B Function Sum

Time limit: 2s

Description

You just learned polynomial and exponential functions. The polynomial function $Poly$ is defined as $Poly(x) = x^{\boldsymbol{P}}$. The exponential function $Expo$ is defined as $Expo(x) = \boldsymbol{E}^x$.

You want to multiply those two functions, so you define the multiplication function $Multiply$ as $Multiply(x) = Poly(x) \times Expo(x)$. Find the sum of $Multiply(x)$ for the first $\boldsymbol{N}$ positive integers. In other words, find the value of $\sum_{i=1}^{\boldsymbol{N}} Multiply(i)$.

Since the sum can be large, print the remainder of $\sum_{i=1}^{\boldsymbol{N}} Multiply(i)$ divided by $\boldsymbol{M}$.

Input

The first line contains four integers $\boldsymbol{N}$, $\boldsymbol{M}$, $\boldsymbol{P}$, and $\boldsymbol{E}$ ($1 \leq \boldsymbol{N} \leq 10^9; 1 \leq \boldsymbol{M} \leq 10^9; 0 \leq \boldsymbol{P} \leq 1\,000; 1 \leq \boldsymbol{E} \leq 1\,000$) separated by spaces.

Output

The first line contains the remainder of $\sum_{i=1}^{\boldsymbol{N}} Multiply(i)$ divided by $\boldsymbol{M}$.

Sample Input 1	Sample Output 1
3 29 3 2	18

Explanation of samples

In sample input 1, the values of functions $Poly$, $Expo$, and $Multiply$ are as follows:

i	$Poly(i)$	$Expo(i)$	$Multiply(i)$
1	$1^3 = 1$	$2^1 = 2$	$1 \times 2 = 2$
2	$2^3 = 8$	$2^2 = 4$	$8 \times 4 = 32$
3	$3^3 = 27$	$2^3 = 8$	$27 \times 8 = 216$

Therefore, $\sum_{i=1}^{3} Multiply(i) = 2 + 32 + 216 = 250 = 29 \times 8 + 18$.