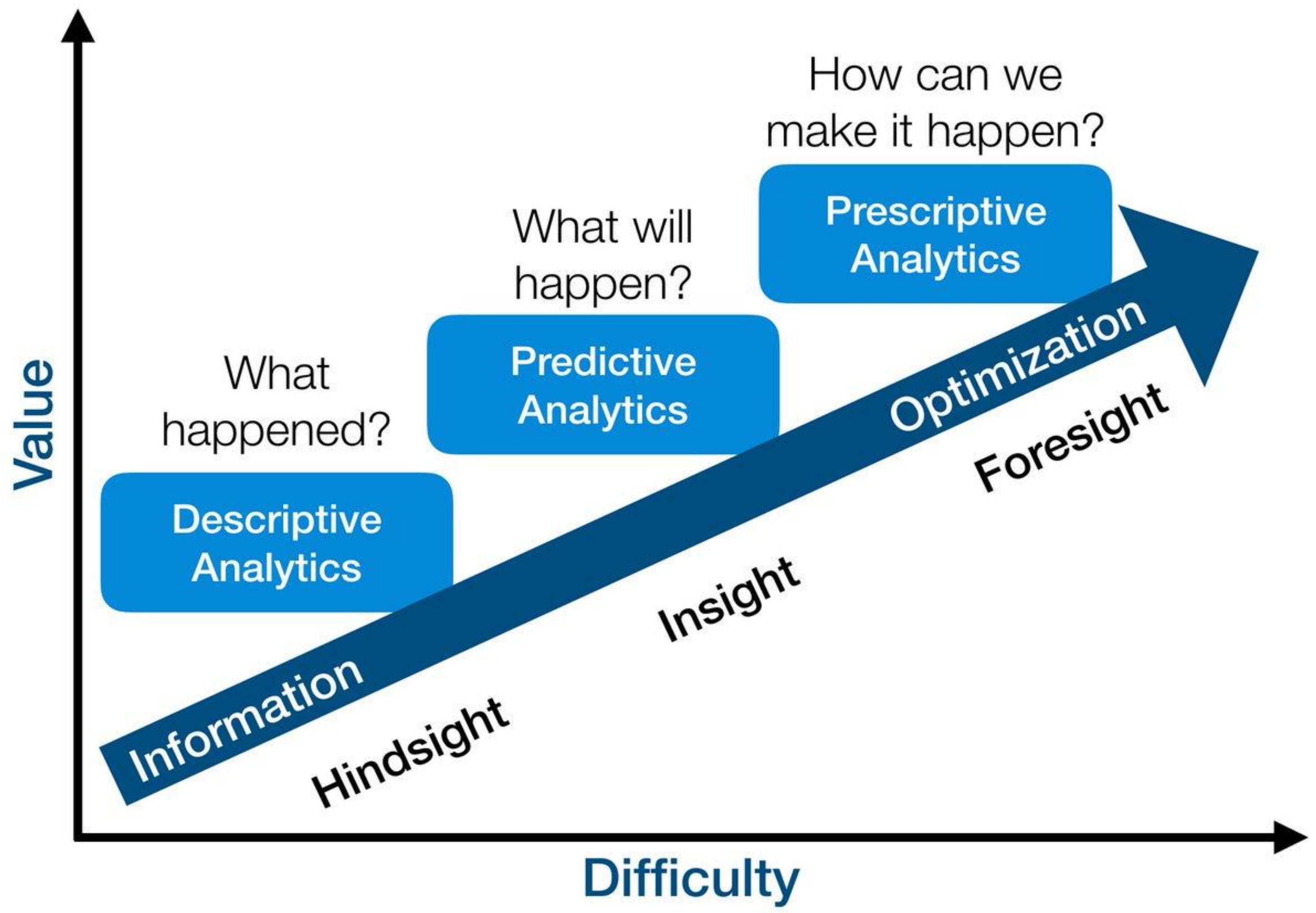
Python for Analytics

Analytics ?

Types of Analytics ?

Descriptive Predictive Prescriptive

Descriptive	Predictive	Prescriptive
What has happened?	What could happen in the future?	What should a business do?


Value
Difficulty
What happened?
Descriptive Analytics
What will happen?
Predictive Analytics
How can we make it happen?
Prescriptive Analytics
Information
Optimization
Hindsight
Insight
Foresight

Python

Who gifted Python ?

Guido Van Rossam

- 1989
- National Research institute in Netherland

Guido VanRossam -

"Over six years ago, in December 1989, I was looking for a hobby programming project that would keep me occupied during the week around Christmas. My office would be closed, but I had a home computer, and not much else on my hands. I decided to write an interpreter for the new scripting language I had been thinking about lately: a descendant of ABC that would appeal to Unix/C hackers. I chose Python as a working title for the project, being in a slightly irreverent mood and a big fan of Monty Python's Flying Circus."

Why Python?

Simple & Easy To Learn

Open Source

```
a=3
b=5
Sum=a+b
```

High-level

Interpreted

Large community

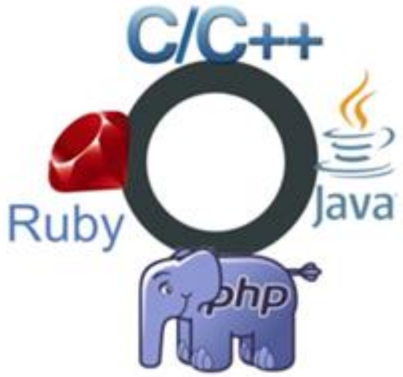
Java

```
public class HelloWorld {
    public static void main(String[] args) {
        System.out.println("Hello, world");
    }
}
```

Python

```
print("Hello, world")
```

It's that **SIMPLE**!



Web Development

- Develop web applications
- Scrape websites

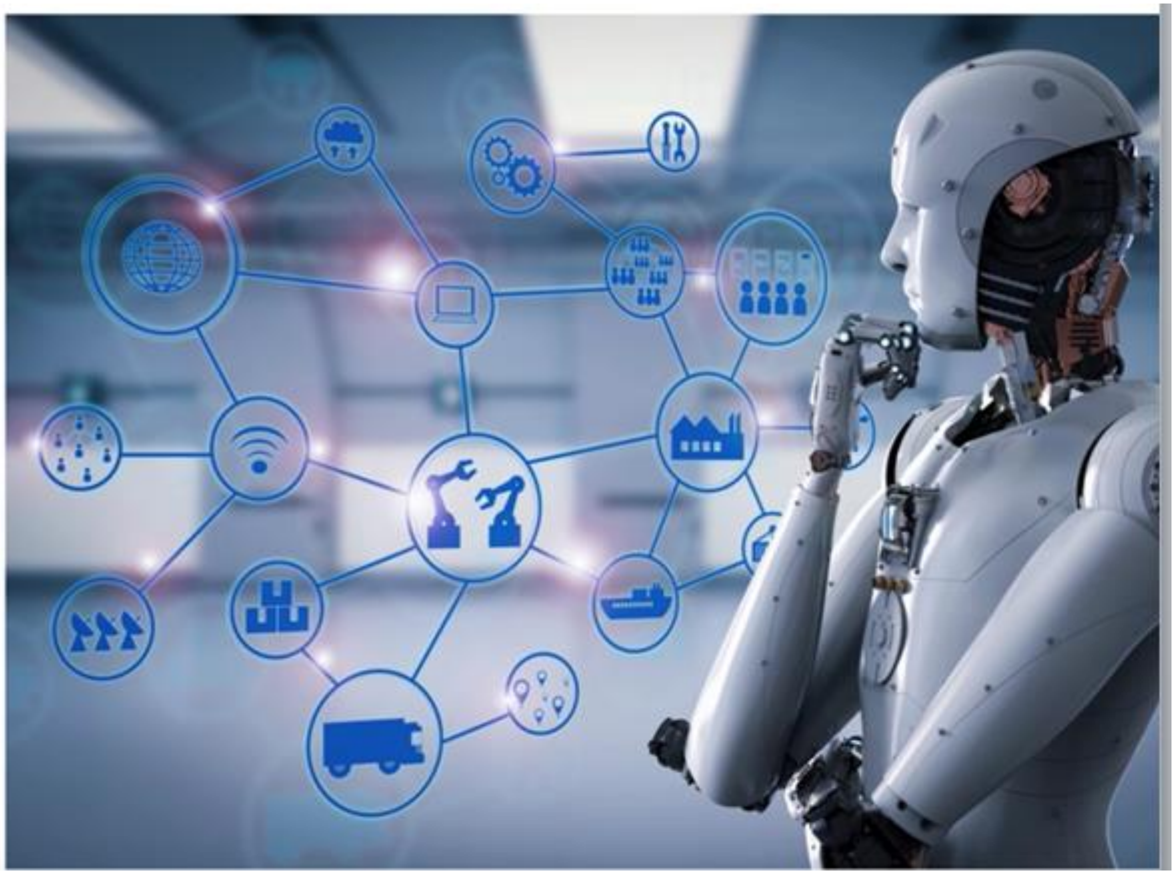
Frameworks

django | Flask | Pylons | WEB2PY

Artificial Intelligence

Libraries

- Scikit-learn
- Keras
- Tensorflow
- Opencv



Big Data

- Python handles **BIG DATA!**
- Python supports parallel computing
- You can write MapReduce codes in Python

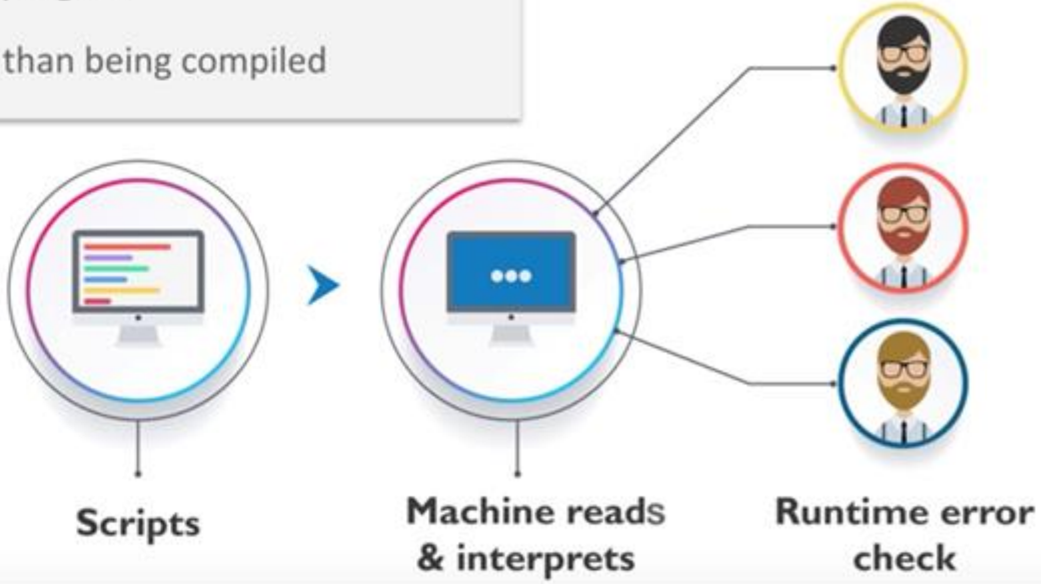
hadoop HDFS

Libraries

PYDOOP | DASK | PySpark

Scripting: Automation

- It is the most popular scripting language in the industry
- Automate certain tasks in a program
- They are interpreted rather than being compiled



Data Science

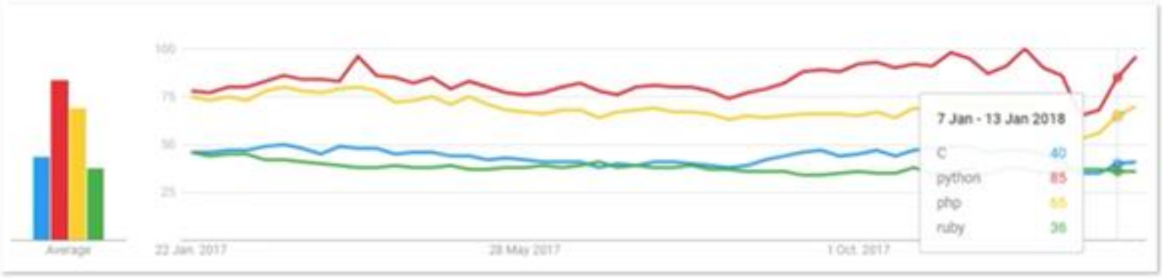
- ➢ Well-suited for data manipulation & analysis
- ➢ Deals with tabular data with heterogeneously-typed columns
- ➢ Arbitrary matrix data
- ➢ Observational/ statistical datasets

Libraries

NumPy | Pandas | matplotlib | seaborn

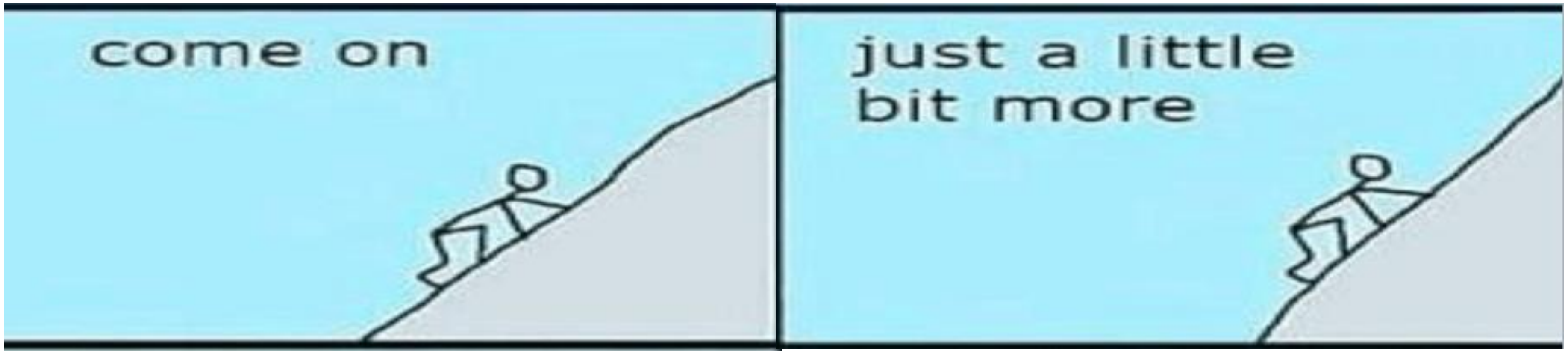
Popularity & High Salary

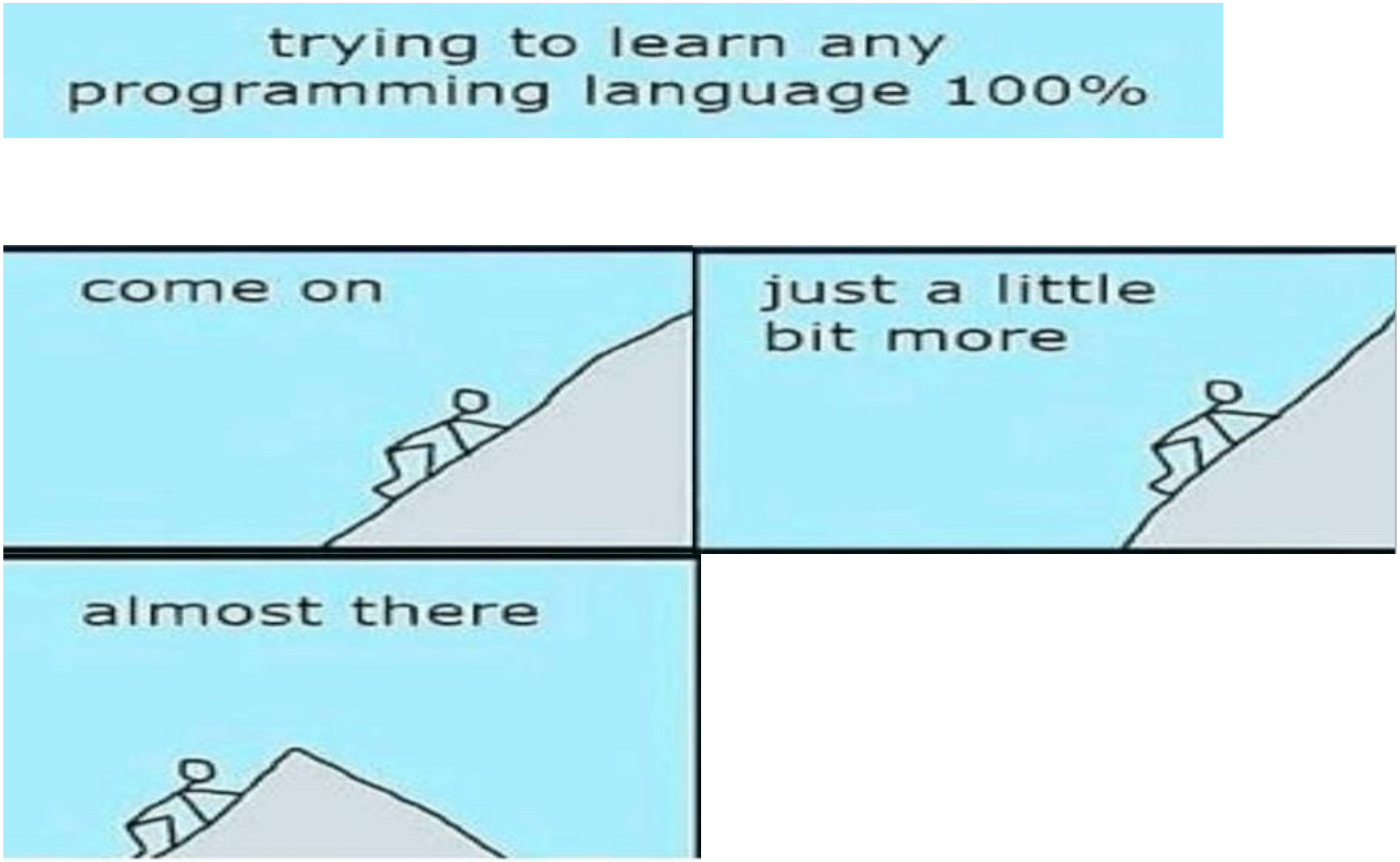
USD $116,028

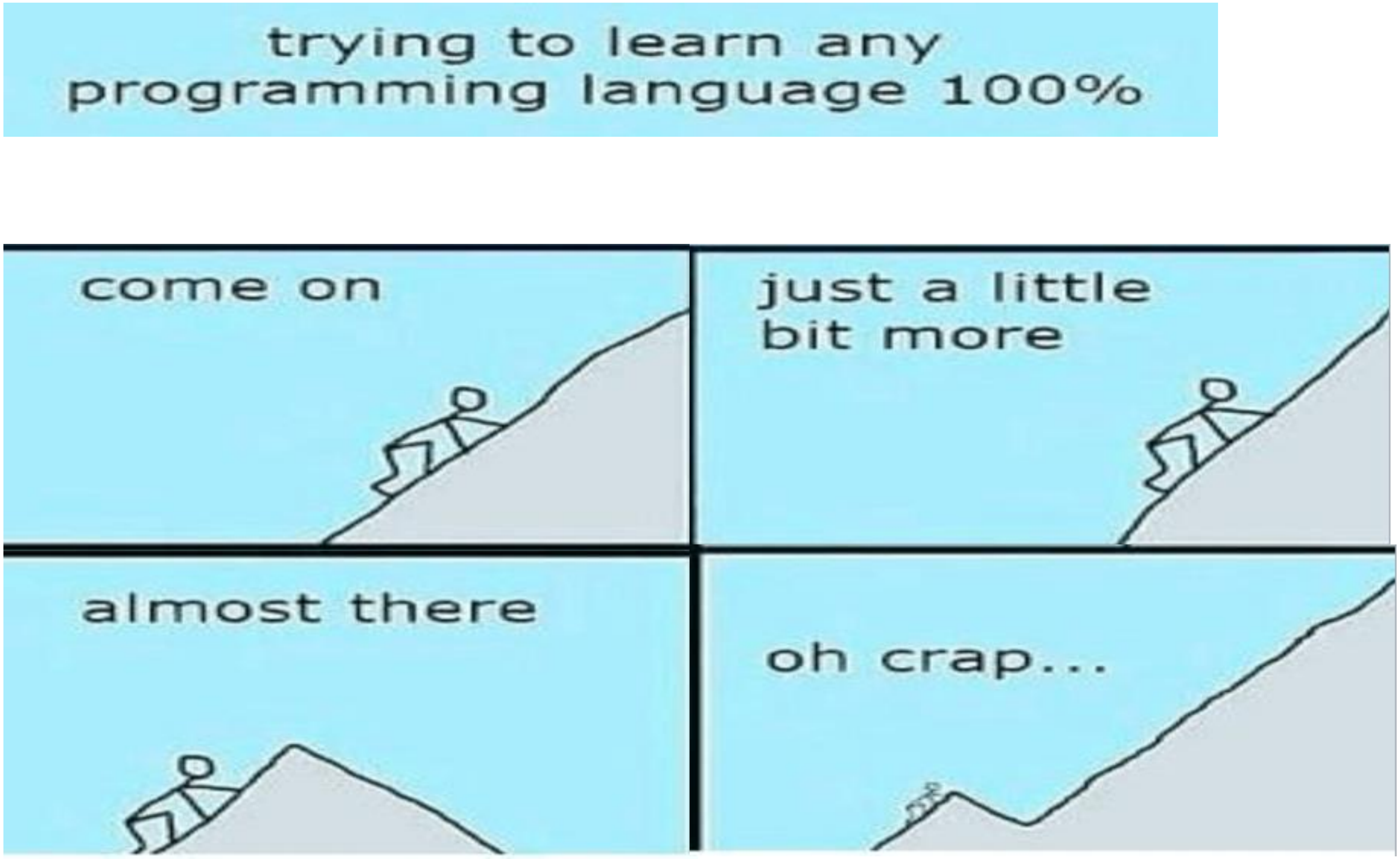


Big Giants

trying to learn any programming language 100%




trying to learn any programming language 100%
come on
just a little bit more
almost there


trying to learn any programming language 100%
come on
just a little bit more
almost there
oh crap...

Lets Get Started with Python

- Launch Anaconda/Jupyter

Aa
case sensitive
≠
Case Sensitive

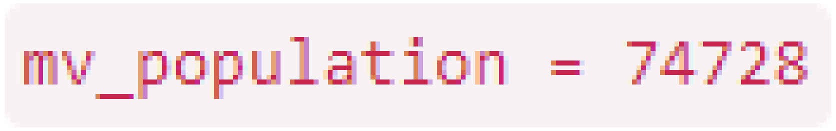
spacing
matters

Errors
are not bad!

Data Types

1. Integers
2. Floats
3. Boolean
4. String

Variables & Assignment Operators



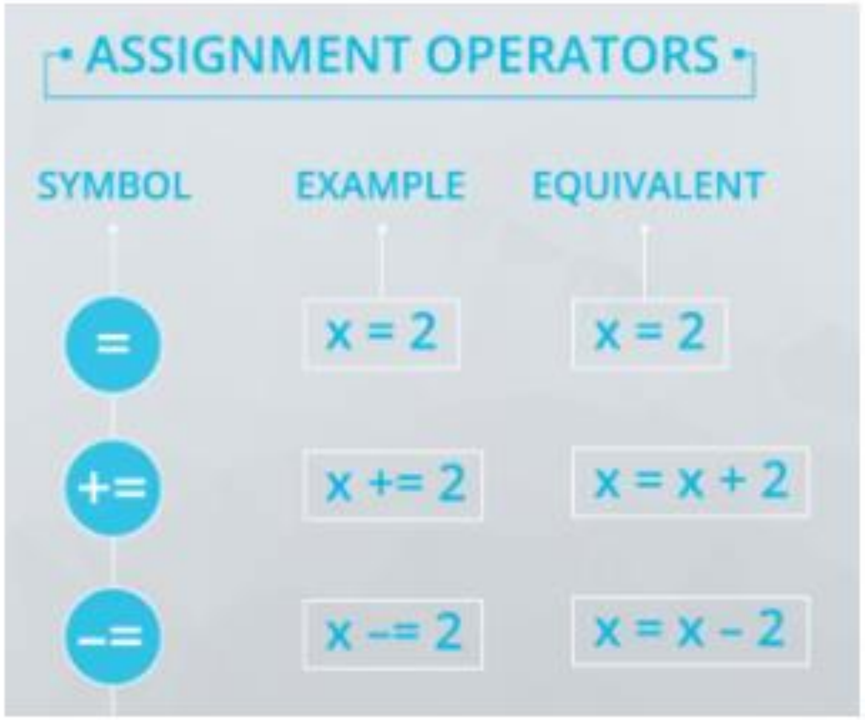
```
mv_population = 74728
```

NOTE: You can't use reserved words or built-in identifiers

Keywords in Python programming language

False	class	finally	is	return
None	continue	for	lambda	try
True	def	from	nonlocal	while
and	del	global	not	with
as	elif	if	or	yield
assert	else	import	pass	
break	except	in	raise	

Variables & Assignment Operators



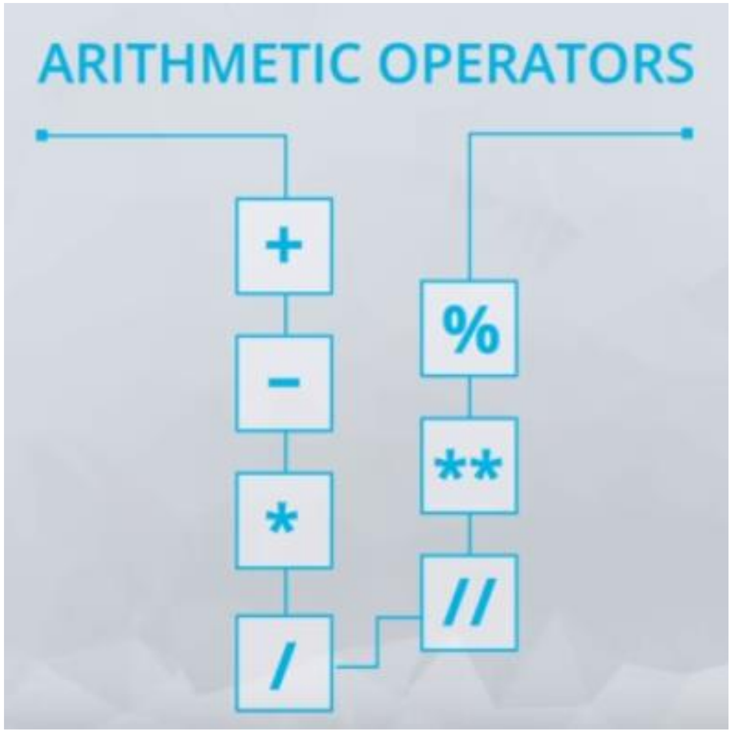
ASSIGNMENT OPERATORS

SYMBOL	EXAMPLE	EQUIVALENT
=	x = 2	x = 2
+=	x += 2	x = x + 2
–=	x –= 2	x = x – 2

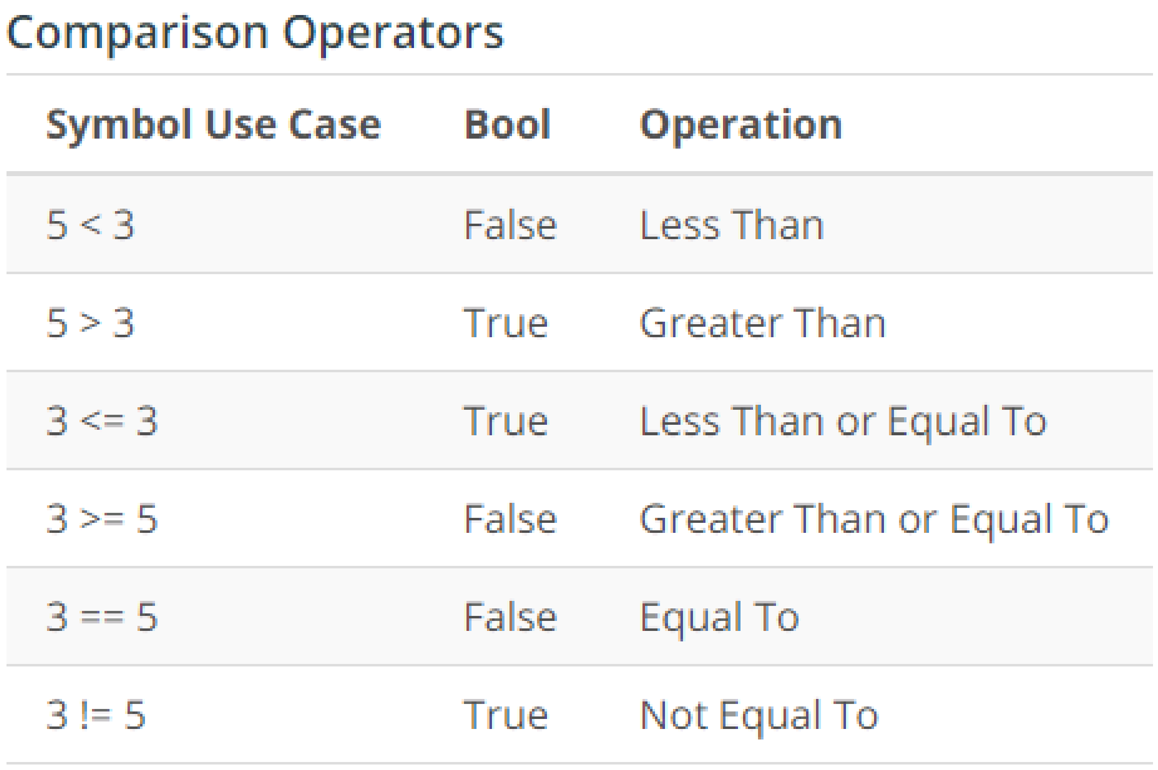
Operators

1. **Arithmetic**
2. **Comparison**
3. **Logical**

1. Arithmetic Operators



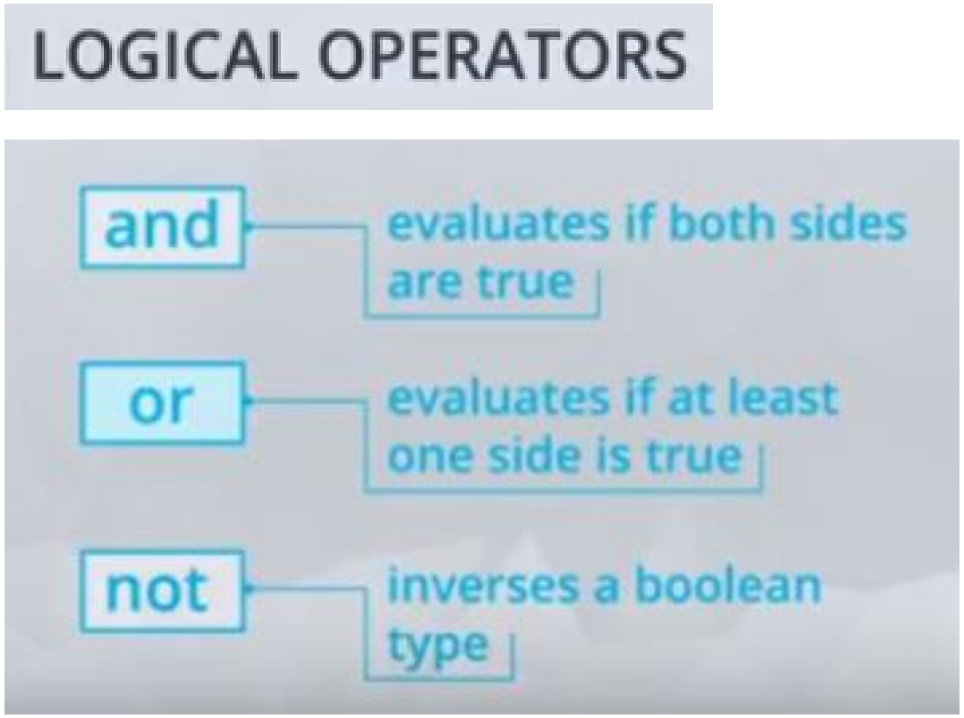
2. Comparison Operators



Comparison Operators

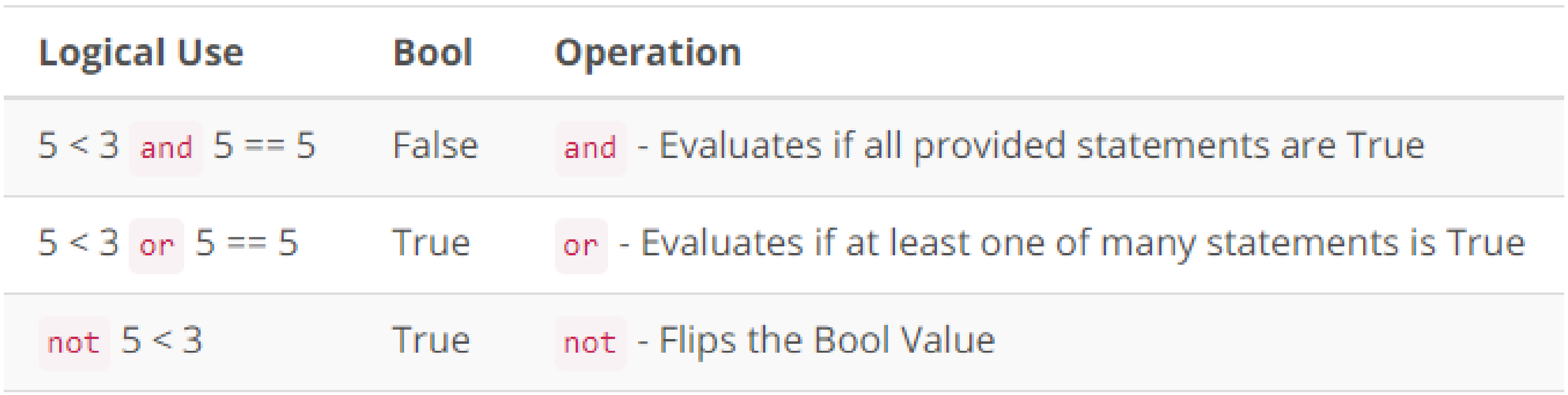
Symbol Use Case	Bool	Operation
5 < 3	False	Less Than
5 > 3	True	Greater Than
3 <= 3	True	Less Than or Equal To
3 >= 5	False	Greater Than or Equal To
3 == 5	False	Equal To
3 != 5	True	Not Equal To

3. Logical Operators


LOGICAL OPERATORS

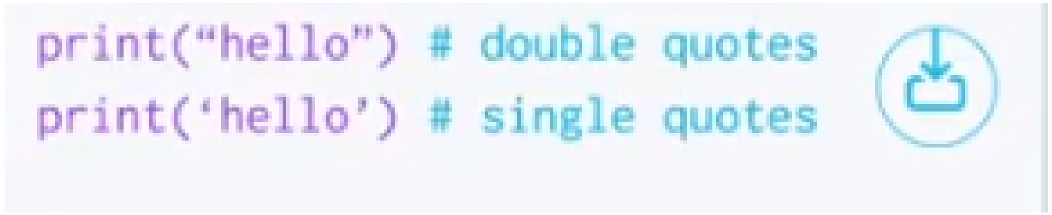
and	evaluates if both sides are true
or	evaluates if at least one side is true
not	inverses a boolean type

Boolean Results – Comparison/Logical Operators

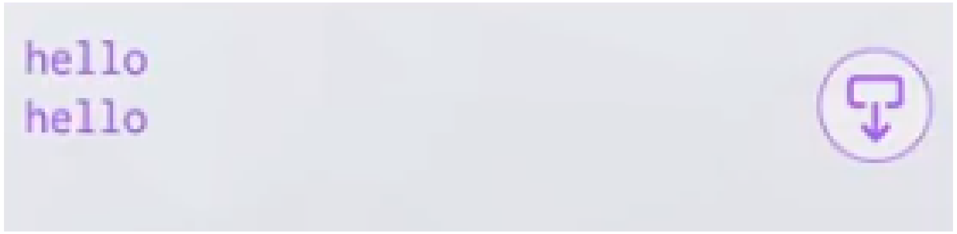


Logical Use	Bool	Operation
5 < 3 `and` 5 == 5	False	`and` - Evaluates if all provided statements are True
5 < 3 `or` 5 == 5	True	`or` - Evaluates if at least one of many statements is True
`not` 5 < 3	True	`not` - Flips the Bool Value

String - Data Type

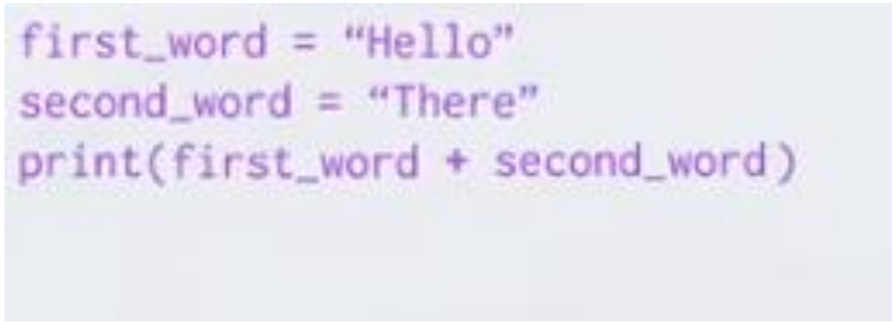


```
print("hello") # double quotes
print('hello') # single quotes
```

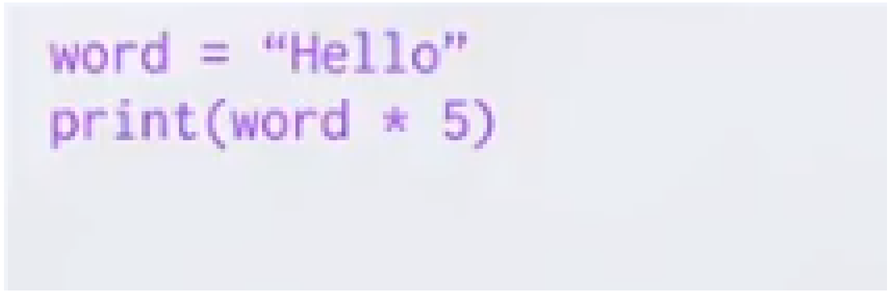


```
hello
hello
```

String - Addition / Multiplication

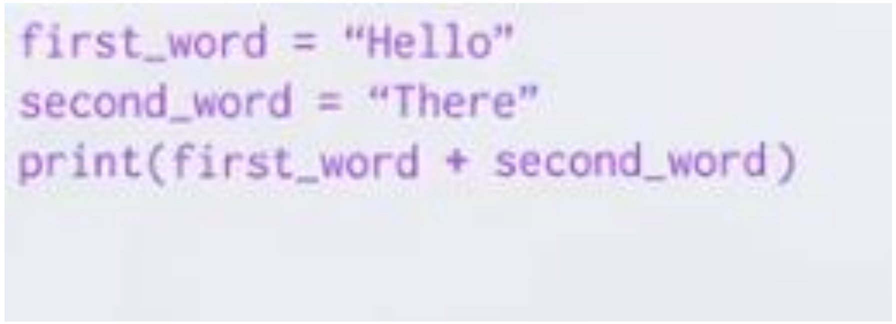


```
first_word = “Hello”
second_word = “There”
print(first_word + second_word)
```



```
word = “Hello”
print(word * 5)
```

String - Addition / Multiplication



```
first_word = "Hello"
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print(first_word + second_word)
```
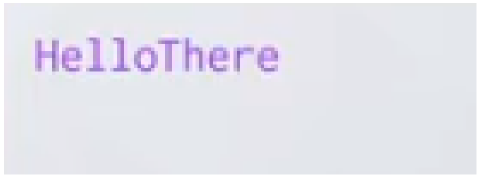
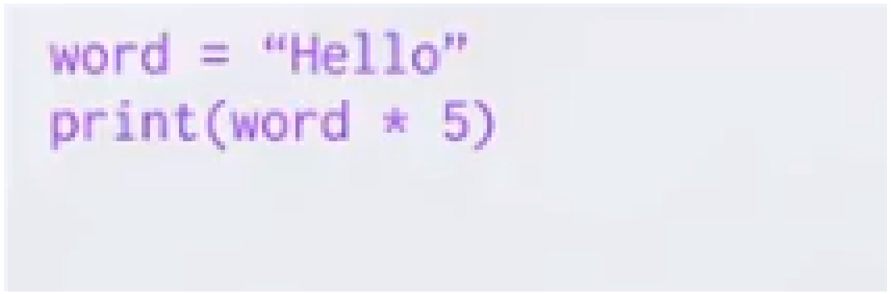
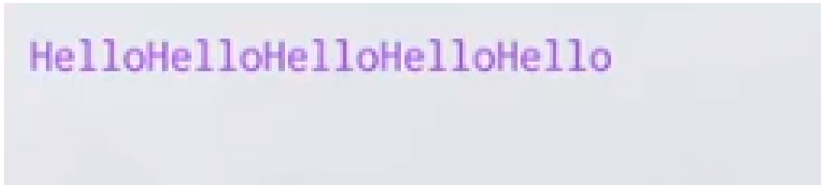



```
HelloThere
```



```
word = "Hello"
print(word * 5)
```

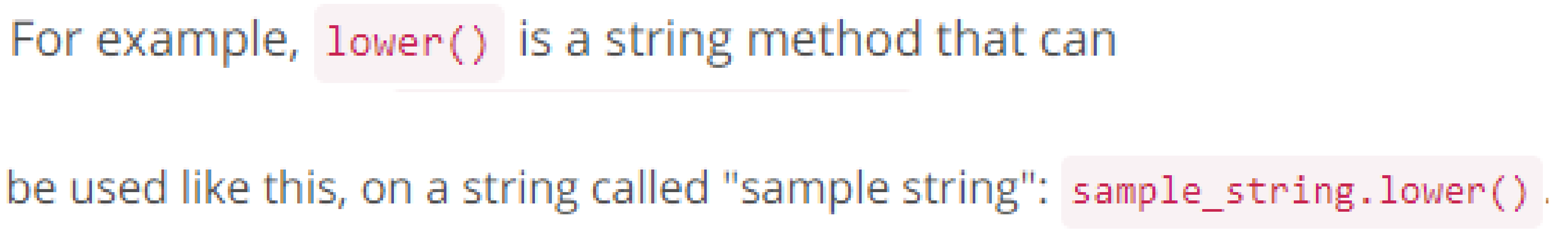


```
HelloHelloHelloHelloHello
```

String Methods

Methods actually are functions that belong to an object/specific to the data type and are called using **dot notation**.

String Methods

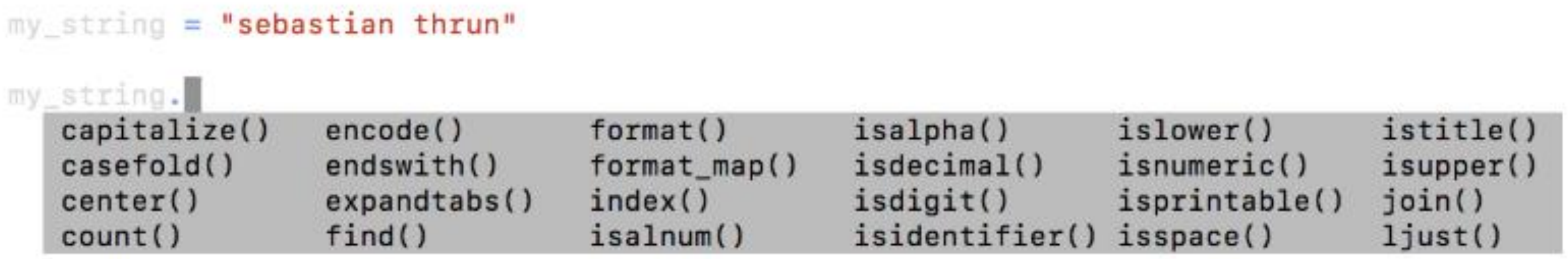


For example, `lower()` is a string method that can

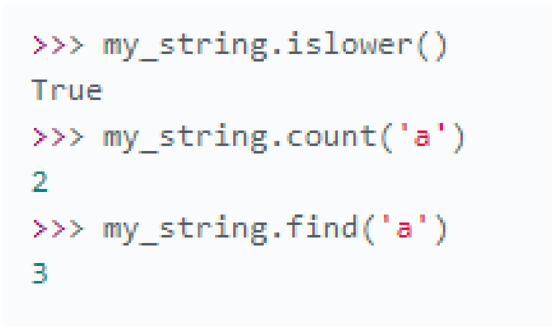
be used like this, on a string called "sample string": `sample_string.lower()`

String Methods

some methods that are possible with any string.

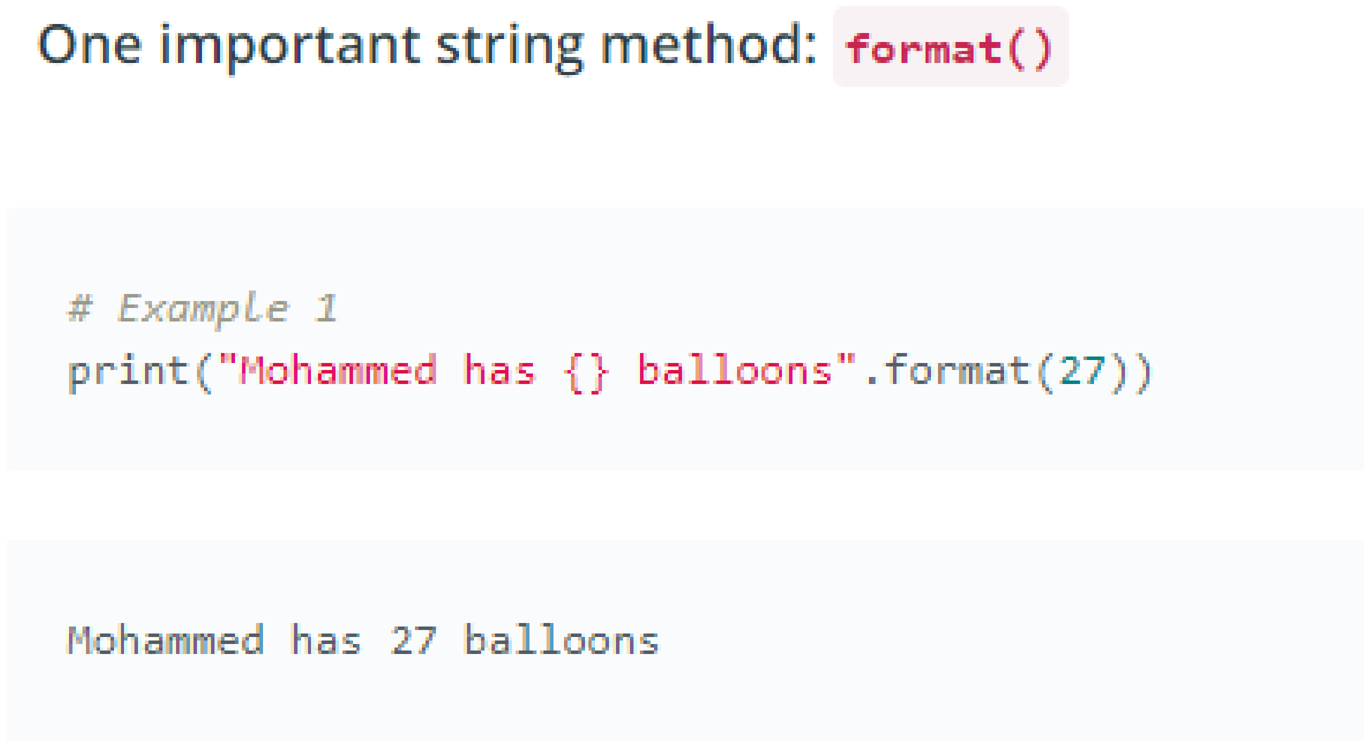


```
my_string = "sebastian thrun"

my_string.
 capitalize()   encode()       format()       isalpha()       islower()      istitle()
 casefold()     endswith()     format_map()   isdecimal()     isnumeric()    isupper()
 center()       expandtabs()   index()        isdigit()       isprintable()  join()
 count()        find()         isalnum()      isidentifier()  isspace()      ljust()
```



```
>>> my_string.islower()
True
>>> my_string.count('a')
2
>>> my_string.find('a')
3
```

String Methods

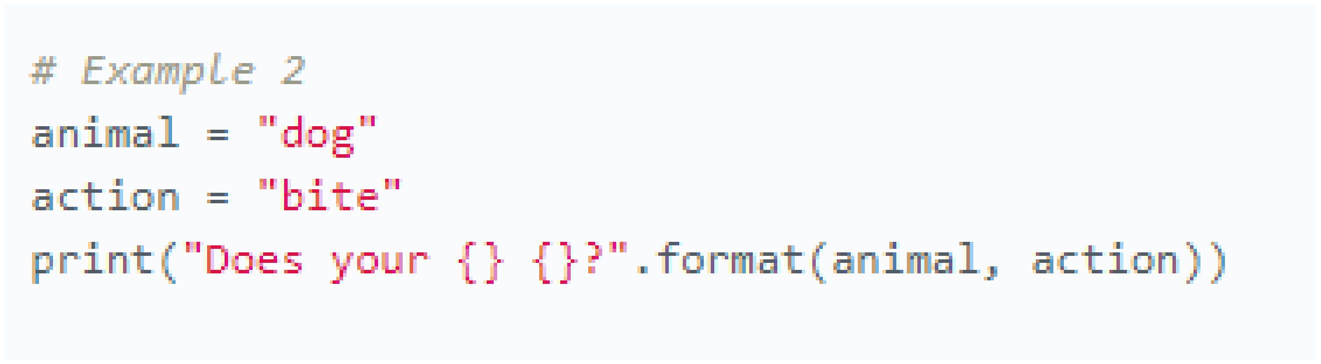


One important string method: `format()`

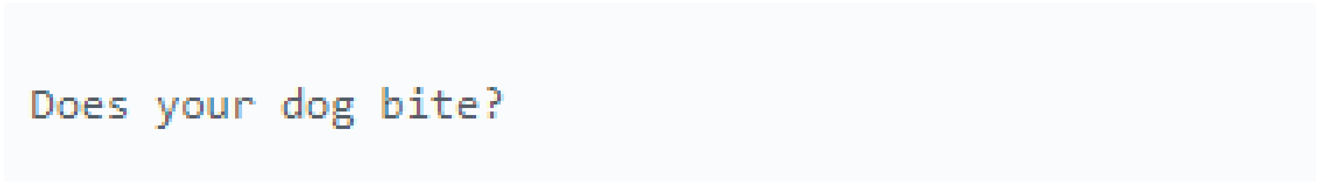
```
# Example 1
print("Mohammed has {} balloons".format(27))
```

```
Mohammed has 27 balloons
```

String Methods

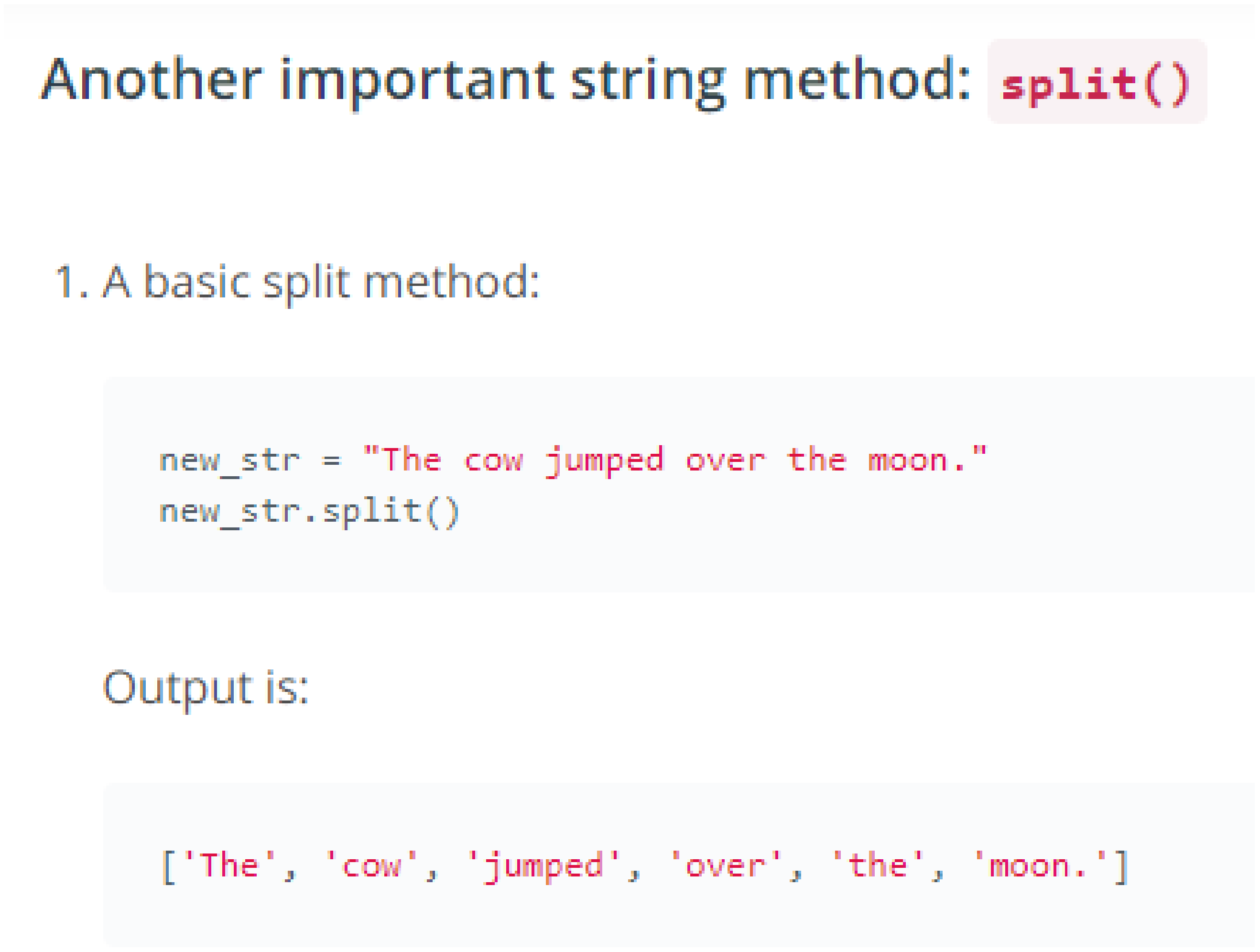


```
# Example 2
animal = "dog"
action = "bite"
print("Does your {} {}?".format(animal, action))
```



```
Does your dog bite?
```

String Methods



Another important string method: `split()`

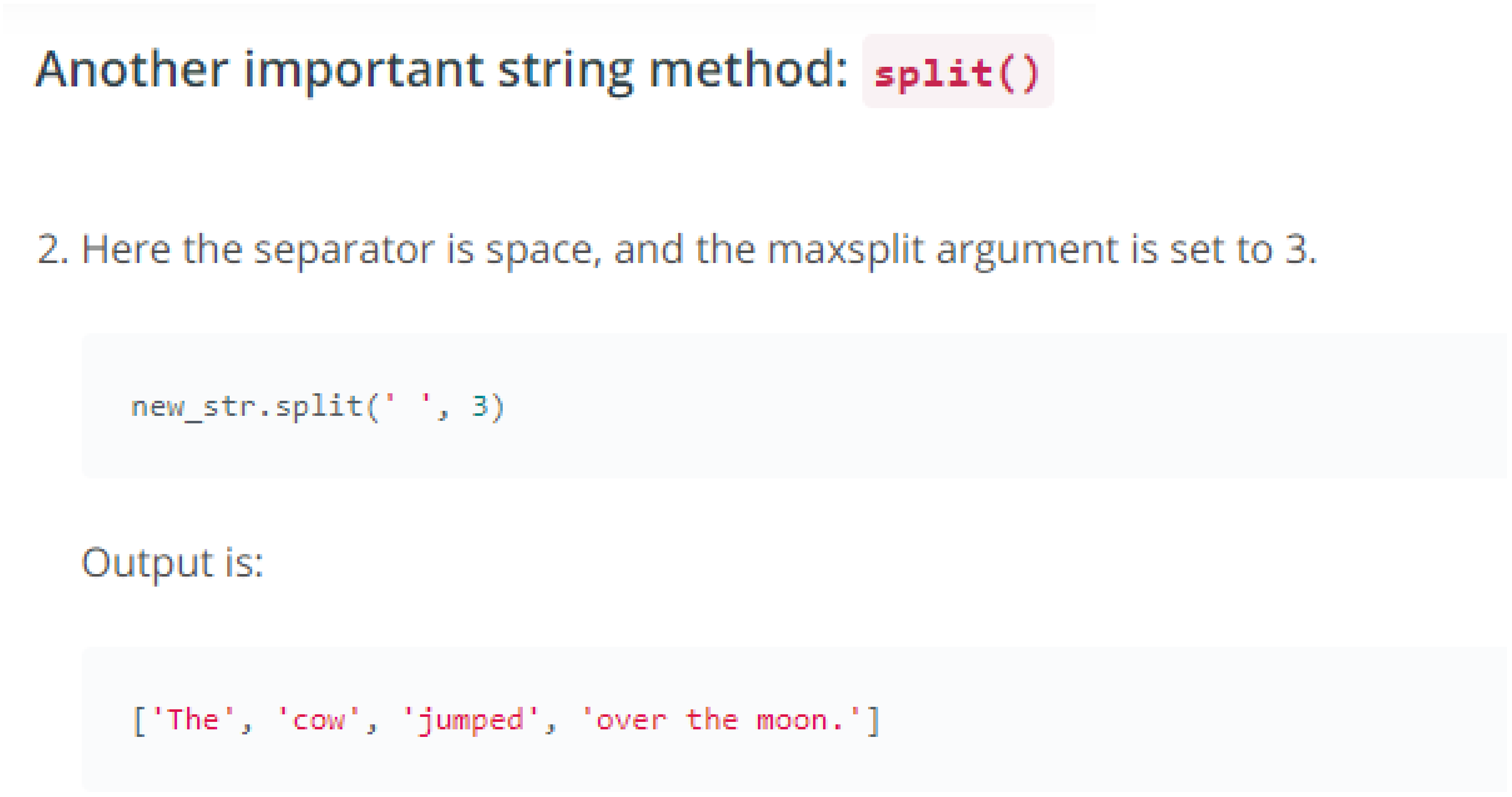
1. A basic split method:

```
new_str = "The cow jumped over the moon."
new_str.split()
```

Output is:

```
['The', 'cow', 'jumped', 'over', 'the', 'moon.']
```

String Methods



Another important string method: `split()`

2. Here the separator is space, and the maxsplit argument is set to 3.

```
new_str.split(' ', 3)
```

Output is:

```
['The', 'cow', 'jumped', 'over the moon.']
```

Type and Type Conversion

Data structures

Data structures

1. List
2. Tuples
3. Set
4. Dictionary

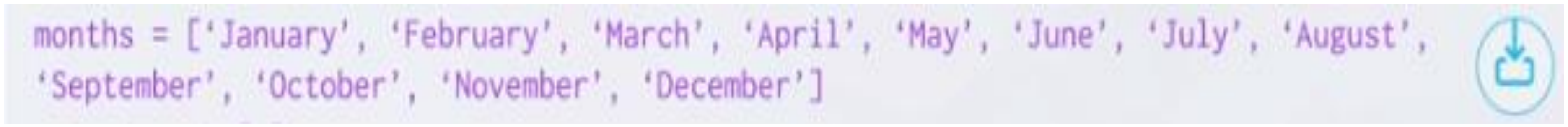
Also Compound Data structure

List

Data structures are containers that organize and group different data types together.

List is one of the most common and basic data structures in Python.

List



```
months = ['January', 'February', 'March', 'April', 'May', 'June', 'July', 'August',
'September', 'October', 'November', 'December']
```

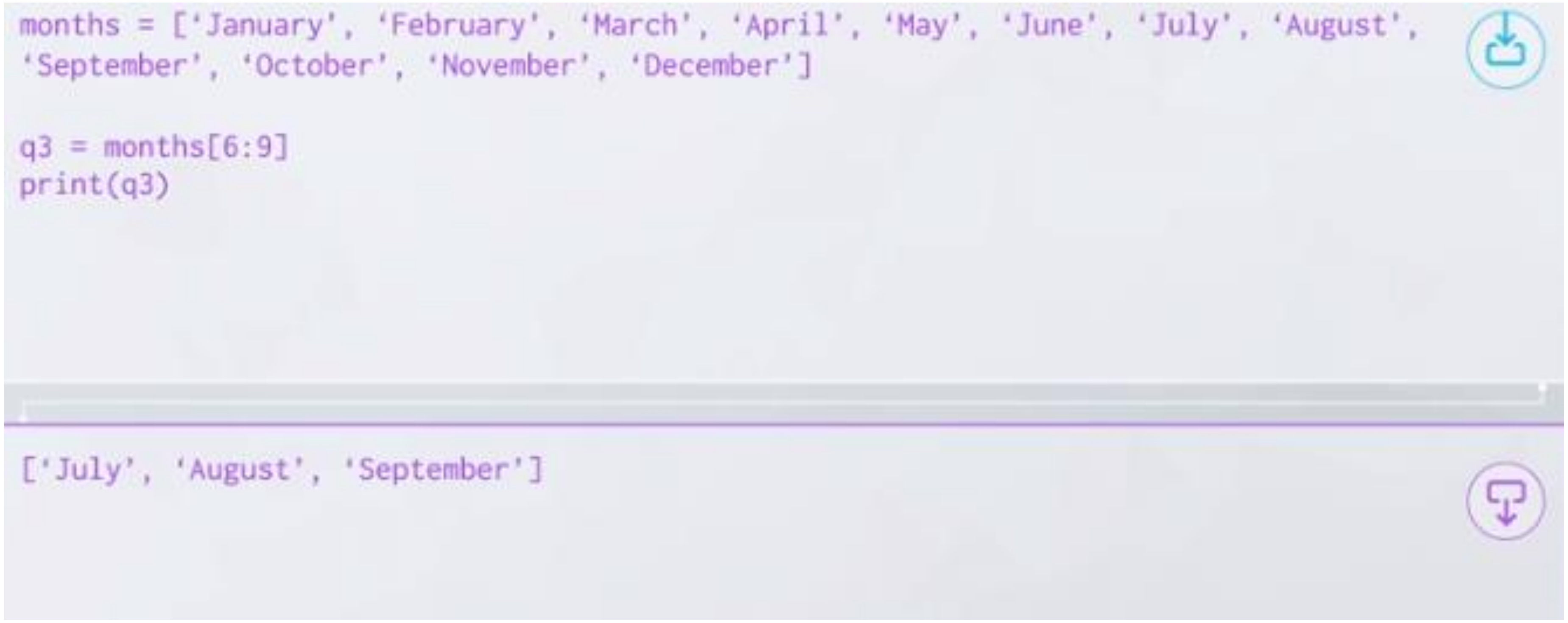
List - Indexing

```
months = [‘January’, ‘February’, ‘March’, ‘April’, ‘May’, ‘June’, ‘July’, ‘August’,
‘September’, ‘October’, ‘November’, ‘December’]
```

```
print(months[0])
print(months[1])
print(months[7])
```

```
January
February
August
```

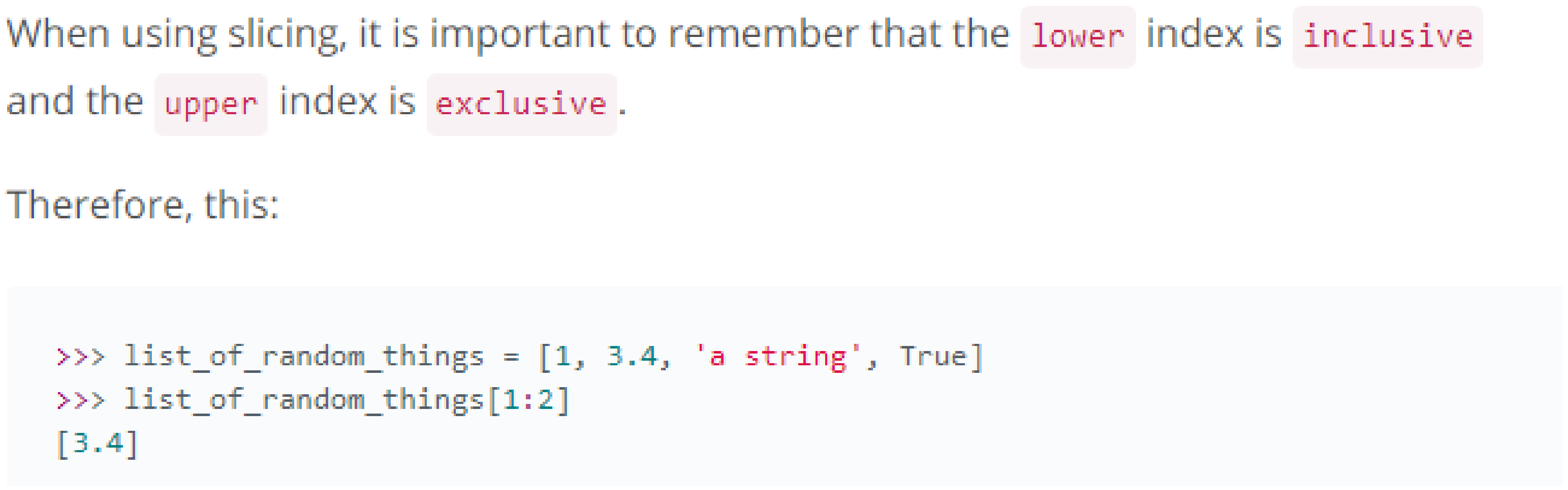
Slice and Dice with Lists



```
months = ['January', 'February', 'March', 'April', 'May', 'June', 'July', 'August',
'September', 'October', 'November', 'December']

q3 = months[6:9]
print(q3)
```

```
['July', 'August', 'September']
```

Slice and Dice with Lists

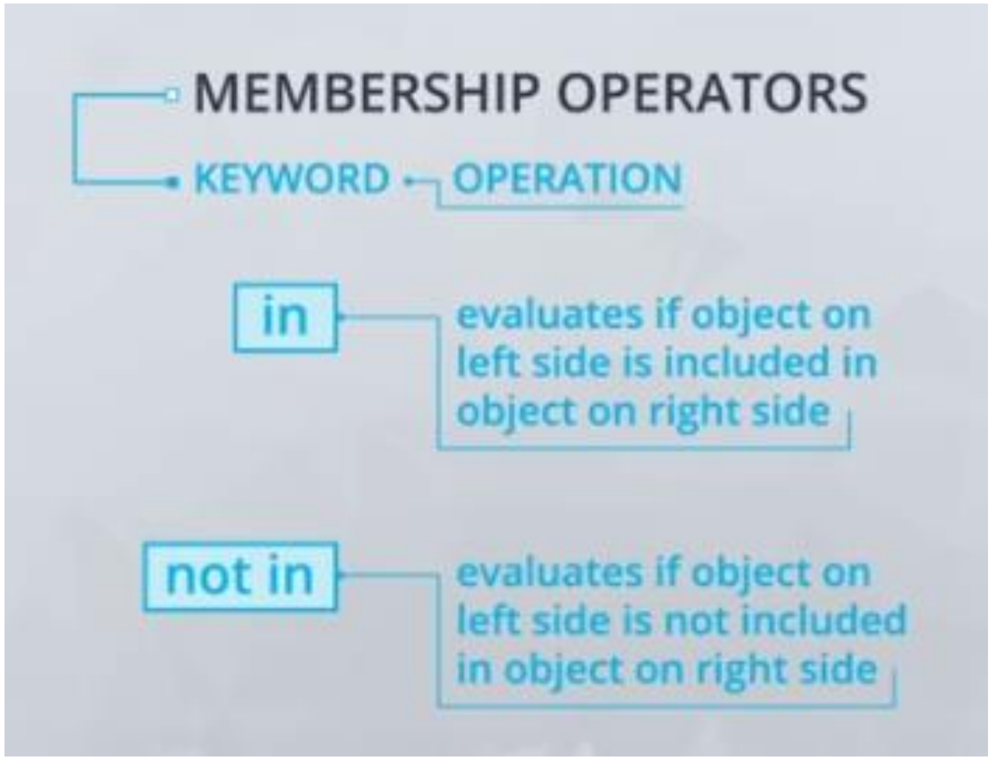


When using slicing, it is important to remember that the `lower` index is `inclusive` and the `upper` index is `exclusive`.

Therefore, this:

```
>>> list_of_random_things = [1, 3.4, 'a string', True]
>>> list_of_random_things[1:2]
[3.4]
```

Membership Operators



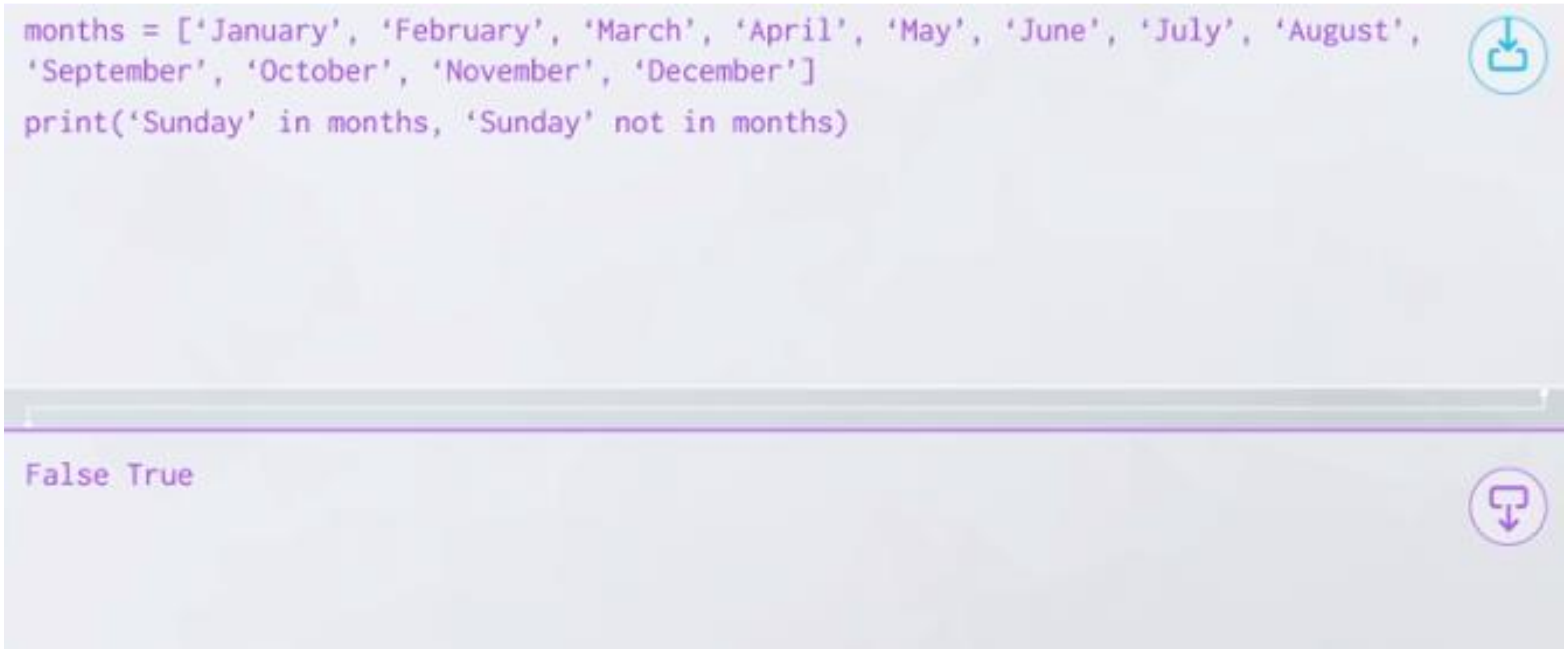
MEMBERSHIP OPERATORS

KEYWORD — OPERATION

in — evaluates if object on left side is included in object on right side

not in — evaluates if object on left side is not included in object on right side

List and Membership Operators



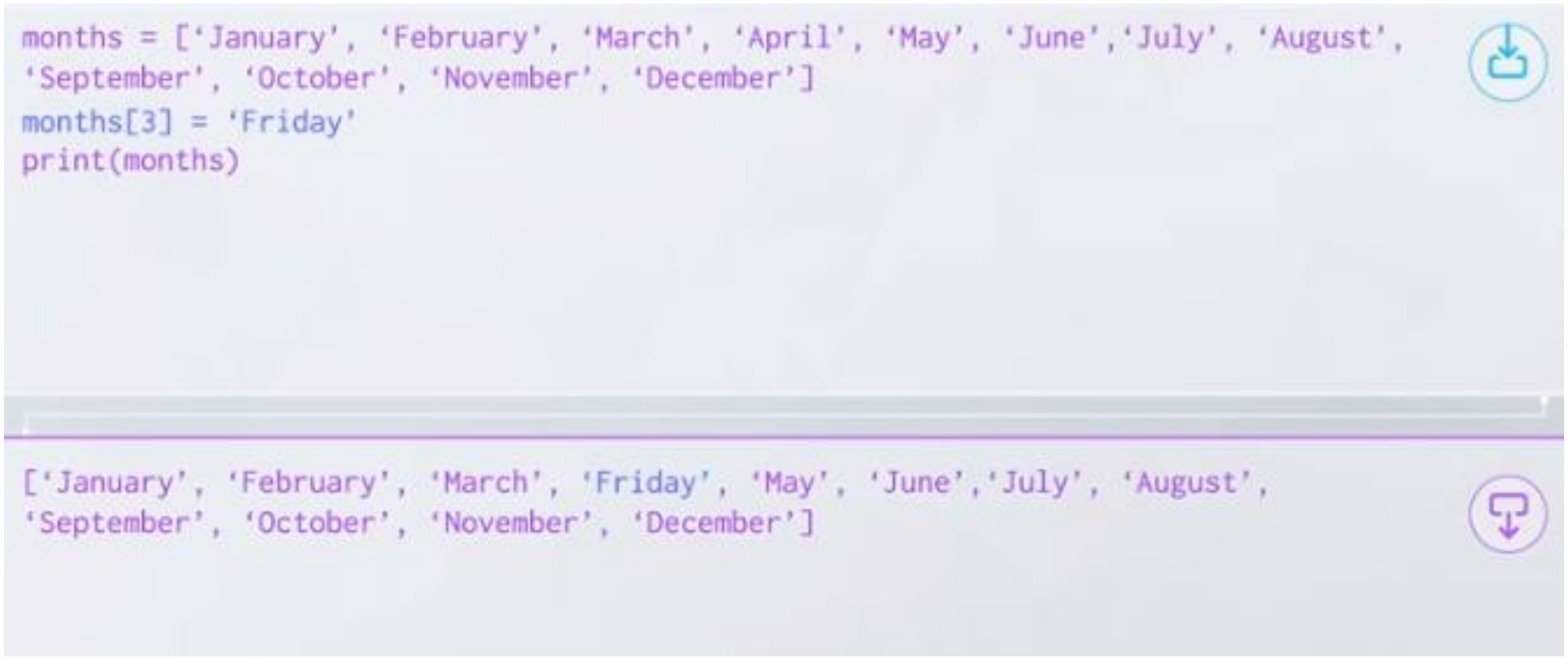
```
months = ['January', 'February', 'March', 'April', 'May', 'June', 'July', 'August',
'September', 'October', 'November', 'December']
print('Sunday' in months, 'Sunday' not in months)
```

```
False True
```

Mutability

- **Mutability** is about whether or not we can change an object once it has been created.
- If an object can be changed, then it is called **mutable**.
- If an object cannot be changed without creating a completely new object then the object is considered **immutable**.

Mutability



```
months = ['January', 'February', 'March', 'April', 'May', 'June','July', 'August',
'September', 'October', 'November', 'December']
months[3] = 'Friday'
print(months)
```

```
['January', 'February', 'March', 'Friday', 'May', 'June','July', 'August',
'September', 'October', 'November', 'December']
```

List Methods

Join method

Join is a string method that takes a list of strings as an argument, and returns a string consisting of the list elements joined by a separator string.

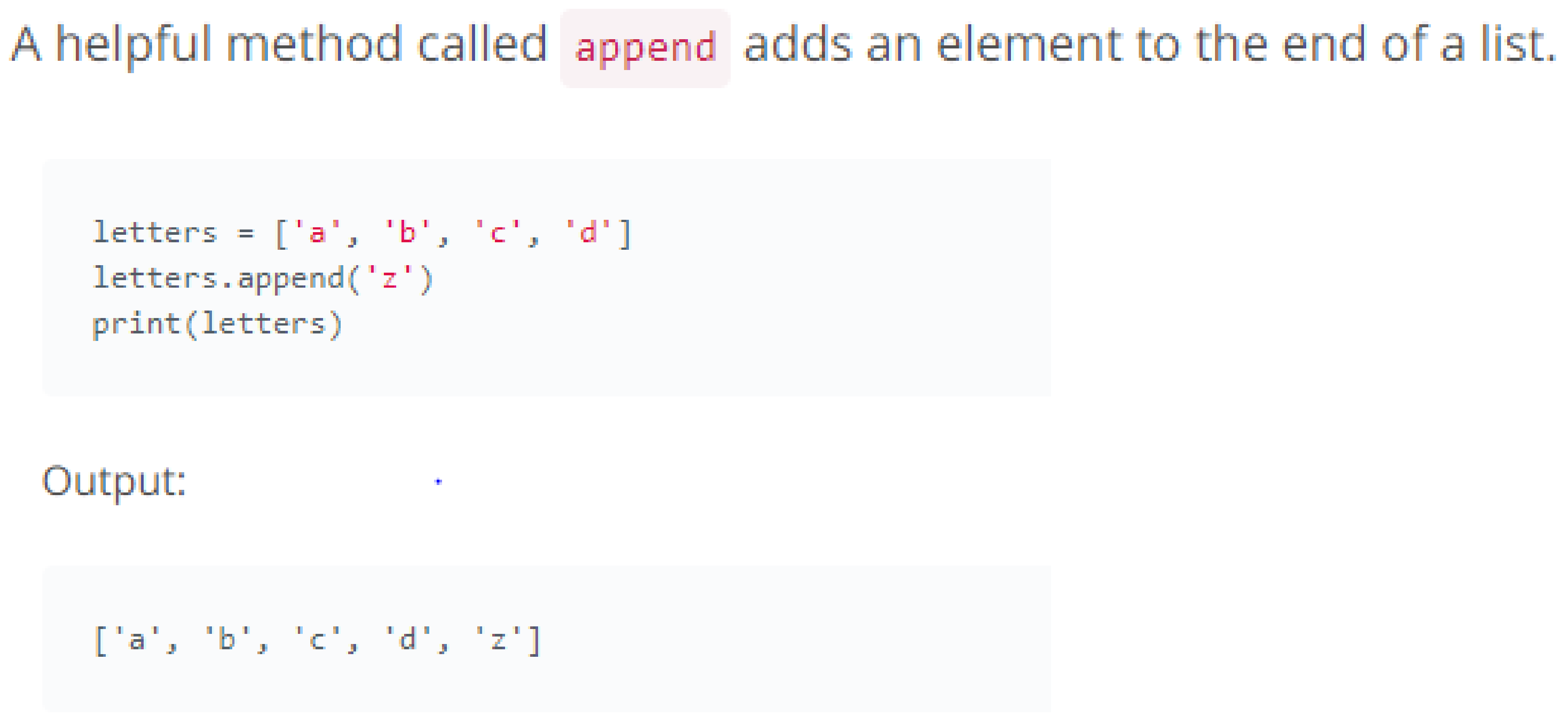
```
name = "-".join(["García", "O'Kelly"])
print(name)
```

Output:

```
García-O'Kelly
```

List Methods

append method



A helpful method called `append` adds an element to the end of a list.

```
letters = ['a', 'b', 'c', 'd']
letters.append('z')
print(letters)
```

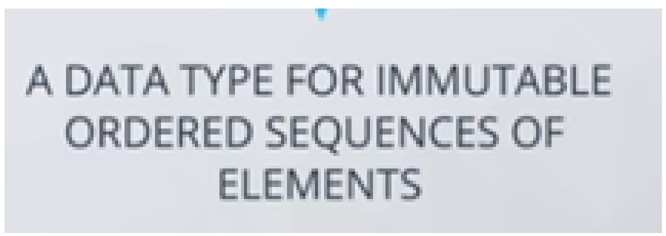
Output:

```
['a', 'b', 'c', 'd', 'z']
```

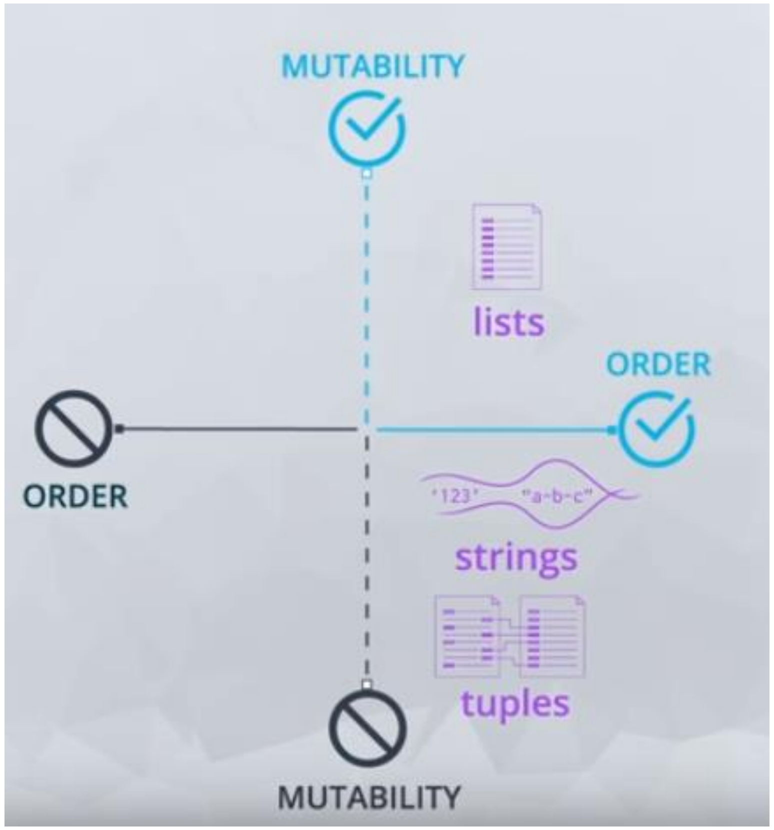
Tuples

Tuples are immutable ordered sequence of elements

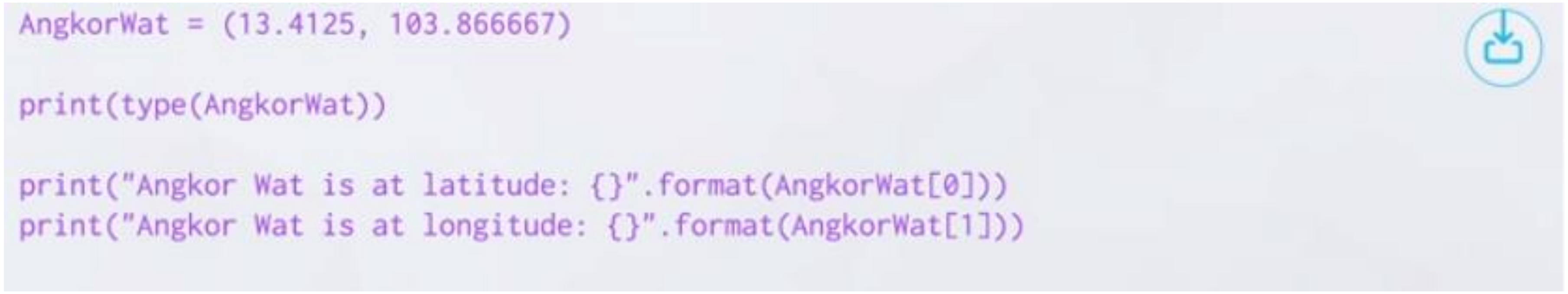
Tuples



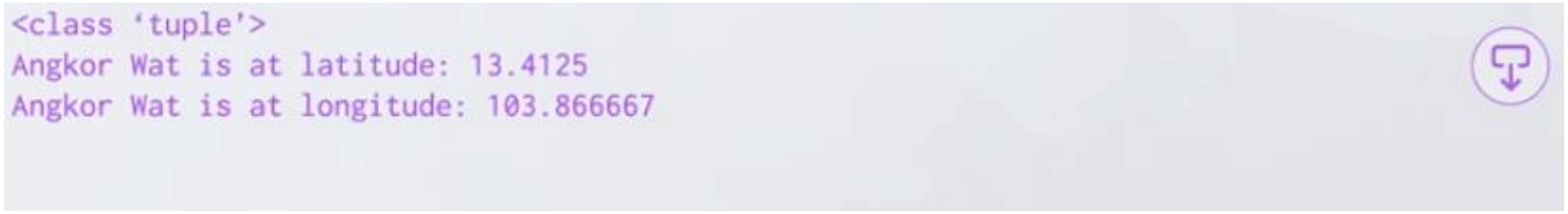
A DATA TYPE FOR IMMUTABLE ORDERED SEQUENCES OF ELEMENTS



Tuples - Indexing



```
AngkorWat = (13.4125, 103.866667)

print(type(AngkorWat))

print("Angkor Wat is at latitude: {}".format(AngkorWat[0]))
print("Angkor Wat is at longitude: {}".format(AngkorWat[1]))
```

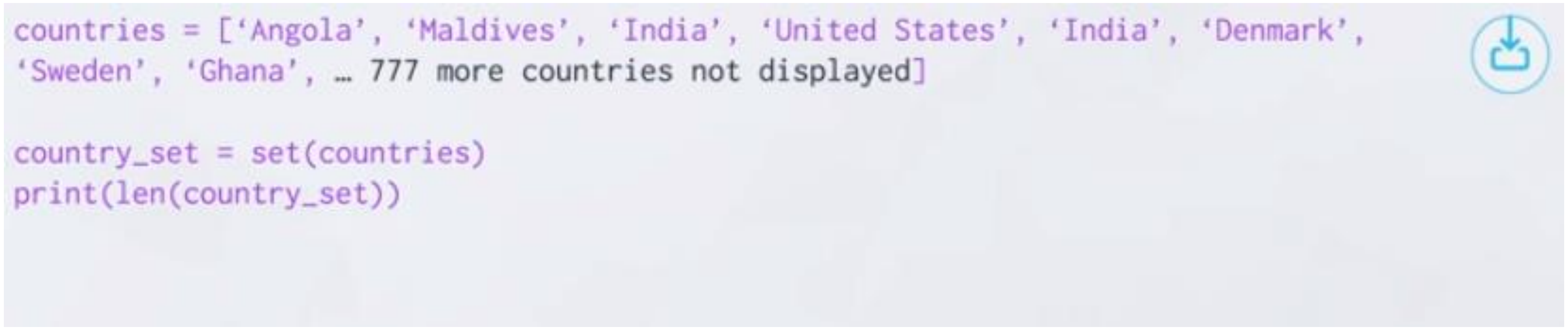


```
<class 'tuple'>
Angkor Wat is at latitude: 13.4125
Angkor Wat is at longitude: 103.866667
```

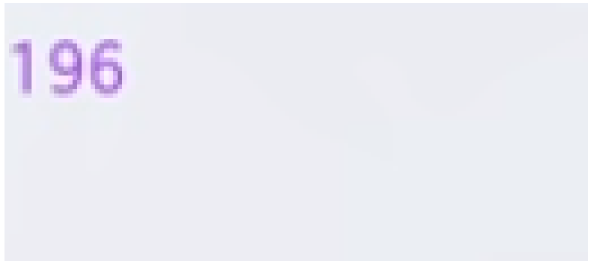
SET

Sets are mutable ordered sequence of elements

SET

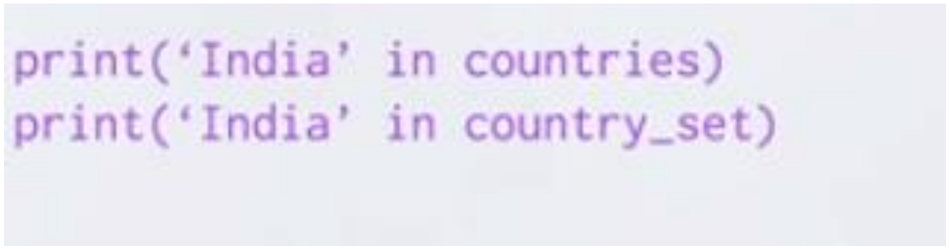


```
countries = [‘Angola’, ‘Maldives’, ‘India’, ‘United States’, ‘India’, ‘Denmark’,
‘Sweden’, ‘Ghana’, … 777 more countries not displayed]

country_set = set(countries)
print(len(country_set))
```

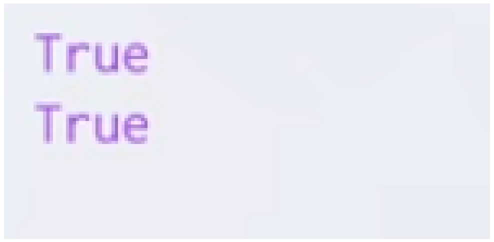


```
196
```

SET and Membership operators



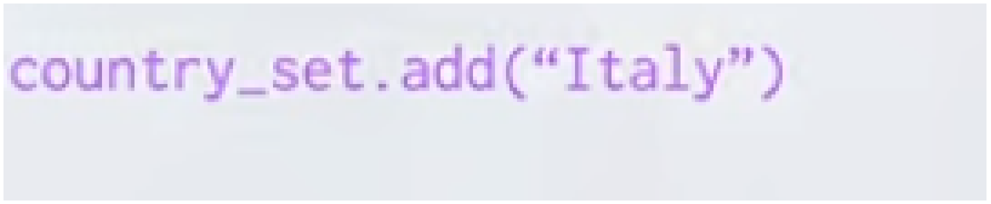
```
print('India' in countries)
print('India' in country_set)
```



```
True
True
```

SET Methods

add method

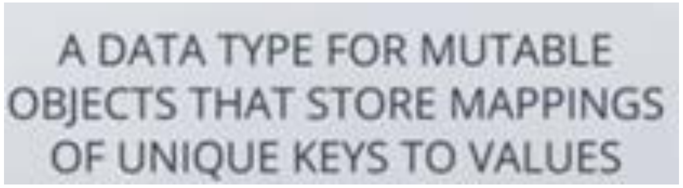


```
country_set.add("Italy")
```

SET Methods

Methods like union, intersection, and difference are easy to perform with sets, and are much faster than such operators with other containers

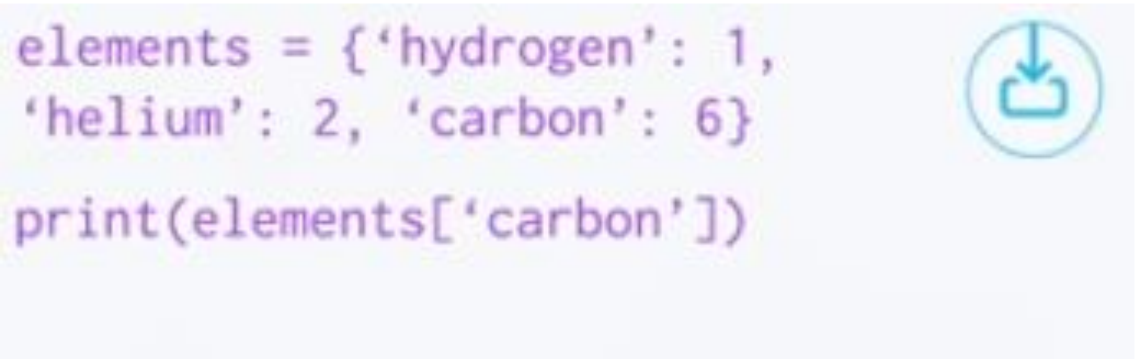
Dictionaries



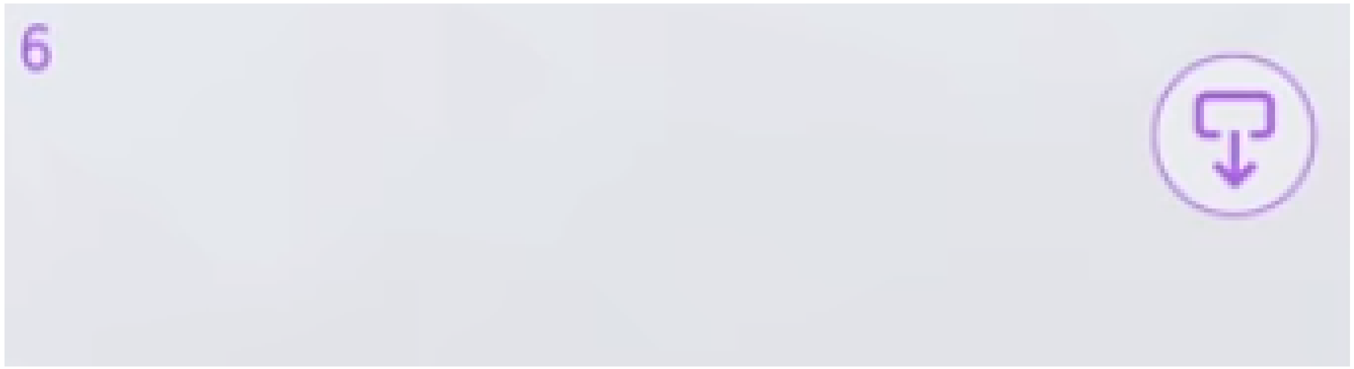
A DATA TYPE FOR MUTABLE OBJECTS THAT STORE MAPPINGS OF UNIQUE KEYS TO VALUES

A **dictionary** is a mutable data type that stores mappings of unique keys to values

Dictionaries Indexing(Key)

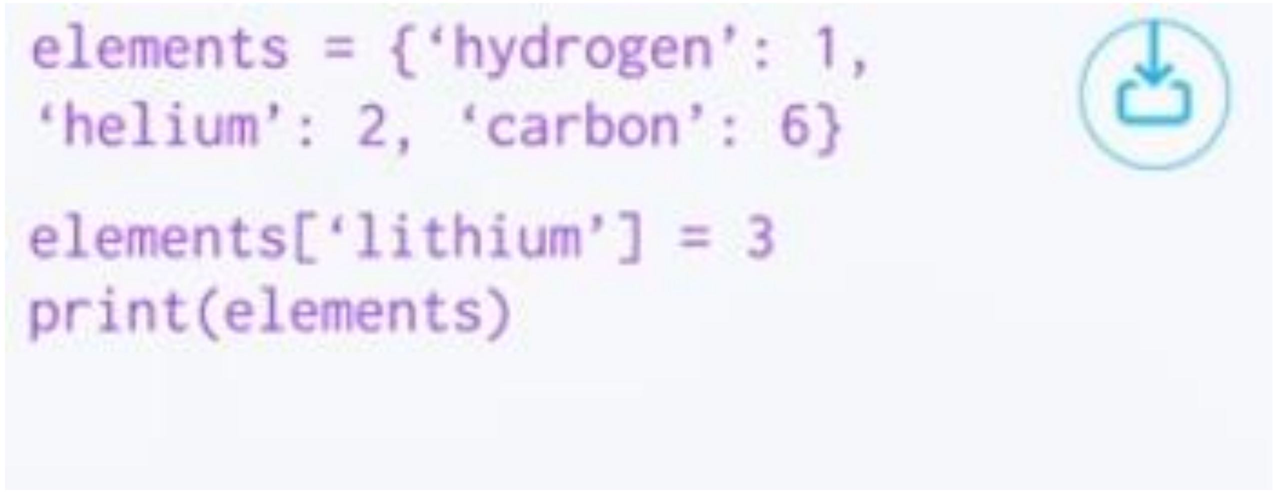


```
elements = {'hydrogen': 1,
'helium': 2, 'carbon': 6}

print(elements['carbon'])
```

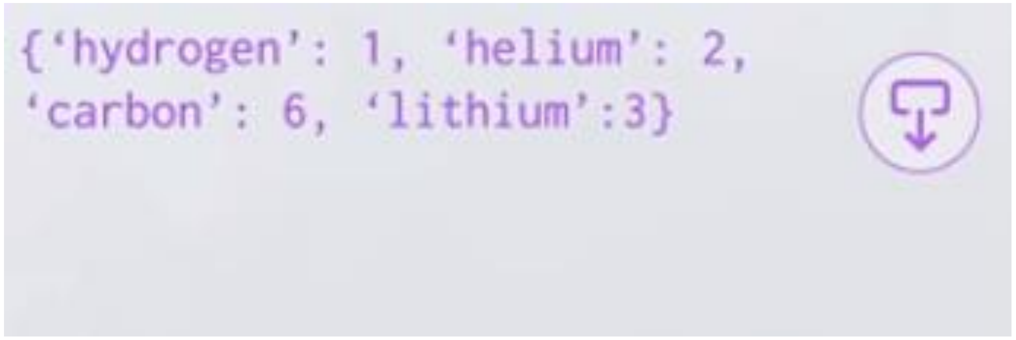


```
6
```

Dictionaries - Adding Key/Values

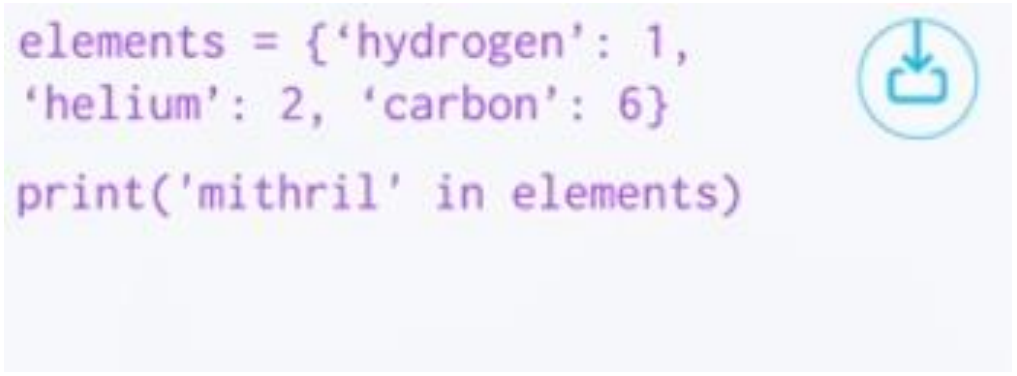


```
elements = {'hydrogen': 1,
'helium': 2, 'carbon': 6}
elements['lithium'] = 3
print(elements)
```

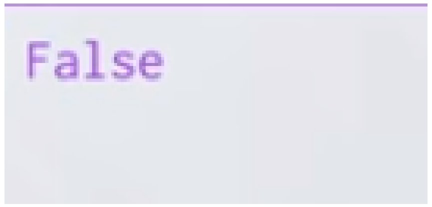


```
{'hydrogen': 1, 'helium': 2,
'carbon': 6, 'lithium':3}
```

Dictionaries and Membership Operators



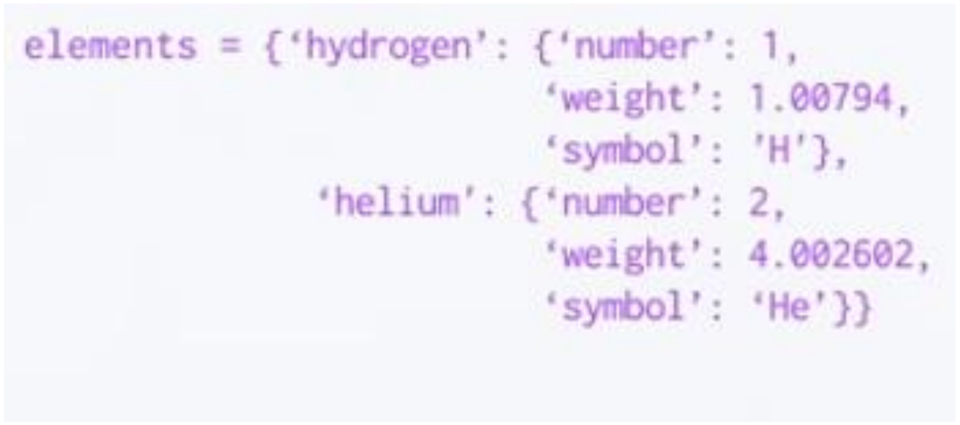
```
elements = {‘hydrogen’: 1,
‘helium’: 2, ‘carbon’: 6}
print('mithril' in elements)
```



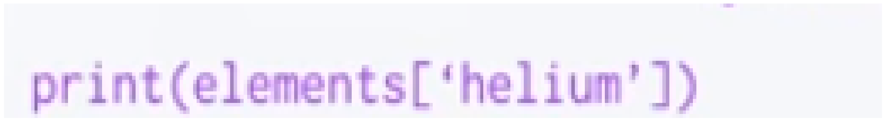
```
False
```

Compound Data Structures

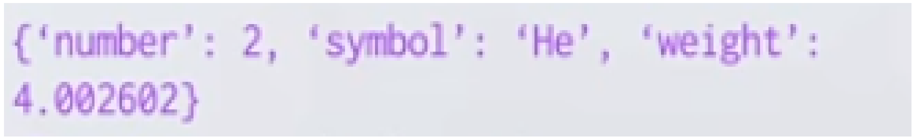
We can include containers in other containers to create compound data structures.



```
elements = {‘hydrogen’: {‘number’: 1,
                         ‘weight’: 1.00794,
                         ‘symbol’: 'H'},
              ‘helium’: {‘number’: 2,
                         ‘weight’: 4.002602,
                         ‘symbol’: ‘He’}}
```

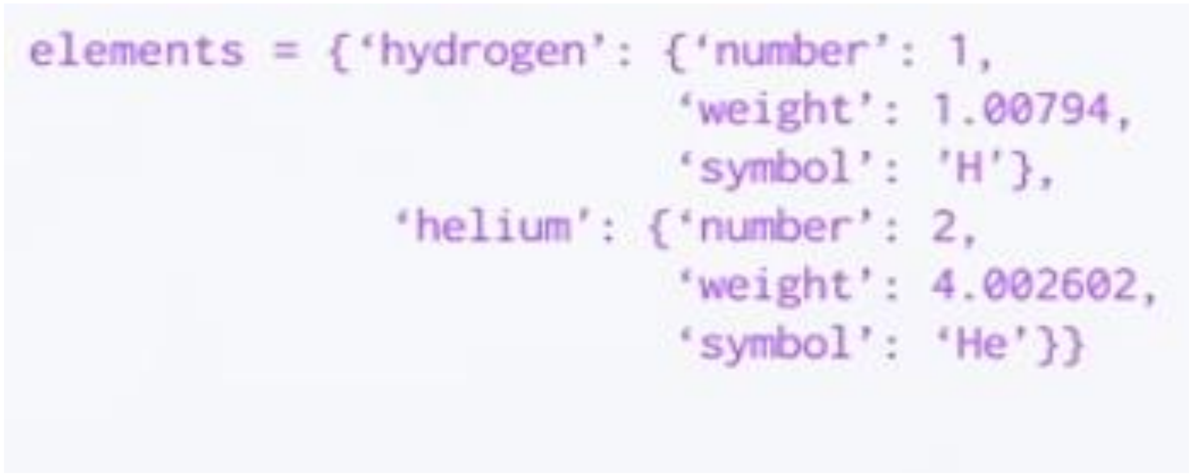


```
print(elements[‘helium’])
```

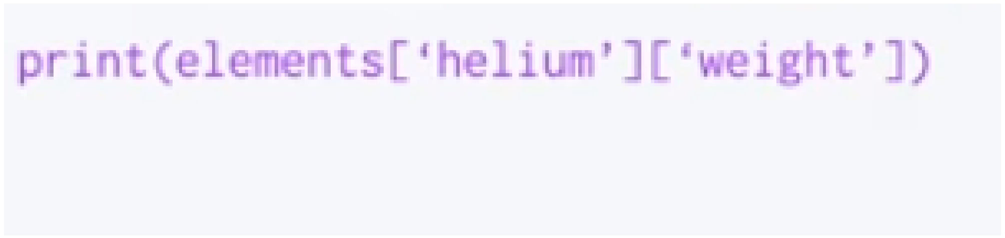


```
{‘number’: 2, ‘symbol’: ‘He’, ‘weight’:
4.002602}
```

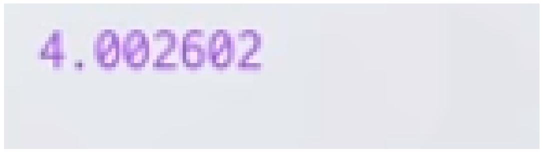
Compound Data Structures



```
elements = {‘hydrogen’: {‘number’: 1,
                         ‘weight’: 1.00794,
                         ‘symbol’: 'H'},
            ‘helium’: {‘number’: 2,
                       ‘weight’: 4.002602,
                       ‘symbol’: ‘He’}}
```



```
print(elements[‘helium’][‘weight’])
```



```
4.002602
```

Data Structure	Ordered	Mutable	Constructor	Example
list	Yes	Yes	`[ ]` or `list()`	[5, 'yes', 5.7]
tuple	Yes	No	`( )` or `tuple()`	(5, 'yes', 5.7)
set	No	Yes	`{ }` or `set()`	{5, 'yes', 5.7}
dictionary	No	Keys: No	`{ }` or `dict()`	{'Jun':75, 'Jul':89}

Control Flow

- Conditional Statements
- Loops - For / While
- Break and Continue

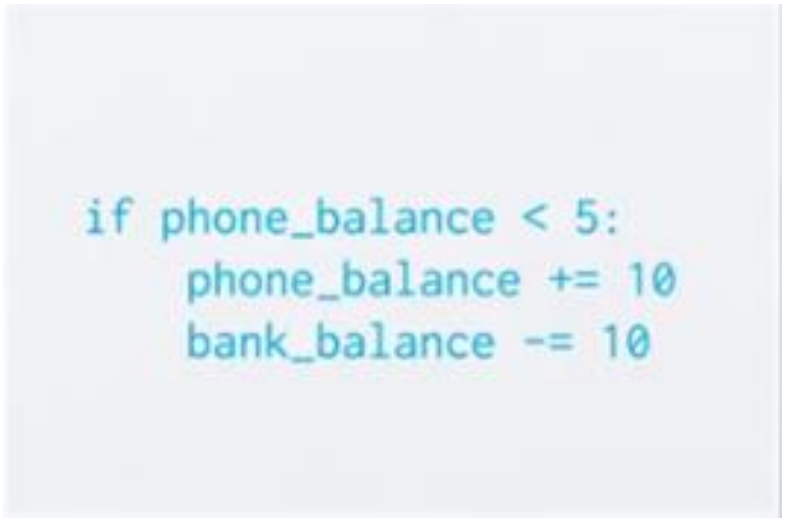
Conditional Statement

- If Statement

If Statement

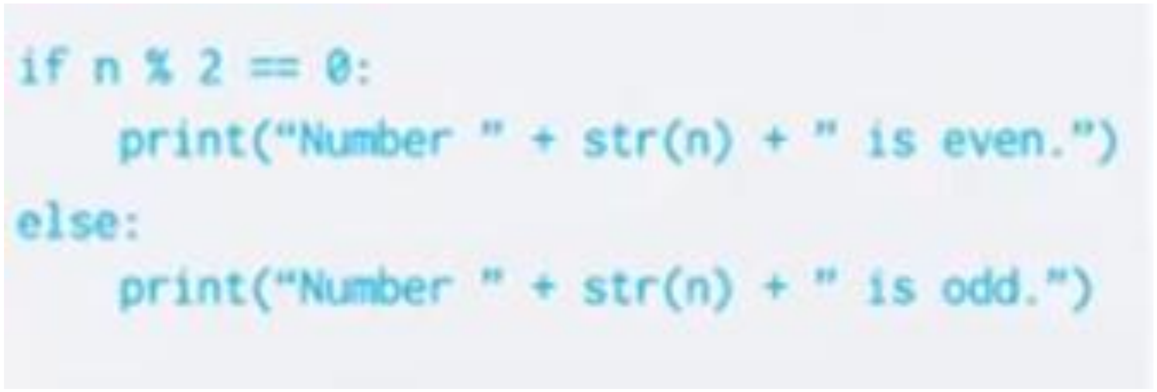
An if statement is a conditional statement that runs or skips code based on whether a condition is true or false.

If Statement



```
if phone_balance < 5:
    phone_balance += 10
    bank_balance -= 10
```

If - else Statement



```
if n % 2 == 0:
    print("Number " + str(n) + " is even.")
else:
    print("Number " + str(n) + " is odd.")
```

If - elif - else Statement

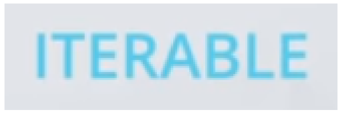
Loops

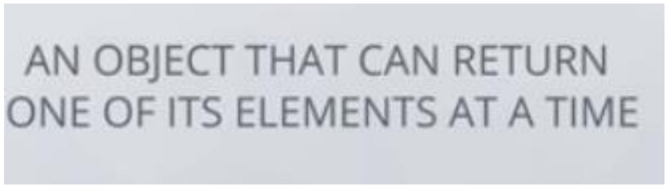
- For
- While

For Loop

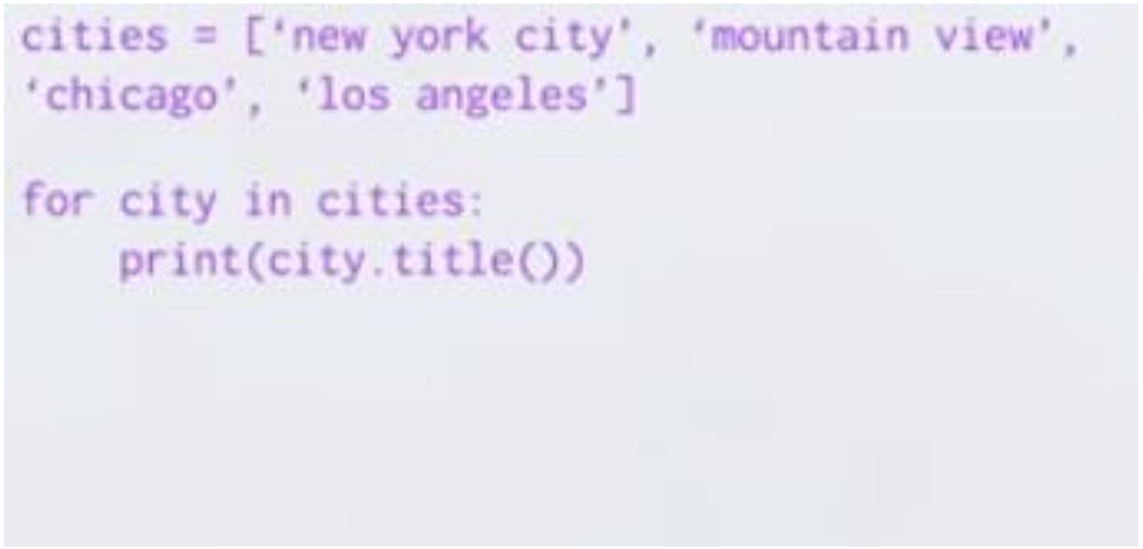
For loop is used to iterate or do something repeatedly, over an **iterable**.

For Loop


ITERABLE

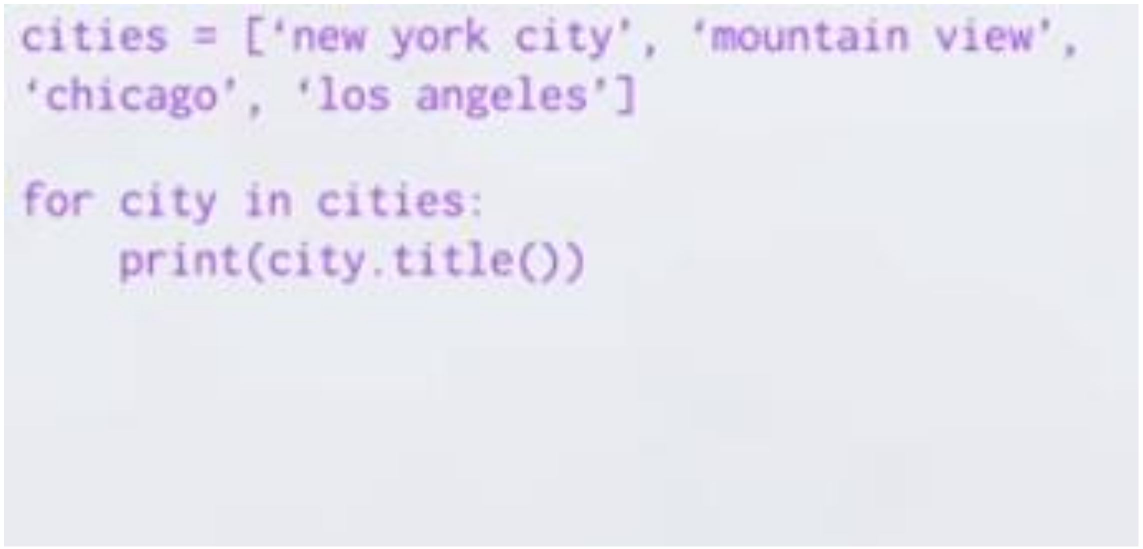

AN OBJECT THAT CAN RETURN
ONE OF ITS ELEMENTS AT A TIME

For Loop

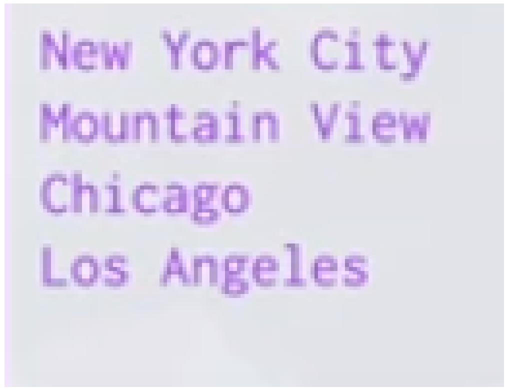


```
cities = ['new york city', 'mountain view',
'chicago', 'los angeles']

for city in cities:
    print(city.title())
```

For Loop



```
cities = ['new york city', 'mountain view',
'chicago', 'los angeles']

for city in cities:
    print(city.title())
```



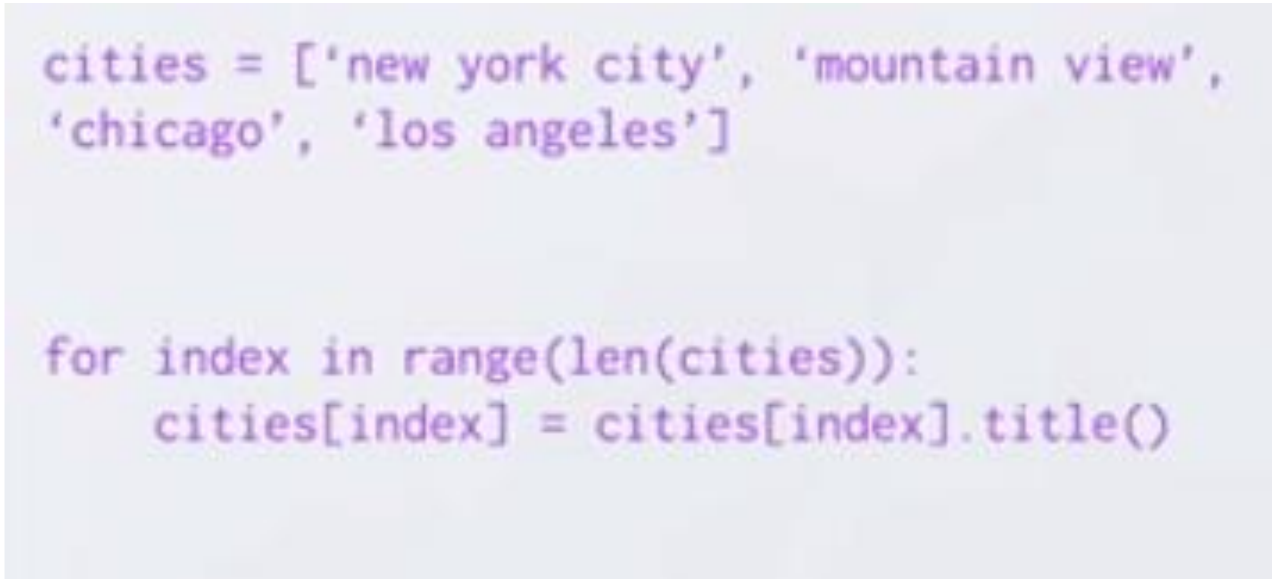
```
New York City
Mountain View
Chicago
Los Angeles
```

For Loop

How will you modify a list in a for loop without creating a new list ?

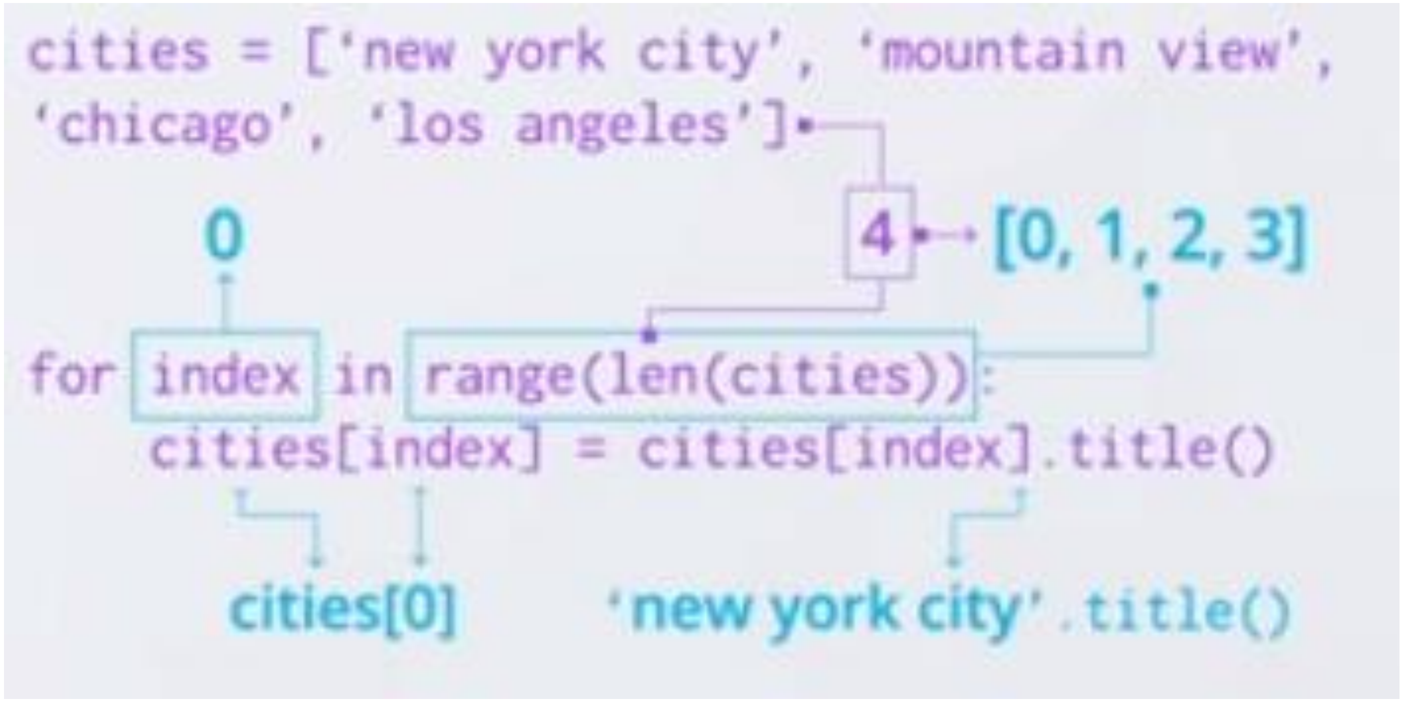
HINT: Use the range function - Check out

For Loops to modify the same list



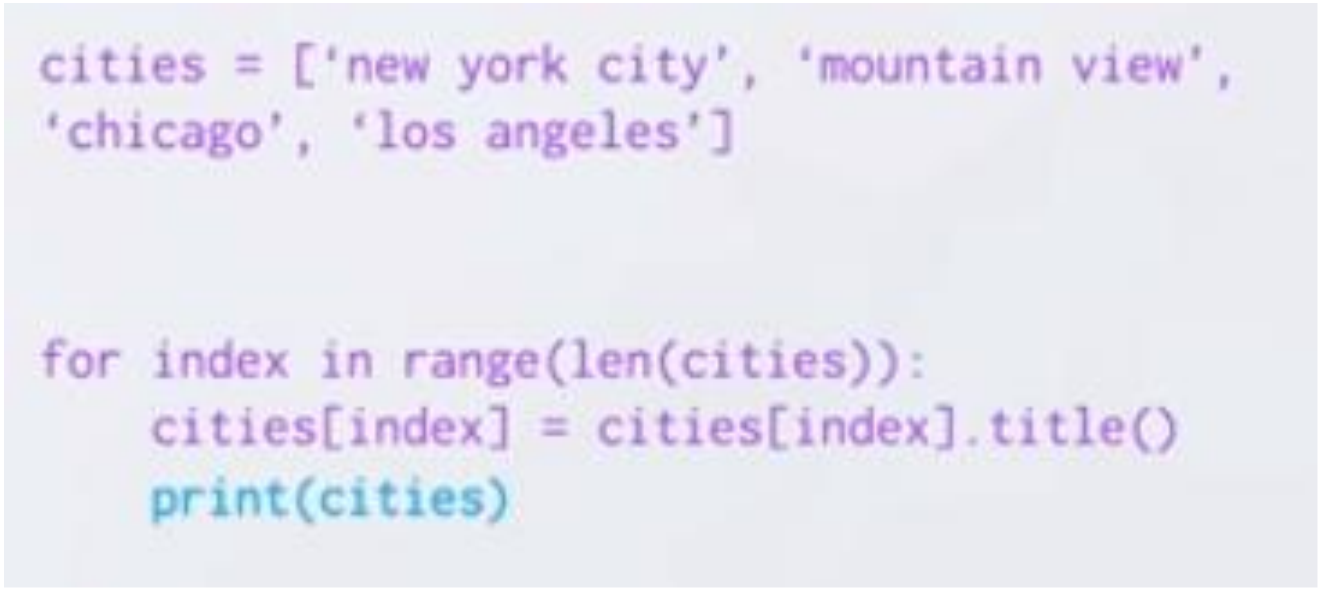
```
cities = [‘new york city’, ‘mountain view’,
‘chicago’, ‘los angeles’]


for index in range(len(cities)):
    cities[index] = cities[index].title()
```

For Loops to modify a list

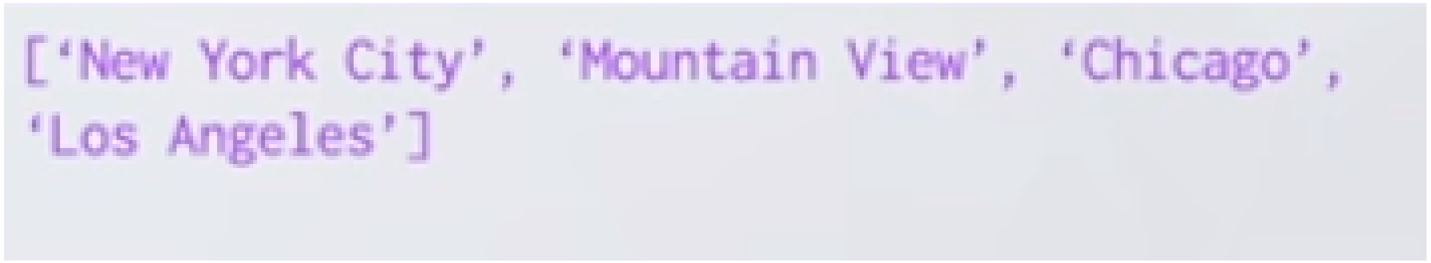


```
cities = ['new york city', 'mountain view',
'chicago', 'los angeles']

for index in range(len(cities)):
    cities[index] = cities[index].title()
```

For Loops to modify a list



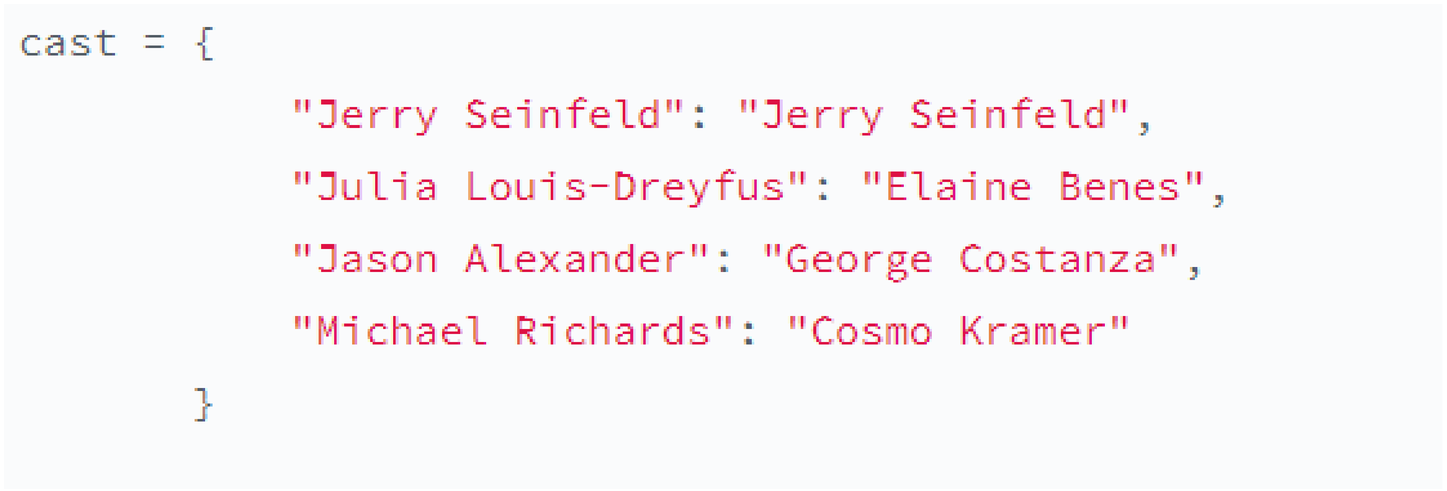
```
cities = ['new york city', 'mountain view',
'chicago', 'los angeles']


for index in range(len(cities)):
    cities[index] = cities[index].title()
    print(cities)
```



```
['New York City', 'Mountain View', 'Chicago',
'Los Angeles']
```

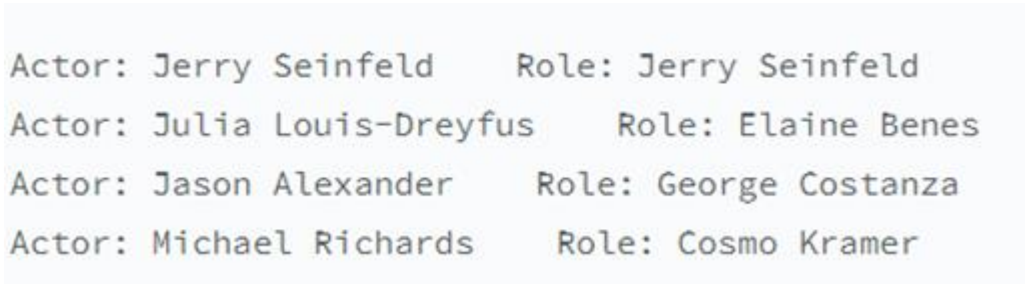
For Loops - Iterating Dictionaries

For Loops - Iterating Dictionaries



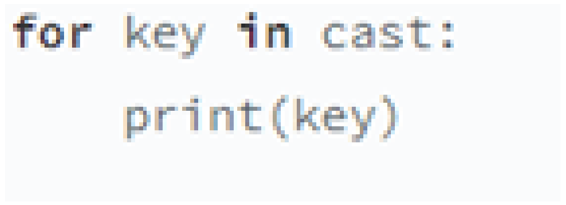
```
cast = {
            "Jerry Seinfeld": "Jerry Seinfeld",
            "Julia Louis-Dreyfus": "Elaine Benes",
            "Jason Alexander": "George Costanza",
            "Michael Richards": "Cosmo Kramer"
        }
```

How to get the below output:

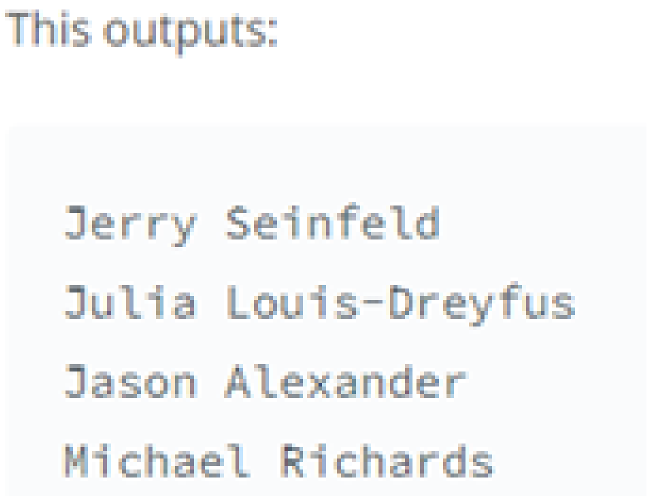


```
Actor: Jerry Seinfeld    Role: Jerry Seinfeld
Actor: Julia Louis-Dreyfus    Role: Elaine Benes
Actor: Jason Alexander    Role: George Costanza
Actor: Michael Richards    Role: Cosmo Kramer
```

For Loops - Iterating Dictionaries



```
for key in cast:
    print(key)
```



This outputs:

```
Jerry Seinfeld
Julia Louis-Dreyfus
Jason Alexander
Michael Richards
```

For Loops - Iterate through both keys and values

Iterate through both keys and values

```
for key, value in cast.items():
    print("Actor: {}    Role: {}".format(key, value))
```

This outputs:

```
Actor: Jerry Seinfeld    Role: Jerry Seinfeld
Actor: Julia Louis-Dreyfus    Role: Elaine Benes
Actor: Jason Alexander    Role: George Costanza
Actor: Michael Richards    Role: Cosmo Kramer
```

While Loops

While Loops

Use case:

When the company has limited budget and it decides to give hike to all candidates till the hike reaches **100000$** and to stop post that

Break and Continue

BREAK

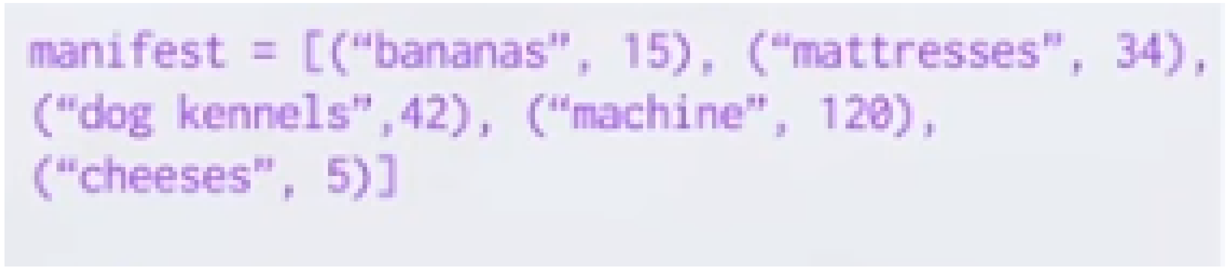
TERMINATES A FOR
OR WHILE LOOP

Break

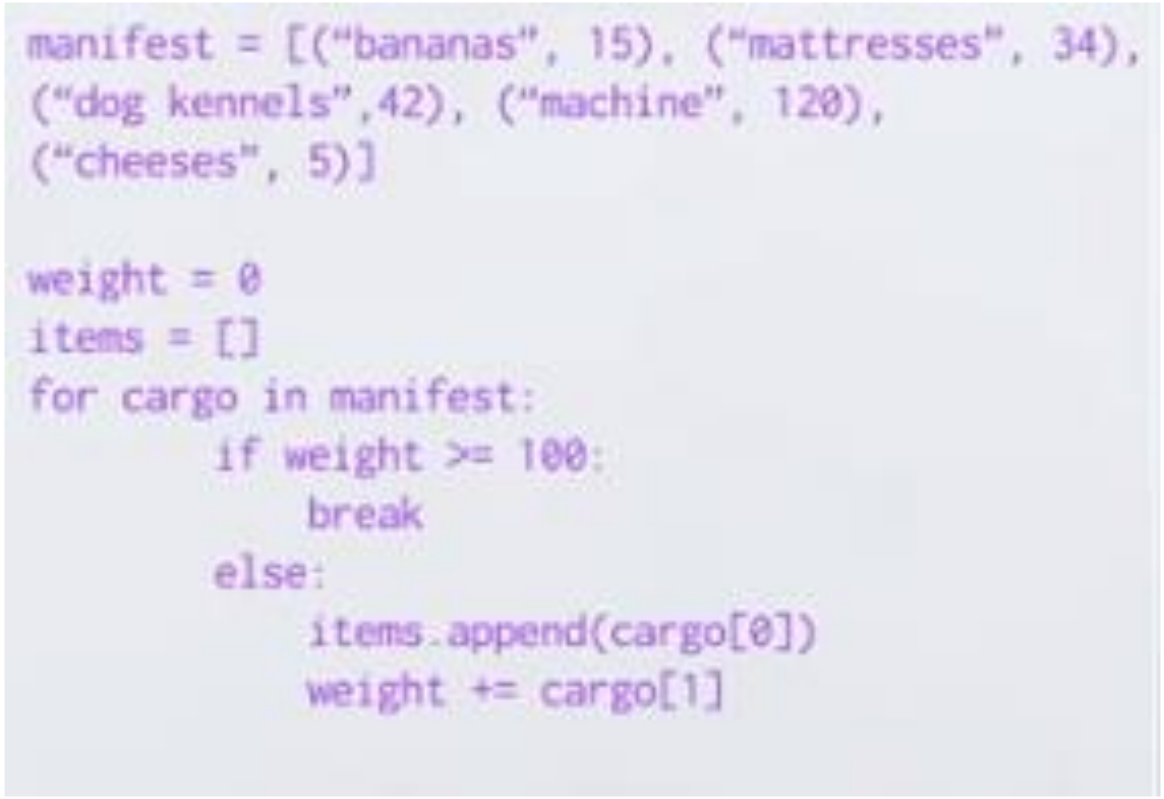
Scenario:

You need to load a cargo ship with different items in the list. But the ship can load atmost 100 tonnes and the loading must be stopped if the total weight exceeds so.

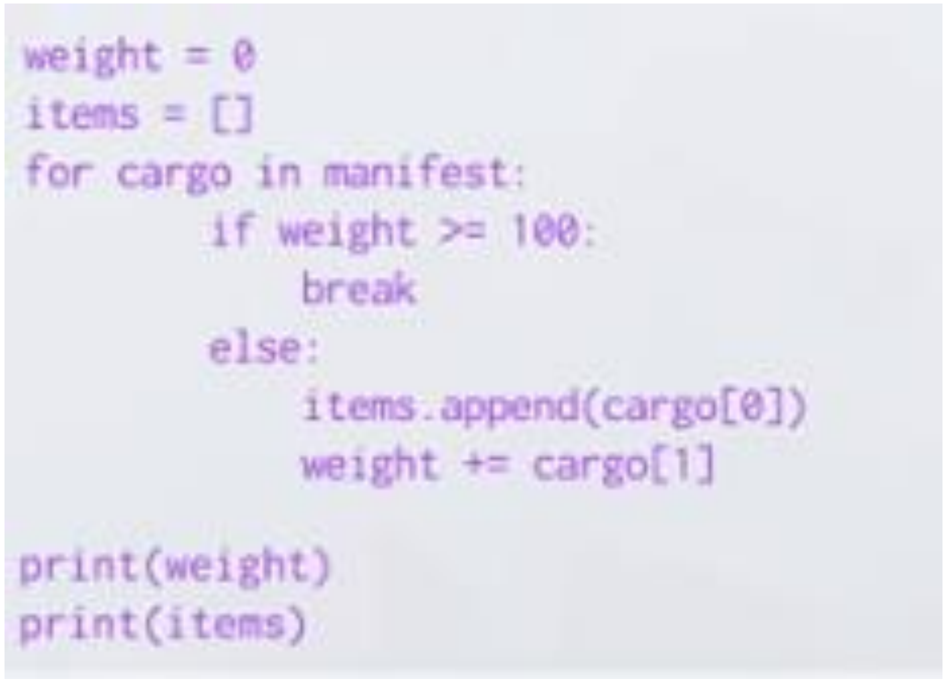
What all the items will get loaded into the ship ?



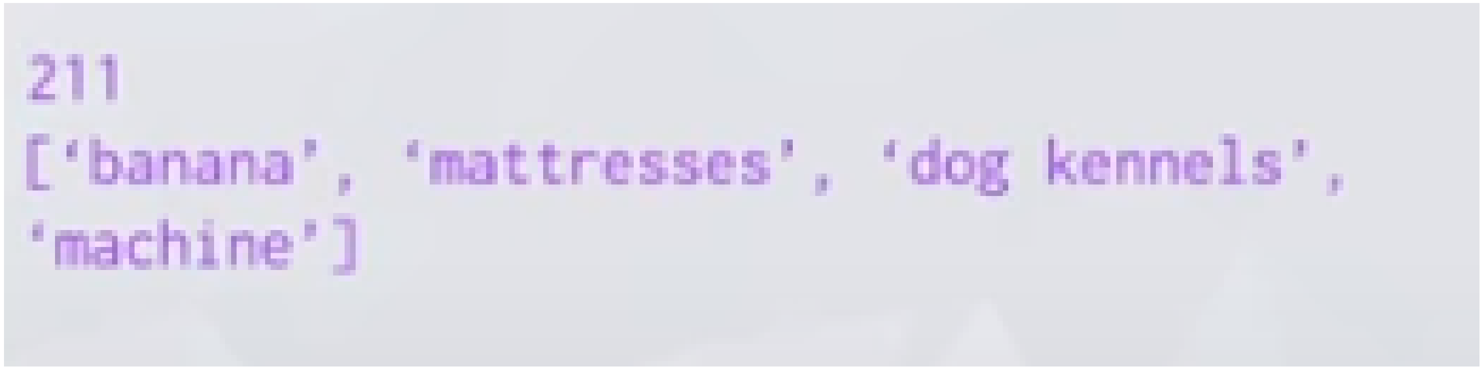
```
manifest = [("bananas", 15), ("mattresses", 34),
("dog kennels",42), ("machine", 120),
("cheeses", 5)]
```



```
manifest = [("bananas", 15), ("mattresses", 34),
("dog kennels",42), ("machine", 120),
("cheeses", 5)]

weight = 0
items = []
for cargo in manifest:
        if weight >= 100:
            break
        else:
            items.append(cargo[0])
            weight += cargo[1]
```



```
weight = 0
items = []
for cargo in manifest:
        if weight >= 100:
            break
        else:
            items.append(cargo[0])
            weight += cargo[1]

print(weight)
print(items)
```

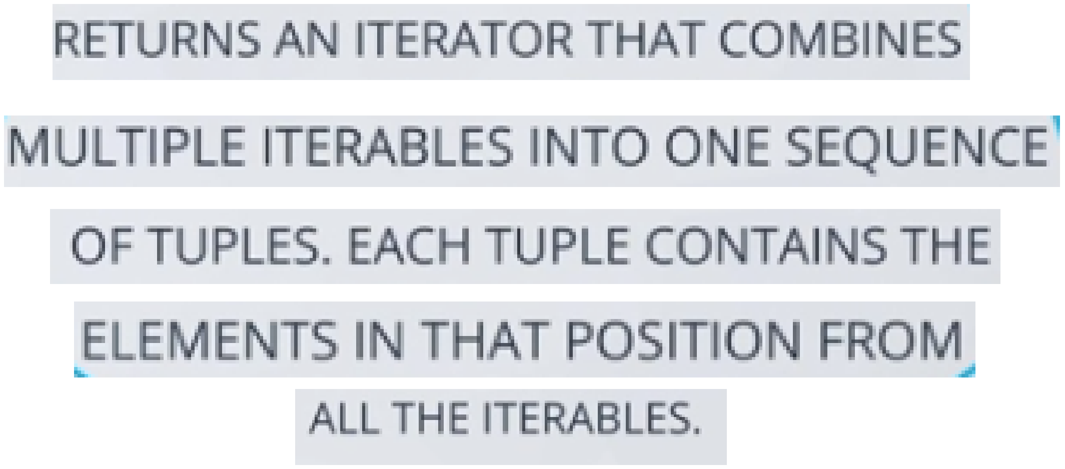


```
211
['banana', 'mattresses', 'dog kennels',
'machine']
```

CONTINUE

TERMINATES ONE ITERATION OF A FOR OR WHILE LOOP

Zip and Enumerate



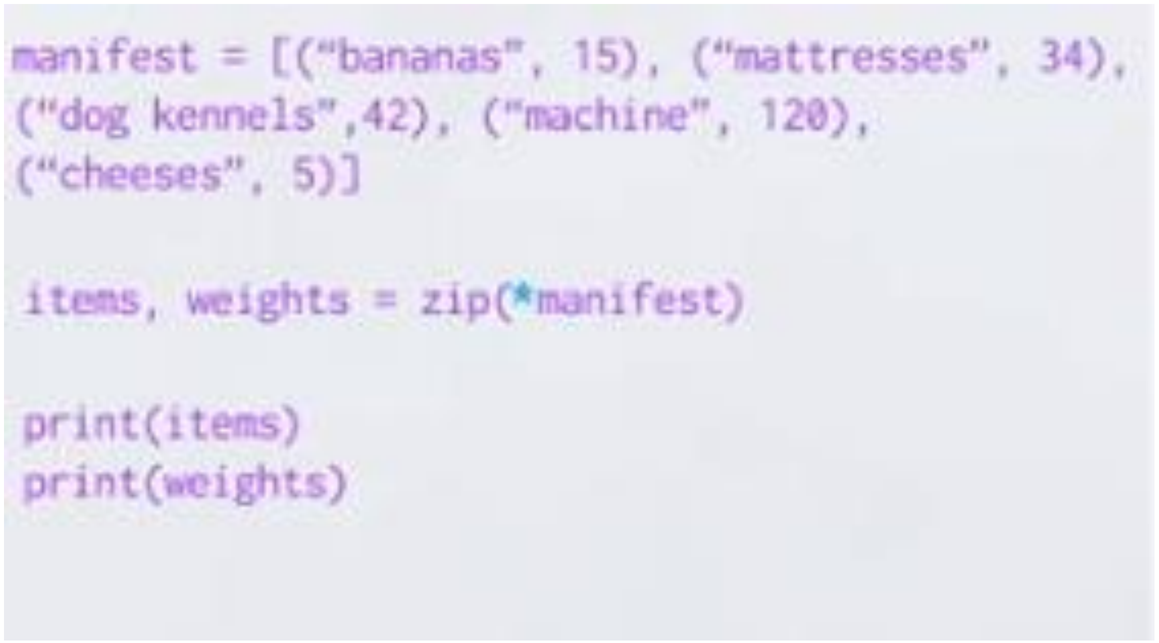
RETURNS AN ITERATOR THAT COMBINES MULTIPLE ITERABLES INTO ONE SEQUENCE OF TUPLES. EACH TUPLE CONTAINS THE ELEMENTS IN THAT POSITION FROM ALL THE ITERABLES.

```
items = ['bananas', 'mattresses', 'dog kennels',
'machine', 'cheeses']

weights = [15, 34, 42, 120, 5]
```

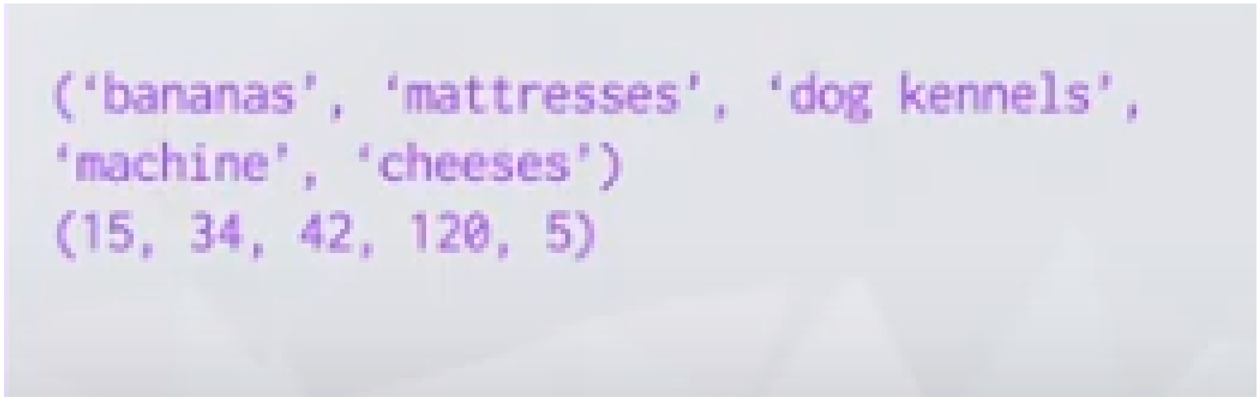
```
for cargo in zip(items, weights):
    print(cargo[0], cargo[1])
```

```
[("bananas", 15), ("mattresses", 34),
("dog kennels",42), ("machine", 120),
("cheeses", 5)]
```

Unzipping Using (*)



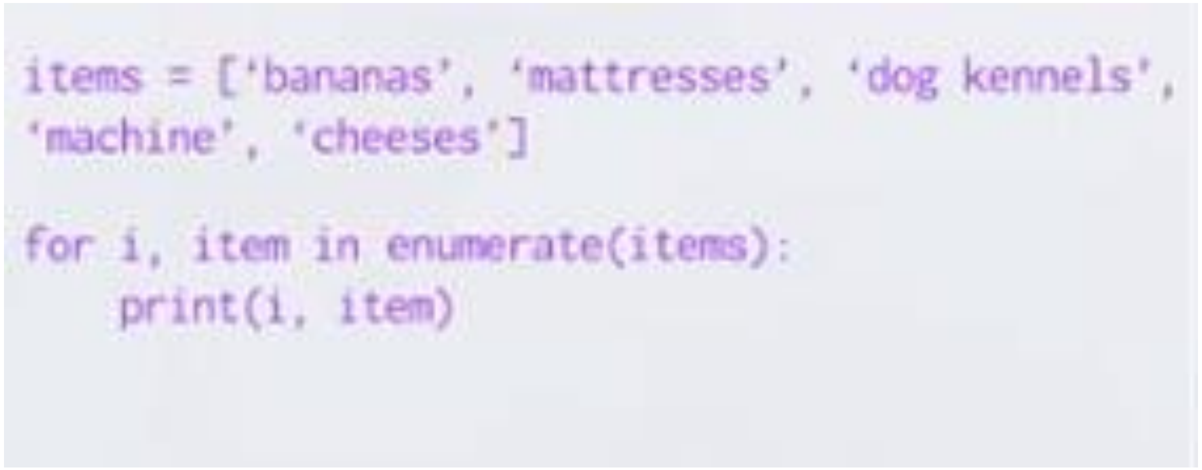
```
manifest = [("bananas", 15), ("mattresses", 34),
("dog kennels",42), ("machine", 120),
("cheeses", 5)]

 items, weights = zip(*manifest)

 print(items)
 print(weights)
```



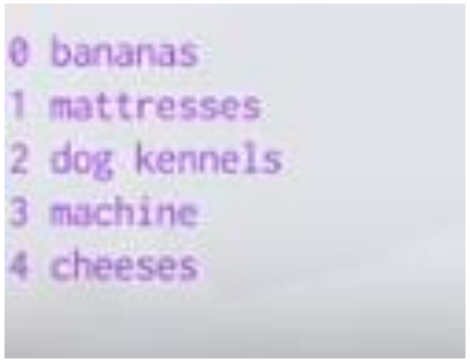
```
('bananas', 'mattresses', 'dog kennels',
'machine', 'cheeses')
(15, 34, 42, 120, 5)
```

Enumerate

`enumerate` is a built in function that returns an iterator of tuples containing indices and values of a list. You'll often use this when you want the index along with each element of an iterable in a loop.



```
items = ['bananas', 'mattresses', 'dog kennels',
'machine', 'cheeses']

for i, item in enumerate(items):
    print(i, item)
```



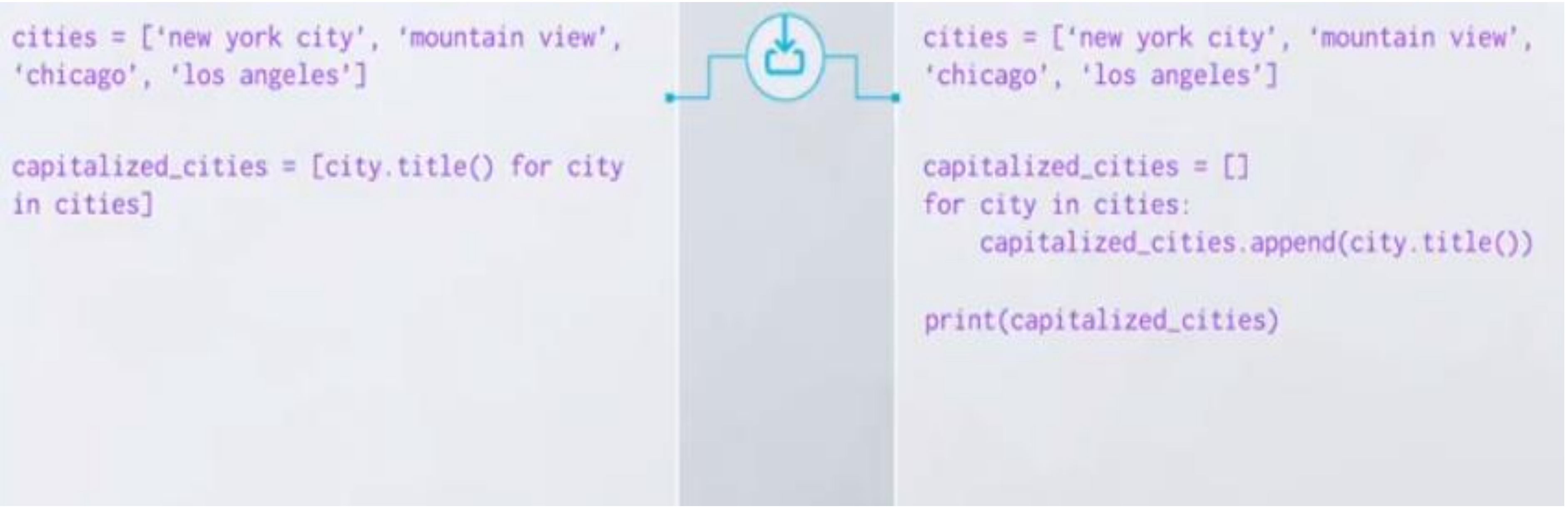
```
0 bananas
1 mattresses
2 dog kennels
3 machine
4 cheeses
```

List Comprehensions

```
cities = ['new york city', 'mountain view',
'chicago', 'los angeles']
```

```
capitalized_cities = []
for city in cities:
    capitalized_cities.append(city.title())
```

```
capitalized_cities = [city.title() for city in cities]
```

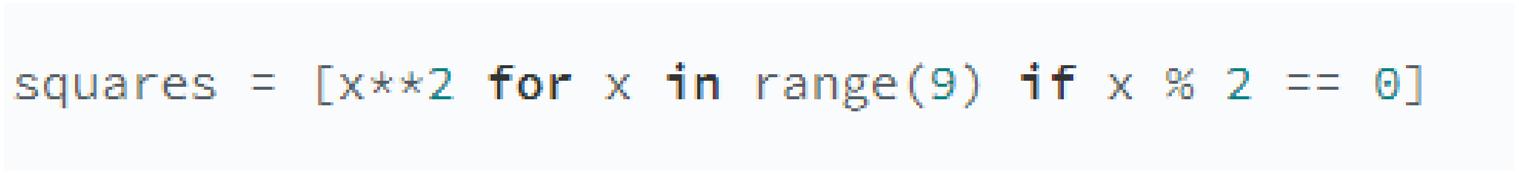


```
cities = [‘new york city’, ‘mountain view’,
‘chicago’, ‘los angeles’]

capitalized_cities = [city.title() for city
in cities]
```

```
cities = [‘new york city’, ‘mountain view’,
‘chicago’, ‘los angeles’]

capitalized_cities = []
for city in cities:
    capitalized_cities.append(city.title())

print(capitalized_cities)
```

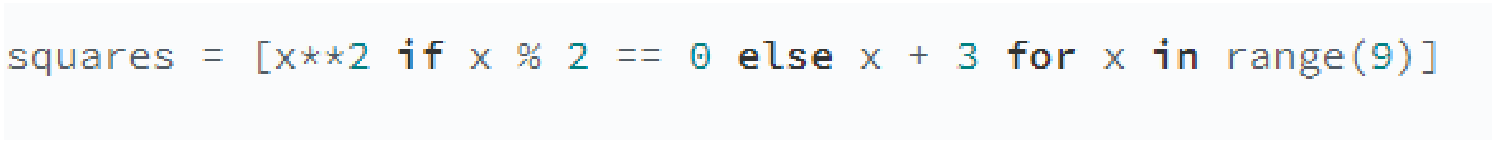
Conditionals in List Comprehensions

Only if -



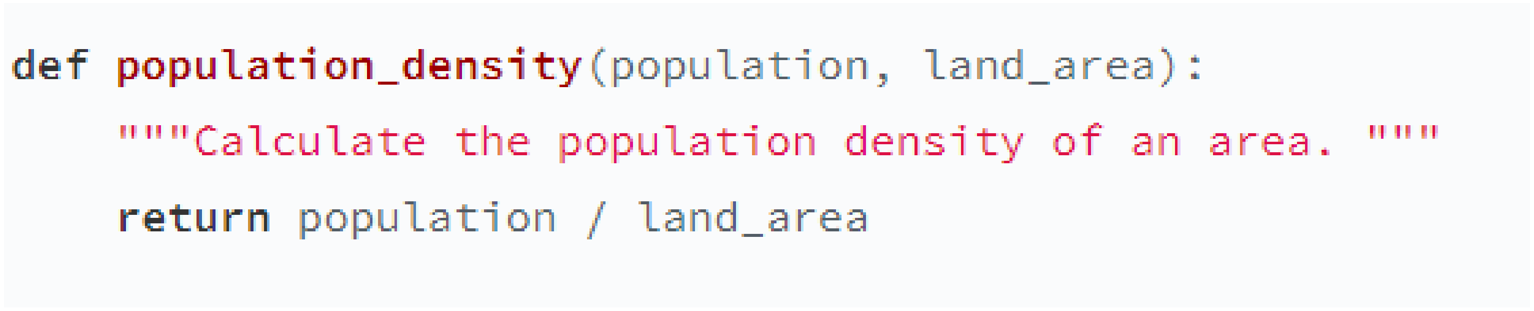
```
squares = [x**2 for x in range(9) if x % 2 == 0]
```

With if else -



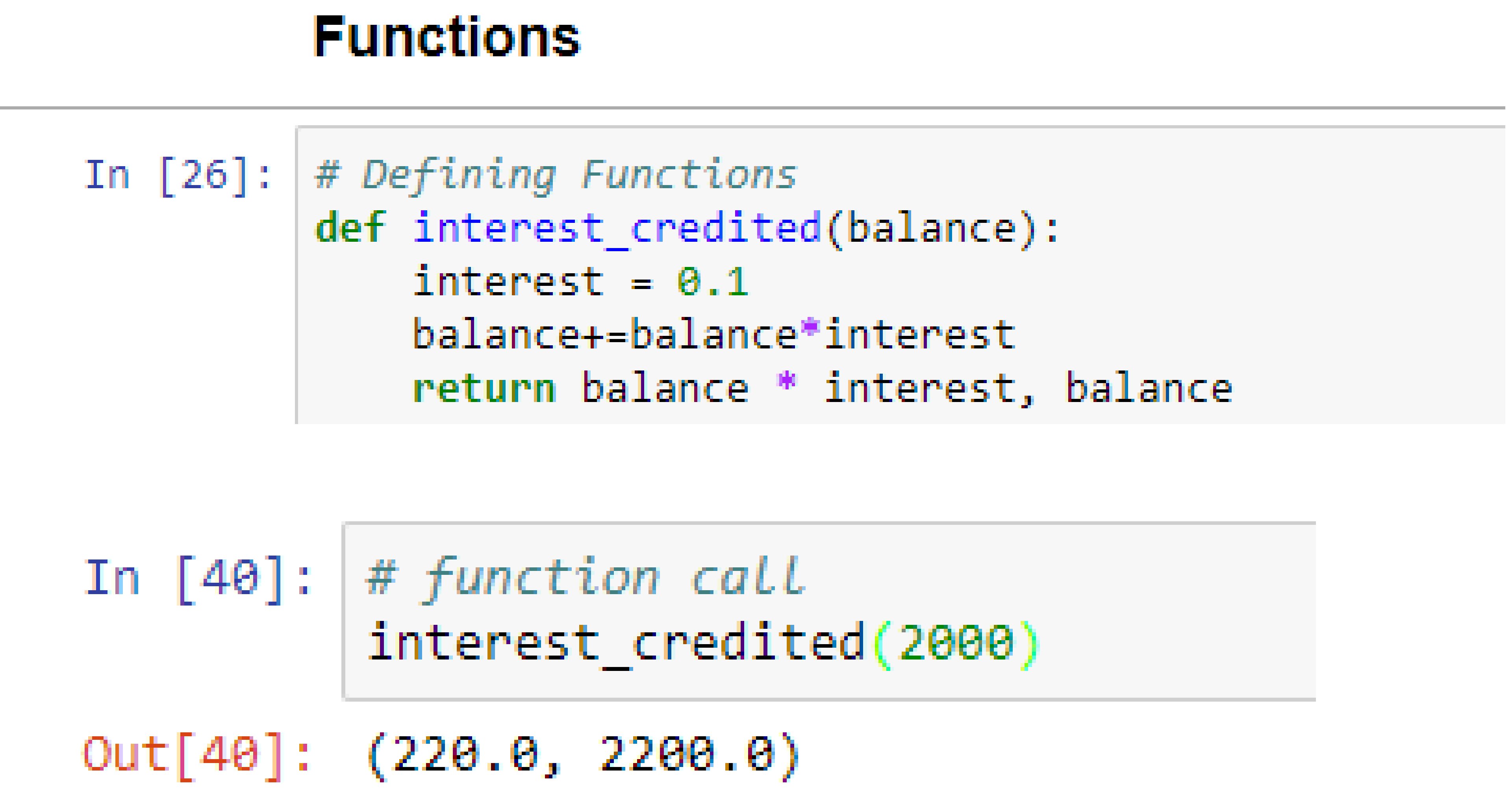
```
squares = [x**2 if x % 2 == 0 else x + 3 for x in range(9)]
```

Functions



```python
def population_density(population, land_area):
    """Calculate the population density of an area. """
    return population / land_area
```

Defining Functions



Functions

```
In [26]: # Defining Functions
         def interest_credited(balance):
             interest = 0.1
             balance+=balance*interest
             return balance * interest, balance
```

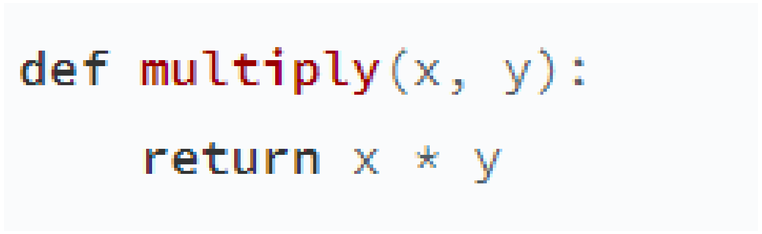
```
In [40]: # function call
         interest_credited(2000)

Out[40]: (220.0, 2200.0)
```

Print

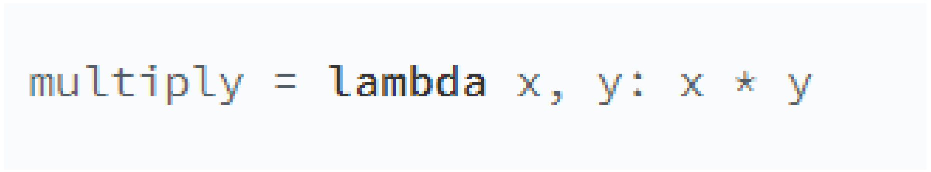
vs

Return

Lambda Expressions



```python
def multiply(x, y):
    return x * y
```



```python
multiply = lambda x, y: x * y
```