Problem F. Fibonnacci Suffix Array

Input file:	*standard input*
Output file:	*standard output*
Time limit:	5 seconds
Memory limit:	512 mebibytes

The sequence of Fibonacci words is defined as follows: $fib_0 = b, fib_1 = a, fib_n = fib_{n-1}fib_{n-2}$ for $n \geq 2$. fib_n is the concatenation of fib_{n-1} and fib_{n-2}.

The first few Fibonacci words are: b, a, ab, aba, $abaab$, $abaababa$, $abaababaabaab$, ...

A suffix array for string s of length n is a permutation sa of integers from 1 to n such that $s[sa_1..n], s[sa_2..n], \ldots, s[sa_n..n]$ is the list of non-empty suffixes of s sorted in lexicographical order.

Let sa be the suffix array for fib_n. Your task is to calculate the value of $(sa_{p_1} \bmod m), (sa_{p_2} \bmod m), \ldots, (sa_{p_q} \bmod m)$.

Input

The input consists of several test cases terminated by end-of-file. For each test case:

The first line contains three integers n, q and m.

The second line contains q integers $p_1, p_2, \ldots, p_q$.

- $1 \leq n \leq 10^{18}$
- $1 \leq q \leq 10^5$
- $1 \leq m \leq 2 \times 10^9$
- $1 \leq p_i \leq \min(10^{18}, |fib_n|)$
- The sum of q does not exceed 10^6.

Output

For each test case, output q values $(sa_{p_1} \bmod m), (sa_{p_2} \bmod m), \ldots, (sa_{p_q} \bmod m)$, separated by spaces.

Examples

standard input	standard output
1 1 10 1 2 2 10 1 2 3 3 10 1 2 3 4 5 10 1 2 3 4 5 5 8 10 1 2 3 4 5 6 7 8	1 1 2 3 1 2 3 4 1 5 2 8 3 6 1 4 7 2 5