Project Euler #190: Maximising a weighted product

This problem is a programming version of Problem 190 from projecteuler.net

Let $S_m = (x_1, x_2, \ldots, x_m)$ be the m-tuple of positive real numbers with $x_1 + x_2 + \ldots + x_m = m$ for which $P_m = x_1 \times x_2^2 \times \ldots \times x_m^m$ is maximised.

For example, it can be verified that $P_{10} \approx 4112.085$.

Let's make a generalization of S_m. Let $T_m(X, a) = (x_1, x_2, \ldots, x_m)$ (where X is a natural number and a is an m-tuple of natural numbers) be the m-tuple of positive real numbers with $x_1 + x_2 + \ldots + x_m = X$ for which $Q_m(X, a) = x_1^{a_1} \times x_2^{a_2} \times \ldots \times x_m^{a_m}$ is maximised.

It's easy to see that $S_m = T_m(m, (1, 2, \ldots m))$.

You're given three natural numbers: X, A and m. Find the sum of $Q_m(X, a)$ among all a with $a_1 + a_2 + \ldots + a_m = A$ modulo $10^9 + 7$. It is guaranteed that in every test case this sum could be represented as a rational fraction with a denominator not divisible by $10^9 + 7$.

Definitions

In this problem it is considered that set of natural numbers does not include 0.

If we have some rational number $\frac{p}{q}$ where p is integer and q is natural, then $\frac{p}{q} \pmod{m} = p \times q^{-1} \pmod{m}$ where q^{-1} is a modular multiplicative inverse.

Input Format

The only line of each test case contains exactly three integers separated by single spaces: X, A and m.

Constraints

- $1 \leq X, A, m \leq 5 \times 10^4$

Output Format

Print exactly one number which is the answer to the problem modulo $10^9 + 7$.

Sample Input

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6 3 2
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Sample Output

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64
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Explanation

There are two ways to represent 3 as a sum of two ordered natural numbers: $3 = 1 + 2$ and $3 = 2 + 1$. $Q_2(6, (1, 2)) = Q_2(6, (2, 1)) = 32$, thus the answer is 64.