grid0

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

You have a grid with N rows and M columns. A cell can either be black or white, initially all cells are white, expect (sx, sy) which is black.

A distance from point (x_1, y_1) to point (x_2, y_2) can be calculated by $|x_1 - x_2| + |y_1 - y_2|$

Then, you are given $N \cdot M - 1$ queries (x_i, y_i), which is guaranteed to be white cell. For each query, you must find distance from (x_i, y_i) to shortest black cell. Then that cell is marked as a black cell.

Input

The input consists of $1 + N \cdot M$ lines. First line contain $1 <= N, M; N \cdot M <= 100000$, denoting dimension of the grid. Second line contain (sx, sy), denoting position of the first black cell. The next $N \cdot M - 1$ lines contain $x_i, y_i; 1 <= x_i <= M, 1 <= y_i <= N$

Output

The output consists of $N \cdot M - 1$ lines. Line i contain one integer, the answer to the ith query.

Example:

Input

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

Output

```
2 1 2 1 1 1 1 1
```

Scoring

Subtask 1 (40 points): $N \cdot M <= 1000$
Subtask 2 (20 points): $N = 1, M <= 100000$
Subtask 3 (40 points): No additional constraints.