Problem F. Forward Teleporters

There are n cities numbered by integers from 1 to n. Unfortunately there isn't any road between cities, so the only way to move between cities is using a teleporter. Each city i (except city n) has a teleporter that transports the passenger to city p_i, where p_i is an integer satisfying $i < p_i \leq n$. Unfortunately we cannot use the teleporter backwards, so it is impossible to use the teleporter in city i, to move from city p_i to city i.

With these teleporters, it is always possible to arrive at city n from any other cities, and there is only one possible way. For each city, I would like to know the number of teleporters I need to use to go from city i to city n. Write a program that does the job for you.

Input

Your input consists of an arbitrary number of records, but no more than 5.

Each input consists of two lines. The first line contains an integer n $(2 \leq n \leq 100{,}000)$. The second line contains $n-1$ integers $p_1, p_2, \ldots, p_{n-1}$ $(i < p_i \leq n)$, each separated by a space.

The end of input is indicated by a line containing only the value -1.

Output

For each input record, print a line that contains $n-1$ integers, each separated by a space. The i-th integer among them should be the number of teleporters I need to use in order to go from city i to city n.

Example

Standard input	Standard output
5 5 5 5 5 4 2 3 4 -1	1 1 1 1 3 2 1

Explanation of the example

For the first example: All the teleporters are heading towards city 5, so I need to use only one teleporter regardless of the city that I depart.

For the second example: All the teleporters on city i are heading towards city $i+1$, so the teleporters look like 1->2->3->4.

Time Limit

1 second.