

2046 Multiple Exponentiation

Modulo arithmetic is an interesting topic as there are different ways of computing the results effectively. Consider the multiple exponentiation problem, which computes the following modulo arithmetic:

$$y = a^{p^{\dots^p}} \bmod n$$

where there are m exponentiations. The numbers a , p , m and n are all positive integers greater than 1 and less than 65535. Furthermore, a and p are prime numbers such that $n \leq 2a$ and $n \leq 2p$. This ensures the existence of useful discrete logarithms.

Write a program to compute the value of y .

Input

Your program should be structured as a loop to read in lines of 4 numbers, in the order of a , p , m and n , from the standard input.

In your program, no error checking is required for input.

Output

Print out the results to standard output, using a line for each test case.

Sample Input

```
3 3 1 5
3 3 2 5
3 3 3 5
47 47 1 67
47 47 2 67
47 47 3 67
32719 54323 99 65399
```

Sample Output

```
2
2
2
6
19
54
46184
```