Not Another Linear Algebra Problem

Input file:	`standard input`
Output file:	`standard output`
Time limit:	5 seconds
Memory limit:	1024 megabytes

What age is it that you are still solving traditional linear algebra problem?

You are given a prime number q.

Suppose A and B are two $n \times n$ square matrices such that $AB \equiv A \pmod q$, and each element of A and B is an integer from 0 to $q-1$.

- Here, $S \equiv T \pmod q$ implies that for each $1 \le i, j \le n$, we have $S_{i,j} \equiv T_{i,j} \pmod q$.

Given a fixed matrix B ($\det B \neq 0$), it's too easy for you to just find an arbitrary suitable matrix A.

Let $f(B)$ represent the number of matrices that satisfy the equation above. Your task is to calculate:

$$\sum_{B \in M_n(\mathbb{F}_q)} [\det B \neq 0] 3^{f(B)}$$

The answer can be quite large, you only need to output it modulo another given prime number, *mod*.

Input

The first line of the input contains three integers n, q and mod. ($1 \le n \le 10^7$, $2 \le q < mod$, $10^8 \le mod \le 10^9 + 7$).

It is guaranteed that q and mod are two prime numbers.

Output

Output a single line contains a single integer, indicating the answer modulo the given number *mod*.

Examples

standard input	standard output
2 2 1000000007	43046970
100 127 998244353	881381862

Note

For $B = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$, matrices A that satisfy the condition are: $\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$, $\begin{pmatrix} 0 & 0 \\ 1 & 1 \end{pmatrix}$, $\begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix}$, $\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$, totaling 4.

For $B = \begin{pmatrix} 0 & 1 \\ 1 & 1 \end{pmatrix}$, the matrices A that satisfy the condition are: $\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$, totaling 1.

For $B = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, all matrices A satisfy the condition, totaling 16.

For $B = \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$, matrices A that satisfy the condition are: $\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$, $\begin{pmatrix} 0 & 0 \\ 1 & 0 \end{pmatrix}$, $\begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}$, $\begin{pmatrix} 1 & 0 \\ 1 & 0 \end{pmatrix}$, totaling 4.

For $B = \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$, matrices A that satisfy the condition are: $\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$, $\begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix}$, $\begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix}$, $\begin{pmatrix} 0 & 1 \\ 0 & 1 \end{pmatrix}$, totaling 4.

For $B = \begin{pmatrix} 1 & 1 \\ 1 & 0 \end{pmatrix}$, the matrices A that satisfy the condition are: $\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$, totaling 1.

Therefore, the answer is $3^4 + 3^1 + 3^{16} + 3^4 + 3^4 + 3^1 \equiv 43046970 \pmod{10^9 + 7}$.