Problem A. Decompose the number

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	64 mebibytes

You are given three integers n, m and k. You are to find the number of ways to decompose n in the sum of k non-negative integers not exceeding m, that is, to represent n as $x_1 + x_2 + \ldots + x_k$ for some $0 \le x_i \le m$. Since the answer can be very large, find it modulo $10^9 + 7$.

Input

The only line contains three numbers n, m and k ($1 \le n, m, k \le 10^6$).

Output

Print the required count modulo $10^9 + 7$.

Examples

standard input	standard output
3 2 4	16
5 10 3	21
5 1 3	0

Problem B. Count the multiples

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	64 mebibytes

You are given m positive integers $a_1, a_2, \ldots, a_m$. Your task is to count such positive integers x that are divisible by at least one of a_i's. Since there are infinitely many such numbers, your task is to count only such of them that are not exceeding n.

Input

The first line of input contains two positive integers n and m ($1 \le n \le 10^{18}$, $1 \le m \le 10$). The second line consists of n (not necessarily distinct) positive integers $a_1, a_2, \ldots, a_n$.

Output

Print the only integer standing for the required count.

Example

standard input	standard output
6 2 2 3	4

Problem C. Count sequences

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	64 mebibytes

You are given two positive integers n and m. Your task is to find the number of sequences of size n which contain only numbers from 1 to m and each of these numbers occurs at least once. Since the answer may be very large, output it modulo $10^9 + 7$.

Input

The only line contains two positive integers n and m ($1 \le n, m \le 10^6$).

Output

The only line of the output should contain the required count modulo $10^9 + 7$.

Examples

standard input	standard output
3 2	6
2 3	0
3 3	6

Problem D. Gauss Cannon

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	64 mebibytes

You are a spy in the enemy's battalion. This battalion is getting ready to march at the moment.

Actually, you're a saboteur-spy. Now you have all required information, and your task is to shoot all enemies.

Your battalion consists of n rows of soldiers, each row contains m people so that all people form a rectangle $n \times m$. You are the guy in the corner of this rectangle.

Your battalion is equipped by Gauss cannons. This means that when you make a shot, you harm (and almost surely kill) all people on some ray which starts at your location (we consider all soldiers as points on a two-dimensional plane).

Now you're concerned about the minimal number of shots needed to kill all other people. You can shoot very fast, so no one will suspect that something goes wrong before he'll die (and hence no one will change his position).

Input

The only line of input contains two numbers n and m ($1 \le n, m \le 10^6$).

Output

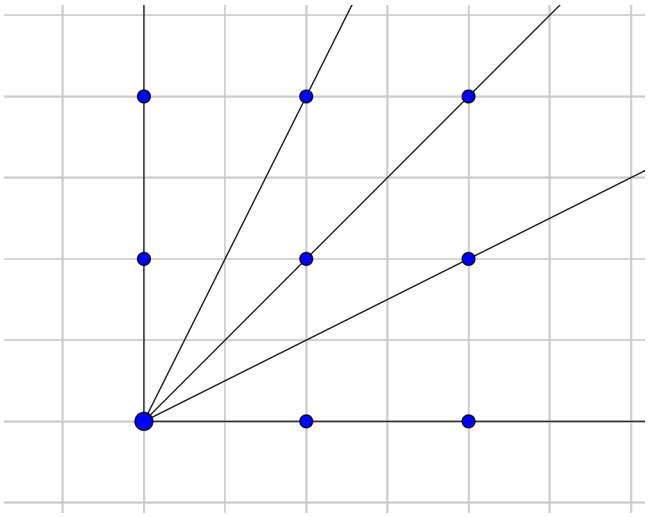
Output the minimal number of shots needed to kill all other people.

Examples

standard input	standard output
3 2	4
3 3	5

Note

The picture below illustrates the required shots for the second example.



Problem E. Boxes with Toys

Input file:	*standard input*
Output file:	*standard output*
Time limit:	4 seconds
Memory limit:	64 mebibytes

You have n boxes, each containing some toys. There are m kinds of toys, each type can occur in several boxes, but each box contains toys of different types.

You want to choose some boxes such that you'll have toys of all types if you keep these boxes for yourself. Find the number of ways to do this modulo $10^9 + 7$.

Input

The first line of input contains two integers n and m ($1 \le n \le 10^6$, $1 \le m \le 20$). Each of the following n lines contains an integer k_i ($0 \le k_i \le m$) followed by k_i distinct integers from 1 to m, representing the toys in that box.

Output

The first and only line of output should contain the requested number of ways modulo $10^9 + 7$.

Examples

standard input	standard output
3 3 3 1 2 3 3 1 2 3 3 1 2 3	7
3 3 1 1 1 2 1 3	1
4 5 2 2 3 2 1 2 4 1 2 3 5 4 1 2 4 5	6

Problem F. LCM sum

Input file:	*standard input*
Output file:	*standard output*
Time limit:	1 second
Memory limit:	64 mebibytes

Given n, calculate the sum $LCM(1, n) + LCM(2, n) + \ldots + LCM(n, n)$. Recall that $LCM(x, y)$ is the least common multiplier of x and y, that is, the least positive integer divisible by both n and m.

Input

Input consists of several testcases. The first line contains the only integer T denoting the number of testcases ($1 \le T \le 3 \cdot 10^5$). Each of the following lines contains number n ($1 \le n \le 10^6$).

Output

For each n print the answer to the problem for this n.

Example

standard input	standard output
3 1 2 5	1 4 55