Problem E: Eventually periodic sequence

Given is a function $f : 0..N \to 0..N$ for a non-negative N and a non-negative integer $n \in N$. One can construct an infinite sequence $F = f^1(n), f^2(n), ...f^k(n)...$, where $f^k(n)$ is defined recursively as follows: $f^1(n) = f(n)$ and $f^{k+1}(n) = f(f^k(n))$.

It is easy to see that each such sequence F is eventually periodic, that is periodic from some point onwards, e.g 1, 2, 7, 5, 4, 6, 5, 4, 6, 5, 4, 6 ... . Given non-negative integer $N \leq 11000000$, $n \leq N$ and f, you are to compute the period of sequence F.

Each line of input contains N, n and the a description of f in postfix notation, also known as Reverse Polish Notation (RPN). The operands are either unsigned integer constants or N or the variable x. Only binary operands are allowed: + (addition), * (multiplication) and % (modulo, i.e. remainder of integer division). Operands and operators are separated by whitespace. The operand % occurs exactly once in a function and it is the last (rightmost, or topmost if you wish) operator and its second operand is always N whose value is read from input. The following function:

2 x * 7 + N %

is the RPN rendition of the more familiar infix (2*x+7)%N. All input lines are shorter than 100 characters. The last line of input has N equal 0 and should not be processed.

For each line of input, output one line with one integer number, the period of F corresponding to the data given in the input line.

Sample input

10 1 x N %
11 1 x x 1 + * N %
1728 1 x x 1 + * x 2 + * N %
1728 1 x x 1 + x 2 + * * N %
100003 1 x x 123 + * x 12345 + * N %
0 0 0 N %

Output for sample input

1 3 6 6 369