

# Problem 2812: Find the Safest Path in a Grid

## Problem Information

**Difficulty:** Medium

**Acceptance Rate:** 48.50%

**Paid Only:** No

**Tags:** Array, Binary Search, Breadth-First Search, Union Find, Heap (Priority Queue), Matrix

## Problem Description

You are given a **0-indexed** 2D matrix `grid` of size  $n \times n$ , where  $(r, c)$  represents:

\* A cell containing a thief if  $grid[r][c] = 1$  \* An empty cell if  $grid[r][c] = 0$

You are initially positioned at cell  $(0, 0)$ . In one move, you can move to any adjacent cell in the grid, including cells containing thieves.

The **safeness factor** of a path on the grid is defined as the **minimum** manhattan distance from any cell in the path to any thief in the grid.

Return **the maximum safeness factor** of all paths leading to cell  $(n - 1, n - 1)$ .

An **adjacent** cell of cell  $(r, c)$ , is one of the cells  $(r, c + 1)$ ,  $(r, c - 1)$ ,  $(r + 1, c)$  and  $(r - 1, c)$  if it exists.

The **Manhattan distance** between two cells  $(a, b)$  and  $(x, y)$  is equal to  $|a - x| + |b - y|$ , where  $|val|$  denotes the absolute value of  $val$ .

**Example 1:**



**Input:** `grid = [[1,0,0],[0,0,0],[0,0,1]]` **Output:** 0 **Explanation:** All paths from  $(0, 0)$  to  $(n - 1, n - 1)$  go through the thieves in cells  $(0, 0)$  and  $(n - 1, n - 1)$ .

**Example 2:**



**Input:** grid = [[0,0,1],[0,0,0],[0,0,0]] **Output:** 2 **Explanation:** The path depicted in the picture above has a safeness factor of 2 since: - The closest cell of the path to the thief at cell (0, 2) is cell (0, 0). The distance between them is  $|0 - 0| + |0 - 2| = 2$ . It can be shown that there are no other paths with a higher safeness factor.

**Example 3:**



**Input:** grid = [[0,0,0,1],[0,0,0,0],[0,0,0,0],[1,0,0,0]] **Output:** 2 **Explanation:** The path depicted in the picture above has a safeness factor of 2 since: - The closest cell of the path to the thief at cell (0, 3) is cell (1, 2). The distance between them is  $|0 - 1| + |3 - 2| = 2$ . - The closest cell of the path to the thief at cell (3, 0) is cell (3, 2). The distance between them is  $|3 - 3| + |0 - 2| = 2$ . It can be shown that there are no other paths with a higher safeness factor.

**Constraints:**

\*  $1 \leq \text{grid.length} == n \leq 400$  \*  $\text{grid}[i].\text{length} == n$  \*  $\text{grid}[i][j]$  is either '0' or '1'. \* There is at least one thief in the 'grid'.

## Code Snippets

**C++:**

```
class Solution {
public:
    int maximumSafenessFactor(vector<vector<int>>& grid) {

    }
};
```

**Java:**

```
class Solution {
    public int maximumSafenessFactor(List<List<Integer>> grid) {

    }
}
```

**Python3:**

```
class Solution:
    def maximumSafenessFactor(self, grid: List[List[int]]) -> int:
```