Beautiful Summation

Time limit: *4000 ms*
Memory limit: *256 MB*

Andy loves arithmetic and geometric progressions. He has mastered the summation formulas for arithmetic and geometric progressions. But, he is already bored with those standard formulas. So, he comes up with a more beautiful summation, i.e.

$$S_N = \sum_{k=1}^{N} P^k \times k^Q$$

But, he does not know how to calculate the value of S_N. Since you are an awesome problem solver, Andy asks your help to calculate the value of S_N modulo M for given numbers P, Q, N, and M.

Standard input

There is only one line in the input containing four integers separated by single spaces, P, Q, N, and M that represent the parameters in Andy's summation.

Standard output

You should output an integer between 0 and $M-1$ representing the result of Andy's summation after modulo by M.

Constraints and notes

- $1 \leq P \leq 1\,000$
- $0 \leq Q \leq 1\,000$
- $1 \leq N, M \leq 10^9$

- For 20% of the test files, $N \leq 10^6$.
- For another 40% of the test files (not including the 20% above), $M \leq 10^6$.

Input	Output	Explanation
`2 3 4 10`	`4`	$S_4 = \sum_{k=1}^{4} 2^k \times k^3$ $S_4 = 2^1 \times 1^3 + 2^2 \times 2^3 + 2^3 \times 3^3 + 2^4 \times 4^3$ $S_4 = 2 + 32 + 216 + 1024$ $S_4 = 1274$ So, $S_4 \mod 10 = 4$
`7 0 5 128`	`23`	$S_5 = \sum_{k=1}^{5} 7^k \times k^0$ $S_5 = 7^1 \times 1^0 + 7^2 \times 2^0 + 7^3 \times 3^0 + 7^4 \times 4^0 + 7^5 \times 5^0$ $S_5 = 7 + 49 + 343 + 2401 + 16807$ $S_5 = 19607$ So, $S_5 \mod 128 = 23$.