



## USACO 2020 US OPEN CONTEST, GOLD PROBLEM 3. EXERCISE

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English (en) ▾

Farmer John has come up with a new morning exercise routine for the cows (again)!

As before, Farmer John's  $N$  cows ( $1 \leq N \leq 10^4$ ) are standing in a line. The  $i$ -th cow from the left has label  $i$  for each  $1 \leq i \leq N$ . He tells them to repeat the following step until the cows are in the same order as when they started.

- Given a permutation  $A$  of length  $N$ , the cows change their order such that the  $i$ -th cow from the left before the change is  $A_i$ -th from the left after the change.

For example, if  $A = (1, 2, 3, 4, 5)$  then the cows perform one step. If  $A = (2, 3, 1, 5, 4)$ , then the cows perform six steps. The order of the cows from left to right after each step is as follows:

- 0 steps: (1, 2, 3, 4, 5)
- 1 step: (3, 1, 2, 5, 4)
- 2 steps: (2, 3, 1, 4, 5)
- 3 steps: (1, 2, 3, 5, 4)
- 4 steps: (3, 1, 2, 4, 5)
- 5 steps: (2, 3, 1, 5, 4)
- 6 steps: (1, 2, 3, 4, 5)

Find the sum of all positive integers  $K$  such that there exists a permutation of length  $N$  that requires the cows to take exactly  $K$  steps.

As this number may be very large, output the answer modulo  $M$  ( $10^8 \leq M \leq 10^9 + 7$ ,  $M$  is prime).

### INPUT FORMAT (file exercise.in):

The first line contains  $N$  and  $M$ .

### OUTPUT FORMAT (file exercise.out):

A single integer.

### SAMPLE INPUT:

```
5 1000000007
```

### SAMPLE OUTPUT:

```
21
```

There exist permutations that cause the cows to take 1, 2, 3, 4, 5, and 6 steps. Thus, the answer is  $1 + 2 + 3 + 4 + 5 + 6 = 21$ .

### SCORING:

- Test cases 2-5 satisfy  $N \leq 10^2$ .
- Test cases 6-10 satisfy no additional constraints.

Problem credits: Benjamin Qi

