F - No Passage

Editorial (/contests/abc413/tasks/abc413_f/editorial)

/

Time Limit: 2.5 sec / Memory Limit: 1024 MiB

Score : 525 points

Problem Statement

There is an $H \times W$ grid. Let (i, j) denote the cell at the i-th row from the top and j-th column from the left. Among these, K cells are goals. The i-th goal $(1 \leq i \leq K)$ is cell (R_i, C_i).

Takahashi and Aoki play a game using this grid and a single piece placed on the grid. Takahashi and Aoki repeatedly perform the following series of operations until the piece reaches a goal cell:

- Aoki chooses an integer a between 1 and 4, inclusive.
- Then, Takahashi chooses an integer b between 1 and 4, inclusive, where $a \neq b$ must be satisfied. Let (i, j) be the cell where the piece is placed before the operation. Based on the chosen integer b and the piece's position, move the piece.
  - When $b = 1$: If $(i - 1, j)$ is within the grid, move the piece from cell (i, j) to cell $(i - 1, j)$; if it is outside the grid, do nothing.
  - When $b = 2$: If $(i + 1, j)$ is within the grid, move the piece from cell (i, j) to cell $(i + 1, j)$; if it is outside the grid, do nothing.
  - When $b = 3$: If $(i, j - 1)$ is within the grid, move the piece from cell (i, j) to cell $(i, j - 1)$; if it is outside the grid, do nothing.
  - When $b = 4$: If $(i, j + 1)$ is within the grid, move the piece from cell (i, j) to cell $(i, j + 1)$; if it is outside the grid, do nothing.

Takahashi's objective is to minimize the number of moves until the piece reaches a goal. Aoki's objective is to prevent the piece from reaching the goal; if that is impossible, his objective is to maximize the number of moves until the piece reaches a goal.

For all pairs of integers (i, j) satisfying $1 \leq i \leq H, 1 \leq j \leq W$, solve the following problem and find the sum of all solutions:

> Start the game with the piece at cell (i, j). Assume both players act optimally toward their respective objectives. If Takahashi can make the piece reach a goal, the solution is the minimum number of moves; otherwise, the solution is 0.

Constraints

- $2 \leq H \leq 3000$
- $2 \leq W \leq 3000$
- $1 \leq K \leq \min(HW, 3000)$
- $1 \leq R_i \leq H$
- $1 \leq C_i \leq W$
- $(R_i, C_i) \neq (R_j, C_j)$ $(1 \leq i < j \leq K)$
- All input values are integers.

Input

The input is given from standard input in the following format:

$$
\begin{array}{ll}
H & W \quad K \\
R_1 & C_1 \\
R_2 & C_2 \\
\vdots & \\
R_K & C_K
\end{array}
$$

Output

Print the answer.

Sample Input 1 Copy

Copy

2026-01-02 (Fri)
05:26:41 +11:00

```
2 3 2
1 2
2 1
```

Sample Output 1 Copy

```
2
```
Copy

When $(i, j) = (1, 2), (2, 1)$, the starting cell is a goal, so the solution is 0.

When $(i, j) = (1, 1), (2, 2)$, no matter which a Aoki chooses, Takahashi can make the piece reach a goal in 1 move from the starting cell, so the solution is 1.

When $(i, j) = (1, 3), (2, 3)$, Takahashi cannot reach a goal, so the solution is 0.

The sum of these is $0 \times 2 + 1 \times 2 + 0 \times 2 = 2$. Thus, print 2.

Sample Input 2 Copy

```
9 3 9
1 3
6 1
4 1
1 2
2 1
7 1
9 3
8 1
9 2
```
Copy

Sample Output 2 Copy

```
43
```
Copy

Sample Input 3 Copy

```
```
Copy

```
10 10 36
3 8
5 10
3 10
6 10
2 10
2 8
7 10
1 10
1 8
7 6
7 8
2 5
1 6
8 8
7 5
2 4
9 8
7 4
4 3
10 10
10 8
8 10
10 6
6 2
4 2
10 5
8 3
1 2
2 1
4 1
10 4
10 3
8 1
6 1
10 2
9 1
```

Sample Output 3 Copy

```
153
```
Copy

/#telegram)

♯url=https%3A%2F%2Fatcoder.jp%2Fcontests%2Fabc413%2Ftasks%2Fabc413_f%3Flang%3Den&title=F%20-

2026-01-02 (Fri)
05:26:41 +11:00