COMP9021 Principles of Programming

Term 1, 2024

Coding Quiz 6

Worth 4 marks and due Week 9 Thursday @ 9pm

Description

You are provided with a **stub** in which you need to **insert your code where indicated without doing any changes to the existing code** to complete the task.

Given the value of **seed** and **density**, the provided code **randomly** fills an array (or grid) of size **10 x 10** with **0s** and **1s**.

Your task is to determine the **maximum number of "spikes" in a shape**.

A **shape** is made up of **1s connected horizontally or vertically (it can contain holes)**.

A **"spike"** in a shape is a **1** that **is part of this shape** and "**sticks out**" (**has exactly one neighbour in the shape**).

Neighbours are only considered **vertically** or **horizontally** (**not diagonally**).

Note that a **shape** with a **single 1** is also a **spike**.

See test cases below for more examples.

Due Date and Submission

Quiz 6 is due **Week 9 Thursday 11 April 2024 @ 9.00pm** (Sydney time).

Note that **late** submission with **5% penalty per day** is allowed **up to 3 days** from the due date, that is, any late submission after **Week 9 Sunday 14 April 2024 @ 9pm** will be discarded.

Make sure not to change the filename **`quiz_6.py`** while submitting by clicking on **[Mark]** button in **Ed**. It is your responsibility to check that your submission did go through properly using **Submissions** link in Ed otherwise your mark will be **zero** for Quiz 6.

Test Cases

```
$ python3 quiz_6.py
Enter two integers, the second one being strictly positive: 0 8
Here is the grid that has been generated:
1 1 0 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 0
0 1 1 0 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1
1 1 1 1 0 1 1 1 1 1
1 0 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 0
1 1 1 1 1 1 1 0 1 1
The maximum number of spikes of some shape is: 1
```

```
$  python3 quiz_6.py
Enter two integers, the second one being strictly  positive: 0 7
Here is the grid that has been generated:
      1  1  1  1  0  1  1  1  1  1
      1  1  1  1  1  1  1  1  1  1
      1  0  1  1  1  1  1  1  1  1
      1  0  1  0  1  1  1  1  1  0
      1  1  1  1  1  1  1  1  1  1
      1  1  0  1  1  0  0  1  1  1
      1  1  1  1  1  0  1  1  1  1
      1  1  1  1  1  1  0  1  1  1
      1  1  1  1  1  1  0  0  1  1
      1  0  1  1  1  1  0  1  1  1
The maximum number of spikes of some shape is: 3
```

```
$  python3 quiz_6.py
Enter two integers, the second one being strictly positive: 0 2
Here is the grid that has been generated:
      1  1  0  1  1  1  1  1  1  0
      0  1  0  0  1  0  1  0  0  1
      1  0  1  1  1  0  1  1  1  0
      0  0  1  0  1  1  0  1  0  0
      0  0  0  1  0  0  1  1  0  1
      1  0  1  0  1  1  0  1  1  0
      1  0  0  0  0  1  1  0  0  0
      0  0  0  1  1  0  0  1  1  1
      1  1  0  1  0  1  1  0  0  0
      1  0  0  1  0  1  1  0  0  0
The maximum number of spikes of some shape is: 7
```

```
$ python3 quiz_6.py
Enter two integers, the second one being strictly positive: 0 4
Here is the grid that has been generated:
    1 1 0 1 1 1 1 1 1 1
    1 1 1 0 1 1 1 0 0 1
    1 0 1 1 1 1 1 1 1 0
    0 0 1 0 1 1 1 1 0 1
    1 1 1 1 0 0 1 1 0 1
    1 0 1 1 1 1 0 1 1 1
    1 1 1 1 0 1 1 0 0 1
    1 0 0 1 1 1 1 1 1 1
    1 1 0 1 0 1 1 1 1 0
    1 0 1 1 1 1 1 0 0 1
The maximum number of spikes of some shape is: 8
```

```
$ python3 quiz_6.py
Enter two integers, the second one being strictly positive: 1 2
Here is the grid that has been generated:
    0 0 1 0 1 1 1 1 0 0
    1 0 1 1 0 1 1 0 0 1
    0 0 0 0 1 0 1 0 0 1
    1 0 1 0 0 1 1 0 1 0
    0 1 0 1 1 0 1 1 1 1
    0 1 0 1 1 0 1 1 0 1
    0 0 1 1 1 0 1 0 1 1
    0 0 0 0 0 0 1 1 1 1
    1 0 1 0 0 1 0 1 1 0
    1 1 1 1 1 0 1 1 0 0
The maximum number of spikes of some shape is: 5
```

```
$ python3 quiz_6.py
Enter two integers, the second one being strictly positive: 2 2
Here is the grid that has been generated:
0 0 0 1 0 1 1 0 0 0
1 1 1 1 1 0 0 1 1 1
1 1 0 0 0 0 0 0 1 0
0 1 0 1 1 1 1 1 1 0
1 1 0 1 1 1 1 1 1 1
1 1 0 1 0 1 1 1 1 1
1 0 1 1 0 1 0 0 0 0
0 1 0 0 0 1 0 0 0 1
0 0 1 1 0 0 0 0 0 0
0 0 0 1 1 0 0 0 0 1
The maximum number of spikes of some shape is: 4
```

Test Cases Explained

```
$  python3 quiz_6.py
Enter two integers, the second one being strictly  positive: 0 8
Here  is  the  grid  that  has  been  generated:
1 1 0 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 0
0 1 1 0 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1
1 1 1 1 0 1 1 1 1 1
1 0 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 0
1 1 1 1 1 1 1 0 1 1
The maximum number of spikes of some shape is: 1
```

```
$  python3 quiz_6.py
Enter two integers, the second one being strictly  positive: 0 7
Here  is  the  grid  that  has  been  generated:
1 1 1 1 0 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1
1 0 1 1 1 1 1 1 1 1
1 0 1 0 1 1 1 1 1 0
1 1 1 1 1 1 1 1 1 1
1 1 0 1 1 0 0 1 1 1
1 1 1 1 1 0 1 1 1 1
1 1 1 1 1 1 0 1 1 1
1 1 1 1 1 1 0 0 1 1
1 0 1 1 1 1 0 1 1 1
The maximum number of spikes of some shape is: 3
```

```
$   python3 quiz_6.py
```

Enter two integers, the second one being strictly positive: **0 2**

Here is the grid that has been generated:

```
1 1 0 1 1 1 1 1 1 0
0 1 0 0 1 0 1 0 0 1
1 0 1 1 1 0 1 1 1 0
0 0 1 0 1 1 0 1 0 0
0 0 0 1 0 0 1 1 0 1
1 0 1 0 1 1 0 1 1 0
1 0 0 0 0 1 1 0 0 0
0 0 0 1 1 0 0 1 1 1
1 1 0 1 0 1 1 0 0 0
1 0 0 1 0 1 1 0 0 0
```

The maximum number of spikes of some shape is: **7**

```
$  python3 quiz_6.py
Enter two integers, the second one being strictly positive: 0 4
Here is the grid that has been generated:
1 1 0 1 1 1 1 1 1 1
1 1 1 0 1 1 1 0 0 1
1 0 1 1 1 1 1 1 1 0
0 0 1 0 1 1 1 1 0 1
1 1 1 1 0 0 1 1 0 1
1 0 1 1 1 1 0 1 1 1
1 1 1 1 0 1 1 0 0 1
1 0 0 1 1 1 1 1 1 1
1 1 0 1 0 1 1 1 1 0
1 0 1 1 1 1 1 0 0 1
The maximum number of spikes of some shape is: 8
```

```
$  python3 quiz_6.py
Enter two integers, the second one being strictly positive: 1 2
Here is the grid that has been generated:
0 0 1 0 1 1 1 1 0 0
1 0 1 1 0 1 1 0 0 1
0 0 0 0 1 0 1 0 0 1
1 0 1 0 0 1 1 0 1 0
0 1 0 1 1 0 1 1 1 1
0 1 0 1 1 0 1 1 0 1
0 0 1 1 1 0 1 0 1 1
0 0 0 0 0 0 1 1 1 1
1 0 1 0 0 1 0 1 1 0
1 1 1 1 1 0 1 1 0 0
The maximum number of spikes of some shape is: 5
```

```
$   python3 quiz_6.py
Enter two integers, the second one being strictly positive: 2 2
Here is the grid that has been generated:
0 0 0 1 0 1 1 0 0 0
1 1 1 1 1 0 0 1 1 1
1 1 0 0 0 0 0 0 1 0
0 1 0 1 1 1 1 1 1 0
1 1 0 1 1 1 1 1 1 1
1 1 0 1 0 1 1 1 1 1
1 0 1 1 0 1 0 0 0 0
0 1 0 0 0 1 0 0 0 1
0 0 1 1 0 0 0 0 0 0
0 0 0 1 1 0 0 0 0 1
The maximum number of spikes of some shape is: 4
```