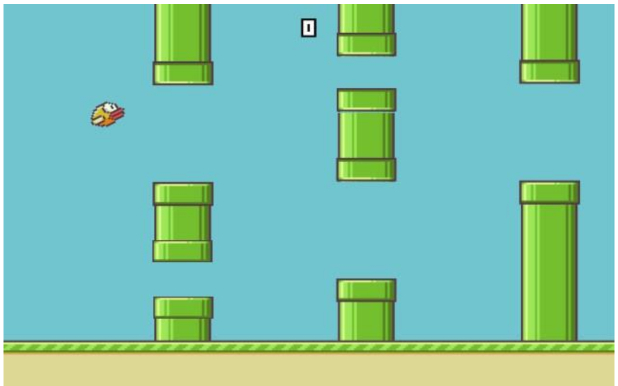
Week 13

PROBLEM A: Flappy Bird



A version of flappy bird is as shown in picture above. Jarvis needs to develop an algorithm to analysize the way of going through the obstables.

At each interval, the flappy bird always flies forward at a constant speed. However, before reaching the next interval, it may decide to either remain at the same height, or fly up by a fixed distance, or fly down down by a fixed distance. Such fixed distance is defined as “one” step. The height of the game screen is also aligned into discrete steps. Each vertical obstacle is placed between a pair of steps at an interval. No obstacle overlaps with another.

Given an obstacle map, determine the height at which the flappy bird must start in order to successfully fly through all the obstacles. Every provided map will have only one such solution.

INPUT:

1st line : the screen height H, $2 \leq H \leq 10$, and total intervals of the game T, $1 \leq T \leq 2000$

Each of the following T lines lists out H numbers, $o_1 .. o_H$.
o_i indicates obstacle at height i; 0 means no obstacle, 1 otherwise.
The first line is for the first interval and so on.

OUTPUT:

The starting height that will allow the flappy bird to fly through the map of obstacles.

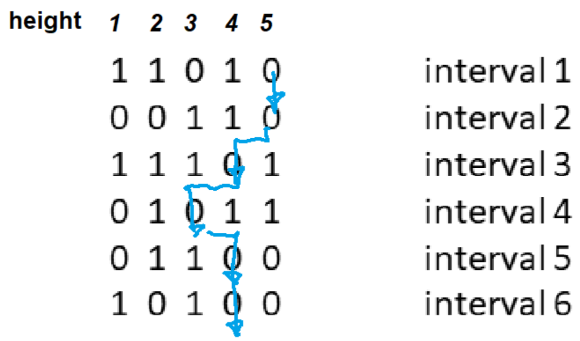
EXAMPLE

INPUT	OUTPUT

5 6
1 1 0 1 0
0 0 1 1 0
1 1 1 0 1
0 1 0 1 1
0 1 1 0 0
1 0 1 0 0
	5

Explanation of the example

Only when the flappy bird starts at height 5 will it be able to fly through all the intervals without getting blocked by an obstacle.



height	1	2	3	4	5	
	1	1	0	1	0	interval 1
	0	0	1	1	0	interval 2
	1	1	1	0	1	interval 3
	0	1	0	1	1	interval 4
	0	1	1	0	0	interval 5
	1	0	1	0	0	interval 6

PROBLEM B: Finding the size of the largest cloud

As a part of environmental management and local weather forecast, an array of cameras is placed around the city to keep track of the sky image.

At each fixed interval, a snapshot of the camera will be processed by the information extraction program. One of the required features is to detect the size of the largest cloud in the snapshot image. Given that the image is already processed into a matrix of black/white pixels. The program is required to report the number of pixels occupied by the largest cloud in the image.

A pixel is considered connected to an adjacent pixel only in one of the 4 directions, which are up, down, left, and right.

Write the program that report the size of the largest cloud in the given image.

INPUT:
1st line: The number of rows, $M \leq 500$, and the number of columns, $N \leq 1000$, of the image.

Each of the following M lines list rows of the image from top to bottom. Each row consists of N pixels ordered by column. Each pixel is either 0 (sky) or 1 (cloud).

OUTPUT: The size, in number of pixels, of the largest cloud in the image

EXAMPLE

INPUT	OUTPUT
4 6 0 **1** 0 0 0 0 **1 1 1** 0 0 0 0 0 **1** 0 1 1 0 0 **1** 0 1 0	6

Note: The largest cloud consists of the bold pixels.