Area Under Path (areaunderpath)

Peter is standing at the origin of the Cartesian plane, and he decided to take a *regular* walk to point (N, M) for some positive integers N and M. In each step of a *regular* walk, Peter must move parallel to one of the axes. During a move, he can go either one unit to the right or one unit up.

Figure 1: Peter on his morning walk on the Cartesian plane.

Formally, a regular walk from $(0, 0)$ to (N, M) is a sequence of points (x_i, y_i) $(0 \leq i \leq N + M)$ such that

- $(x_0, y_0) = (0, 0)$ and $(x_{N+M}, y_{N+M}) = (N, M)$, and
- for each $i = 1, \ldots, N + M$, either $(x_i, y_i) = (x_{i-1} + 1, y_{i-1})$ or $(x_i, y_i) = (x_{i-1}, y_{i-1} + 1)$.

We define the area under a regular walk as the area of the polygon whose vertices in clockwise order are $(0, 0) = (x_0, y_0), (x_1, y_1), \ldots, (x_{N+M}, y_{N+M}) = (N, M)$ and $(N, 0)$.

Given a prime number P and a remainder R, you have to find the number W of *regular* walks from $(0, 0)$ to (N, M) under which the area is congruent to R modulo P. Since the answer can be very large, you have to compute it modulo $10^9 + 7$.

✍ The *modulo* operation (a mod m) can be written in C/C++/Python as `(a % m)` and in Pascal as `(a mod m)`. To avoid the *integer overflow* error, remember to reduce all partial results through the modulus, and not just the final result!
Notice that if $x < 10^9 + 7$*, then* $2x$ *fits into a* C/C++ `int` *and* Pascal `longint`.

☞ Among the attachments of this task you may find a template file `areaunderpath.*` with a sample incomplete implementation.

Input

The input file consists of a single line containing integers N, M, P, R.

Output

The output file must contain a single line consisting of integer W.

Constraints

- $1 \leq N, M \leq 1\,000\,000$.
- $1 \leq P \leq 100$.
- $0 \leq R < P$.
- P is a prime number.

Scoring

Your program will be tested against several test cases grouped in subtasks. In order to obtain the score of a subtask, your program needs to correctly solve all of its test cases.

– **Subtask 1** (0 points) Examples.

– **Subtask 2** (20 points) $N, M \leq 10$.

– **Subtask 3** (15 points) $N, M \leq 100$.

– **Subtask 4** (30 points) $N \equiv M \equiv 0 \pmod{P}$.

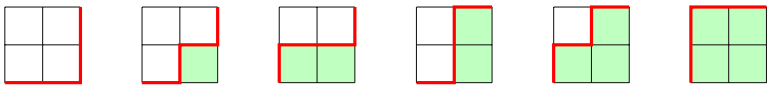
– **Subtask 5** (35 points) No additional limitations.

Examples

input	output
2 2 3 1	2
2 7 5 3	7

Explanation

In the **first sample case**, there are six possible *regular* walks from $(0, 0)$ to (N, M), as shown in the figure below.



The area under the second and the sixth paths are 1 and 4 respectively, both of which give a remainder of 1 when divided by 3.