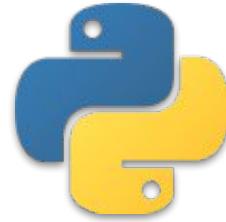




Collection Types

- List
- Tuple
- Dictionary
- Set





Lists

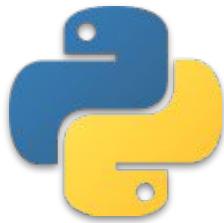


Table of Contents



- ▶ Introduction
- ▶ Creating a List
- ▶ Basic Operations with Lists



1

Introduction

```
fruit = [ 'apple', 'orange', 'Banana' ]  
best = [ 'Clarusway' ]  
list()
```



What do you know
about [lists]?



Students, write your response!

Introduction



▶ What is a collection type?

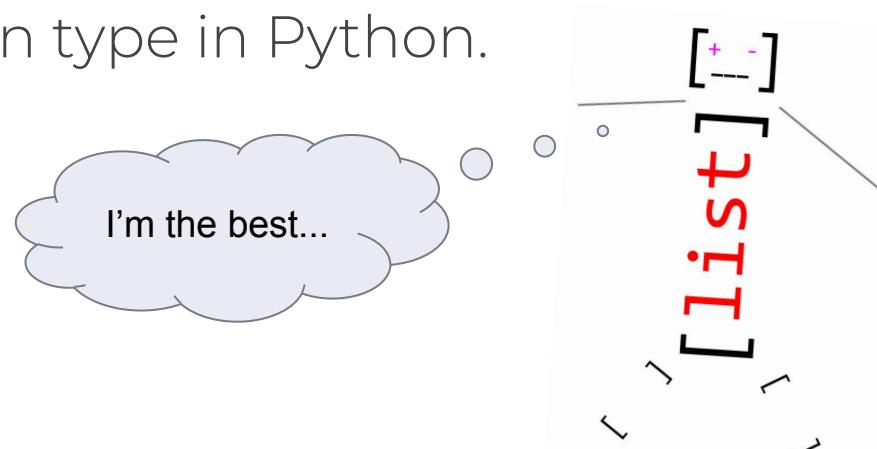
- ▷ There are various **collection types** in Python. While types such as `int` and `str` hold a single value, collection types hold *multiple values*.
- ▷ In your programs, you usually need to group several items to render as a single object. We use **collection types** of data to do this job.

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 `lists` are iterable like other collections and `string` 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 `lists` are iterable like other collections and `string` 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
```

```
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] # single element list  
7 print(new_list_2)  
8
```

! It has only one element.

single element list

! 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

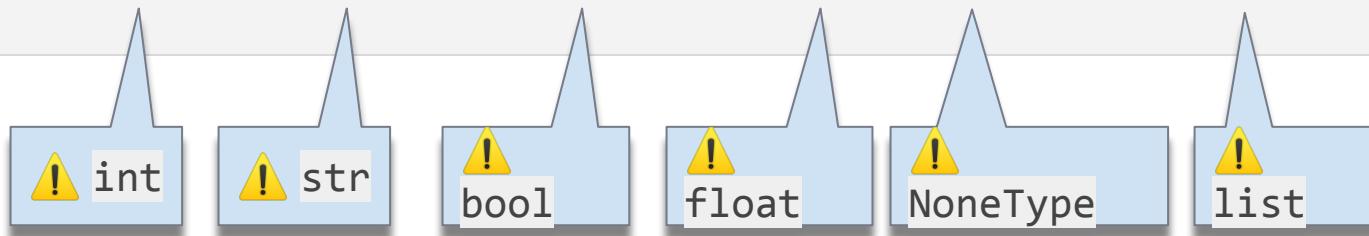
- ▶ The components of a **list** are not limited to a single data type, given that Python is a dynamic language.
- ▶ Here is an example :

```
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!

WAY TO REINVENT YOURSELF

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)
```

Each item/char including
spaces came into the list

```
["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

REINVENT YOURSELF

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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!

REINVENT YOURSELF

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]]
```

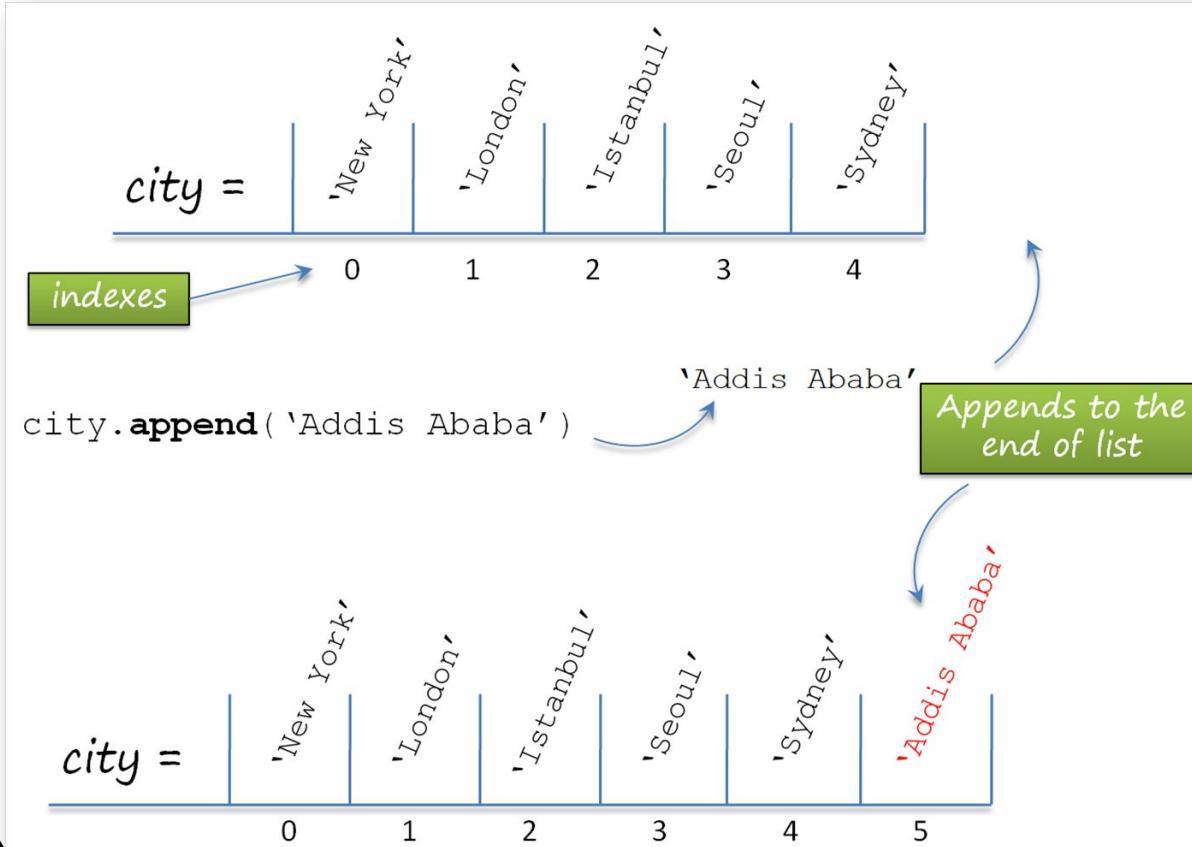
Basic Operations with lists

- ▶ 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...



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]

0	1	2	3	4

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

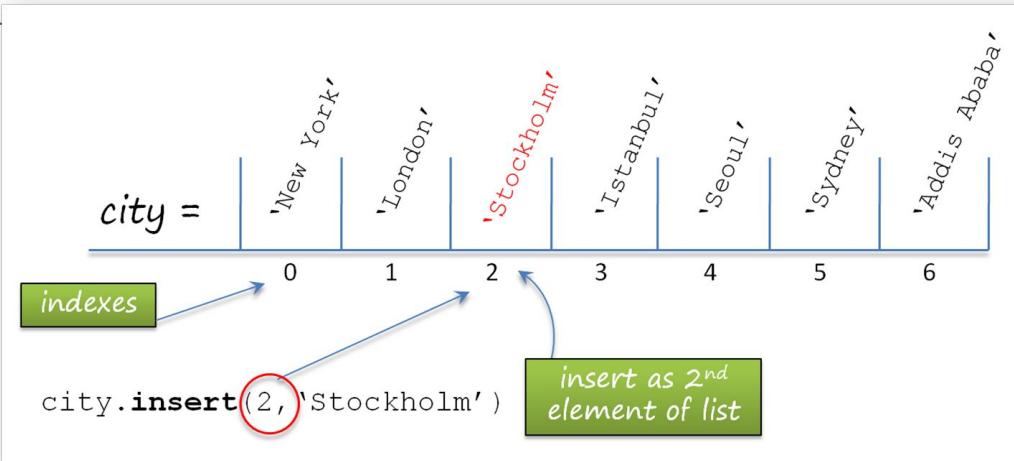


- ▶ Consider this pre-class example



```
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



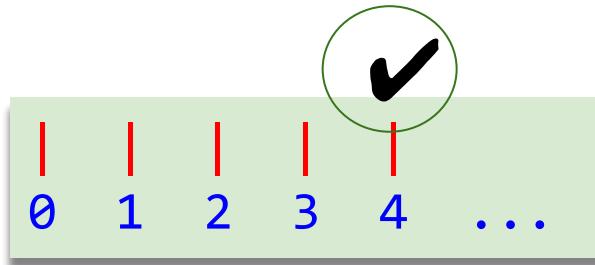
▶ Task :

- ▷ 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 = [1, 2, 3, 4]  
numbers.insert(4, 5)
```

```
print(numbers)
```

index

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

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



- 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)
```



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)
```



USWY[®]
Students, write your response!
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Do not remove this bar



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!

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Basic Operations with lists



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

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

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

```
Traceback (most recent call
```

```
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()  
  
TypeError:  
last)  
<ipython  
1 mix_list = [ 0 , 1 ,  a , 7 ]  
----> 2 mix_list.sort()  
3 print(mix_list)
```

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

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
```

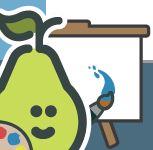
Basic Operations with lists



- ▶ 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:



Students, draw anywhere on this slide!

THANKS!

End of the Lesson (Lists)

next Lesson

Accessing Lists

click above

