

# 499. The Maze III

## Description

There is a ball in a `maze` with empty spaces (represented as `0`) and walls (represented as `1`). The ball can go through the empty spaces by rolling **up**, **down**, **left** or **right**, but it won't stop rolling until hitting a wall. When the ball stops, it could choose the next direction. There is also a hole in this maze. The ball will drop into the hole if it rolls onto the hole.

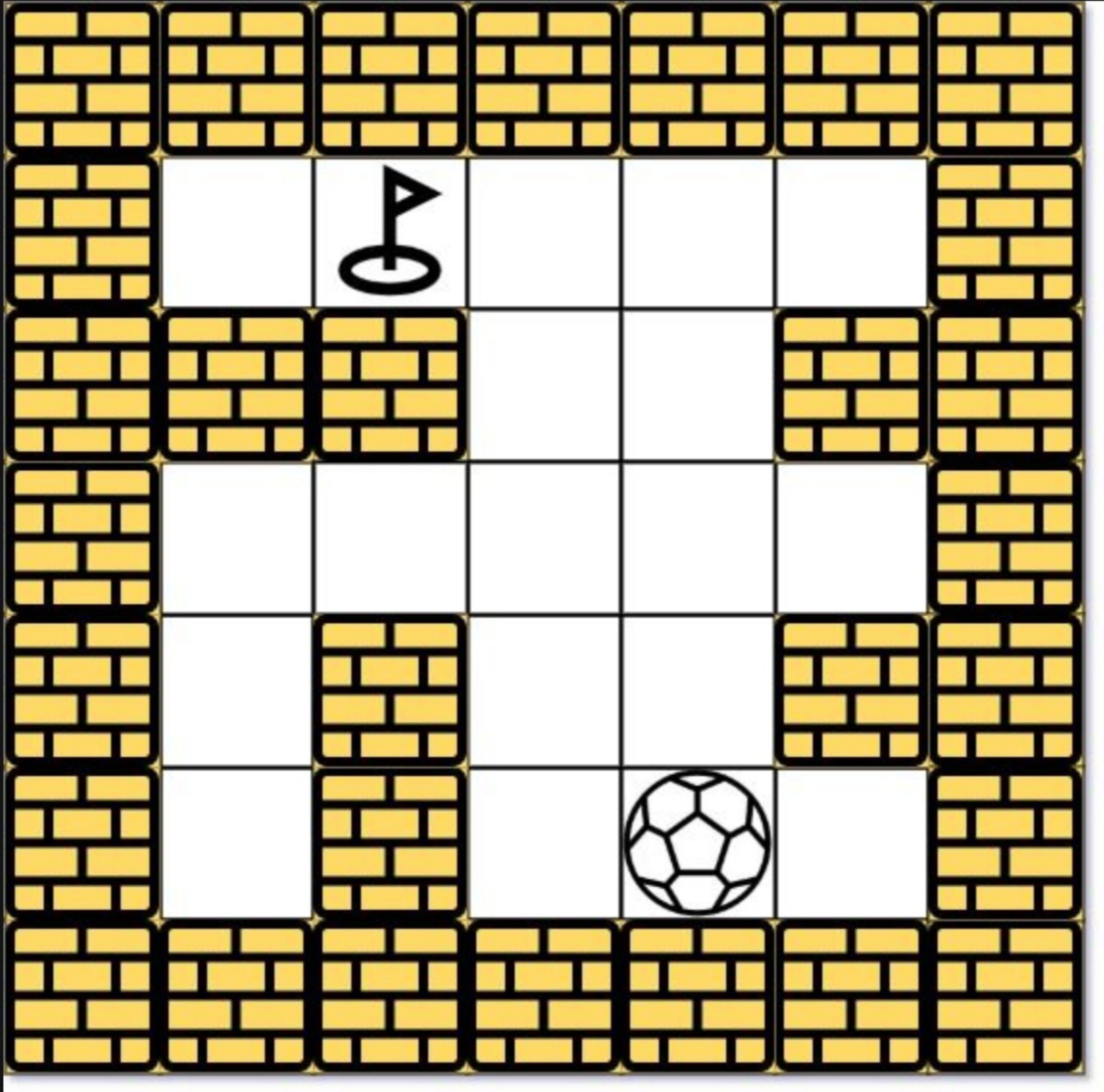
Given the `m x n` `maze`, the ball's position `ball` and the hole's position `hole`, where `ball = [ball_row, ball_col]` and `hole = [hole_row, hole_col]`, return *a string* `instructions` *of all the instructions that the ball should follow to drop in the hole with the **shortest distance** possible*. If there are multiple valid instructions, return the **lexicographically minimum** one. If the ball can't drop in the hole, return `"impossible"`.

If there is a way for the ball to drop in the hole, the answer `instructions` should contain the characters `'u'` (i.e., up), `'d'` (i.e., down), `'l'` (i.e., left), and `'r'` (i.e., right).

The **distance** is the number of **empty spaces** traveled by the ball from the start position (excluded) to the destination (included).

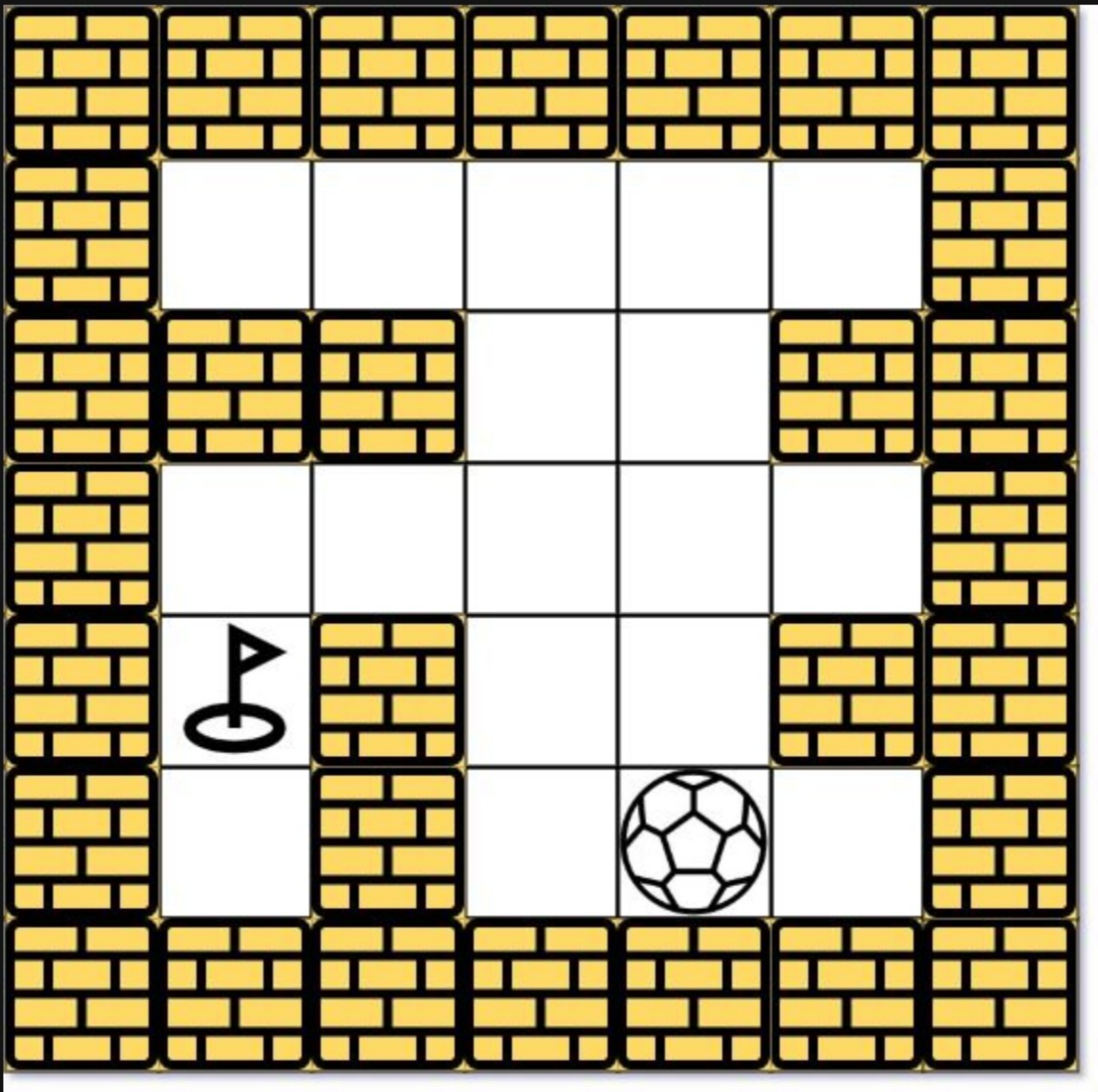
You may assume that **the borders of the maze are all walls** (see examples).

### Example 1:



**Input:** `maze = [[0,0,0,0,0],[1,1,0,0,1],[0,0,0,0,0],[0,1,0,0,1],[0,1,0,0,0]]`, `ball = [4,3]`, `hole = [0,1]`  
**Output:** `"lul"`  
**Explanation:** There are two shortest ways for the ball to drop into the hole. The first way is left -> up -> left, represented by `"lul"`. The second way is up -> left, represented by `'ul'`. Both ways have shortest distance 6, but the first way is lexicographically smaller because `'l' < 'u'`. So the output is `"lul"`.

### Example 2:



**Input:** `maze = [[0,0,0,0,0],[1,1,0,0,1],[0,0,0,0,0],[0,1,0,0,1],[0,1,0,0,0]]`, `ball = [4,3]`, `hole = [3,0]`  
**Output:** `"impossible"`  
**Explanation:** The ball cannot reach the hole.

### Example 3:

**Input:** `maze = [[0,0,0,0,0,0,0],[0,0,1,0,0,1,0],[0,0,0,0,1,0,0],[0,0,0,0,0,0,1]]`, `ball = [0,4]`, `hole = [3,5]`  
**Output:** `"dldr"`

### Constraints:

- `m == maze.length`
- `n == maze[i].length`
- `1 <= m, n <= 100`
- `maze[i][j]` is `0` or `1`.
- `ball.length == 2`
- `hole.length == 2`
- `0 <= ball_row, hole_row <= m`
- `0 <= ball_col, hole_col <= n`
- Both the ball and the hole exist in an empty space, and they will not be in the same position initially.
- The maze contains **at least 2 empty spaces**.

