

Sequence Shift

Input file: **standard input**
Output file: **standard output**
Time limit: 2.5 seconds
Memory limit: 512 megabytes

You are given two sequences of length n : $[a_1, a_2, \dots, a_n]$ and $[b_1, b_2, \dots, b_n]$. The value of $f(a, b)$ is defined as $f(a, b) = \max \{a_i + b_i\}$, where $1 \leq i \leq n$.

The sequence b can be shifted. You will then be given q operations, each operation can be divided into the following two steps:

- First, shift the sequence b to the left by one position, and drop the first element, so the sequence b' will be $[b'_1 = b_2, b'_2 = b_3, \dots, b'_{n-1} = b_n]$.
- Then, append v to the rightmost place of b , so the sequence b' will be $[b'_1 = b_2, b'_2 = b_3, \dots, b'_{n-1} = b_n, b'_n = v]$.

In this problem, your task is to figure out the value of $f(a, b)$ before/after each operation.

Input

The first line of the input contains two integers n and q ($1 \leq n \leq 1\,000\,000$, $0 \leq q \leq 1\,000\,000$), denoting the length of the sequences and the number of operations.

The second line contains n integers $a_1, a_2, \dots, a_n$, denoting the sequence a .

The third line contains n integers $b_1, b_2, \dots, b_n$, denoting the initial sequence b .

Each of the next q lines contains a single integer v , denoting the value that will be appended in each operation. The value of v will be encrypted in order to enforce online processing.

It is guaranteed that all the values of a_i, b_i and v are chosen uniformly at random from integers in the range $[1, 10^9]$. The randomness condition does not apply to the sample test(s), but your solution must pass the sample test(s) as well.

Let *last* be the previous value of $f(a, b)$ that you answered. For each operation, the actual value of v is $v \oplus \text{last}$. In the expressions above, the symbol “ $\oplus$ ” denotes the bitwise exclusive-or operation. Also, note that the constraints described in the statement above apply to the corresponding parameters only after decryption, the encrypted values are not subject to those constraints.

Output

Print $q + 1$ lines.

Output a single integer in the first line, denoting the initial value of $f(a, b)$.

In the k -th line ($2 \leq k \leq q + 1$), output a single integer denoting the current value of $f(a, b)$ after the $(k - 1)$ -th operation.

Example

standard input	standard output
5 3	11
1 4 3 2 5	13
7 5 8 3 2	16
3	25
6	
4	