Problem L
Logical Resonance
Time limit: 2 seconds

This is a multi-pass problem.

In the digital archives of Kivotos, Plana has discovered a collection of mysterious records known as Bitemporal Logs. Each log consists of n entries labeled 1 to n forming a rooted tree. However, the structural constraints differ depending on whether the temporal flow is retrospective (**Logic A**) or prospective (**Logic B**):

- **Logic A:** The tree is rooted at entry 1; every other entry i has a parent p_i such that $p_i < i$.
- **Logic B:** The tree is rooted at entry n; every other entry i has a parent q_i such that $q_i > i$.

To analyze the structural properties, Plana defines two types of entries:

- **Terminal:** An entry that serves as a parent to *no* other entries.
- **Hub:** An entry that serves as a parent to *at least one* other entry.

Plana observed a perfect symmetry called *Logical Resonance*. This property holds between a Logic A log and a Logic B log if and only if:

$$\textit{For every } i\textit{, entry } i \textit{ is a Terminal in Logic A} \iff \textit{entry } i \textit{ is a Hub in Logic B.}$$

Plana has mathematically proven that the number of valid Logic A logs and Logic B logs under this constraint is identical. Now, she tasks you with designing a Universal Translation Protocol — a bijection — to transform one log format into the other.

Evaluation of correctness

Your solution is executed twice on each test. In the first run, your solution needs to convert each Logic A log into a Logic B log that satisfies the Logical Resonance condition. In the second run, given a Logic B log produced by your first run, your solution needs to exactly recover the original Logic A log.

The input of the second run consists of the same Logic B logs as your output from the first run, possibly in a different order. For each input Logic B log in the second run, you need to output its corresponding Logic A log. Your solution is considered correct if, for every such Logic B log, your output is exactly the same Logic A log that generated it in the first run.

A testing tool is provided to help you develop and test your solution.

Input

The first line of the input contains two integers r ($r \in \{1, 2\}$) and T ($1 \le T \le 10^5$), representing the run number and the number of test cases.

For each test case, the first line contains an integer n ($2 \le n \le 10^3$).

If $r = 1$, the second line contains n integers $p_1, p_2, \ldots, p_n$ representing the Logic A log. It is guaranteed that $p_1 = 0$, and for $2 \le i \le n$, $1 \le p_i < i$ is the entry that entry i is attached to. Here we use 0 to denote that an entry has no parent (i.e., it is the root).

Otherwise, if $r = 2$, the second line contains n integers $q_1, q_2, \ldots, q_n$ representing the Logic B log. It is guaranteed that $q_n = 0$, and for $1 \le i \le n - 1$, $i < q_i \le n$ is the entry that entry i is attached to.

It is guaranteed that the sum of n^2 over all test cases does not exceed 10^7.

Output

If $r = 1$, for each test case, output n integers separated by a space, $q_1, q_2, \ldots, q_n$, representing the converted Logic B log. It must hold that $q_n = 0$, and for $1 \le i \le n-1$, $i < q_i \le n$. The *Logical Resonance* property must hold: entry i is a Terminal in Logic A if and only if entry i is a Hub in Logic B.

Otherwise, if $r = 2$, for each test case, output n integers separated by a space, $p_1, p_2, \ldots, p_n$, representing the restored Logic A log.

Sample Input 1 **Pass 1** **Sample Output 1**

1 3 4 0 1 1 2 4 0 1 2 1 4 0 1 1 1	3 3 4 0 3 4 4 0 2 3 4 0

Sample Input 1 **Pass 2** **Sample Output 1**

2 3 4 2 3 4 0 4 3 3 4 0 4 3 4 4 0	0 1 1 1 0 1 1 2 0 1 2 1

Explanation of Sample 1: A possible valid bijection is shown below.