Counting Fish in a Pond

In this problem, we consider a rectangular pond which is being photographed from a drone hovering above the pond. There is some fish in the pond. The problem is to detect the fish in the photo.
The foto is divided into $M \times N$ cells. Each fish in the pond is oriented strictly horizontally or vertically. Therefore, its image is contained in exactly one row or in exactly one column in the photo.
Typically, but not always, an image of a fish consists of its **head**, **body** and **tail**. Some fish are displayed only partially in the photo. The images of some fish in the photo may overlap each other.

In this problem, we are concerned only with the fish which image is displayed correctly in the photo.

A fish is **displayed correctly** if its image in the photo consists of a contiguous sequence of cells in one row or in one column.
Also, all following conditions are satisfied:

- The first and the last cell in the sequence display the fish head and tail.
- The fish head and fish tail look the same in the photo.
- All other cells in the sequence display fish body and they look different from head/tail cells.
- All cells which are not part of the fish image and which which are directly adjacent to the fish image horizontally, vertically or diagonally, are empty and do not contain any part of any other fish.
- No part of the image of a fish is adjacent to the border of the pond.
- Fish image occupies at least 3 cells.

The **length** of a correctly displayed fish is equal to the number of cells in its image.

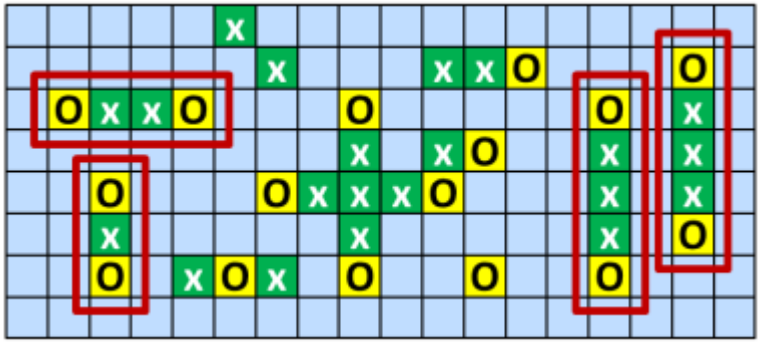

Image 1. The image depicts an 8×18 photo of a pond with some fish in it.
Symbols 'O' on yellow background represent fish heads and tails, symbols 'x' on green background represent fish body. Blue cells are empty. Note that not all symbols 'O' and 'x' are part of a correctly displayed fish. There are 4 correctly displayed fish which are highlighted with maroon boxes. Their lengths, from left to right are 4, 3, 5, 5. The image illustrates Example 1 below.

The task

Determine the number and the lengths of all correcly displayed fish in the given photo of a pond.

Input

The photo of a pond is represented in the input as a rectangular matrix containing only values 0, 1, 2. The first input line contains two integers M and N representing the number of rows and the number of columns of the input matrix. Next, there are exactly M lines. Each line contains N values, the values correspond to the values in a particular matrix row. Each value is 0, 1 or 2. Value 0 represents empty cell, value 1 represents fish body, value 2 represents fish head/tail. All values are separated by single space.
It is guaranteed that the input matrix always contains at least one correcly displayed fish.
It holds $2 \leq M, N \leq 1000$.

Output

The output contains one or more text lines. Each line contains two integers L, $C(L)$, separated by space. Value L represents the length of a fish, value $C(L)$ represents the number of correctly displayed fish in the pond which length is exactly L. The lines are sorted in ascending order of values L. Only positive values of $C(L)$ are printed. When $C(L) = 0$ neither L nor $C(L)$ is printed. The output contains no empty line.

Example 1

Input

```
8 18
0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 1 0 0 0 1 1 2 0 0 0 2 0
0 2 1 1 2 0 0 0 2 0 0 0 0 0 2 0 1 0
0 0 0 0 0 0 0 0 1 0 1 2 0 0 1 0 1 0
0 0 2 0 0 0 2 1 1 1 2 0 0 0 1 0 1 0
0 0 1 0 0 0 0 0 1 0 0 0 0 0 1 0 2 0
0 0 2 0 1 2 1 0 2 0 0 2 0 0 2 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

Output

```
3 1
4 1
5 2
```

Example 2

Input

```
7 9
0 0 0 0 0 0 0 0 0
0 2 0 2 1 1 1 2 0
0 1 0 0 0 0 0 0 0
0 1 0 2 0 2 0 2 0
0 1 0 1 0 1 0 1 0
0 2 0 2 0 2 0 2 0
0 0 0 0 0 0 0 0 0
```

Output

```
3 3
5 2
```

Example 3

Input

```
10 16
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 2 1 2 0 0 0 1 1 1 0 0
0 0 0 0 0 0 0 0 0 0 0 1 1 1 0 0
0 0 0 0 2 0 0 1 1 0 0 0 0 0 0 0
0 2 0 0 1 0 0 0 0 0 2 1 1 2 0 0
0 0 0 0 1 0 0 2 0 0 0 0 0 0 0 0
0 0 2 0 2 0 0 1 0 2 1 1 1 2 0 0
0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 2 0 0 2 0 0 1 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

Output

```
3 1
4 3
5 1
```

Public data

The public data set is intended for easier debugging and approximate program correctness checking. The public data set is stored also in the upload system and each time a student submits a solution it is run on the public dataset and the program output to stdout and stderr is available to him/her.
Link to public data set