

Problem D

National Museum of Korea

Time limit: 5 seconds

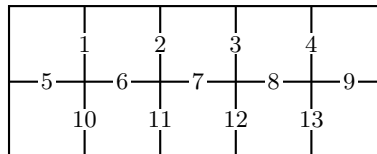
Seoul, South Korea

The Hanguk Society for the Preservation of Culture (HSPC) is organizing an event for high schoolers in the east wing of the National Museum of Korea. As high schoolers can be rowdy at times, the HSPC would like to place chaperones in some of the exhibit rooms to ensure that no priceless artifacts get damaged. The chaperones may guard up to two rooms at a time, as long as the door between them is not closed. However, it's not yet certain which doors between exhibit rooms will remain open at the event. The HSPC would like to know how many volunteer chaperones it needs, even as the door plans change.

The east wing can be modeled as a $2 \times n$ grid, where each grid cell represents a room containing an exhibit. The boundaries between grid cells represent doors. The doors are numbered.

- The $n - 1$ doors between adjacent rooms on the top row are numbered 1 through $n - 1$, from left to right.
- The n doors between rooms in the top and bottom rows of the grid are numbered n through $2n - 1$, from left to right.
- The $n - 1$ doors between adjacent rooms on the bottom row are numbered $2n$ through $3n - 2$, from left to right.

See the diagram for more information.



Chaperones may guard one room, or they may guard two adjacent rooms that are separated by a single open door. Initially, all doors are closed. As doors open and close, find (a) c_i , the minimum number of chaperones needed to guard every room and (b) the number of ways to divide up the rooms into c_i groups so that they may be guarded by c_i chaperones.

Note that there is one way to guard a pair of rooms with an open door between them by using a single chaperone (by placing a chaperone in charge of both rooms). On the same note, if the door were closed, there would still be only one way to guard those rooms by using two chaperones (by placing a chaperone in charge of each room).

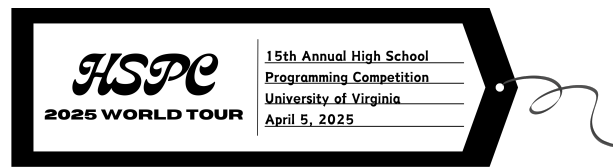
Input

On the first line are two integers n, q , the width of the museum and the number of door toggles ($2 \leq n \leq 100\,000$, $1 \leq q \leq 100\,000$).

The following q lines each contain a single integer d_i , the index of the door to toggle. ($1 \leq d_i \leq 3n - 2$).

Output

Output q lines. On the i^{th} line, output two integers c_i, w_i , where c_i is the number of chaperones needed after the first i toggles. Since it could be large, let w_i be the remainder when the number of ways to use those chaperones is divided by 998 244 353.



Sample Input 1

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

Sample Output 1