

## Problem D. Judgment of Mahou Shoujo

Input file: standard input  
 Output file: standard output  
 Time limit: 2 seconds  
 Memory limit: 1024 megabytes

There are  $n$  Mahou Shoujo sitting in a circle, numbered clockwise from 1 to  $n$ . Among them, some are actually *Majo*.

For the next  $n - 3$  days, the following events occur one by one:

- In the night, **exactly one** Majo wakes up and kills the first living Mahou Shoujo on her left or right (this person could also be a Majo);
- In the morning, everyone wakes up and discovers the dead Mahou Shoujo.

Kamome, as the judge of the Mahou Shoujo, needs to find, after each morning when a dead Mahou Shoujo is discovered, the minimum number of Majo that could have been present on the first day.



Picture 1: The Judgement

### Input

Each test contains multiple test cases. The first line contains one integer  $t$  ( $1 \leq t \leq 10^5$ ), indicating the number of test cases. The description of the test cases follows.

The first line contains two integers  $n$  ( $4 \leq n \leq 2 \times 10^5$ ,  $1 \leq \sum n \leq 10^6$ ), indicating the number of Mahou Shoujo.

The second line contains  $n - 3$  integers  $p_i$  ( $1 \leq p_i \leq n$ ,  $p_i \neq p_j$  for  $1 \leq i < j \leq n - 3$ ) indicating the Mahou Shoujo who died on the  $i$ -th day.

### Output

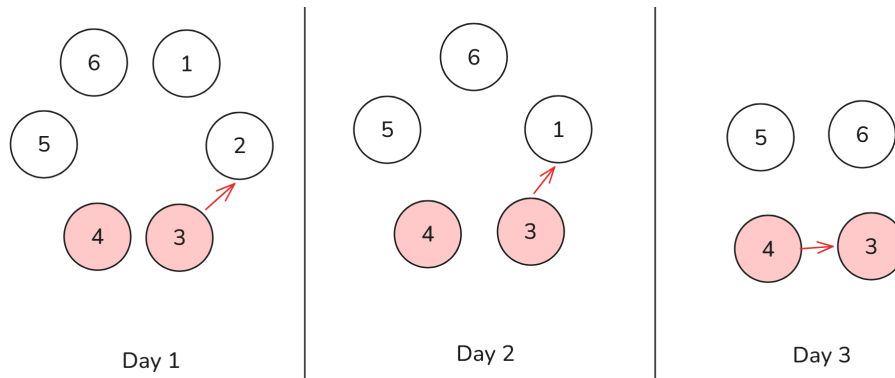
For each test case, output one line containing  $n - 3$  integers, indicating the minimum number of Majo that could have been present on the first day after discovering the dead Mahou Shoujo on the  $i$ -th day.

### Examples

standard input	standard output
5	1 1
5	1 1 2
1 2	1 1 1 1 1 1
6	1 1 2 2 3 3 3
2 1 3	1 2 2 3 3 3 3
9	
1 2 3 4 5 6	
10	
1 3 5 7 9 2 4	
10	
2 5 1 8 10 9 4	

### Note

For the second test case, on the third day, at least 2 Majo could have been present on the first day. A possible example is 3 and 4 being the Majo, where 3 kills 2 on the first day, 3 kills 1 on the second day, and 4 kills 3 on the third day.



Picture 2: A possible example