



SE Bootcamp

Hyperiondev

Beginner Data Structures – Lists & 2D Lists

Objectives

- Learn about the most frequently used and versatile collection data type in Python - the list.
- Learn syntax for generating and indexing 2D lists

Lists

- ★ **Lists** are used when we need to **store a lot of data**, or the **order** in which the data is stored is **important**.
- ★ Lists are capable of **holding many items** in one place as well as keeping the data **in order**.
- ★ Python will also provide each piece of data an **index** that represents its **position in the list**.

Lists Cont.

- ★ A list is a specialised format of storing and organising data.
- ★ A list is basically a group of items / data.
- ★ Lists are known as sequence data types because they behave like an ordered collection of items.

List Example and Syntax

```
my_list=[]  
#You can even create empty lists  
  
names=["Billy", "Jimmy", "Sally", "Rachel"]  
various=["Tom", 32, True, 21.3]  
  
# Lists are excellent for storing multiple pieces of data  
# from string to integers, floats, and even booleans  
  
# Lists remove the need to create multiple different  
# variables taking up memory in your program, making the  
# process of storing data easier and more efficient
```

Indexing Lists

- ★ Similar to strings, we are able to **index** and **slice** lists.
- ★ However, instead of indexing by character, we index lists by the entire value in that specific position.

Indexing Example

```
names = ["Billy", "Sally", "Cammy"]  
print(names[0])  
  
# Result >> "Billy"  
  
print(names[-1])  
  
# Result >> "Cammy"
```

Finding the Length of a List

- ★ Similar to what we did with strings, we can use the `len()` function to find the length of a list.
- ★ Example :

```
my_list = ["The", "Joy", "of", "Learning"]  
  
print(len(my_list))  
  
# Result >> 4
```


Accessing all values in a List

- ★ Sometimes we need to access all values / items in a list at the **same time**; to achieve this we can simply **iterate** through the list with a **for loop**
- ★ This would be especially useful when we **cannot exactly see** all the data within a list and we must **evaluate** the data / make adjustments / add to the list / remove from the list.

Looping through Lists Example

```
names = ["Jimmy", "Billy", "Terry", "Kerry", "Joe"]
```

```
# Remember that the temp variable in a for loop  
# can be named anything and that it only  
# exists within the loop.
```

```
for i in names:  
    print(names)
```

```
# Result >> Jimmy  
#           Billy  
#           Terry  
#           Kerry  
#           Joe
```

In Operator and Lists

```
names = ["Jimmy", "Billy", "Terry", "Kerry", "Joe"]

name_one = "Lucy"
name_two = "Terry"

if name_one in names:
    print(''
        This if statement will NOT execute, because Lucy
        does not exist in the list
        '')

if name_two in names:
    print(''
        This if statement will execute, because Terry
        does in fact exist within the list
        '')
```

Appending data to Lists

- ★ You can add new items to a list by using the `.append()` method, keep in mind that append will only add to the **end of a list** and nowhere else.
- ★ Example:

```
names = ["Jimmy", "Billy", "Terry", "Kerry", "Joe"]  
  
names.append("Sally")  
# The list is now updated with the new item  
  
print(names)  
  
# Result >> ['Jimmy', 'Billy', 'Terry', 'Kerry', 'Joe', 'Sally']
```

Extending Lists

- ★ Adds multiple values to the end of the list.
- ★ Similar to append, but adds multiple values instead of only one.

```
numbers = [1,2,3,4]
numbers.extend([5,6,7,8])
print(numbers)
# Result >> [1,2,3,4,5,6,7,8]
```

Inserting into List

- ★ Used to add items at a specific position in the list using indexing.
- ★ Takes two arguments, first is the index, followed by the element to add.

```
numbers = [1, 2, 3, 4, 5]
```

```
numbers.insert(2, 'Hi')
```

```
print(numbers)
```

```
# Result >> [1, 2, 'Hi', 3, 4, 5]
```

Clearing a List

- ★ The `clear` method will **remove all elements** from a list
- ★ Keep in mind that `.clear()` needs no arguments

```
numbers = [1,2,3,4,5]
numbers.clear()
print(numbers)
# Result >> []
```

Popping from a List

- ★ The `pop` method will **remove** an element at an **index**, then **return** it.
- ★ **Return** means that the removed element can be stored and used in a **variable**

```
numbers = [1, 2, 3, 4, 5]

popped_number = numbers.pop()
# If no index is specified, then pop will remove
# the last element in the list

print(popped_number)

# Result >> 5
```


List Comprehension

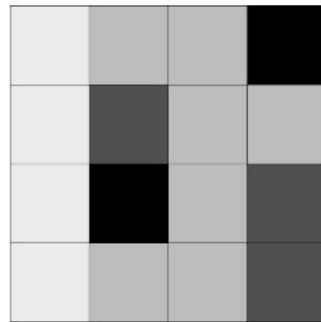
- ★ A variant for loop, used to generate new lists.
Basically tweaked versions of existing lists.
- ★ Written as : `_(1)_ for _(2)_ in _(3)_`
- ★ First position contains the action to be taken on each element of a list
- ★ Second position contains the index variable, and the third position is the list we iterate over.
- ★ Reads like : “for `_(2)_` in `_(3)_`, do `_(1)_`”

Example

```
numbers = [1, 2, 3, 4, 5]
double_numbers = [num * 2 for num in numbers]
print(double_numbers)
# Result >> [2, 4, 6, 8, 10]
```

2D Lists

- How does a list become two-dimensional?
- Create a list, where each element is a list.



236	189	189	0
236	80	189	189
236	0	189	80
236	189	189	80

- `grayscale_image = [[236, 189, 189, 0], [236, 80, 189, 189], [236, 0, 189, 80], [236, 189, 189, 80]]`

How to Create a 2D List

```
number_of_rows = 3  
number_of_columns = 2  
empty_grid = [[None] * number_of_columns for _ in range(number_of_rows)]
```

- Creates a 2 x 3 list, all elements are the value **None**.

How to Iterate over a 2D List

```
for row in my_2d_list: # outer loop for rows
    for col in row: # inner loop for columns
        # Do something.
```

Indexing a 2D List

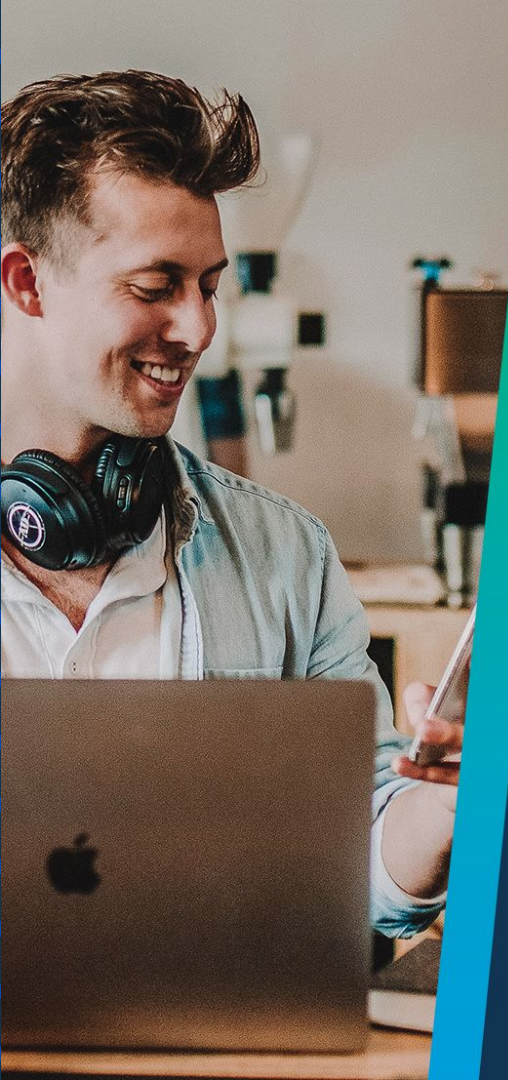
```
grayscale_image = [[236, 189, 189, 0],  
                   [236, 80, 189, 189],  
                   [236, 0, 189, 80],  
                   [236, 189, 189, 80]]
```

```
last_pixel = grayscale_image[3][3]
```

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Q & A Section

Please use this time to ask any questions relating to the topic, should you have any.



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**Thank You for
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