A permutation is a bijection from a set $X$ onto itself. If $X$ is finite, the elements of $X$ are often numbered $1, 2, 3, \ldots n$. A permutation of a set with five elements is often denoted by

$$\begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 3 & 2 & 5 & 1 & 4 \end{pmatrix}$$

meaning the element 1 is mapped to the element 3 of the set, the element 2 is mapped to the element 2 and so on and so forth. Another way of denoting permutations is to use cycle notation. Cycle notation is not necessarily unique. The following cycle

$$(247)$$

means that the element 2 is mapped to the element 4, the element 4 is mapped to the element 7 and the element 7 is mapped to the element 2. The cycle above could also be written

$$(724)$$

The product of several cycles is evaluated from **right** to **left**. The above permutation can be written as

$$(53)(51)(54)$$

$$(1354)(1)$$

$$(1)(1354)$$

A permutation can be written uniquely as the product of cylces

$$\begin{pmatrix} 1 & 2 & \ldots & n \\ b_1 & b_2 & \ldots & b_n \end{pmatrix} = (1)^{a_1}(12)^{a_2}(123)^{a_3}(1234)^{a_4}\ldots(1\ldots n)^{a_n}$$

if $0 \leq a_i \leq i-1$ holds for each exponent $a_i$. The example permutation can be uniquely written as

$$\begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 3 & 2 & 5 & 1 & 4 \end{pmatrix} = (1)^0(12)^1(123)^2(1234)^2(12345)^2$$

Your task is to compute the $a_i$'s of a given permutation.

## Input

The input consists of several test cases. Each test case consists of three lines. The first line contains the number $n$, $1 \leq n \leq 200000$. The second line contains the elements from 1 to $n$. The third line contains a mapping for every element from the second line.

## Output

For each test case there should be one line of output. Print all the $a_i$'s on a single line separated by one space in the order $a_1 \ldots a_n$

## Sample Input

```
5
1 2 3 4 5
3 2 5 1 4
4
1 2 3 4
3 4 1 2
```

## Sample Output

```
0 1 2 2 2
0 0 0 2
```