Problem B: Divisible Subset Quest

Filename: `divisible`

Time limit: `5 seconds`

Justin and Brygida are on a mathematical adventure exploring the mysterious set of numbers from 0 to n. One evening, as they sit by the campfire, Brygida poses an intriguing question to Justin:

"Out of all subsets of the set {1, 2, ..., n}, how many have a sum that is divisible by a given number d?"

Justin, eager to impress Brygida, wants to find an efficient way to count such subsets. He calls upon your programming skills to help him solve this puzzle.

The Problem

Given two integers n and d, determine the number of subsets of the set {1, 2, ..., n} whose sum of elements is divisible by d. Since the answer can be very large, output it modulo $10^9 + 7$.

The Input

The first line contains an integer **c**, the number of test cases. The test cases follow, one per line. Each case will contain two space separated integers, **n** and **d**, representing the number of integers in the set from which subsets are taken and the divisibility value for the case.

The Output

For each test case, output a single integer — the number of subsets of {1, ..., n} whose sum is divisible by d, modulo $10^9 + 7$. (Note: if n = 0, this indicates subsets of the empty set.)

Input Bounds and Corresponding Credit

30 Points	70 Points
$1 \leq c \leq 10$ $0 \leq n \leq 20$ $1 \leq d \leq 10$	$1 \leq c \leq 20$ $0 \leq n \leq 10^5$ $1 \leq d \leq 1000$

Samples

Input	Output
2 3 3 1 1	4 2