1$ integers p_i ($1 \leq p_i < i$), which denote a road between the $(i + 1)$ -th park and p_i -th park.

In the third line there are n integers v_i ($0 \leq v_i \leq 10^6$), where v_i denotes the beauty of i -th park.

Output

If expected beauty of Vito's journey which starts at i -th park is $\frac{a}{b}$ for integers a and b , then in i -th line of output print $ab^{-1} \pmod{10^9 + 7}$ where b^{-1} is modular inverse of $b \pmod{10^9 + 7}$.

Scoring

Subtask	Points	Constraints
1	10	$n \leq 10$
2	30	$n \leq 1000$
3	30	In sequence p_i no value is present more than 2 times.
4	40	No additional constraints.

If your program, on some test, outputs the first line correct, but outputs a wrong answer in the following lines, **it will receive 50% of points for that test.**

The number of points in a subtask corresponds to the least number of points achieved by some test in that subtask.



Probni primjeri

input

2
1
2 1

output

500000006
2

input

3
1 1
8 8 8

output

14
14
14

input

11
1 1 1 2 3 4 1 2 6 2
1 1000 5 3 18 200 8 9 0 2 2

output

968750272
610352580
450521029
536458466
199219275
662760680
190972315
90277951
824219264
941840425
532552597

Clarification of the first example:

The expected beauty of a journey starting at the first park is $2.5 \pmod{10^9+7} = \frac{5}{2} \pmod{10^9+7} = 5 \cdot 2^{-1} \pmod{10^9+7} = 5 \cdot 500000004 \pmod{10^9+7} = 500000006 \pmod{10^9+7}$ and starting from the second park it is 2.

Clarification of the second example:

Probability that both snakes are red is $\frac{1}{4}$ and in that case if Vito starts at the first park he randomly chooses which road he will take.