Find the Path

You are given a table, a, with n rows and m columns. The top-left corner of the table has coordinates $(0, 0)$, and the bottom-right corner has coordinates $(n-1, m-1)$. The i^{th} cell contains integer $a_{i,j}$.

A path in the table is a sequence of cells $(r_1, c_1), (r_2, c_2), \ldots, (r_k, c_k)$ such that for each $i \in \{1, \ldots, k-1\}$, cell (r_i, c_i) and cell (r_{i+1}, c_{i+1}) share a side.

The weight of the path $(r_1, c_1), (r_2, c_2), \ldots, (r_k, c_k)$ is defined by $\sum_{i=1}^{k} a_{r_i, c_i}$ where a_{r_i, c_i} is the weight of the cell (r_i, c_i).

You must answer q queries. In each query, you are given the coordinates of two cells, (r_1, c_1) and (r_2, c_2). You must find and print the minimum possible weight of a path connecting them.

Note: A cell can share sides with at most 4 other cells. A cell with coordinates (r, c) shares sides with $(r-1, c)$, $(r+1, c)$, $(r, c-1)$ and $(r, c+1)$.

Input Format

The first line contains 2 space-separated integers, n (the number of rows in a) and m (the number of columns in a), respectively.
Each of n subsequent lines contains m space-separated integers. The j^{th} integer in the i^{th} line denotes the value of $a_{i,j}$.
The next line contains a single integer, q, denoting the number of queries.
Each of the q subsequent lines describes a query in the form of 4 space-separated integers: r_1, c_1, r_2, and c_2, respectively.

Constraints

- $1 \leq n \leq 7$
- $1 \leq m \leq 5 \times 10^3$
- $0 \leq a_{i,j} \leq 3 \times 10^3$
- $1 \leq q \leq 3 \times 10^4$

For each query:

- $0 \leq r_1, r_2 < n$
- $0 \leq c_1, c_2 < m$

Output Format

On a new line for each query, print a single integer denoting the minimum possible weight of a path between (r_1, c_1) and (r_2, c_2).

Sample Input

```
3 5
0 0 0 0 0
1 9 9 9 1
0 0 0 0 0
3
0 0 2 4
```

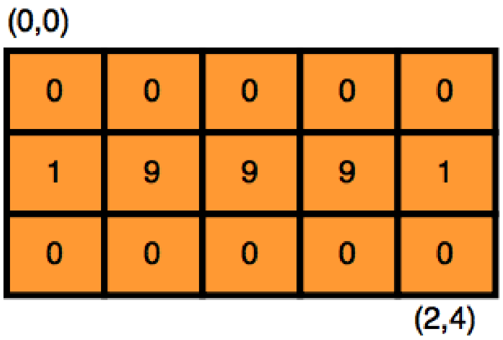
```
0 3 2 3
1 1 1 3
```

Sample Output

```
1
1
18
```

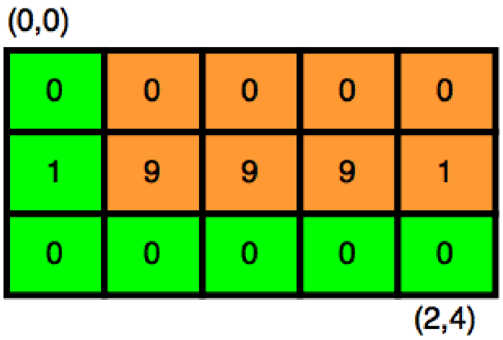
Explanation

The input table looks like this:



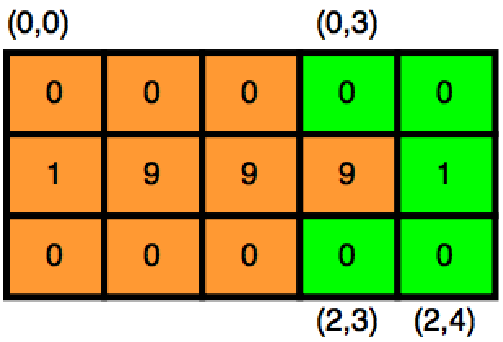
The first two queries are explained below:

1. In the first query, we have to find the minimum possible weight of a path connecting $(0, 0)$ and $(2, 4)$. Here is one possible path:



   The total weight of the path is $0+1+0+0+0+0+0=1$.

2. In the second query, we have to find the minimum possible weight of a path connecting $(0, 3)$ and $(2, 3)$. Here is one possible path:



   The total weight of the path is $0+0+1+0+0=1$.