Problem D. Digital Descent

Time limit: 2 seconds
Memory limit: 1024 mebibytes

This is an interactive problem.

You are given an integer d. Consider a rooted tree with vertices labeled from 1 to $2^{d+1}-1$. The tree is defined by a hidden sequence $\pi = (\pi_1, \pi_2, \ldots, \pi_{2^{d+1}-1})$ containing each vertex label exactly once; that is, π is a permutation of the vertex labels. The root of the tree is vertex π_1, and the parent of vertex π_i is vertex $\pi_{\lfloor i/2 \rfloor}$ for $2 \le i \le 2^{d+1}-1$. The sequence π is hidden from you, but it is guaranteed that $\pi_i = i$ for $2^d \le i \le 2^{d+1}-1$.

Your task is to determine the root and the parent of every other vertex using at most d queries of the following form:

- `?` k v_1 v_2 $\ldots$ v_k: Choose k pairwise distinct vertices $v_1, v_2, \ldots, v_k$, none of which is the root. The response is the **set** $\{\mathrm{par}(v_i) : 1 \le i \le k\}$, where $\mathrm{par}(v)$ denotes the label of the parent of vertex v.

The interactor may be adaptive and is not required to fix the permutation π in advance. However, it is guaranteed that after every response, there exists a permutation π satisfying the conditions above and consistent with all responses given so far.

Interaction Protocol

Your program must interact with the interactor through standard input and standard output.

First, read an integer d.

To make a query, print a line in the following format:

- `?` k v_1 v_2 $\ldots$ v_k

Here, k must satisfy $1 \le k \le 2^{d+1}-2$, and each v_i must satisfy $1 \le v_i \le 2^{d+1}-1$. The vertices $v_1, v_2, \ldots, v_k$ must be pairwise distinct, and none of them may be the root.

The interactor responds with a line containing an integer m, followed by m integers $u_1, u_2, \ldots, u_m$. These integers are the distinct parents of the queried vertices, listed in increasing order. Each parent appears exactly once, even if it is the parent of more than one queried vertex.

You may make at most d queries.

Printing the final answer does not count toward the query limit.

To give your final answer, print a line in the following format:

- `!` p_1 p_2 $\ldots$ $p_{2^{d+1}-1}$

Here, p_i must be the label of the parent of vertex i, or 0 if vertex i is the root.

If you make an invalid query, the interactor responds with -1. If you receive -1, your program must terminate immediately without printing anything else.

After printing each query and the final answer, you must flush the output buffer. Failing to do so can result in an unexpected verdict. You can flush the output by using the following methods:

- In `C++`, call `fflush(stdout)` or `cout.flush()`.
- In `Java`, call `System.out.flush()`.
- In `Python`, call `sys.stdout.flush()`.

For other languages, you should refer to the official documentation for your language.

Constraints

- $2 \le d \le 15$

Example

standard input	standard output
2 2 1 2 2 2 3	 ? 2 5 7 ? 4 6 7 2 1 ! 3 3 0 1 1 2 2

Note

In the example, $d = 2$ and $\pi = (3, 1, 2, 4, 5, 6, 7)$.