Collection Types

- List
- Tuple
- Dictionary
- Set

Lists

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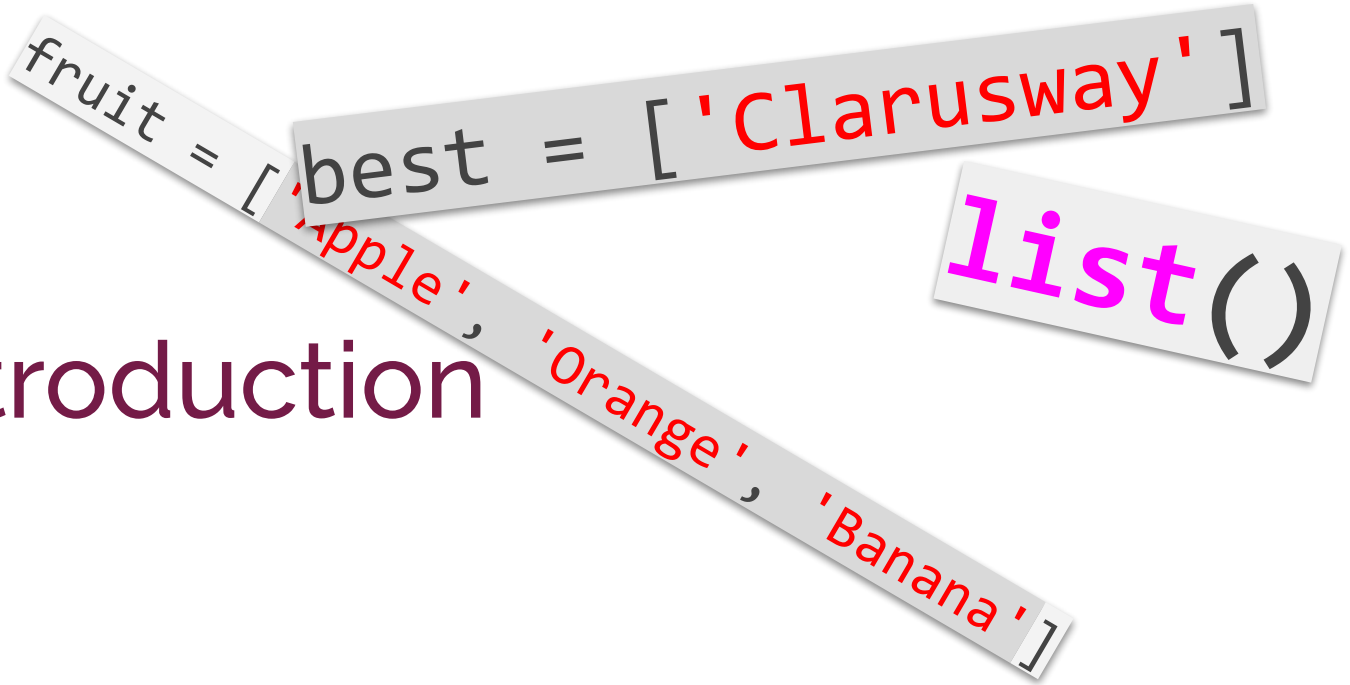

1

Introduction

What do you know about `[lists]`?

Students, write your response!

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Introduction

- **What is a collection type?**
  - There are various collection types in Python. While types such as `int` and `str` hold a **single value**, collection types hold *multiple values*.
  - In your programs, you usually need to group several items to render as a single object. We use collection types of data to do this job.

Introduction

- **What is a `list` ?**
  - One of the most useful collections in Python is a `list`.
  - In Python, a `list` is only an ordered collection of valid Python values.
  - The `list` type is probably the most commonly used collection type in Python.

2

Creating a `list`

Creating a `list`

- A `list` can be created by enclosing values, separated by commas, in square brackets 👉 `[]`.
- Another way to create a `list` is to call the `list()` function.

- `[]`
- `list()`

Creating a `list`

- A `list` can be created by enclosing values, separated by commas, in square brackets 👉 `[]`.
- Another way to create a `list` is to call the `list()` function.

- `[]`
- `list()`

```
list_1 = ['h', 'a', 'p', 'p', 'y']
word = 'happy'
list_2 = list(word)
print(list_1)
print(list_2)
```

What is the output? Try to figure out in your mind...

Creating a `list`

- A `list` can be created by enclosing values, separated by commas, in square brackets 👉 `[]`.
- Another way to create a `list` is to call the `list()` function.

- `[]`
- `list()`

```
list_1 = ['h', 'a', 'p', 'p', 'y']
word = 'happy'
list_2 = list(word)
print(list_1)
print(list_2)
```

```
['h', 'a', 'p', 'p', 'y']
['h', 'a', 'p', 'p', 'y']
```

Creating a `list` (review of pre-class)

- Here is another example of creating a `list` :

```
1  country = ['USA', 'Brasil', 'UK', 'Germany', 'Turkey', 'New Zealand']
2
3  print(country)
4
```

Creating a `list` (review of pre-class)

Here is another example of creating a `list` :

```
1  country = ['USA', 'Brasil', 'UK', 'Germany', 'Turkey', 'New Zealand']
2
3  print(country)
4
```

```
1  ['USA', 'Brasil', 'UK', 'Germany', 'Turkey', 'New Zealand']
2
```

Creating a `list` (review of pre-class)

Here is another example of creating a `list` :

```
1  country = ['USA', 'Brasil', 'UK', 'Germany', 'Turkey', 'New Zealand']
2
3  print(country)
4
```

```
1  ['USA', 'Brasil', 'UK', 'Germany', 'Turkey', 'New Zealand']
2
```

Tips:

- All the country names are printed in the same order as they were stored in the list because lists are **ordered**.

Creating a `list` (review of pre-class)

- Here is another example of creating a `list` using `list()`.
- We can do it when we want to create a `list` from an iterable object: that is, type of object whose elements you can import individually. The `list`s are iterable like other collections and `str`ing types.

```
1  string_1 = 'I quit smoking'
2
3  new_list_1 = list(string_1)  # we created multi element list
4  print(new_list_1)
5
6  new_list_2 = [string_1]  # this is a single element list
7  print(new_list_2)
8
```

What is the output? Try to figure out in your mind...

Students, write your response!
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Creating a `list` (review of pre-class)

- Here is another example of creating a `list` using `list()`.
- We can do it when we want to create a `list` from an iterable object: that is, type of object whose elements you can import individually. The `list`s are iterable like other collections and `str`ing types.

```
1  string_1 = 'I quit smoking'
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3  new_list_1 = list(string_1)  # we created multi element list
4  print(new_list_1)
5
6  new_list_2 = [string_1]  # this is a single element list
7  print(new_list_2)
8
```

```
1  ['I', ' ', 'q', 'u', 'i', 't', ' ', 's', 'm', 'o', 'k', 'i', 'n', 'g']
2  ['I quit smoking']
3
```

Creating a `list`

Tips:

- Note that, using `list()` function, all characters of string_1 including spaces was moved into a new_list_1.
- If you noticed, **lists** can contain **more than one** of the **same** value.

```
1  string_1 = 'I quit smoking'
2
3  new_list_1 = list(string_1)  # we created multi element list
4  print(new_list_1)
5
6  new_list_2 = [string_1]  # this is a single element list
7  print(new_list_2)
8
```

```
1  ['I', ' ', 'q', 'u', 'i', 't', ' ', 's', 'm', 'o', 'k', 'i', 'n', 'g']
2  ['I quit smoking']
3
```

Creating a `list`

Tips:

- Note that, using `list()` function, all characters of string_1 including spaces was moved into a new_list_1.
- If you noticed, **lists** can contain **more than one** of the **same** value.

```
1  string_1 = 'I quit smoking'
2
3  new_list_1 = list(string_1)  # we created multi element list
4  print(new_list_1)
5
6  new_list_2 = [string_1]  #  gle element list
7  print(new_list_2)
8
```

⚠ It has only one element.

⚠ It has 14 elements.

```
1  ['I', ' ', 'q', 'u', 'i', 't', ' ', 's', 'm', 'o', 'k', 'i', 'n', 'g']
2  ['I quit smoking']
3
```

Creating a `list`

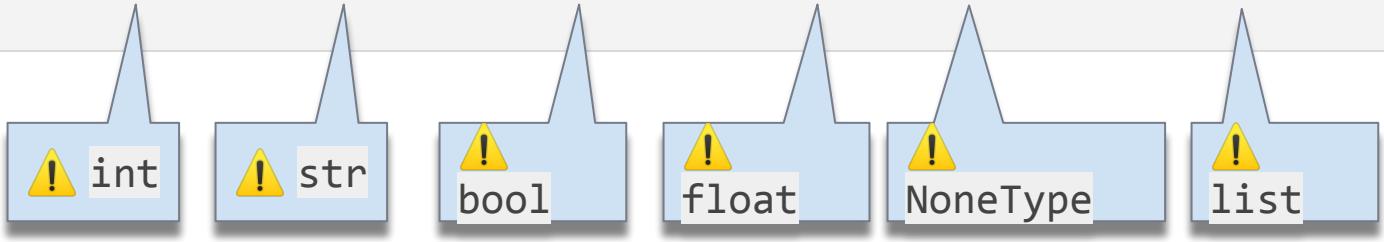
- The components of a `list` are not limited to a single data type, given that Python is a dynamic language.
- Here is an example :

```
mixed_list = [11, 'Joseph', False, 3.14, None, [1, 2, 3]]
```

Creating a `list`

- The components of a `list` are not limited to a single data type, given that Python is a dynamic language.
- Here is an example :

```
mixed_list = [11, 'Joseph', False, 3.14, None, [1, 2, 3]]
```



Creating a `list`

- Task:
  - Try to figure out the output of these list operations in your mind.

```
my_list = ['Joseph', 'Clarusway', 2020]
new_list1 = list(my_list) # what will be the output?
new_list2 = [my_list]  # what will be the output?
print(new_list1)
print(len(new_list1))  # what is the length of the variable?

print(new_list2)
print(len(new_list2))
```

Students, write your response!

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Creating a `list`

- The output:.

```
['Joseph', 'Clarusway', 2020]
3
[['Joseph', 'Clarusway', 2020]]
1
```

Creating a `list`

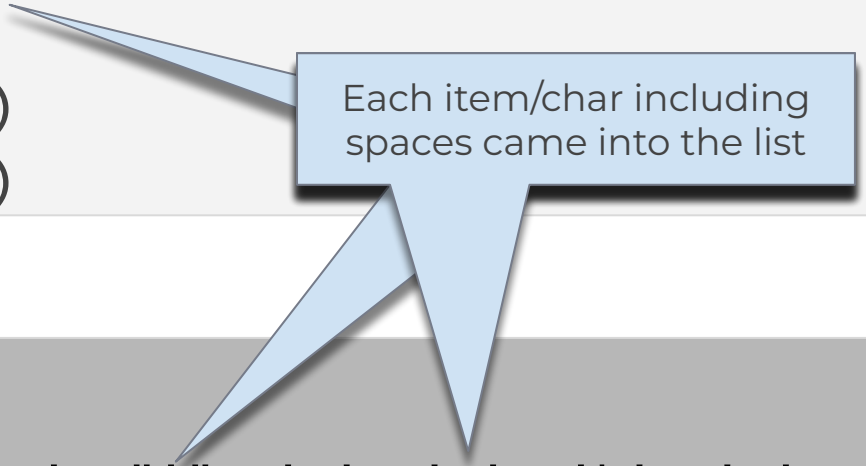
- Task:
  - Create a list from **string** value of `"2020's hard"`.
  - Use both `list()` function and square brackets `[]`.

Creating a `list`

- The code :

```
my_list1 = ["2020's hard"]
my_list2 = list("2020's hard")

print(my_list1)
print(my_list2)
```




```
["2020's hard"]
['2', '0', '2', '0', "'", 's', ' ', 'h', 'a', 'r', 'd']
```

3

Basic Operations with Lists

Basic Operations with `lists`

- In most cases, we'll have to make an empty `list` to fill it later with the data you want.

How to create an empty list?

Students choose an option

Basic Operations with `lists`

- In most cases, we'll have to make an empty `list` to fill it later with the data you want.

```
empty_list_1 = []
empty_list_2 = list()
```

Two methods for creating an empty list.

Basic Operations with `lists`

- We can add an element into a list using `.append()` or `.insert()` methods.
- `.append()` appends an object to the end of a `list`.

- `.append()`
- `.insert()`

Basic Operations with `lists`

- We can add an element into a list using `.append()` or `.insert()` methods.
- `.append()` appends an object to the end of a `list`.

- `.append()`
- `.insert()`

```
numbers = [1, 4, 7]
numbers.append(9)
numbers.append('9')
print(numbers)
```

What is the output? Try to figure out in your mind...

Basic Operations with `lists`

- We can add an element into a list using `.append()` or `.insert()` methods.
- `.append()` appends an object to the end of a `list`.

- `.append()`
- `.insert()`

```
numbers = [1, 4, 7]
numbers.append(9)
numbers.append('9')
print(numbers)
```

```
[1, 4, 7, 9, '9']
```

Basic Operations with `lists`

- Take a look at the example 👇

```
1  empty_list = []
2  empty_list.append(6666)
3  empty_list.append('Multiverse')
4  empty_list.append([0])
5
6  print(empty_list)
7
8
```

What is the output? Try to figure out in your mind...

Students, write your response!

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Basic Operations with `lists`

- Take a look at the example 👇

```
1  empty_list = []
2  empty_list.append(6666)
3  empty_list.append('Multiverse')
4  empty_list.append([0])
5
6  print(empty_list)
7
8
```

Output

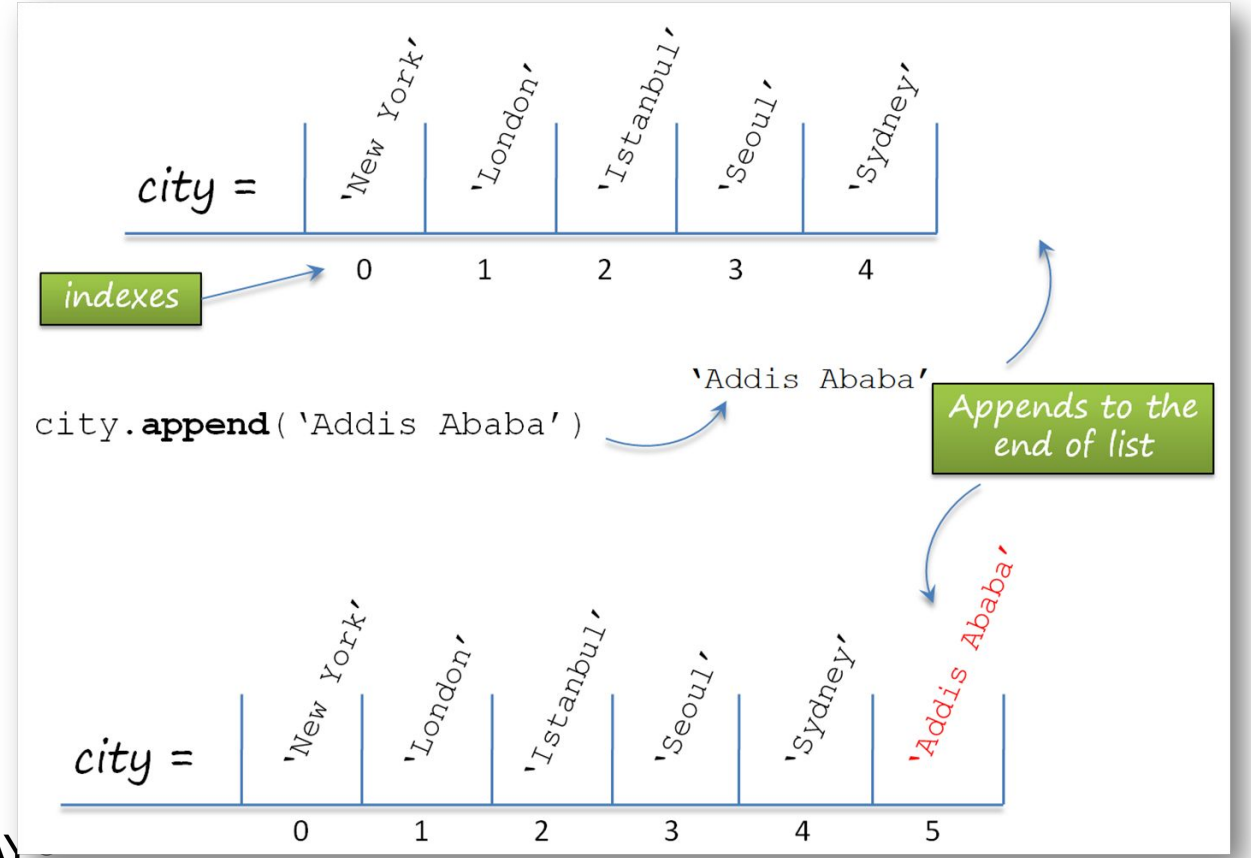
```
[6666, 'Multiverse', [0]]
```

Basic Operations with `lists`

- Here's the pre-class example 👇

```
1  city = ['New York', 'London', 'Istanbul', 'Seoul', 'Sydney']
2  city.append('Addis Ababa')
3
4  print(city)
5
```

Basic Operations with `lists`



Basic Operations with `lists`

- Here's an another example 👇

```
1  city = ['New York', 'London', 'Istanbul', 'Seoul', 'Sydney']
2  city.append('Addis Ababa')
3
4  print(city)
5
```

```
1  ['New York', 'London', 'Istanbul', 'Seoul', 'Sydney', 'Addis Ababa']
2
```

Basic Operations with `lists`

- Task :
  - Create an empty `list` and then collect the `int` numbers (1 - 4) one by one into the `list` you created using `.append()` method.

Basic Operations with `lists`

- The code can be like :

```
numbers = []
numbers.append(1)
numbers.append(2)
numbers.append(3)
numbers.append(4)

print(numbers)
```

```
[1, 2, 3, 4]
```

Basic Operations with `lists`

- `.insert()` adds a new object to the `list` at a specific (given) **index**.

- `.append()`
- `.insert()`

Basic Operations with `lists`

- `.insert()` adds a new object to the `list` at a specific (given) index.

- `.append()`
- `.insert()`

```
numbers = [1, 4, 7]
numbers.insert(2, 9)
print(numbers)
numbers.insert(2, 6)
print(numbers)
```

What is the output? Try to figure out in your mind...

Students, write your response!

Basic Operations with `lists`

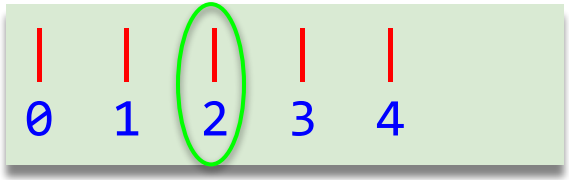
- `.insert()` adds a new object to the `list` at a specific (given) index.

- `.append()`
- `.insert()`

```
numbers = [1, 4, 7]
numbers.insert(2, 9)
print(numbers)
numbers.insert(2, 6)
print(numbers)
```

Adds into index '2'

```
[1, 4, 9, 7]
[1, 4, 6, 9, 7]
```



Basic Operations with `lists`

- Consider this pre-class example 👇

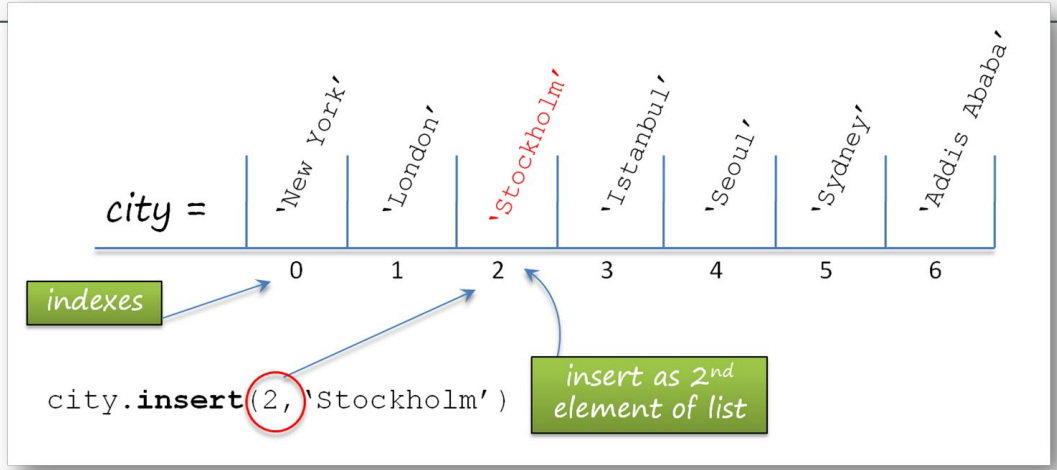
```
1  city = ['New York', 'London', 'Istanbul', 'Seoul', 'Sydney', 'Addis Ababa']
2  city.insert(2, 'Stockholm')
3
4  print(city)
5
```

Basic Operations with `lists`

- Consider this pre-class example 👇

```
1  city = ['New York', 'London', 'Istanbul', 'Seoul', 'Sydney', 'Addis Ababa']
2  city.insert(2, 'Stockholm')
3
4  print(city)
5
```

```
1  ['New York', 'London', 'Stockholm', 'Istanbul', 'Seoul', 'Sydney', 'Addis Ababa']
2
```

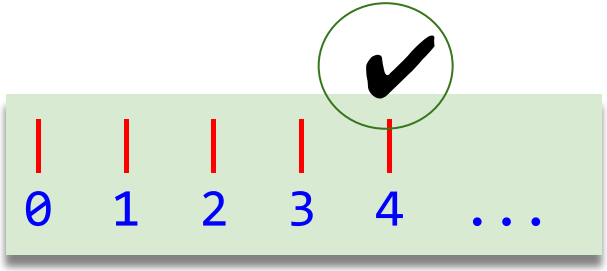


Basic Operations with `lists`

- Task :
  - Create a `list` which consists of the `int` numbers (1 - 4) and then insert number **5** at the **end** of the `list` using `.insert()` method.

Basic Operations with `lists`

- The code can be like :




```
numbers = [3, 4, 5, 6]
numbers.insert(4, 7)

print(numbers)
```

index

```
[3, 4, 5, 6, 7]
```

Basic Operations with `lists`

- We can remove and sort the elements of the `list`.
- `.remove()` removes the elements from the `list`.

- `.remove()`
- `.sort()`

Basic Operations with `lists`

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```
numbers = [1, 4, 7, 9]
numbers.remove(7)
print(numbers)
```

Basic Operations with `lists`

- We can remove and sort the elements of the `list`.
- `.remove()` removes the elements from the `list`.

- `.remove()`
- `.sort()`

```
numbers = [1, 4, 7, 9]
numbers.remove(7)
print(numbers)
```

```
[1, 4, 9]
```

Basic Operations with `lists`

- Consider this pre-class example 👇

```
1  city = ['New York', 'London', 'Stockholm', 'Istanbul', 'Seoul', 'Sydney', 'Addis Ababa']
2  city.remove('London')
3  print(city)  # we have deleted 'London'
4
```

Basic Operations with `lists`

- Consider this pre-class example 👇

```
1  city = ['New York', 'London', 'Stockholm', 'Istanbul', 'Seoul', 'Sydney', 'Addis Ababa']
2  city.remove('London')
3  print(city)  # we have deleted 'London'
4
```

```
1  ['New York', 'Stockholm', 'Istanbul', 'Seoul', 'Sydney', 'Addis Ababa']
2
```

Basic Operations with `lists`

- `.sort()` sorts the elements in the `list`.

- `.remove()`
- `.sort()`

Basic Operations with `lists`

- `.sort()` sorts the elements in the `list`.

- `.remove()`
- `.sort()`

```
numbers = [4, 1, 9, 7]
numbers.sort()
print(numbers)
```

Basic Operations with `lists`

- `.sort()` sorts the elements in the `list`.

- `.remove()`
- `.sort()`

```
numbers = [4, 1, 9, 7]
numbers.sort()
print(numbers)
```

```
[1, 4, 7, 9]
```

Basic Operations with `lists`

- Here's the pre-class example 👇

```
1  city = ['New York', 'Stockholm', 'Istanbul', 'Seoul', 'Sydney', 'Addis Ababa']
2  city.sort()  # lists the items in alphabetical order
3  print(city)
4
```

Basic Operations with `lists`

- Here's an example 👇

```
1  city = ['New York', 'Stockholm', 'Istanbul', 'Seoul', 'Sydney', 'Addis Ababa']
2  city.sort()  # lists the items in alphabetical order
3  print(city)
4
```

```
1  ['Addis Ababa', 'Istanbul', 'New York', 'Seoul', 'Stockholm', 'Sydney']
2
```

Basic Operations with `lists`

- `.sort()` sorts the elements in the `list`.

```
mix_list = ['d', 1, 'a', 7]
mix_list.sort()
print(mix_list)
```

What is the output? Try to figure out in your mind...

Students, write your response!

Basic Operations with `lists`

- `.sort()` sorts the elements in the `list`.

```
mix_list = ['d', 1, 'a', 7]
mix_list.sort()
print(mix_list)
```

```
TypeError                                 Traceback (most recent call
last)
<ipython-input-7-ad44188425eb> in <module>
      1 mix_list = ['d', 1, 'a', 7]
----> 2 mix_list.sort()
      3 print(mix_list)

TypeError: '<' not supported between instances of 'int' and 'str'
```

Basic Operations with `lists`

- `.sort()` sorts the elements in the `list`.

```
mix_li
mix_li
print(
```

The items to be sorted in the list should be the same type.

```
TypeErro                                                    recent call
last)
<ipythor
      1 mix_list = [ 'd', 1, 'a', 7]
----> 2 mix_list.sort()
      3 print(mix_list)

TypeError: '<' not supported between instances of 'int' and 'str'
```

Basic Operations with `lists`

- Sort these elements in the `lists`. **Do not** play with **Playground**, push your brains!..

```
list_1 = ['one', 'four', 'nine']
list_2 = ['*-', '@', 'False']
list_3 = [True, False]
list_4 = [[3], [44], [-12]]
list_5 = [[1, 3], [44, 0], [-12, 1]]
```

Basic Operations with `lists`

- Now! You can Play with **Playgrounds**. 😀

```
list_1 = ['one', 'four', 'nine']
list_2 = ['*-', '@', 'False']
list_3 = [True, False]
list_4 = [[3], [44], [-12]]
list_5 = [[1, 3], [44, -40], [-12, 1]]
```

Basic Operations with `lists`

- We can also measure the length of the list by using `len()` function. Take a look at this pre-class example 👇

```
1  city = ['Addis Ababa', 'Istanbul', 'New York', 'Seoul', 'Stockholm', 'Sydney']
2  print(len(city))
3
```

Basic Operations with `lists`

- We can also measure the length of the list by using `len()` function. Take a look at this pre-class example 👇

```
1  city = ['Addis Ababa', 'Istanbul', 'New York', 'Seoul', 'Stockholm', 'Sydney']
2  print(len(city))
3
```

```
1  6
2
```

Basic Operations with `lists`

- Calculate the length of these `lists`. **Do not** play with **Playground**, push your brains!..

```
list_1 = ['one', 'four', 'nine']
list_2 = ['*-', 4, 'False', 0]
list_3 = [True, False]
```

Circle how you are feeling:

Pear Deck

Students, draw anywhere on this slide!

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THANKS!

End of the Lesson

(Lists)

next Lesson

Accessing Lists

click above