Number of M-Coprime Arrays

HackerRank

An array of integers is called m-coprime if the following conditions are both satisfied:

- All the integers in the array are positive divisors of m.
- Each pair of adjacent elements in the array is coprime (i.e., element i is always coprime with element $i+1$).

Two arrays, A and B, of size n are *different* if and only if there exists an index i such that $A[i] \neq B[i]$.

You are given q queries where each query consists of integers n and m. For each query, find the number of m-coprime arrays of size n, modulo 10^9+7, and print it on a new line.

Input Format

The first line contains an integer, q, denoting the number of queries.
Each of the q subsequent lines contains two space-separated integers describing the respective values of n (the size of the array) and m.

Constraints

- $1 \leq q \leq 100$
- $1 \leq n, m \leq 10^{18}$

Output Format

For each query, print the number of m-coprime arrays of size n modulo 10^9+7 on a new line.

Sample Input 0

```
1
2 6
```

Sample Output 0

```
9
```

Explanation 0

Given $n=2$ and $m=6$, we want to find the possible m-coprime arrays of length n. The elements of each array must be taken from the set of divisors of m, which is $\{1,2,3,6\}$ for the given value of m. We then assemble all possible 6-coprime arrays of size $n=2$:

1. $[1,1]$
2. $[1,2]$

3. $[1, 3]$
4. $[1, 6]$
5. $[2, 1]$
6. $[2, 3]$
7. $[3, 1]$
8. $[3, 2]$
9. $[6, 1]$

As there are nine such arrays, we print the value of $9 \bmod (10^9 + 7) = 9$ on a new line.