CMPUT 274 - Tangible Computing **Fall 2017**
Morning Problem: Polynomial Evaluation

Description

A fun exercise for children to work on their mental arithmetic is to make them evaluate large polynomial expressions (without calling them that). Being no longer a child, this is not a fun exercise for me and I would rather have this process automated for my convenience.

In fact, I am so lazy that I am willing to give up some accuracy so that my eyes need only look at the remainder of the answer modulo some number m of my choosing. Can you do this for me?

That is, given a polynomial f with integer coefficients, an integer x, and a positive integer m you should compute $f(x) \mod m$.

Input

The first line will contain three space-separated integers d, x, m. The value $0 \leq d \leq 100\,000$ will be the degree of the polynomial, $0 \leq x \leq 2^{15} - 1$ will be the value at which I want to evaluate my polynomial, and $1 \leq m \leq 2^{15} - 1$ will be the modulus to ease my eyes.

The second line will consist of a space-separated list of $(d+1)$ coefficients $a_0, a_1, \ldots, a_d$ each digit a_k satisfying $0 \leq a_k \leq 2^{15} - 1$. These describe my degree-d polynomial

$$f(x) = \sum_{k=0}^{d} a_k x^k = a_0 + a_1 x + a_2 x^2 + \cdots + a_d x^d$$

Output

You must print out a single line, containing the result of computing $f(x) \mod m$ at my specified value x.

Sample Input 1

```
2 4 100
5 3 1
```

Sample Output 1

```
33
```

Explanation:

The first polynomial is $f(x) = 5 + 3x + x^2$, for which $f(4) = 5 + 3 \cdot 4 + 4^2 \equiv 33 \mod 100$.

Sample Input 2

```
5 1 8
3 2 5 4 6 6
```

Sample Output 2

```
2
```

Explanation:

The second polynomial is $f(x) = 3 + 2x + 5x^2 + 4x^3 + 6x^4 + 6x^5$, for which $f(1) = 26 \equiv 2 \mod 8$.

Sample Input 3

```
1 3 10
3 1
```

Sample Output 3

```
6
```

Explanation:

The third polynomial is $f(x) = 3 + x$, for which $f(3) \equiv 6 \mod 10$.