

Problem H. Treelection

Input file: standard input
Output file: standard output
Time limit: 3 seconds
Memory limit: 256 megabytes

The company X has N employees numbered from 1 through N . For every $2 \leq u \leq N$, the employee numbered P_u ($1 \leq P_u < u$) is the manager of the employee numbered u . Employee 1 is the CEO and has no manager. Employee v is said to be a leader of employee u if v is the manager of u or there is an employee w such that v is the manager of w and w is a leader of u .

The company X wants to setup a work council through elections, in which every employee except the CEO will vote. Unfortunately the elections are rigged, and employees can only vote for one of their leaders.

Find out which employees can end up being the sole winner of the election. An employee is the sole winner if they get **strictly** more votes than any other employee.

Input

The first line contains T , the number of testcases. Then the testcases follow

Each testcase consists of two lines.

The first line which contains N .

The second line contains $N - 1$ space separated integers, P_2, P_3, \dots, P_N , where P_i is the manager of the employee i . It is guaranteed that $1 \leq P_i < i$ for all valid i .

Constraints

- $1 \leq T$
- $2 \leq N \leq 10^6$
- The sum of N over all testcases doesn't exceed 10^6 .
- $1 \leq P_i < i$ for all $2 \leq i \leq N$.

Output

For each testcase, print a single line containing a string of length N , whose i -th character is 1 if the employee i can be the sole winner of the election, and 0 otherwise.

Example

standard input	standard output
2	1100
4	10000
1 2 3	
5	
1 1 2 2	

Note

In the first testcase, employee 2 will be the sole winner if employee 2 votes for employee 1 and employees 3 and 4 vote for employee 2. In this case employee 1 gets 1 vote and employee 2 gets 2 votes.