Problem C. Topology

Time limit: 2 seconds
Memory limit: 1024 megabytes

You are given a tree consisting of n vertices, rooted at vertex 1. It is guaranteed that every vertex has a smaller index than all of its children. A topological order of this tree is a permutation $p_1, p_2, \ldots, p_n$ of n that satisfies the following constraint: For all $1 \le i < j \le n$, vertex p_j is not the parent of vertex p_i.

For each $1 \le i \le n$, calculate the number of topological orders of the given tree satisfying $p_i = i$, modulo 998 244 353.

Input

There is only one test case in each test file.

The first line contains an integer n ($2 \le n \le 5\,000$), denoting the number of vertices of the tree.

The second line contains $(n-1)$ integers $f_2, f_3, \ldots, f_n$ ($1 \le f_i < i$), where f_i is the parent of vertex i.

Output

Output one line containing n integers $a_1, a_2, \cdots, a_n$ separated by a space, where a_i is the number of topological orders satisfying $p_i = i$, modulo 998 244 353.

Examples

standard input	standard output
4 1 1 2	3 2 1 2
9 1 1 2 2 3 3 4 5	672 420 180 160 152 108 120 170 210

Note

For the first sample test case, all topological orders of the tree are $\{1, 2, 3, 4\}$, $\{1, 3, 2, 4\}$ and $\{1, 2, 4, 3\}$. There are 3 of them satisfying $p_1 = 1$, 2 of them satisfying $p_2 = 2$, 1 of them satisfying $p_3 = 3$, and 2 of them satisfying $p_4 = 4$.