F: Hue Of My Heritage

Time Limit: 2 seconds

The human body is generally unable to produce purple as an eye color. However, in a specific lineage, a unique genetic factor causes *purple eyes* to be passed down through generations. The family tree is represented as a rooted tree where each node represents a unique individual, possibly with some children. In this model, each child is associated with a single primary ancestor: the one parent who may carry the gene.

The inheritance of this trait follows a strict set of rules:

- The root of the tree has purple eyes.
- For any node u that has purple eyes, each of its children independently has a $\frac{1}{2}$ probability of inheriting purple eyes.
- If a node does not have purple eyes, none of its children can have purple eyes.

Each level of the tree represents a *generation*. Calculate the expected number of generations which have at least one node with purple eyes.

Input

The first line of input contains a single integer T ($1 \le T \le 10^4$), representing the number of test cases.

The descriptions of T test cases follow. Each test case starts with a line containing a single integer n ($2 \le n \le 5 \cdot 10^5$), the number of nodes in the tree. Node 1 is the root.

The next line contains $n-1$ integers $p_2, p_3, \ldots, p_n$ ($1 \le p_i < i$), where p_i is the parent of node i.

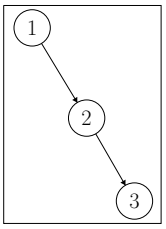
The sum of n over all test cases will not exceed $5 \cdot 10^5$.

Output

For each test case, let E be the expected number of generations which have at least one node with purple eyes. It can be shown that E can be written as $\frac{x}{y}$ with $\gcd(x, y) = 1$ and $y \not\equiv 0 \pmod{998\,244\,353}$. Output the unique integer r in $[0, 998\,244\,353)$ such that $r \cdot y \equiv x \pmod{998\,244\,353}$.

Sample Explanation

To the right is an illustration of the first sample case. There are three possibilities: either only node 1 has purple eyes, nodes 1 and 2 both have purple eyes, or all three nodes have purple eyes. The first case happens with probability $\frac{1}{2}$ and the other two happen with probability $\frac{1}{4}$ each. Therefore, the expected number of generations with at least one node with purple eyes is $1 \cdot \frac{1}{2} + 2 \cdot \frac{1}{4} + 3 \cdot \frac{1}{4} = \frac{9}{4}$. We can see that $249\,561\,090 \cdot 4 \equiv 9 \pmod{998\,244\,353}$, so the answer is $249\,561\,090$.



Sample Input 1	Sample Output 1
3 3 1 2 7 1 1 2 2 3 3 5 1 1 1 1	249561090 639500291 62390274