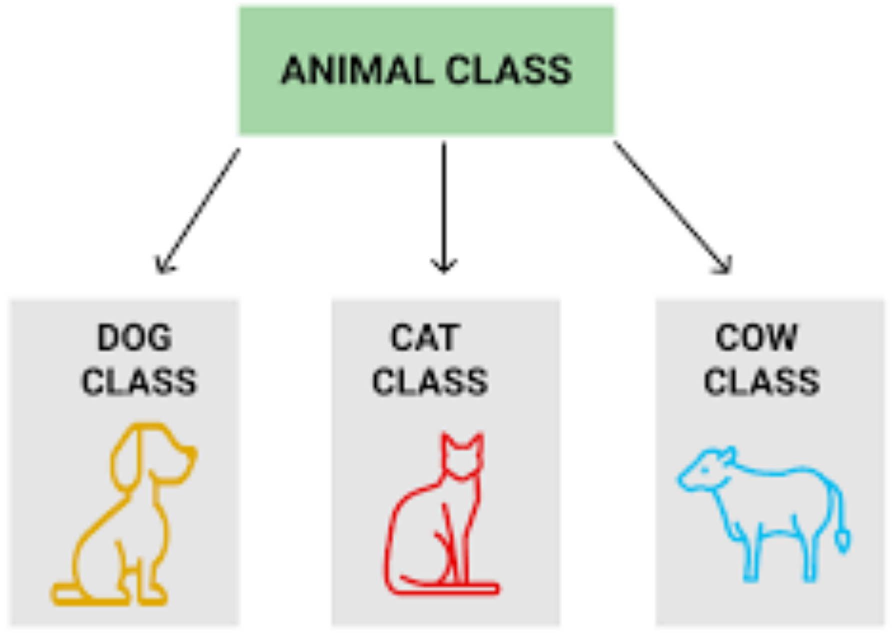
Inheritance

Week 2

Trinity Walton Club

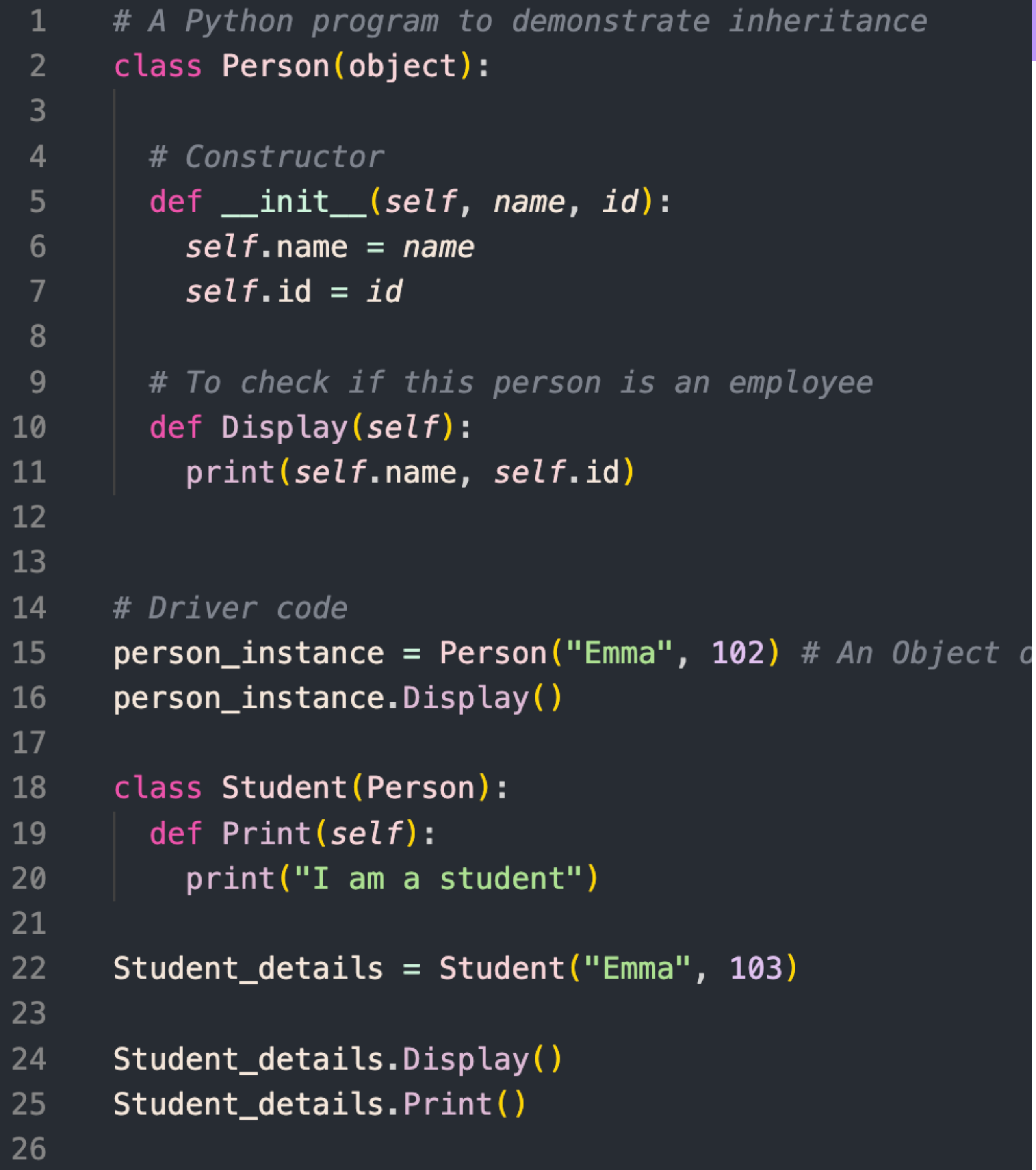
What is Inheritance?



Inheritance is a hierarchy of classes within OOP that allows us to derive properties from one class to another

This represents real-world relationships well

Promotes the reusability of code



```python
# A Python program to demonstrate inheritance
class Person(object):

  # Constructor
  def __init__(self, name, id):
    self.name = name
    self.id = id

  # To check if this person is an employee
  def Display(self):
    print(self.name, self.id)


# Driver code
person_instance = Person("Emma", 102) # An Object o
person_instance.Display()

class Student(Person):
  def Print(self):
    print("I am a student")

Student_details = Student("Emma", 103)

Student_details.Display()
Student_details.Print()
```

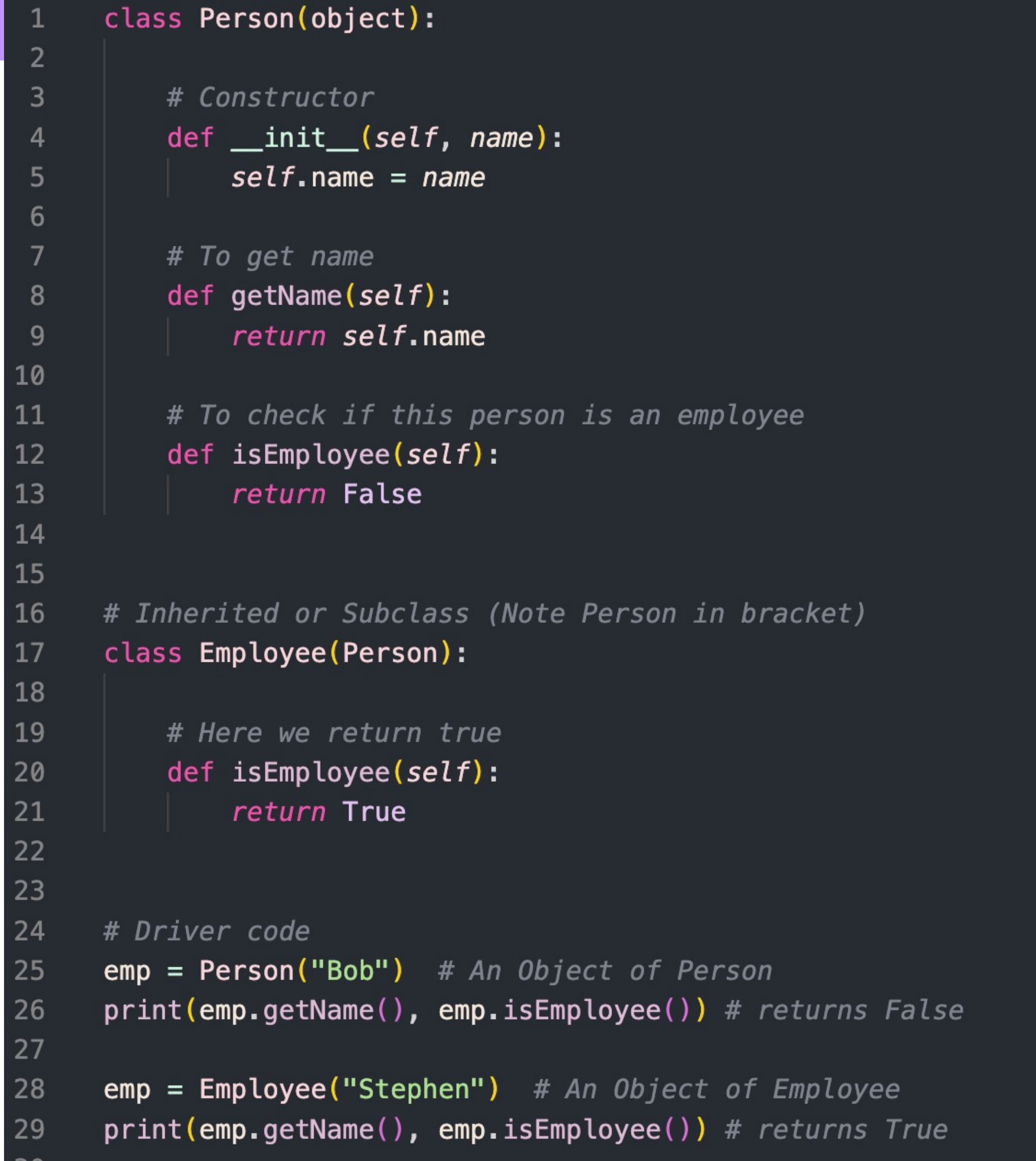
Example 1

```
Class BaseClass:
    {Body}
Class DerivedClass(BaseClass):
    {Body}
```

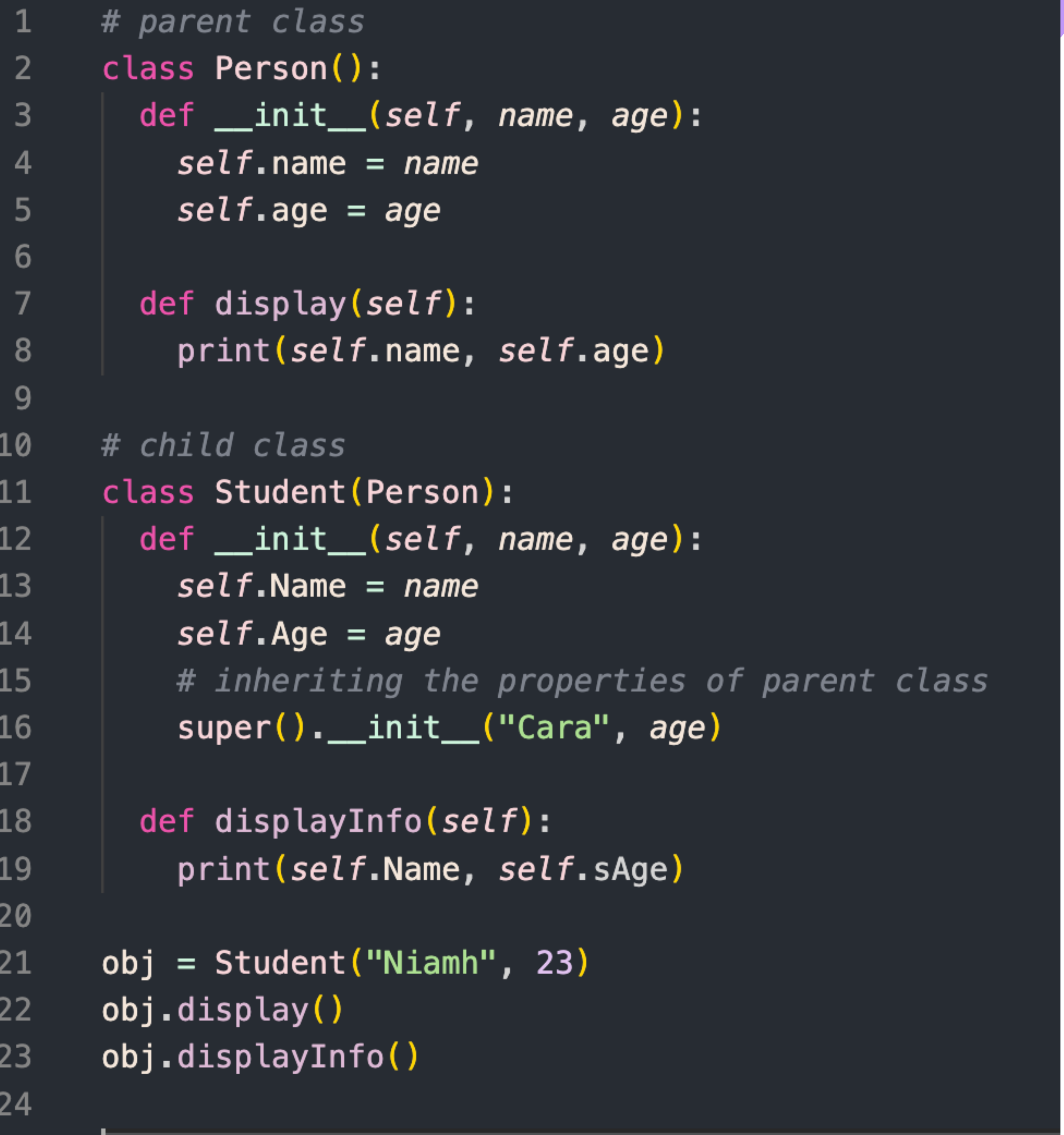
Notice how the the properties of the `Person` class are inherited in the `Student` class

Example 2

We can also create new methods within the child class, that is only accessible to the child class



```python
class Person(object):

    # Constructor
    def __init__(self, name):
        self.name = name

    # To get name
    def getName(self):
        return self.name

    # To check if this person is an employee
    def isEmployee(self):
        return False


# Inherited or Subclass (Note Person in bracket)
class Employee(Person):

    # Here we return true
    def isEmployee(self):
        return True


# Driver code
emp = Person("Bob")  # An Object of Person
print(emp.getName(), emp.isEmployee()) # returns False

emp = Employee("Stephen")  # An Object of Employee
print(emp.getName(), emp.isEmployee()) # returns True
```



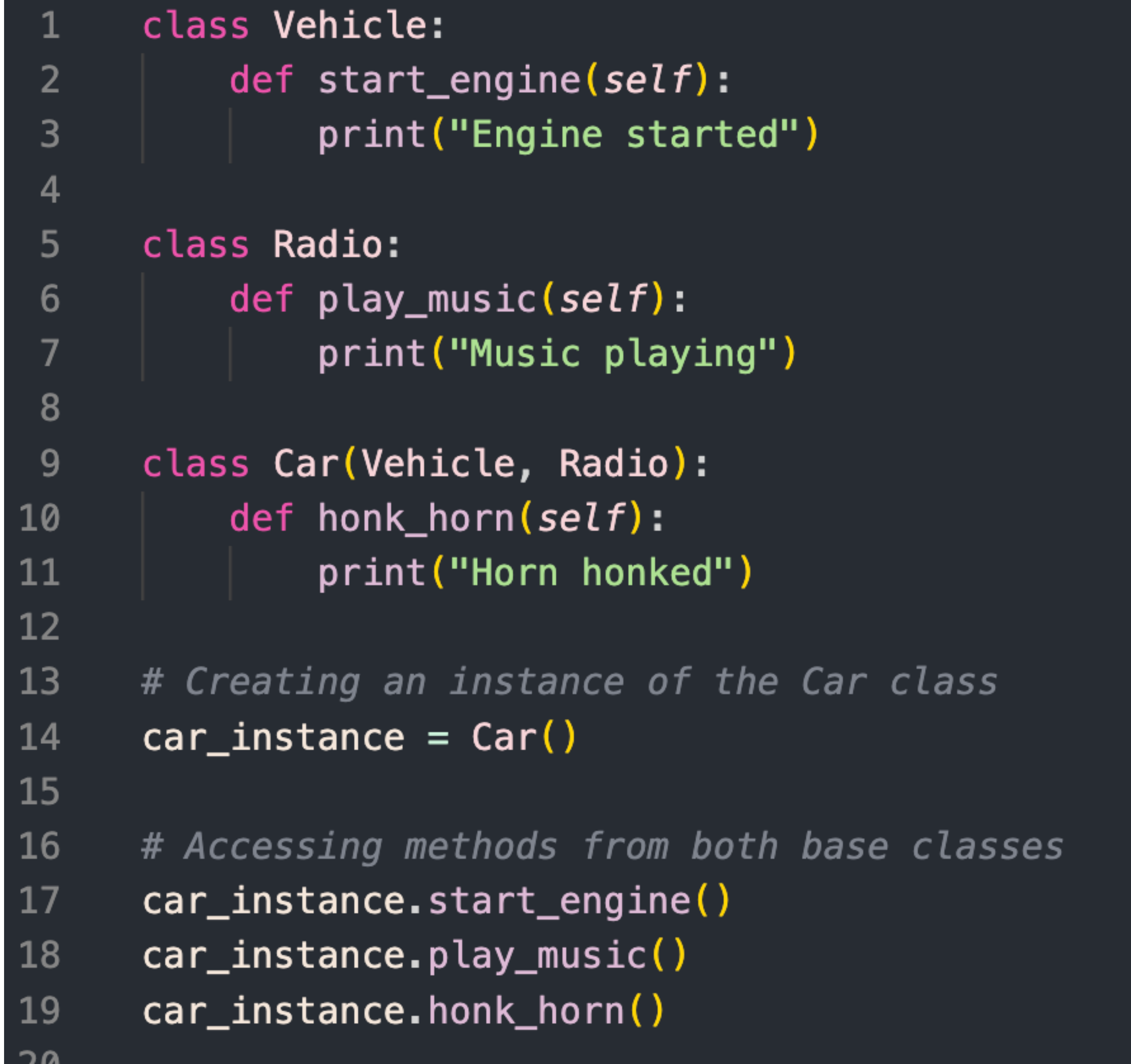
```python
# parent class
class Person():
  def __init__(self, name, age):
    self.name = name
    self.age = age

  def display(self):
    print(self.name, self.age)

# child class
class Student(Person):
  def __init__(self, name, age):
    self.Name = name
    self.Age = age
    # inheriting the properties of parent class
    super().__init__("Cara", age)

  def displayInfo(self):
    print(self.Name, self.sAge)

obj = Student("Niamh", 23)
obj.display()
obj.displayInfo()
```

Example 3

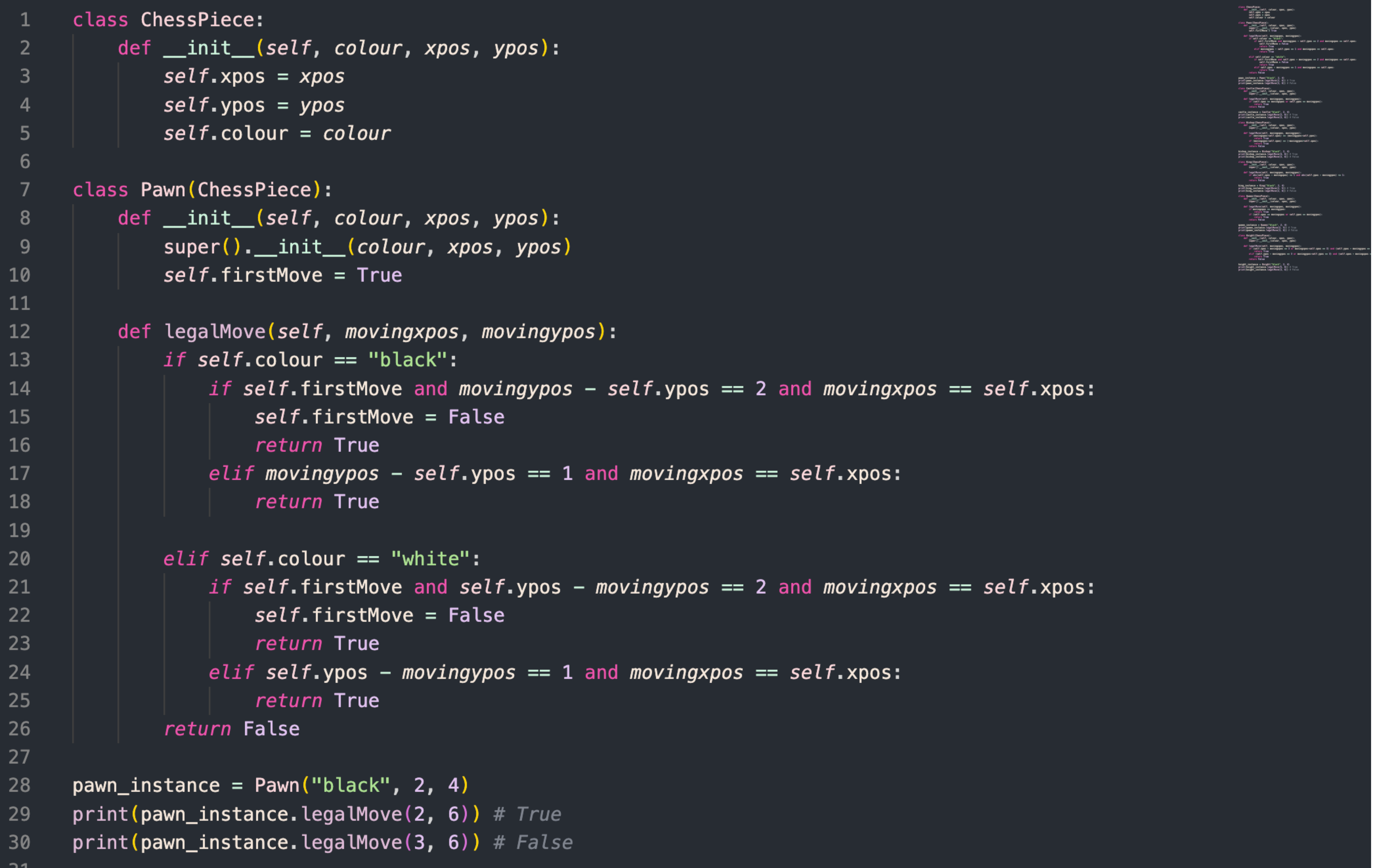
We can inherit the `__init__` from the parent class

Example 4

We can inherit from multiple classes at the same time



```python
class Vehicle:
    def start_engine(self):
        print("Engine started")

class Radio:
    def play_music(self):
        print("Music playing")

class Car(Vehicle, Radio):
    def honk_horn(self):
        print("Horn honked")

# Creating an instance of the Car class
car_instance = Car()

# Accessing methods from both base classes
car_instance.start_engine()
car_instance.play_music()
car_instance.honk_horn()
```



```python
class ChessPiece:
    def __init__(self, colour, xpos, ypos):
        self.xpos = xpos
        self.ypos = ypos
        self.colour = colour

class Pawn(ChessPiece):
    def __init__(self, colour, xpos, ypos):
        super().__init__(colour, xpos, ypos)
        self.firstMove = True

    def legalMove(self, movingxpos, movingypos):
        if self.colour == "black":
            if self.firstMove and movingypos - self.ypos == 2 and movingxpos == self.xpos:
                self.firstMove = False
                return True
            elif movingypos - self.ypos == 1 and movingxpos == self.xpos:
                return True

        elif self.colour == "white":
            if self.firstMove and self.ypos - movingypos == 2 and movingxpos == self.xpos:
                self.firstMove = False
                return True
            elif self.ypos - movingypos == 1 and movingxpos == self.xpos:
                return True
        return False

pawn_instance = Pawn("black", 2, 4)
print(pawn_instance.legalMove(2, 6)) # True
print(pawn_instance.legalMove(3, 6)) # False
```

Exercise

https://github.com/b00rg/walton-programming

https://www.online-python.com/

1. Get into groups of 4-5 people; this will be the team for the group project in this semester
2. Create a `ChessPiece` parent class with the variables initialized of xpos, ypos and colour (with the xpos and ypos being the position of the piece in a 2D array of the chess board)
3. Create a chess piece child class that inherits the variables from the chess piece parent class. Create a function called 'IsLegalMove' that determines whether an inputted x and y variable is legal for the chess piece to move to, based on its current x and y position (self.xpos, self.ypos) Note: each member of the team should work on one chess piece.
4. Create two instances of the chess piece, and test whether the `IsLegalMove` function works:

   a. black_piece, with colour black, xpos 3 and ypos 2

   b. white_piece, with colour white, xpos 5 and ypos 7

Use the `abs()` function to turn a negative number into a positive number

e.g. `abs(-2)` = 2

`abs(2)` = 2

`abs(-2) == abs(2)` returns `True`

References

- https://akshayraut.medium.com/inheritance-in-object-oriented-programming-8c61b93ca5a8
- https://www.geeksforgeeks.org/inheritance-in-python/
- https://en.wikipedia.org/wiki/Grid_chess