# Problem A: Family Tree

Advanced Algorithms for Programming Contests

## Restrictions

Time: 2 seconds
Memory: 512 MB

## Problem description

As you've been really getting into genealogy lately, you decided to write a program that can process a huge family tree containing a continuous series of one person's ancestors in such a way that queries regarding the ancestor-descendant-relationship of any two persons in it can be answered in constant time. To test your program's efficiency, you want to scan an enormous family tree and then answer a large number of such queries.

## Input

The input consists of

- one line containing $N$ ($1 \leq N \leq 10^4$) – the number of people in the tree
- $N$ lines containing their names (the $i$-th line giving the name of person $i$), with each name being a string of length not exceeding 30 consisting only of letters and (possibly) spaces
- one line containing $N$ integers, the $i$-th of which is the index of the direct descendant of person $i$ that is included in the tree. It is 0 for the last descendant, i.e. the one all other persons are ancestors of.
- one line containing $M$ ($1 \leq M \leq 10^4$) – the number of queries you should answer
- $M$ lines, each containing a query in the form "$a$ $b$", $1 \leq a, b \leq N$, $a \neq b$, referring to two of the persons in the tree by their indices.

# Output

Answer each query "$a$ $b$" on a separate line by printing *"$n_a$ is an ancestor of $n_b$."* if $a$ is an ancestor of $b$, *"$n_b$ is an ancestor of $n_a$."* if $b$ is an ancestor of $a$ and *"$n_a$ and $n_b$ are not related."* if neither is the case, where $n_a$ and $n_b$ are the names of $a$ and $b$, respectively.

# Sample input and output

| **Input** | **Output** |
|---|---|
| 4<br>Abe Simpson<br>Homer Simpson<br>Marge Simpson<br>Lisa Simpson<br>2 4 4 0<br>3<br>1 4<br>4 3<br>2 3 | Abe Simpson is an ancestor of Lisa Simpson.<br>Marge Simpson is an ancestor of Lisa Simpson.<br>Homer Simpson and Marge Simpson are not related. |