Let us count 1 2 3

Given two integer *n*, *p*. 4 kinds of query is needed to solve:

1. Counting the number of labeled unrooted trees with *n* nodes.
2. Counting the number of labeled rooted trees with *n* nodes.
3. Counting the number of unlabeled rooted trees with *n* nodes.
4. Counting the number of unlabeled unrooted trees with *n* nodes.

Calculate the answer modulo *p*.

Input

Each line contains three integers *k*, *n*, *p*. *k* denotes which kind of query this case is.
For Kind 1 or Kind 2 query, $1 <= n <= 10^9$.
For Kind 3 or Kind 4 query, $1 <= n <= 10^3$ and $n <= p$.
For all queries, $2 <= p <= 10^4$ and *p* is a prime.

Output

For each query, output a line which contains only one integer.

Example

Input:
1 2 2
2 2 3
3 2 5
4 2 3

Output:
1
2
1
1