

Array

Input file: **standard input**
Output file: **standard output**
Time limit: 4 seconds
Memory limit: 1024 megabytes

Yukikaze received an array (a_1, a_2, \dots, a_n) as a gift. She decided to play with it. The game consists of q turns. In each turn, she will perform some kind of operation (listed below) on all elements in a subarray of a .

1. Given l, r, k , for every element a_i in subarray $(a_l, a_{l+1}, \dots, a_r)$, replace a_i by $a_i + k$.
2. Given l, r, k , for every element a_i in subarray $(a_l, a_{l+1}, \dots, a_r)$, replace a_i by $a_i \times k$.
3. Given l, r, k , for every element a_i in subarray $(a_l, a_{l+1}, \dots, a_r)$, replace a_i by a_i^k .
4. Given l, r, k , find the sum of the k -th powers of elements in the subarray $(a_l, a_{l+1}, \dots, a_r)$. In other words, find the value of $\sum_{i=l}^r a_i^k$.
5. Given l, r , find the product of all elements in the subarray $(a_l, a_{l+1}, \dots, a_r)$. In other words, find the value of $\prod_{i=l}^r a_i$.

In this problem, we define that $0^0 = 1$.

Since the result of operations of the last two kinds may be large, you only have to find it modulo a small integer p .

Input

The first line of the input contains two integers n, p ($1 \leq n \leq 10^5, 2 \leq p \leq 30$), denoting the number of elements in the array a and the modulus for the operations of type 4 and 5.

The next line contains n integers a_1, a_2, \dots, a_n ($0 \leq a_i \leq 10^9$), denoting the initial elements in the array a .

The third line contains one integer q ($1 \leq q \leq 10^5$), denoting the number of operations to be performed.

Each of the following q lines contains 4 integers t, l, r, k ($1 \leq t \leq 5, 1 \leq l \leq r \leq n, 0 \leq k \leq 10^9$) represents an operation of kind t . Note that if $t = 5$, it's guaranteed that $k = 0$.

Output

For each operation of type 4 or 5, output the result modulo p as an integer in a single line.

Example

standard input	standard output
5 29	7
5 2 4 1 3	5
9	3
4 2 4 1	2
1 1 3 2	
2 2 4 3	
3 3 5 2	
5 3 3 0	
4 1 5 2	
2 3 5 0	
3 2 4 0	
4 3 4 1	