

# Cups

MAY 2023  
C++ — 2 SEC — 512 MB

May Day! May Day! Is there an emergency? No, it's the 1st of May! The Guild of Sorcerers take their May Day celebrations *very* seriously. Last year, no fewer than five members were exiled for failing to be sufficiently ebullient. One must remember: fun is mandatory.

This year, the sorcerers have agreed to learn an old fashioned magic trick — and a new one at that. The trick involves  $n$  cups arranged in a circle, each containing a ball. Each ball has a unique number from 0 to  $n-1$ , and the positions of each cup are numbered (from 0 to  $n-1$ ) clockwise around the circle.

The trick also involves four different moves:

1. **Rotate:** Each cup is moved  $i$  places clockwise around the circle. If  $i$  is negative, the cups are moved anticlockwise.
2. **Swap:** For each  $k$  from 0 to  $\frac{n}{2}-1$ , the cups at positions  $2k$  and  $2k+1$  are swapped.
3. **Cycle:** Let the ball under the cup at position  $k$  have the number  $b_k$ . For each  $j$ , the cup at position  $j$  is moved to position  $b_j$ .
4. **Reveal:** The cup at position  $i$  is lifted to reveal the number of the ball underneath.

Before the trick begins, the spectators are shown the number of the ball under each cup. Then, a sorcerer performs  $q$  moves from the list above. Finally, the spectators are asked to guess the position of each ball and the cups are lifted to confirm if they are correct. Successful spectators have their egos inflated, their backs patted, and often receive a nibble and a tipple.

**INPUT** You will be given two integers,  $n$  and  $q$ . Next, you will receive a line of  $n$  unique integers from 0 to  $n-1$ , denoting the starting arrangement of the balls under the cups. This will be followed by  $q$  lines of 1 or 2 integers. The first integer will denote the move to be made. If this is move 1 or 4, there will be a second integer,  $i$ .

$$1 \leq n, q \leq 1,000,000$$

$n$  is even

$$0 \leq i < n$$

**OUTPUT** Execute each move in turn. For each **reveal** move, output the number of the ball under the cup at position  $i$ . Once all the moves have been completed, output the final order of the balls.

**SAMPLE** For example, suppose the initial order of the balls is 5,2,1,4,0,3. After a **rotate 4**, the order is 1,4,0,3,5,2. If this is followed by a **cycle**, the order is 2,0,5,3,1,4. If this is followed by a **swap**, the order is 0,2,3,5,4,1. After a final **rotate -2**, the order is 3,5,4,1,0,2.

## INPUT

```
8 15
0 1 2 3 4 5 6 7
1 3
4 7
2
3
4 5
1 -5
2
4 3
1 -2
4 0
3
1 6
4 3
2
1 1
```

## OUTPUT

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