

## Problem L

# Combination Lock

Gael has a padlock with a combination lock. Unlike a typical combination lock which has several rotating discs (one for each digit) from left to right, Gael's combination lock has  $R \times C$  rotating discs formed in  $R$  rows (numbered from 1 to  $R$ ) and  $C$  columns (numbered from 1 to  $C$ ). For simplicity, the rotating disc in the  $i^{th}$  row and  $j^{th}$  column is denoted as rotating disc  $(i, j)$ .

Similar to a typical combination lock, each rotating disc in Gael's lock has 10 symbols, numbered from 0 to 9. At any point in time, one of the symbols is visible to Gael.

In one operation, Gael can choose one of the  $R \times C$  rotating discs and rotate it  $\frac{1}{10}$  turn clockwise. This causes the symbol visible to Gael to be increased by 1 if the previously visible symbol is not equal to 9, or to be changed to 0 otherwise.

In a typical combination lock, to open the lock, each rotating disc has to be rotated by exactly the correct amount so that the rotating disc shows a predetermined symbol. However, Gael's lock is mechanically magical and behaves differently.

Gael's lock will open if there exists a symbol  $m$  such that the set of rotating discs currently showing the symbol  $m$  forms the letter L. Formally, the lock will open if there exists a symbol  $m$  and integers  $x, y, \delta_x, \delta_y$  ( $0 \leq m \leq 9; 1 \leq x - \delta_x < x \leq R; 1 \leq y < y + \delta_y \leq C$ ) such that the rotating disc  $(i, j)$  is showing symbol  $m$  if and only if at least one of the following is true:

- $i = x$  and  $y \leq j \leq y + \delta_y$
- $x - \delta_x \leq i \leq x$  and  $j = y$

Currently, the symbol visible on the rotating disc  $(i, j)$  is  $S_{i,j}$ . Help Gael to determine the minimum number of operations needed to open his lock.

### Input

Input begins with a line containing two integers:  $R C$  ( $2 \leq R, C \leq 1000$ ) representing the number of rows and columns in Gael's combination lock, respectively. The next  $R$  lines each contains a string  $S_i$  containing  $C$  characters between 0 and 9 representing the symbol currently visible on the rotating discs. The  $j^{th}$  integer on the  $i^{th}$  line is the value of  $S_{i,j}$ .

### Output

Output in a line an integer representing the minimum number of operations needed to open Gael's lock.

**Sample Input #1**

```
3 5
49581
02777
74386
```

**Sample Output #1**

```
3
```

*Explanation for the sample input/output #1*

By doing one operation on the rotating disc (3, 1) and two operations on the rotating disc (1, 3), the rotating discs are showing the following symbols (the operated discs are underlined):

```
49781
02777
84386
```

The set of rotating discs currently showing the symbol 7 forms the letter L. In particular, the values  $m = 7, x = 2, y = 3, \delta_x = 1, \delta_y = 2$  satisfy the condition specified in the problem description for Gael's lock to be opened.

There is no way to open Gael's lock in less than 3 operations.

**Sample Input #2**

```
4 5
01010
10101
01010
10101
```

**Sample Output #2**

```
4
```

*Explanation for the sample input/output #2*

By doing one operation on the rotating disc (1, 2) and (2, 3) and two operations on the rotating disc (2, 2), the set of rotating discs currently showing the symbol 2 forms the letter L. There is no way to open Gael's lock in less than 4 operations.