CoGrammar

# Special Methods

SKILLS FOR LIFE
SKILLS BOOTCAMPS

Department for Education

# Software Engineering Lecture Housekeeping

- The use of disrespectful language is prohibited in the questions, this is a supportive, learning environment for all - please engage accordingly. **(FBV: Mutual Respect.)**
- No question is daft or silly - **ask them!**
- There are **Q&A sessions** midway and at the end of the session, should you wish to ask any follow-up questions. Moderators are going to be answering questions as the session progresses as well.
- If you have any questions outside of this lecture, or that are not answered during this lecture, please do submit these for upcoming Open Classes. You can submit these questions here: **Open Class Questions**

# **Software Engineering Lecture Housekeeping** cont.

- For all **non-academic questions**, please submit a query: **www.hyperiondev.com/support**

- Report a **safeguarding** incident: **www.hyperiondev.com/safeguardreporting**

- We would love your **feedback** on lectures: **Feedback on Lectures**

# Prestigious Co-Certification Opportunities

**New Partnerships!**

- **University of Manchester & Imperial College London** join our circle along with The University of Nottingham Online.

**Exclusive Opportunity:**

- Co-certification spots awarded on a first-come basis.
- Meet the criteria early to gain eligibility for the co-certification.

**New Deadlines:**

- **11 March 2024**: 112 GLH & BYB tasks completion.
- **18 March 2024**: Record interview invitation or self-employment.
- **15 July 2024**: Submit verified job offer or new contract.

CoGrammar

# Lecture Objectives

1. **Describe special methods and their use when working with classes and objects in Python.**

2. **Experiment with different special methods in your classes to see how they will add and change behaviour of your class.**

# Poll:

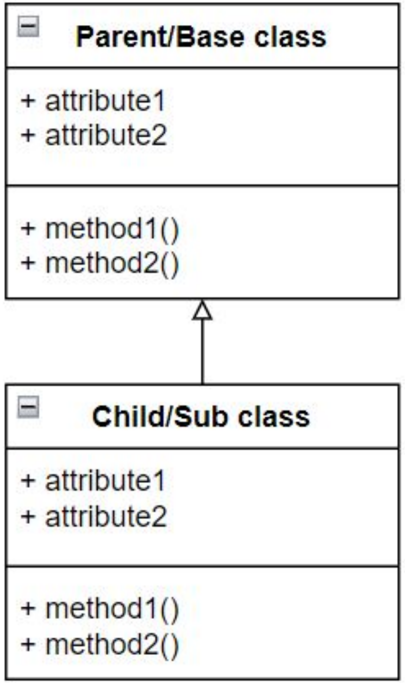
# Assessment

# Recap: Inheritance

# What is Inheritance?

- Sometimes we require a class with the same attributes and properties as another class but we want to extend some of the behaviour or add more attributes.
- Using inheritance we can create a new class with all the properties and attributes of a base class instead of having to redefine them.

# What is Inheritance?



**Parent/Base class**

+ attribute1
+ attribute2

+ method1()
+ method2()

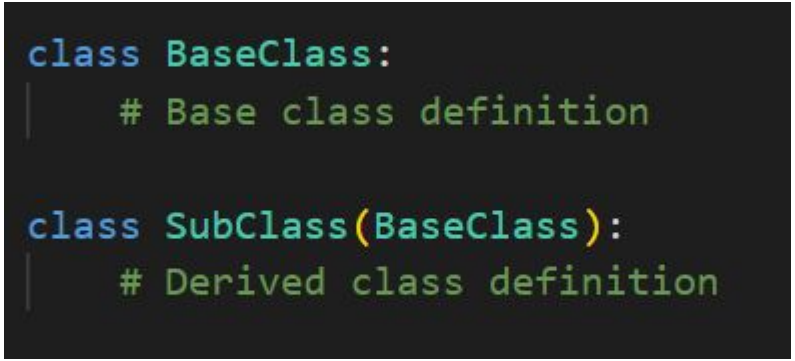
**Child/Sub class**

+ attribute1
+ attribute2

+ method1()
+ method2()

# Inheritance

- Parent/Base class
  - The parent or base class contains all the attributes and properties we want to inherit.
- Child/Subclass
  - The sub class will inherit all of its attributes and properties from the parent class.



```python
class BaseClass:
    # Base class definition

class SubClass(BaseClass):
    # Derived class definition
```

# Method Overriding

- We can override methods in our subclass to either extend or change the behaviour of a method.

- To apply method overriding you simply need to define a method with the same name as the method you would like to override.

- To extend functionality of a method instead of completely overriding we can use the super() function.

# Super()

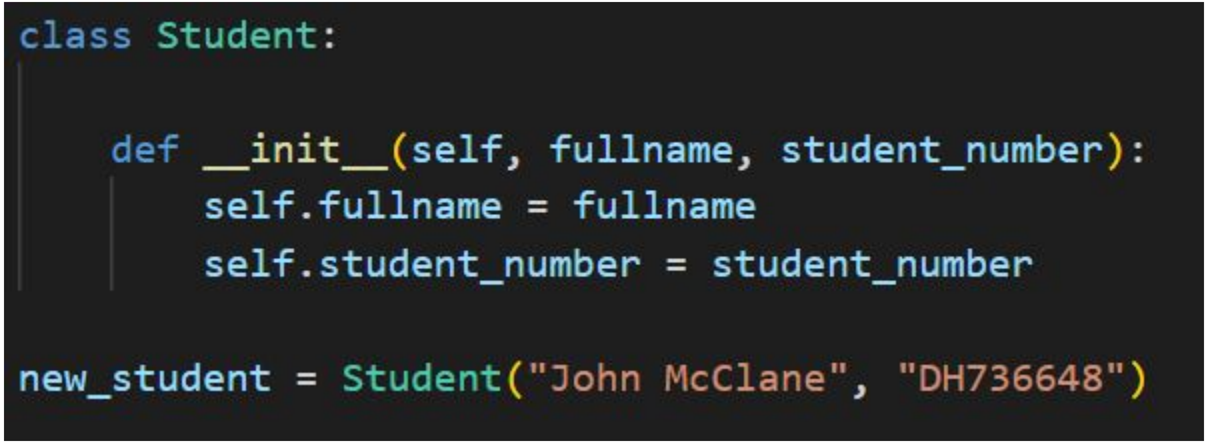
- The super() function allows us to access the attributes and properties of our Parent/Base class.
- Using super() followed by a dot "." we can call to the methods that reside inside our base class.
- When extending functionality of a method we would first want to call the base class method and then add the extended behaviour.

# Special Methods

# __init__()

- The first special method you have seen and used is __init__().
- We use this method to initialize our instance variables and run any setup code when an object is being created.
- The method is automatically called when using the class constructor and the arguments for the method are the values given in the class constructor.

# __init__()



```python
class Student:

    def __init__(self, fullname, student_number):
        self.fullname = fullname
        self.student_number = student_number

new_student = Student("John McClane", "DH736648")
```

# Objects As Strings

- You have probably noticed when using print() that some objects are represented differently than others.
- Some dictionaries and list have {} and [] in the representation and when we print an objects we get a memory address <__main__.Person object at 0x000001EBCA11E650>
- We can set the string representations for our objects to whatever we like using either __repr__() or __str__()

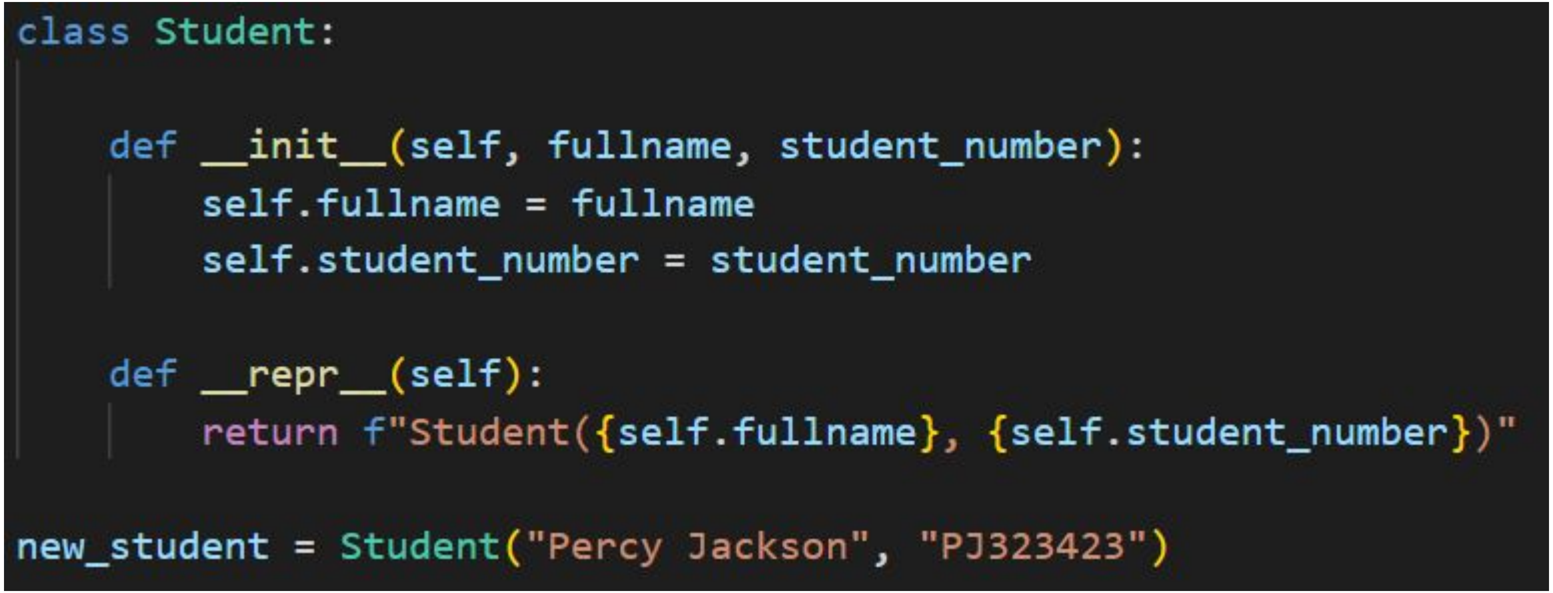
# __repr__()

- This method returns a string for an official representation of the object.

- __repr__() is usually used to build a representation that can assist developers when working with the class.

- The representation will contain extra information about the object that the user would not necessarily see.

# __repr__()

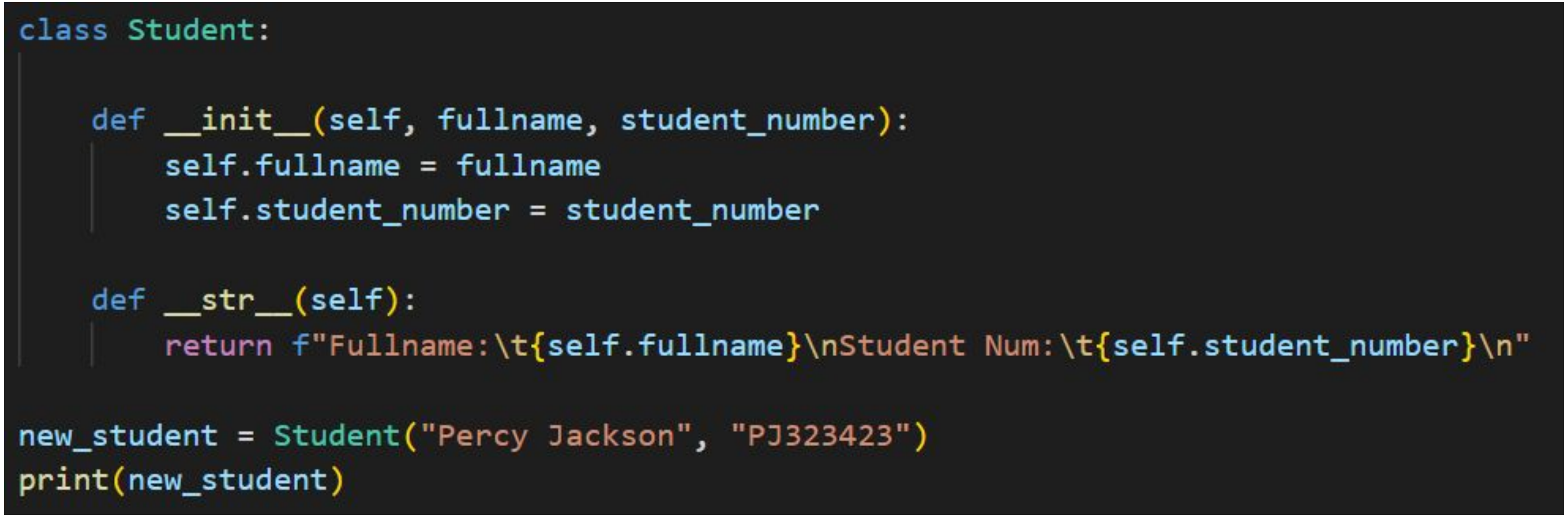


```python
class Student:

    def __init__(self, fullname, student_number):
        self.fullname = fullname
        self.student_number = student_number

    def __repr__(self):
        return f"Student({self.fullname}, {self.student_number})"

new_student = Student("Percy Jackson", "PJ323423")
```

# __str__()

- This method return a representation for your object when the str() function is called.
- When your object is used in the print function it will automatically try to cast your object to a string and will then receive the representation returned by __str__()
- This is usually a representation that users will see.

# __str__()



```python
class Student:

    def __init__(self, fullname, student_number):
        self.fullname = fullname
        self.student_number = student_number

    def __str__(self):
        return f"Fullname:\t{self.fullname}\nStudent Num:\t{self.student_number}\n"

new_student = Student("Percy Jackson", "PJ323423")
print(new_student)
```

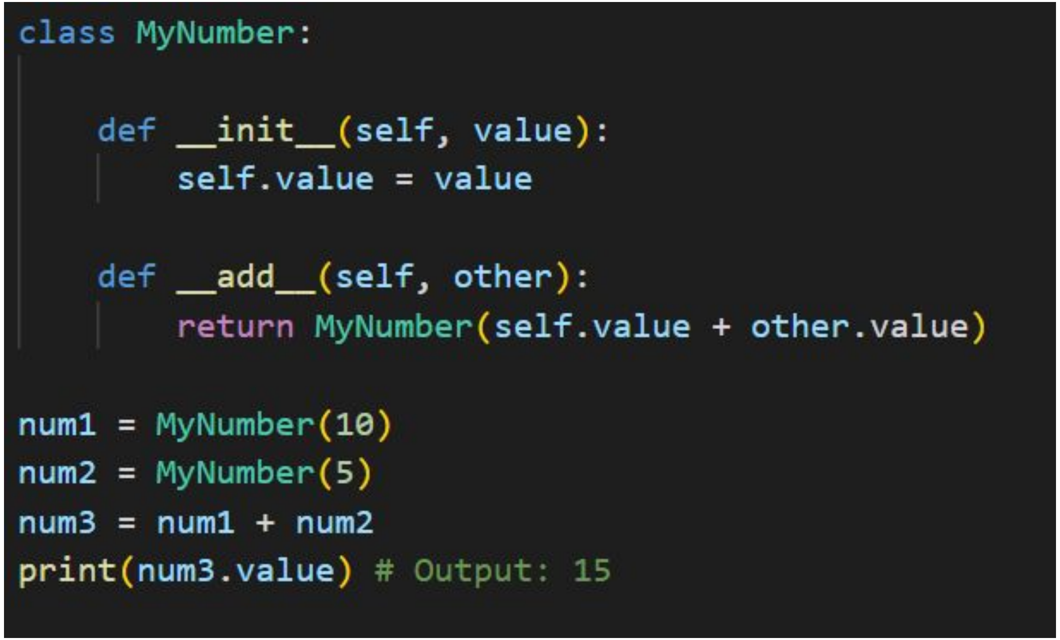
# Special Methods And Math

- Special methods also allow us to set the behaviour for mathematical operations such as +, -, *, /, **

- Using these methods we can determine how the operators will be applied to our objects.

- E.g. When trying to add two of your objects, x and y, together python will try to invoke the __add__() special method that sits inside your object x. The code inside __add__() will then determine how your objects will be added together and returned.
- x + y -> x.__add__(a, y)

# Special Methods And Math



```python
class MyNumber:

    def __init__(self, value):
        self.value = value

    def __add__(self, other):
        return MyNumber(self.value + other.value)

num1 = MyNumber(10)
num2 = MyNumber(5)
num3 = num1 + num2
print(num3.value) # Output: 15
```

# Special Methods And Math

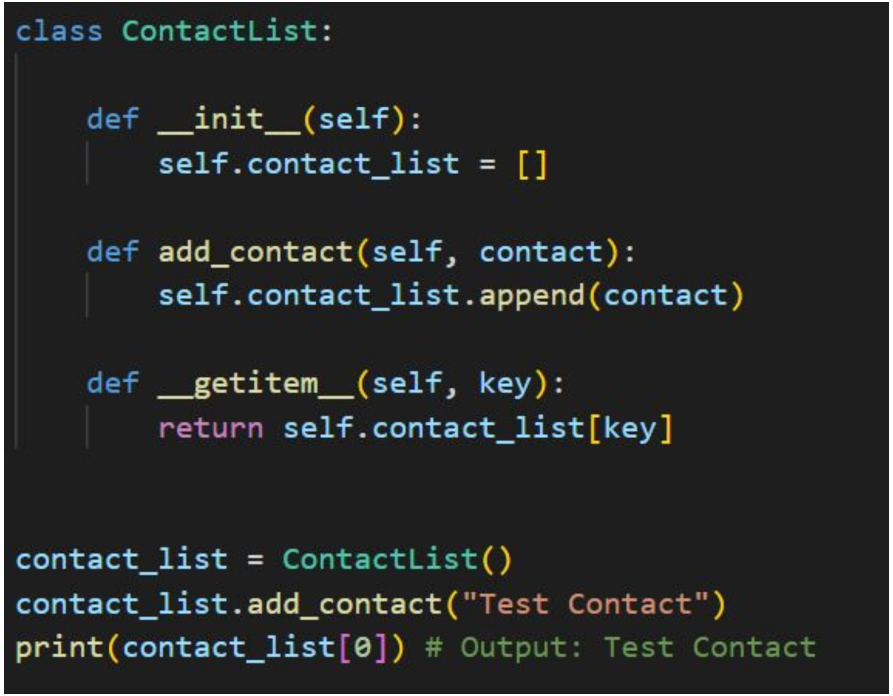
- Some mathematical special operators that are available are:
    - Add -> __add__(self, other)
    - Subtract -> __sub__(self, other)
    - Multiply -> __mul__(self, other)
    - Divide -> __truediv__(self, other)
    - Power -> __pow__(self, other)

# Container-Like Objects

- Using special methods we can also incorporate behaviour that we see in container-like objects such as iterating, indexing, adding and removing items, and getting the length.
- E.g. When we try to get an item from a list the special method __getitem__(self,key) is called. We can then override the behaviour of the method to return the item we desire.

- Object[y] -> Object.__getitem__(y)

# Container-Like Objects



```python
class ContactList:

    def __init__(self):
        self.contact_list = []

    def add_contact(self, contact):
        self.contact_list.append(contact)

    def __getitem__(self, key):
        return self.contact_list[key]


contact_list = ContactList()
contact_list.add_contact("Test Contact")
print(contact_list[0]) # Output: Test Contact
```

# Container-Like Objects

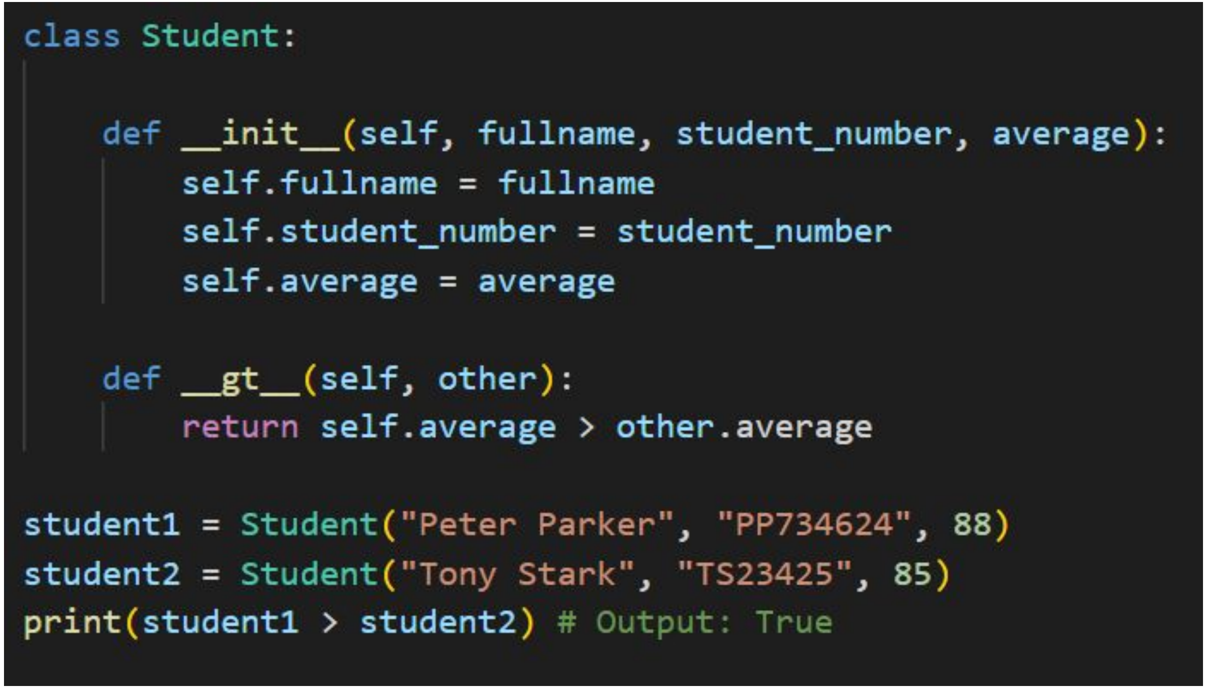
- Some special methods to add for container-like objects are:
    - Length -> __len__(self)
    - Get Item -> __getitem__(self, key)
    - Set Item -> __setitem__(self, key, item)
    - Contains -> __contains__(self, item)
    - Iterator -> __iter__(self)
    - Next -> __next__(self)

# Comparators

- The last special methods we will look at are comparators.
- We will use these methods to set the behaviour when we try to compare our objects to determine which one is smaller or larger or are they equal.
- E.g. When trying to see if object x is greater than object y. The method x__gt__(y) will be called to determine the result. We can then set the behaviour of __gt__() inside our class.

- x > y -> x.__gt__(y)

# Comparators



```python
class Student:

    def __init__(self, fullname, student_number, average):
        self.fullname = fullname
        self.student_number = student_number
        self.average = average

    def __gt__(self, other):
        return self.average > other.average

student1 = Student("Peter Parker", "PP734624", 88)
student2 = Student("Tony Stark", "TS23425", 85)
print(student1 > student2) # Output: True
```

# Poll:

## Assessment

# Wrapping Up

## Special Methods

We can use special methods to add and set specific behaviour for built-in python functions. We can add behaviour for string representation, mathematical operations, container-like objects and many more.

CoGrammar

Questions around special methods

CoGrammar

## Thank you for joining