# Project Euler #214: Totient Chains

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

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

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

E.g. if we start with $5$ the sequence $5 \to 4 \to 2 \to 1$ 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 ($p_1 = 2$, $p_2 = 3$, ...), and consider two positive integers $n$ and $a$. We define the set $S(n, a)$ as:

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

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**

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

**Output Format**

Print the answer to each query in a new line.

**Sample Input**

```
3 2 5
2
3
1
4
7
```

**Sample Output**

```
1
3
1
5
4
```

**Explanation**

$$S(3, 2) = \{1, 2, 3, 4, 5, 6, 9, 10, 12, 15, 18, 20, 25, 30, 36, 45, 50, 60, 75, 90, 100, 150, 180, 225, 300, 450, 900\}$$

The corresponding values of $\psi$ 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 $k$ in this list.
E.g. $k = 7$ (last query), the answer is 4.