

Power Sum

Some people may found [PWSUM](#) a too easy problem. We propose here some serious constraints.

$$\sum_{i=1}^N i^k$$

Input

The input contains several lines, you don't have to process all, it may be impossible, only all first ones you are able to, in the given time. Each line contains two integers : **N**, and **P**, a prime number.

Output

For the k^{th} line, print **Sum(i^k for i in $[1..N]$)**.

As the answer could not fit in a 64-bit container, just output your answer modulo **P**.

The difficulty will seriously increase as you will process lines.

Example

Input:

2 5
3 7
2 13
[...] some more lines

Output:

3
0
9
[...] as many as you can.

Explanations

For the first line : $1^1 + 2^1 = 3 \pmod{5}$.

For the second line : $1^2 + 2^2 + 3^2 = 14 = 0 \pmod{7}$

For the third line : $1^3 + 2^3 = 9 \pmod{13}$.

Constraints

$0 < N \leq 10^9$

$1 < P \leq 10^9$, a prime number

The numbers N are uniform randomly chosen. The prime numbers P are log-uniform randomly chosen.

The challenge is to be the fastest. There are 100000 lines, one point per case.

Constraints allow everybody to get some points.

Have fun ;-)