

# Find Valleys

## ZPRAC-16-17-Lab12

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FIND VALLEYS [30 points]

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### ANNOUNCEMENT:

Up to 20% marks will be allotted for good programming practice. These include

- Comments for non trivial code
  - Indentation: align your code properly
  - Use dynamic memory allocation whenever memory is needed, not doing so will lead to zero marks
  - Use the function definition given, changing the definition will lead to zero marks.
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In a 2D matrix of  $m$  rows and  $n$  columns, an element  $a[i][j]$  is called a valley if it's smaller than all the 8 neighbours surrounding it, and its depth is given by the minimum of the absolute difference between its value and one of its neighbour's value. By definition, the edge elements which do not have 8 neighbours are not valleys.

Given an  $m \times n$  matrix, find the depth of the deepest valley. If there no valleys in the matrix, print -1.

Input:

First line contains  $m$  and  $n$ , next  $m$  lines follow, each containing  $n$  integers denoting the matrix  $a$ .

Output:

A single integer which is the required answer

Constraints:

$$1 \leq n, m \leq 200 \quad 1 \leq n, m \leq 200$$

$$1 \leq a[i][j] \leq 10^9 \quad 1 \leq a[i][j] \leq 10^9$$

Example:

3 4

1 3 4 5

7 10 2 3

3 4 9 14

Output:

1

2 is the only valley with depth 1.