Problem A. Lowest Common Ancestor

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	512 megabytes

Bobo has a rooted tree with n nodes which are conveniently labeled with $1, 2, \ldots, n$. Node 1 is the root, and the i-th node has weight w_i.

He would like to find out $f(2), f(3), \ldots, f(n)$ where

$$f(i) = \sum_{j=1}^{i-1} w_{\mathrm{LCA}(i,j)}.$$

Input

The input contains zero or more test cases, and is terminated by end-of-file. For each test case:

The first line contains an integer n ($2 \le n \le 2 \cdot 10^5$).

The second line contains n integers $w_1, w_2, \ldots, w_n$ ($1 \le w_i \le 10^4$).

The third line contains $(n-1)$ integers $p_2, p_3, \ldots, p_n$, where p_i denotes an edge from the p_i-th node to the i-th node ($1 \le p_i \le n$). The edges form a tree.

It is guaranteed that the sum of n does not exceed $2 \cdot 10^5$.

Output

For each test case, output $(n-1)$ integers: $f(2), f(3), \ldots, f(n)$.

Example

standard input	standard output
3 1 2 3 1 1 5 1 2 3 4 5 1 2 2 1	1 2 1 3 5 4