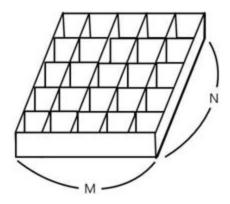
Tomato Farm

Tom has a large tomato farm back in Vietnam. His tomatoes are placed in a box as shown in the picture below.



Some of the tomatoes stored in his warehouse are ripe, but some may still be green(unripe). Each day, unripe tomatoes adjacent to ripe tomatoes ripen under the influence of ripe tomatoes. (adjacent = left, right, front, back) Tom wants to know if the tomatoes stored in the warehouse are ready to be cooked in a few days.

Given the size of the grid-shaped boxes and the information about ripe tomatoes and unripe tomatoes, write a program to calculate how many days it takes for all the tomatoes to ripen.

Input Specification

First line: M N (M: width, N: height where 2 <= M, N <= 1000)

Next N lines: 0s and 1s where O(unripe tomatoes), 1(ripe tomatoes), -1(no

tomatoes)

Output Specification

The minimum days. (O if already ripe, -1 if there's no way to get all ripe tomatoes)

Sample Input1

6 4

000000

000000

000000

```
Sample Output1
8
```

Sample Input2

6 4

0 -1 0 0 0 0

-1 0 0 0 0 0

000000

000001

Sample Output2 -1

Sample Input3

6 4

1 -1 0 0 0 0

0 -1 0 0 0 0

0 0 0 0 -1 0

0 0 0 0 -1 1

Sample Output3

Sample Input4

5 5

-1 1 0 0 0

0 -1 -1 -1 0

0 -1 -1 -1 0

0 -1 -1 -1 0

00000

Sample Output4

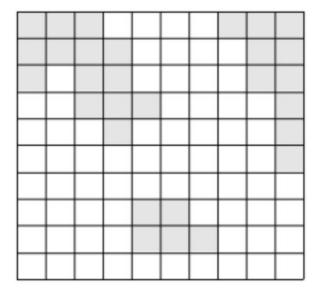
Sample Input5

- 2 2
- 1 -1
- -1 1

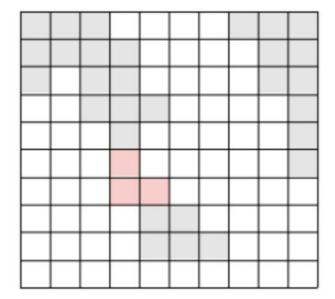
Sample Output5

Bridges

There's a country made up of several islands. The president of this country promised people that he would build bridges to connect the islands. However, after he got re-elected he started thinking that it would be a waste to build all the bridges. One day he came to the conclusion that he can get away by building only one bridge (shortest). This country can be represented by N \times N grid as below (There are 3 islands). Gray square = land, White square = ocean



In order to build the shortest bridge, here's one way.



(There are several different ways to build a bridge that has a length of 3)

Given a N \times N grid map, write a program to get the length of the shortest bridge.

Input Specification

First line: N (size of the map, 1 <= N <= 100)

Next N lines of data.

Output Specification

The shortest length

Sample Input1

10

1 1 1 0 0 0 0 1 1 1

1 1 1 1 0 0 0 0 1 1

1 0 1 1 0 0 0 0 1 1

0 0 1 1 1 0 0 0 0 1

0001000001

0000000001

0000000000

0000110000

0000111000

0000000000

Sample Output1

Sample Input2

10

Sample Output2