Project Euler #214: Totient Chains



This problem is a programming version of Problem 214 from projecteuler.net

Let φ be Euler's totient function, i.e. for a natural number x, $\varphi(x)$ is the number of $1 \le y \le x$, for which $\gcd(x,y)=1$.

By iterating φ , each positive integer generates a decreasing chain of numbers ending in 1.

E.g. if we start with ${\bf 5}$ the sequence ${\bf 5} \to {\bf 4} \to {\bf 2} \to {\bf 1}$ is generated.

For an integer $x \geq 1$, denote $\psi(x)$ the length of its chain. For example, $\psi(1) = 1$ and $\psi(5) = 4$.

Let p_1, p_2, \ldots be the sequence of prime numbers ($p_1 = 2, p_2 = 3, \ldots$), and consider two positive integers n and a. We define the set S(n, a) as:

$$S(n,a) = \{\prod_{i=1}^n p_i^{lpha_i} \mid 0 \leq lpha_i \leq a ext{ for all } 1 \leq i \leq n \}$$

You will be given n, a and k, how many integers $x \in S(n, a)$ satisfy $\psi(x) = k$. Print your answer modulo 1004535809.

Input Format

The first line of each test file contains three space-separated integers n, a (as described above) and q which is the number of queries.

Each of the next q lines contains a value of k.

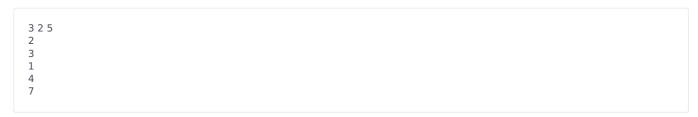
Constraints

- $1 \le q, n, k \le 10^5$.
- $1 \le a \le 2000$.

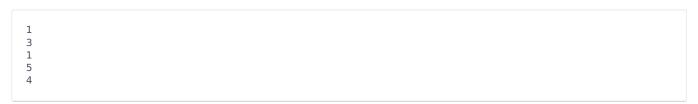
Output Format

Print the answer to each guery in a new line.

Sample Input



Sample Output



Explanation

The corresponding values of $\pmb{\psi}$ are:

$$\{1, 2, 3, 3, 4, 3, 4, 4, 4, 5, 4, 5, 6, 5, 5, 6, 6, 6, 7, 6, 7, 7, 7, 8, 8, 8, 9\}$$

All you need now is to count the occurences of \pmb{k} in this list. E.g. $\pmb{k}=\pmb{7}$ (last query), the answer is 4.