

# 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	0	1	<b>1</b>	

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	<b>1</b>	1	1	1
1	1	1	1	1	1	0	1	1	1
1	1	1	1	1	1	0	0	1	1
<b>1</b>	0	1	1	1	1	0	<b>1</b>	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	<b>1</b>	<b>1</b>	<b>1</b>
1	1	0	0	0	0	0	0	<b>1</b>	0
0	1	0	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	0
1	1	0	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
1	1	0	<b>1</b>	0	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
1	0	<b>1</b>	<b>1</b>	0	<b>1</b>	0	0	0	0
0	1	0	0	0	<b>1</b>	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**