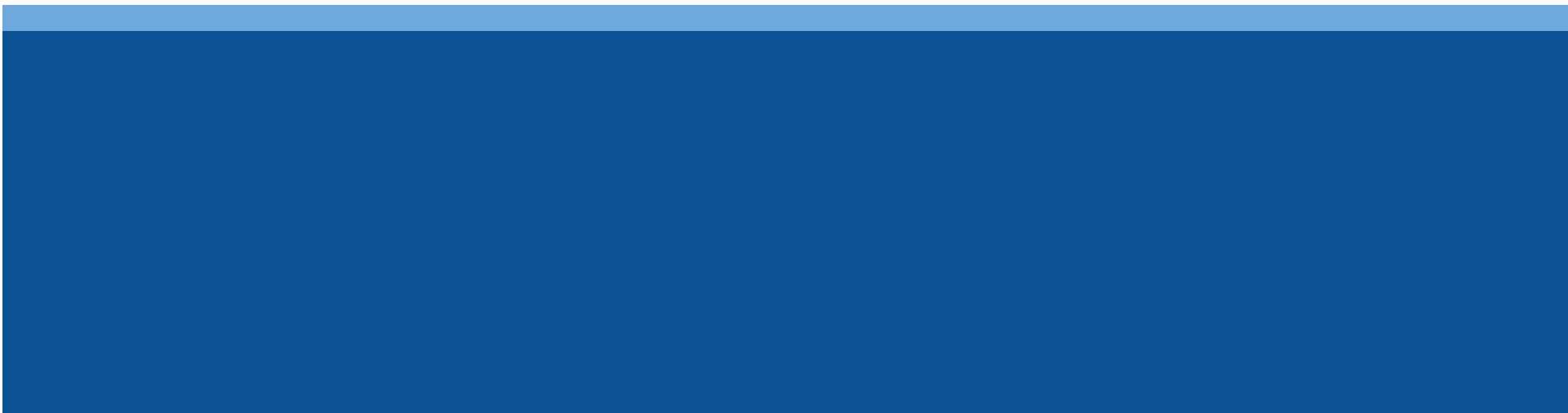


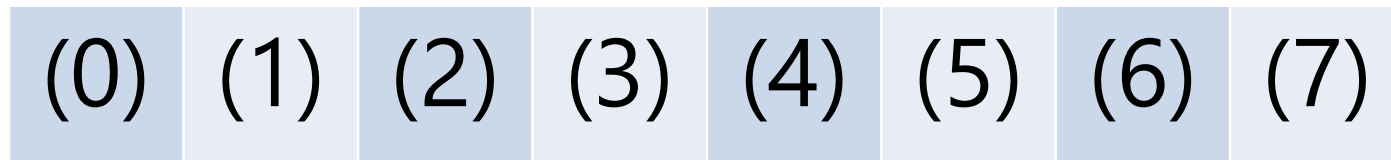
2D Arrays



1D Array - Recap

An **array** is a data structure used to hold multiple values

Each **element** has a unique **index** (or subscript)



Two dimensional Arrays

A **1D array** is where you specified the number elements (columns) in an array – it has **one dimension**.

When declaring a **2 dimensional (2D) array** we specify the **rows** and **columns**

Python treats this as a list within a list

Declares and initialises a 3 by 8 2D Array

```
rows = 3
```

```
cols = 8
```

```
my2dlist = [[0]*cols for i in range(rows)]
```



Inserting values into a pre-initialised array

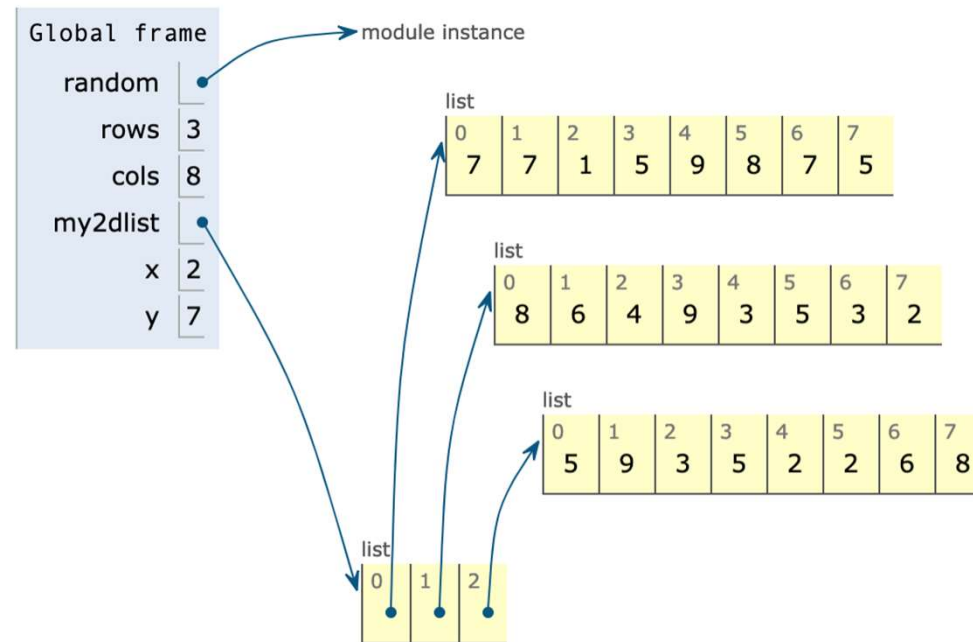
```
for x in range(rows):  
    for y in range(cols):  
        my2dlist[x][y] = random.randint(1,9)
```

This will place a random integer between 1 and 9 into each element of the 2D array called **my2dlist**



Visualisation of the 2D Array

After running the code we could visualise the 2D array as below



Generated using <http://www.pythontutor.com/visualize.html>

2D Array Structure

(0,0)	(0,1)	(0,2)	(0,3)	(0,4)	(0,5)	(0,6)	(0,7)
(1,0)	(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)	(1,7)
(2,0)	(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)	(2,7)



Outputting from the 2D Array

- ❑ If we print the 2d array using the following code

```
print (my2dlist)
```

- ❑ We would get the following output

```
[[7, 4, 4, 5, 6, 7, 9, 6], [9, 8, 2, 3, 8, 1, 7, 7], [4, 6, 2, 6, 5, 2, 5, 8]]
```

- ❑ But if we want to display it row by row we will need to process the output
 - ❑ We will display it row by row, whilst removing the square brackets and commas



Outputting from the 2D Array (continued)

```
row = ""
for x in range(rows):
    for y in range(cols):
        #Build up a row at a time
        row += str(my2dlist[x][y])+ ","

    #remove the last comma by extracting all minus the last char
    row = row[:-1]
    print(row)
    row = ""
```



Output from this

```
6,1,6,9,7,7,6,1  
2,1,8,2,6,5,1,7  
5,3,6,8,7,6,1,6
```

- ❑ You will notice that we have delimited the 2d array using a comma
- ❑ This would be useful if the array was to be written to a file



What if we do not know rows and cols?

The len() function can be used to return the amount of elements in an array

We could use the len function to find the number of rows (3 in this example)

```
my2dArray = [ ['0,0', '0,1'], ['1,0', '1,1'], ['2,0', '2,1'] ]
```

```
for i in range(len(my2dArray)):  
    for j in range(len(my2dArray[i])):  
        print(my2dArray[i][j])
```

As Python stores a 2D array as a list of lists so this returns the length of one of the columns

