International Olympiad in Informatics 2020
Practice Session
April 4, 2020
Singapore, Singapore
Session 8 Tasks

`cakeatstake`
English (US)

Cake at Stake

There are n contestants sitting in a circle, labeled from 1 to n clockwise for simplicity. They are facing elimination, and whoever does not get any cake will be eliminated and sent to the Tiny Loser Chamber.

There are c slices of cake, and in the beginning, the i^{th} slice of cake is held by the contestant labelled a_i.

There are m different operations. In the i^{th} operation, every adjacent pair of contestants from l_i to r_i, going clockwise, will swap cakes in the following manner:

- If both contestants don't have cakes, nothing happens.
- If both contestants have cakes, nothing happens.
- If one contestant has a cake and the other doesn't, the contestant with the cake gives it to the contestant without.

This operation is performed by each adjacent pair of contestants, so contestants l_i and $l_i + 1$ swap cakes in this manner, contestants $l_i + 2$ and $l_i + 3$ swap cakes, and so on, until contestants $r_i - 1$ and r_i. Note that, due to the way the way the contestants are seated in the circle, it could happen that l_i is greater than r_i; in this case, the contestants involved are $l_i, l_i + 1, l_i + 2, \ldots, n, 1, 2, \ldots, r_i$.

These operations are performed in order from first to last until a total of k operations have been performed. If all m operations have already been performed but the number of operations performed has not yet reached k, they start over from the first operation, and so on until k operations are done.

Once all k operations are finished, all contestants holding a slice of cake survive the elimination, while the others are eliminated and sent to the Tiny Loser Chamber.

Which contestants survive?

Input format

The first line of input contains four integers n, c, m and k, the number of contestants, the number of slices of cake, the number of distinct operations and the total number of operations done, respectively.

The next line contains c integers, $a_1, a_2, a_3, \ldots, a_C$, the labels of the contestants who have a cake at the beginning.

The next m lines describe the operations. The i^{th} of these lines contains l_i and r_i, denoting that the i^{th} operation involves all adjacent pairs of contestants from l_i to r_i clockwise. It is guaranteed that there are always an even number of contestants involved in each operation.

Output format

For each test case, output c integers separated by a single space each, the labels of the players who receive a cake and survive the elimination. They must be output in increasing order of label.

Subtasks

In all subtasks $2 \leq n$, $1 \leq k$, $1 \leq m \leq 100\,000$, $1 \leq c < n$, $1 \leq a_i \leq n$, $1 \leq l_i, r_i \leq n$, $l_i \neq r_i$, all a_i are distinct, and there are always an even number of contestants involved in each operation.

Subtask	Points	n	k	Additional Constraints
1	12	$n \leq 4\,000$	$k \leq 4\,000$	
2	8	$n \leq 100\,000$	$k \leq 100\,000$	$c = 1$
3	6	$n \leq 100\,000$	$k \leq 100\,000$	$c = n - 1$
4	18	$n \leq 100\,000$	$k \leq 100\,000$	n is even; l_i is odd
5	40	$n \leq 100\,000$	$k \leq 100\,000$	
6	16	$n \leq 100\,000$	$k \leq 10^{18}$	

Example

Consider the following input:

```
8 4 3 5
2 5 6 7
3 8
8 3
4 7
```

The correct output is:

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1 2 4 8
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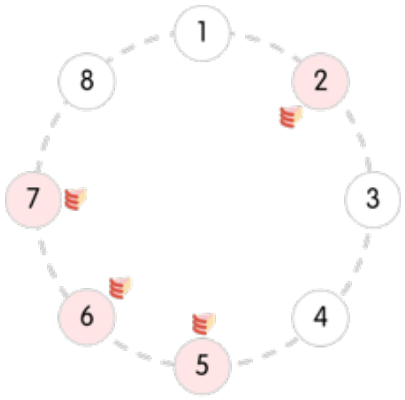
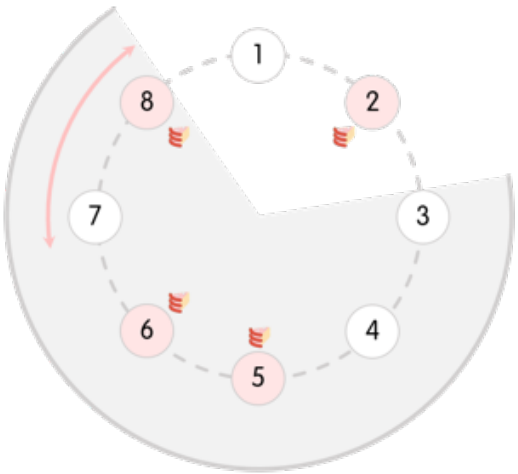
There are $n = 8$ contestants. $c = 4$ contestants, $a_1 = 2$, $a_2 = 5$, $a_3 = 6$ and $a_4 = 7$ all have cakes.



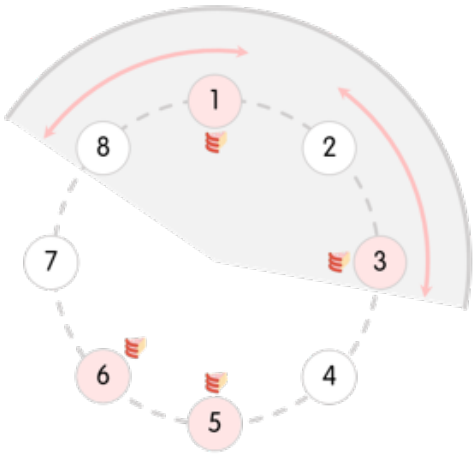
The first operation is for every adjacent pair of contestants from 3 to 8, clockwise, inclusive, to swap cakes.



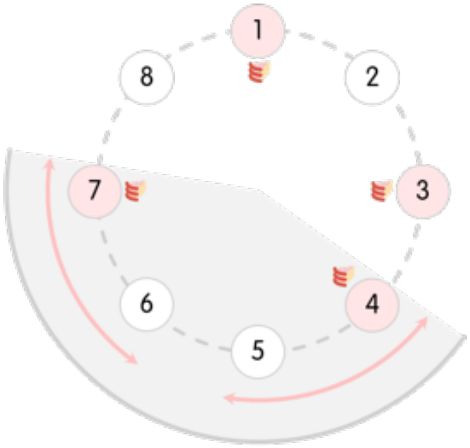
Note that:

- Contestants 3 and 4 both don't have cakes, so nothing happens.
- Contestants 5 and 6 both have cakes, so nothing happens.
- Contestant 7 has a cake while contestant 8 does not, so contestant 7 gives his cake to contestant 8.

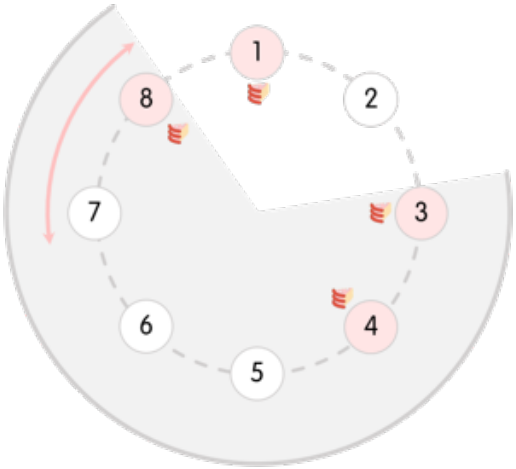
The second operation is for every adjacent pair of contestants from 8 to 3, clockwise, inclusive, to swap cakes.



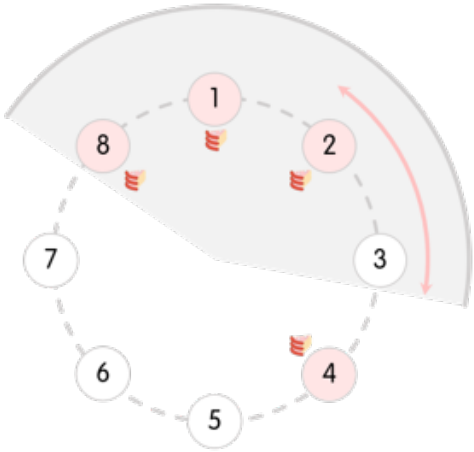
The third operation is for every adjacent pair of contestants from 4 to 7, clockwise, inclusive, to swap cakes.



The fourth operation is for every adjacent pair of contestants from 3 to 8, clockwise, inclusive, to swap cakes. Observe that we are starting over from the first operation, because we need to do a total of 5 operations.



The final operation is for every adjacent pair of contestants from 8 to 3, clockwise, inclusive, to swap cakes.



Now, contestants 1, 2, 4 and 8 are holding cakes, so they survive the Cake at Stake elimination.