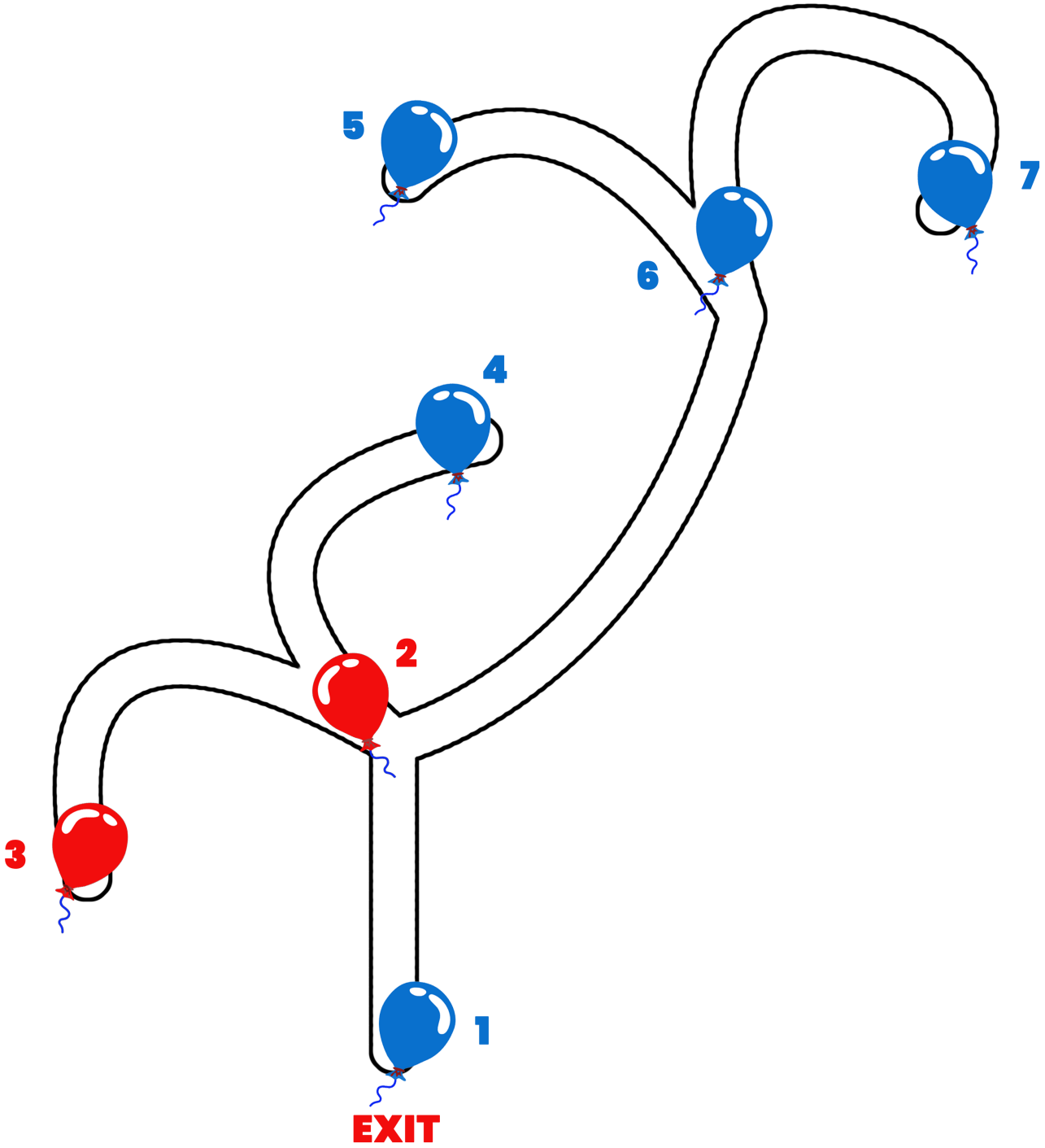
Maze Runner: Balloons of Doom

You wake up inside a maze called "**CodeBlaze**" enclosed by enormous walls, with no memory of what happened earlier but a pen and a notebook in your hand. **The maze is a bit strange** and only has **corridors enclosed by two giant walls**. You meet a girl who is the only human there alone with you inside the maze named "Teresa". You both are feared to death not knowing what happened and where you are. However, Teresa is more determined than you, and she tries so hard to find clues.

Teresa ran through the whole maze to find an exit and she figured out that there was only one exit and it was locked by a huge gate. She also found out that the **corridors do not lead to cyclic paths** in the maze. Then she found out a suspicious button-looking thing and pressed it, and, suddenly, a hologram person materialized before you both and declared, *"Welcome to this intricate maze designed for the sharpest minds. You, my dear contestants, have been chosen. But escaping this maze is no simple feat. You must unlock its secrets by solving a set of questions about the maze. I grant you a limited time to gather your thoughts and take notes with the provided notebook. Answer each question within the allotted time, or you'll remain trapped in this maze forever, destined to wander its empty corridors for eternity.*

Randomly placed along each crossing of corridors are red and blue balloons. Each junction is marked with consecutive integers starting from 1*, including the endpoints (dead-ends) of corridors. Your quest begins at junction* 1*, where the giant exit gate awaits. The questions you'll be asked pertain to two junctions,* a *and* b*. Your task is to count the number of blue balloons along the simple path from junction* a *to junction* b*. Remember, you must answer all the questions at once, solely utilizing the notes you take."*



NOTE: The maze is vast, and its corridors are extensive as well. Attempting to walk from junction a to b for each query to count the number of balloons will leave you in a quandary, unable to answer all the questions within the limited time. Therefore, if you wish to survive, you must devise an efficient algorithm to solve this problem offline (using the notes you've taken in your notebook).

Teresa has been a great help by finding all the clues. Now, it is your moment to reciprocate by preserving both your lives, for your reputation as a brilliant problem solver precedes you. The clock is ticking, and the fate of both you and Teresa hangs in the balance.

Input Format

The following are from the notes that you wrote down in your notebook according to Teresa's observations:

- First line contains two integers n and q where n is the number of junctions in the maze and q is the number of queries that will be asked.
- Second line describes whether the balloon at the i^{th} (i from 1 to n) junction is blue or not, using a 1 or 0, as space separated n integers.
- Third line contains $n-1$ integers describing the **CodeBlaze**'s layout. When Teresa was moving from junction 1 (the exit gate), she noticed that the junction id described as the i^{th} integer comes immediately before the $(i+1)^{st}$ junction.

Lastly, q lines follow each consisting of two space separated integers a and b, which are the questions that'll be asked.

Constraints

$1 \leq n \leq 10^5$

$1 \leq q \leq 10^6$

NOTE: You will encounter a maximum of 25 junctions when walking from the exit gate (junction 1) until you reach the farthust dead-end.

Output Format

Output q lines with the answer to each query.

Sample Input 0

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

Sample Output 0

```
1
3
3
```

Explanation 0

Refer to the diagram included in the problem statement :)