Problem A. A Bit Common

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	1024 megabytes

Given two integers n and m, among all the sequences containing n non-negative integers less than 2^m, you need to count the number of such sequences A that there exists a non-empty subsequence of A in which the bitwise AND of the integers is 1.

Note that a non-empty subsequence of a sequence A is a non-empty sequence that can be obtained by deleting zero or more elements from A and arranging the remaining elements in their original order.

Since the answer may be very large, output it modulo a positive integer q.

The bitwise AND of non-negative integers A and B, A `AND` B is defined as follows:

- When A `AND` B is written in base two, the digit in the 2^d's place ($d \geq 0$) is 1 if those of A and B are **both** 1, and 0 otherwise.

For example, we have 4 `AND` 6 = 4 (in base two: 100 `AND` 110 = 100).

Generally, the bitwise AND of k non-negative integers $p_1, p_2, \ldots, p_k$ is defined as

$$(\ldots((p_1 \texttt{ AND } p_2) \texttt{ AND } p_3) \texttt{ AND } \ldots \texttt{ AND } p_k)$$

and we can prove that this value does not depend on the order of $p_1, p_2, \ldots, p_k$.

Input

The only line contains three integers n ($1 \leq n \leq 5\,000$), m ($1 \leq m \leq 5\,000$) and q ($1 \leq q \leq 10^9$).

Output

Output a line containing an integer, denoting the answer.

Examples

standard input	standard output
2 3 998244353	17
5000 5000 998244353	2274146