

Program 4

Security Breach

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Purpose: Algorithm Design

Due: August 22, 2018 at 11:59 p.m.

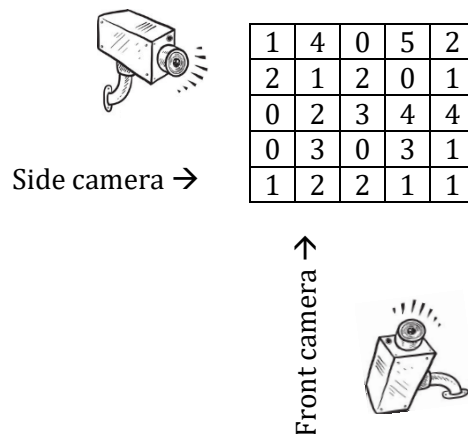
Introduction/Problem Statement

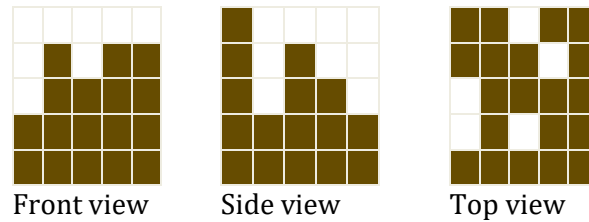
You meet up with one of your old buddies, Butch Douchiere, a close friend, frat brother, and former partner in crime. Since your criminal activities from years past, Butch has lost most of his money betting on snail races and programming competitions. He needs to pull off another job, and swears that if you help him with this last heist, he'll leave his life of crime. You are reluctant, but figure there is no harm in listening to his plan, and then you can decide if you want to help.

There is a shipment of exotic gems, gold, and movie snacks – all very expensive goods – stored in a nearby warehouse, and Butch intends on stealing as much of it as he can. In order to do this, he has to find a way into the building, incapacitate the security guards, pass through an array of laser beams – the usual. However, the true challenge is that the warehouse has a security system that Butch cannot disable. This is where he enlists your technical skills.

The shipment is stored in large cubical crates, all of which have identical dimensions. These crates are stacked in neat piles, forming a three-dimensional grid. The security system takes pictures of the piles once every hour using three cameras: a front camera, a side camera, and a top camera. The front camera shows the height of the tallest pile in each column, the side camera shows the height of the tallest pile in each row, and the top camera shows whether or not each pile is empty. If the security system detects a change in any of these images, it sounds an alarm.

Once Butch is inside, he will determine the heights of the piles and send them to you.





The figures above show a possible layout of the grid and the view from each of the cameras.

The next figure shows a possible grid of heights after the heist is completed.

1	4	0	5	1
2	1	1	0	1
0	1	3	1	4
0	3	0	1	1
2	1	1	1	1

Butch wants to steal as many crates as possible. Since he can't disable the security system, he plans to fool it by arranging the remaining crates into piles so that the next set of camera images are the same. In the above example, it is possible to steal nine crates. The post-heist figure shows that the cameras will detect an identical configuration.

Butch asks you to help him determine the maximum number of crates that can be stolen while leaving a configuration of crates that will fool the security system. Will you help him pull off this final job?

Input

The first line of input contains two integers r ($1 \leq r \leq 100$) and c ($1 \leq c \leq 100$), the number of rows and columns in the grid, respectively. Each of the following r lines contains c integers, indicating the heights (in crates) of the piles in the corresponding row. All heights are between 0 and 10^9 inclusive.

Output

Display the maximum number of crates that can be stolen without being detected.

Example 1

Sample Input 1	Sample Output 1
5 5 1 4 0 5 2 2 1 2 0 1 0 2 3 4 4 0 3 0 3 1 1 2 2 1 1	9

Example 2

Sample Input 2	Sample Output 2
2 3 50 20 3 20 10 3	30

How the program will be graded

Memo

What	Points
Name	1
Time/Space Analysis	10
Test Plan with more than 3 nontrivial tests	8

Source Code Document

What	Points
Name	1
Description	4
Style	10
Pre/Post conditions	10
Functionality	56