IIITD: DSA 2022

Lab 5, Thursday
June 9, 2022
Section A

NOTE: You are not allowed to use arrays for problems A and B. Solutions using the square brackets '[]' anywhere in the entire code will not be marked.

Problem A: Dwight's Prank

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

[3 marks]

Dwight Shrute is tired of Jim's pranks on him, so he decides to mess up the stack of files Jim has. Help Dwight execute his plan.

He performs a total of N operations of the following 3 types on the initially empty stack of files. The i^{th} file is represented by the number i.

1. **1 i** - Add the i^{th} file on top of the stack.
2. **2** - Remove the file on the top of the stack.
3. **3 k** - Reverse the k files at the bottom of the stack.

Your task is to print the file at the top of the stack (or $EMPTY$ is the stack is empty) after every operation Dwight performs.

Input

The first line contains N, the number of operations Dwight performs. The next N lines represent the operation, and are of either of these three forms.

1 i

2

3 k

$1 \leq N \leq 10^6$

$1 \leq i \leq 10^{18}$

$1 \leq k \leq$ current size of stack

$1 \leq N * k \leq 10^6$

It is guaranteed that Dwight does not try to remove files from an empty stack.

Output

Print N integers, the file at the top of the stack after every operation. If the stack is empty, print $EMPTY$.

NOTE: You are not allowed to use arrays for this problem. Solutions using the square brackets '[]' anywhere in the entire code will not be marked.

Examples

standard input	standard output

7
1 1
2
1 1
1 2
3 2
2
2
	1
	EMPTY
	1
	2
	1
	2
	EMPTY

11
1 1
1 2
1 3
3 2
1 4
1 5
3 5
2
3 4
2
2
	1
	2
	3
	3
	4
	5
	2
	1
	5
	4
	3

12
1 90
2
1 3
3 1
3 1
3 1
1 91
3 1
3 2
3 1
2
2
	90
	EMPTY
	3
	3
	3
	3
	91
	91
	3
	3
	91
	EMPTY

12
1 1
1 2
1 3
1 4
3 1
3 2
3 3
3 4
2
2
2
2
	1
	2
	3
	4
	4
	4
	4
	3
	1
	2
	4
	EMPTY

Problem B: Revenge

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

[3 marks]

You wish to take revenge from your DSA TAs by creating a tough problem and asking *them* to solve it. You come up with the following problem.

Create a **circular singly linked list**, given N integers $A_0, A_1, ..., A_{N-1}$. Let the head of the linked list initially be A_0. Perform N operations on the linked list, where each operation consists of the following two steps.

1. Print k nodes of the linked list in sequence starting from the head (the head is the 0^{th} node).
2. Delete the k^{th} node of the linked list, and make the $(k+1)^{th}$ node the head of the linked list.

Note that the k^{th} node is defined as the $(k \ \% \ L)^{th}$ node when $k > L$. Here L denotes the length of linked list (the nodes are $0 - indexed$).

Input

The first line contains N and k. The second line contains N integers $A_0, A_1, ..., A_{N-1}$

$1 \leq N, \, k \leq 10^6$

$1 \leq N * k \leq 10^6$

$1 \leq A_i \leq 10^{18}$ for all valid i

Note: Look closely at the constraints, time limit, and think about the time complexity of your solution.

Output

Print N lines of output. The i^{th} line should contain k integers from the head of the linked list after i operations.

NOTE: You are not allowed to use arrays for this problem. Any solutions using the square brackets '[]' anywhere in the entire code will not be marked.

Examples

standard input	standard output

7 4
0 1 2 3 4 5 6
	0 1 2 3
	5 6 0 1
	3 5 6 0
	3 5 6 0
	5 6 0 5
	0 5 0 5
	5 5 5 5

1 1 1	1
2 6 69 420	69 420 69 420 69 420 420 420 420 420 420 420

3 6
7 1 4
	7 1 4 7 1 4
	1 4 1 4 1 4
	4 4 4 4 4 4

12 3
12 5 7 11 10 1 2 3 4 8 9 6
	12 5 7
	10 1 2
	4 8 9
	12 5 7
	1 2 4
	9 12 5
	1 2 4
	12 5 1
	4 12 5
	4 12 5
	12 5 12
	12 12 12

10 2
1 100 10000 1000000 100000000
10000000000 1000000000000
100000000000000
10000000000000000
1000000000000000000
	1 100
	1000000 100000000
	1000000000000 100000000000000
	1000000000000000000 1
	1000000 100000000
	100000000000000 10000000000000000
	1000000 100000000
	1000000000000000000 1000000
	1000000000000000000 1000000
	1000000 1000000

Note

In the first test case, the linked list looks like this after every operation, starting from the head.

0 1 2 3 4 5 6 (delete 4)

5 6 0 1 2 3 (delete 2)

3 5 6 0 1 (delete 1)

3 5 6 0 (delete 3)

5 6 0 (delete 6)

0 5 (delete 0)

5 (delete 5)

Problem C: Students vs Canteen

Execution Time Limit: 1 second

Aakash bhaiya decides to introduce gol-gappas of 7 flavors to the canteen menu. He carefully prepares the gol-gappas of flavors 0,1,2,3,4,5 and 6 and stacks them on a stand randomly.

The students are queued near the canteen stall and the number of students in the line equals the number of gol-gappas stacked on the stand.

Being avid gol-gappa enjoyers, every student at IIITD has his preference of gol-gappa flavor and refuses to eat anything other than his preferred flavor. So two cases arise,

1. If the student standing at the front of the queue prefers the gol-gappa flavor on the top of the stack then he/she will take the gol-gappa and leave the line.
2. Else, he/she will go to the end of the queue and wait again.

This will continue until nobody likes the gol-gappa on the top and thus nobody left in the queue is able to enjoy his/her preferred gol-gappas.

Your task is to report the number of students who are unable to enjoy their preferred gol-gappas.

Constraints

$1 \ <= \ (students.length \ == \ golgappa.length) \ <= \ 100$

$students[i], \ golgappa[i] \ \in \{0, 1, 2, 3, 4, 5, 6\}$

Input

First line of input is the integer N which is the length of the student/golgappa input.

Second line contains space separated integers $students[i]$

Third and final line contains space separated integers $golgappa[i]$

Output

A single integer, number of students who are unable to enjoy their preferred gol-gappas.

Example Test Cases

Input:

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

Output:

```
5
```

Input:

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

Output:

```
2
```