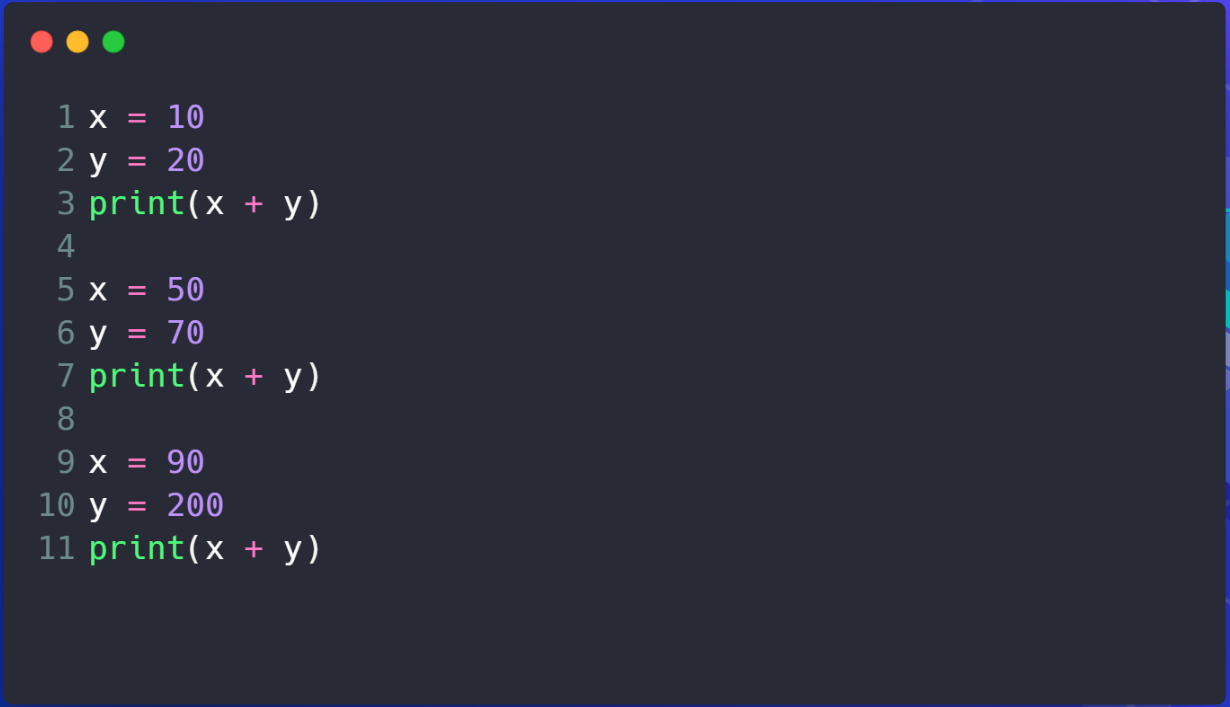
Object Oriented Programming (OOP)

Why OOP ?!

Let's see Why ^_^

Calculate Sum 10000 times ?!



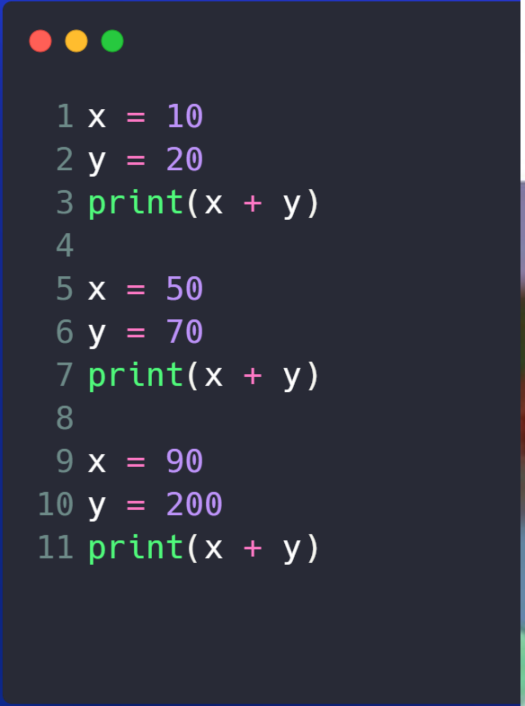
```python
x = 10
y = 20
print(x + y)

x = 50
y = 70
print(x + y)

x = 90
y = 200
print(x + y)
```

Calculate Sum 10000 times ?!

What if I want to modify code to multiply ?

Calculate Sum 10000 times ?!

What if I w

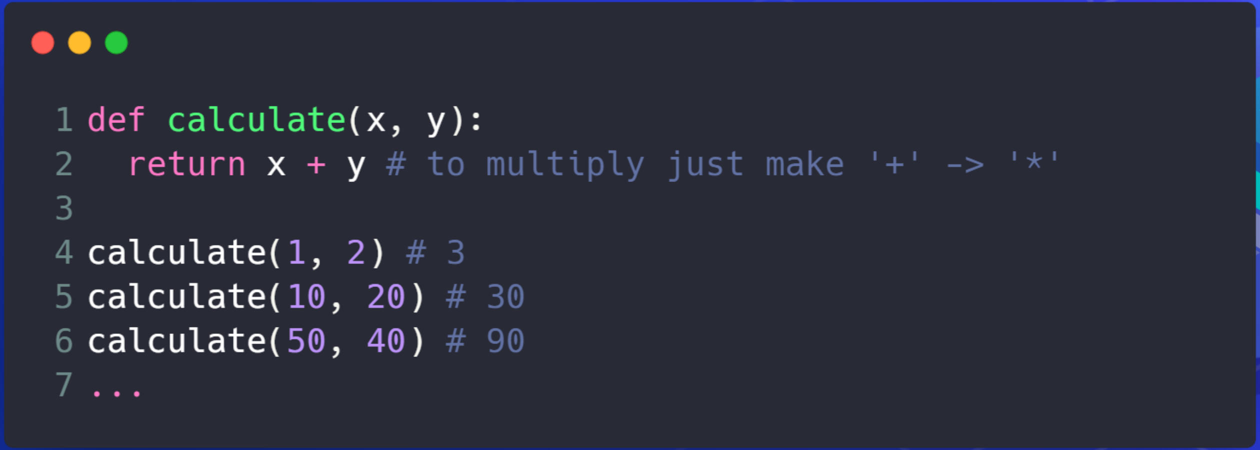


```python
x = 10
y = 20
print(x + y)

x = 50
y = 70
print(x + y)

x = 90
y = 200
print(x + y)
```

Albert Einstein: Insanity is doing the same thing over and over and expecting different results

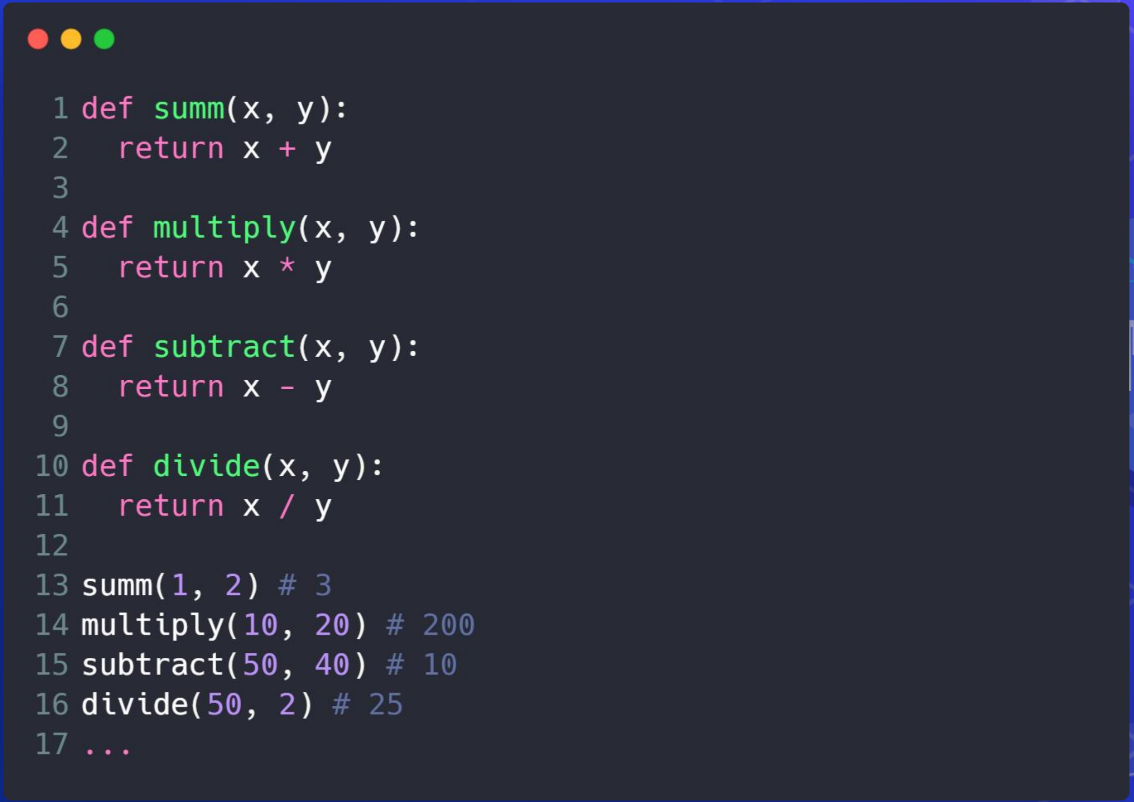
Calculate Sum 10000 times ?!

What if I want to modify code to multiply ?



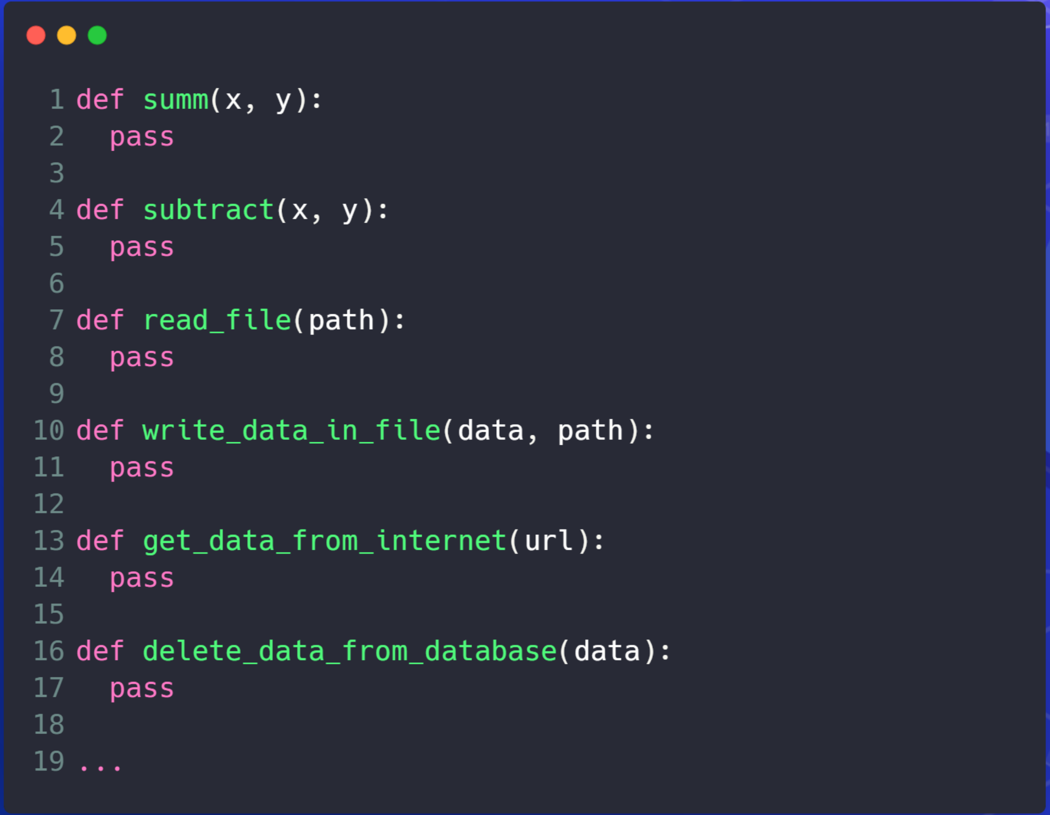
```python
def calculate(x, y):
  return x + y # to multiply just make '+' -> '*'

calculate(1, 2) # 3
calculate(10, 20) # 30
calculate(50, 40) # 90
...
```

Make Full Calculator ?



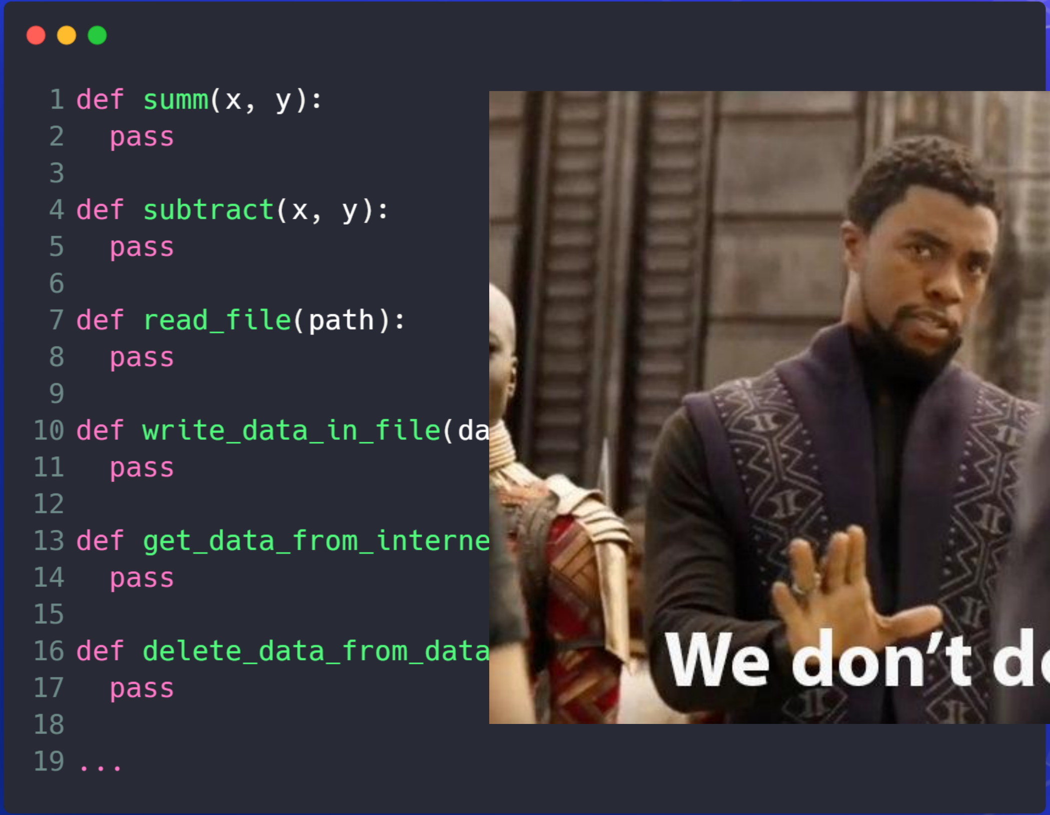
```python
def summ(x, y):
  return x + y

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

def subtract(x, y):
  return x - y

def divide(x, y):
  return x / y

summ(1, 2) # 3
multiply(10, 20) # 200
subtract(50, 40) # 10
divide(50, 2) # 25
...
```

Make Lots of Features ?



```python
def summ(x, y):
  pass

def subtract(x, y):
  pass

def read_file(path):
  pass

def write_data_in_file(data, path):
  pass

def get_data_from_internet(url):
  pass

def delete_data_from_database(data):
  pass

...
```

Make Lots of Features ?



```python
def summ(x, y):
  pass

def subtract(x, y):
  pass

def read_file(path):
  pass

def write_data_in_file(da
  pass

def get_data_from_interne
  pass

def delete_data_from_data
  pass

...
```

What is OOP ?!

Everything is an

Object

Dog

Attributes

- Size
- Color
- Breed
- Age
- ...

Methods

- Run()
- Park()
- Eat()
- Sleep()
- ...

Car

Attributes

- Model
- Color
- Plate Number
- Speed
- ...

Methods

- Steer()
- Back()
- Break()
- Throttle()
- ...

Person

Attributes

- Name
- Age
- Address
- Gender
- ...

Methods

- Eat()
- Sleep()
- Walk()
- Pray()
- ...

Camera

Attributes

- Lens_width
- Has_Flash
- Depth
- ...

Methods

- Take_Photo()
- Take_Video()
- Toggle_Flash()
- Zoom()
- ...

Classes & Objects

Person

Attributes

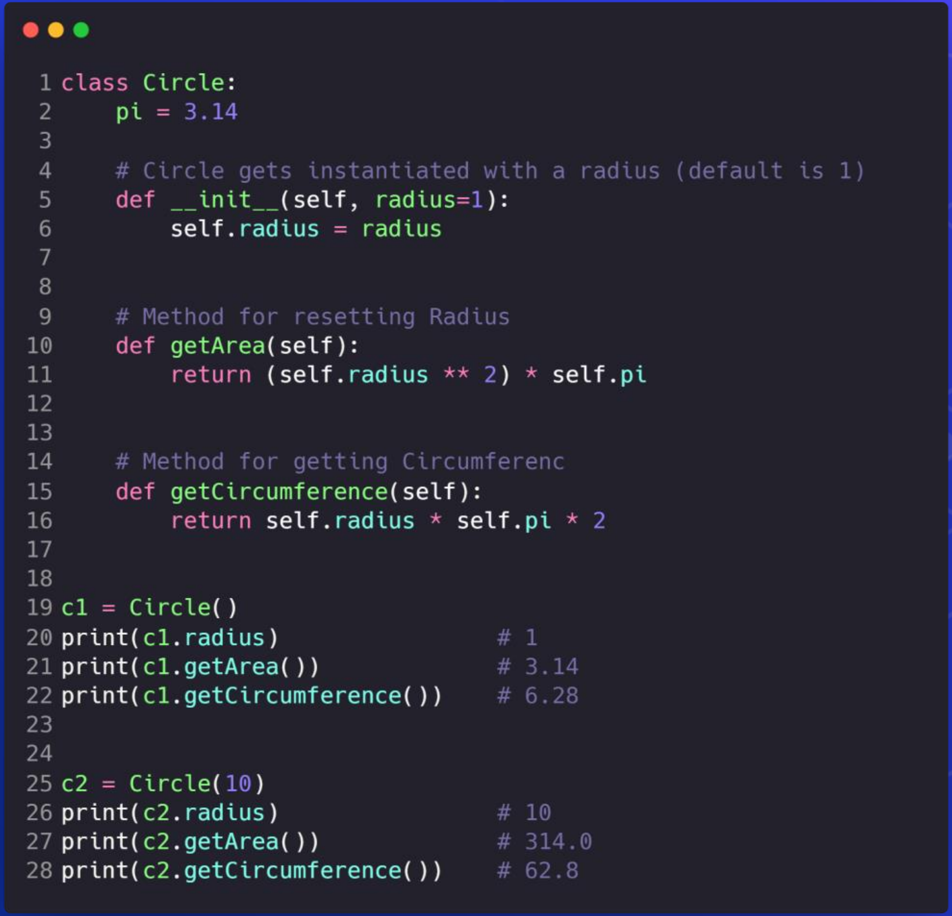
- Name
- Age
- Address
- Gender
- ...

Methods

- Eat()
- Sleep()
- Walk()
- Pray()
- ...

Class: Person

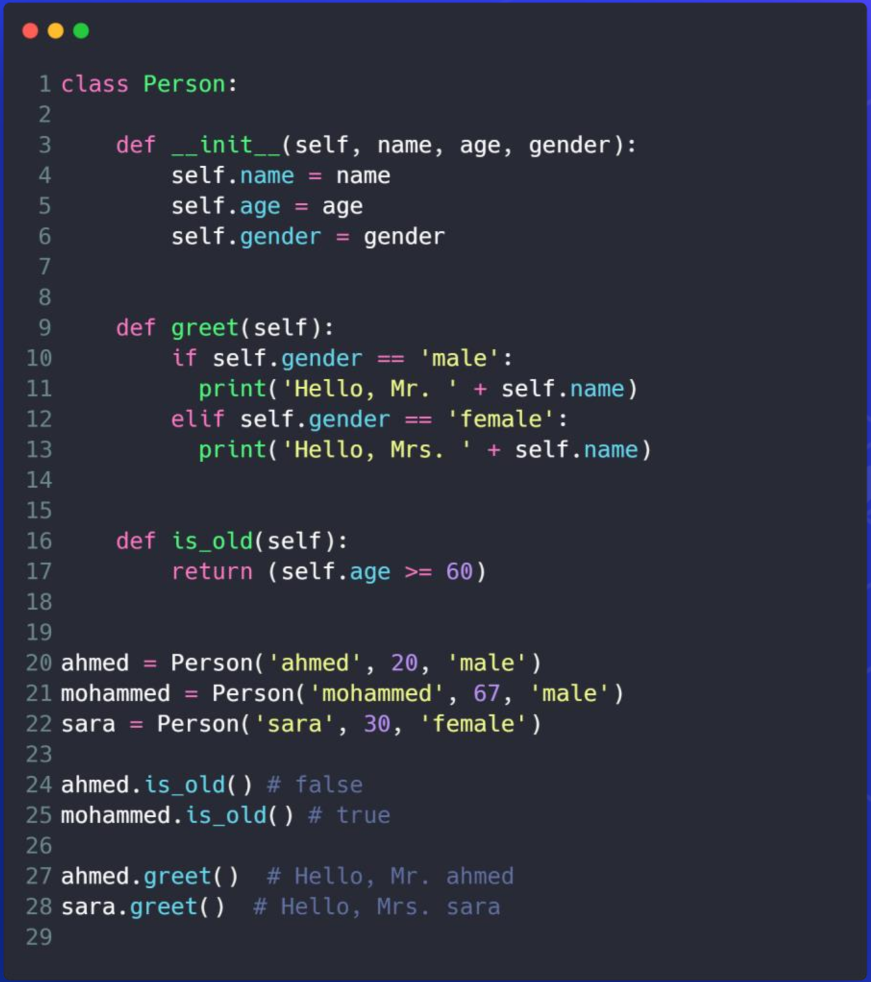
Object 1	Object 2	Object 3
Name: Eslam	Name: Ahmed	Name: Sara
Age: 26	Age: 15	Age: 30
Gender: Male	Gender: Male	Gender: Female
Eat Meat	Eat Chicken	Eat Fish
Sleep at 9 pm	Sleep at 12 am	Sleep at 6 am



```python
class Circle:
    pi = 3.14

    # Circle gets instantiated with a radius (default is 1)
    def __init__(self, radius=1):
        self.radius = radius


    # Method for resetting Radius
    def getArea(self):
        return (self.radius ** 2) * self.pi


    # Method for getting Circumferenc
    def getCircumference(self):
        return self.radius * self.pi * 2


c1 = Circle()
print(c1.radius)                # 1
print(c1.getArea())             # 3.14
print(c1.getCircumference())    # 6.28


c2 = Circle(10)
print(c2.radius)                # 10
print(c2.getArea())             # 314.0
print(c2.getCircumference())    # 62.8
```

OOP in Python ?

Circle



```python
class Person:

    def __init__(self, name, age, gender):
        self.name = name
        self.age = age
        self.gender = gender


    def greet(self):
        if self.gender == 'male':
          print('Hello, Mr. ' + self.name)
        elif self.gender == 'female':
          print('Hello, Mrs. ' + self.name)


    def is_old(self):
        return (self.age >= 60)


ahmed = Person('ahmed', 20, 'male')
mohammed = Person('mohammed', 67, 'male')
sara = Person('sara', 30, 'female')

ahmed.is_old() # false
mohammed.is_old() # true

ahmed.greet()  # Hello, Mr. ahmed
sara.greet()  # Hello, Mrs. sara

```

OOP in Python ?

Person

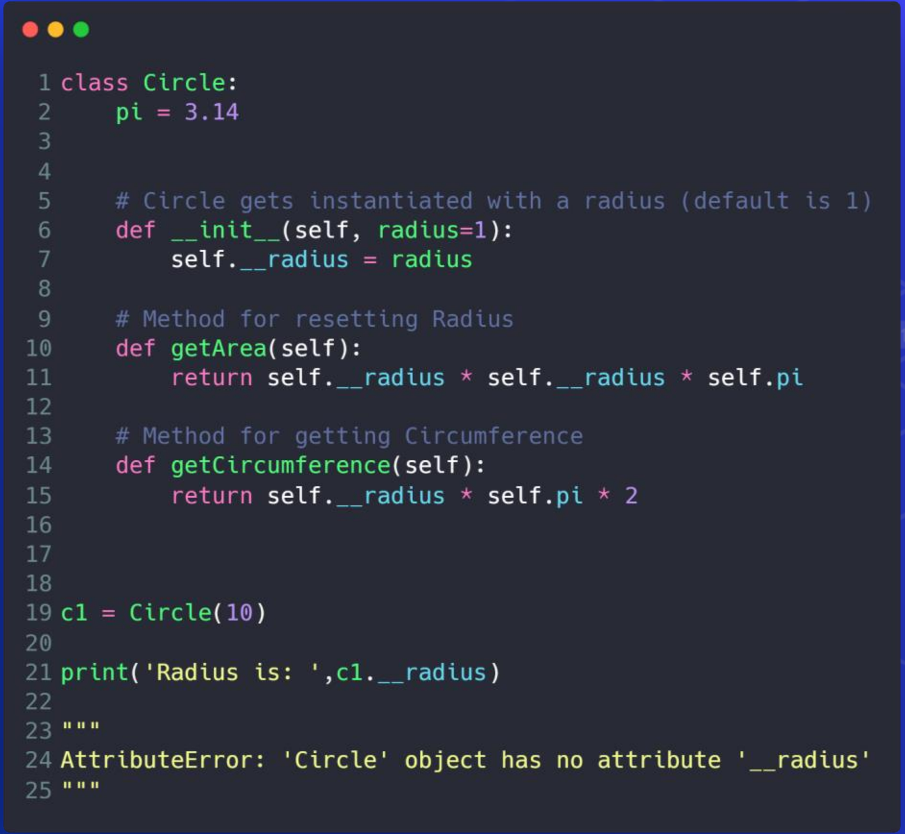
Data Hiding (Encapsulation)

Data Hiding (Encapsulation)

An object's attributes may or may not be visible outside the class definition. You need to name attributes with a double underscore prefix, and those attributes then are not be directly visible to outsiders.

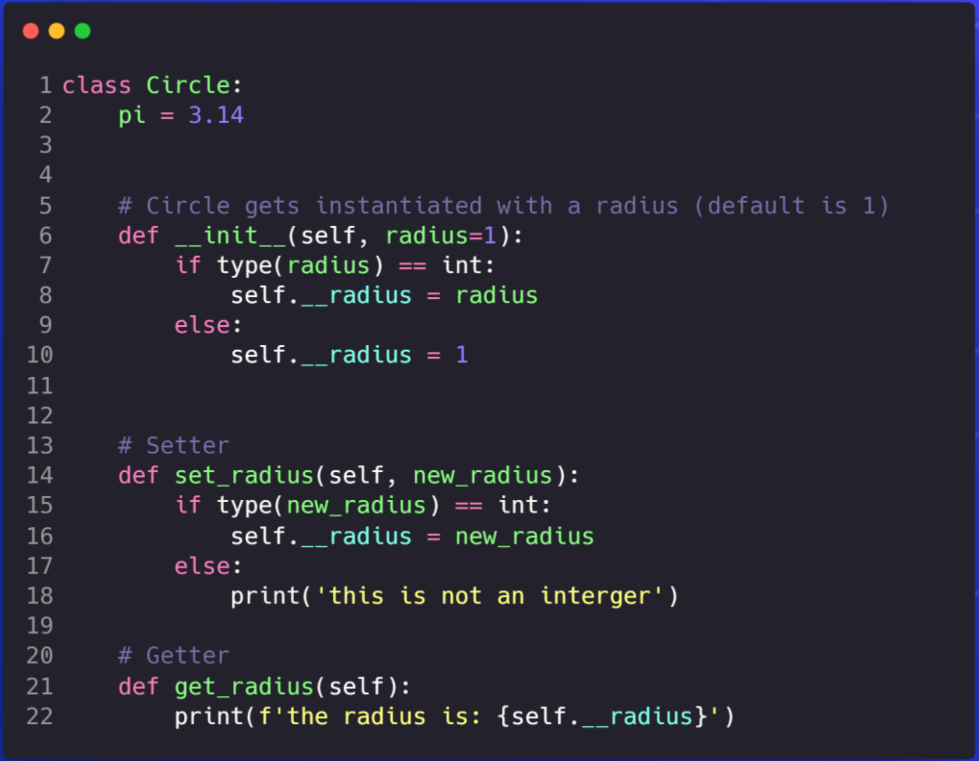
Data Hiding (Encapsulation)

Private members



```python
class Circle:
    pi = 3.14


    # Circle gets instantiated with a radius (default is 1)
    def __init__(self, radius=1):
        self.__radius = radius

    # Method for resetting Radius
    def getArea(self):
        return self.__radius * self.__radius * self.pi

    # Method for getting Circumference
    def getCircumference(self):
        return self.__radius * self.pi * 2



c1 = Circle(10)

print('Radius is: ',c1.__radius)

"""
AttributeError: 'Circle' object has no attribute '__radius'
"""
```

Data Hiding (Encapsulation) Setter and Getter



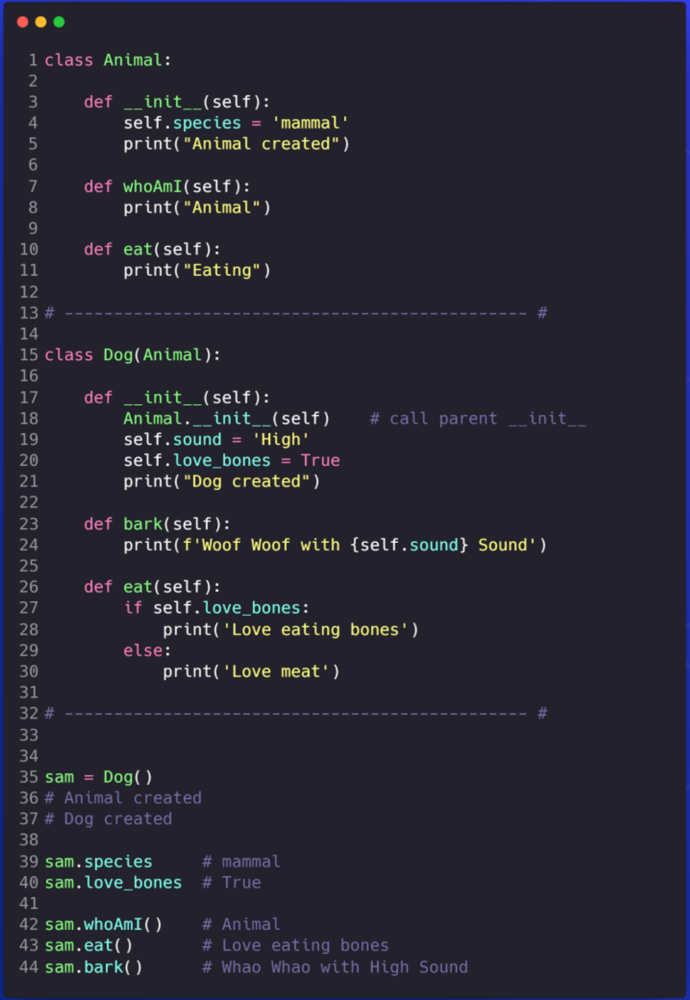
```python
class Circle:
    pi = 3.14


    # Circle gets instantiated with a radius (default is 1)
    def __init__(self, radius=1):
        if type(radius) == int:
            self.__radius = radius
        else:
            self.__radius = 1


    # Setter
    def set_radius(self, new_radius):
        if type(new_radius) == int:
            self.__radius = new_radius
        else:
            print('this is not an interger')

    # Getter
    def get_radius(self):
        print(f'the radius is: {self.__radius}')
```

Inheritance

Inheritance

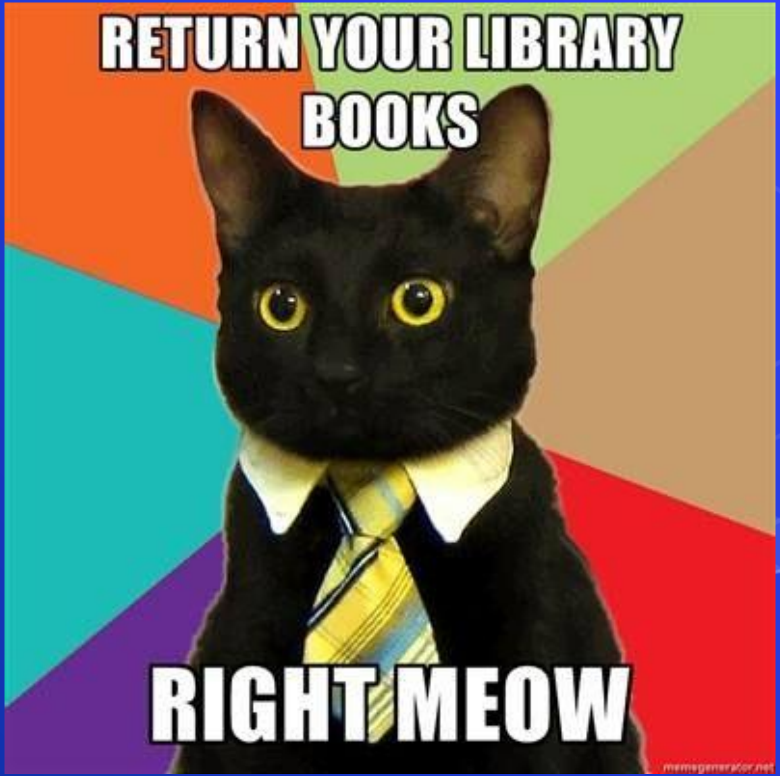
It is a way to form new classes using classes that have already been defined. The newly formed classes are called derived classes, the classes that we derive from are called base classes.

Inheritance

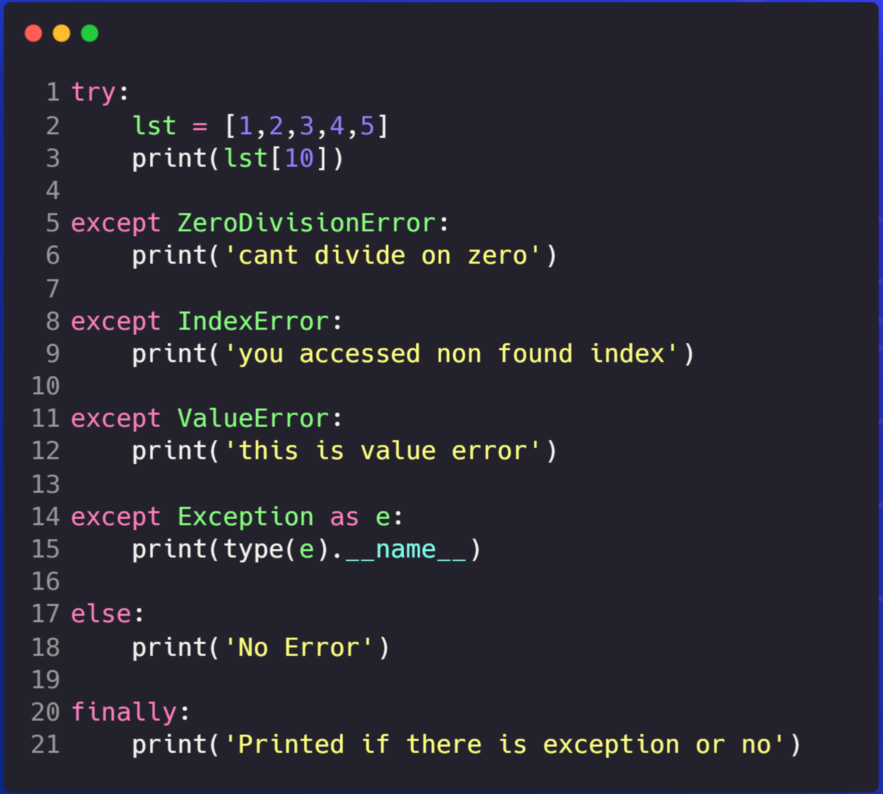


```python
class Animal:

    def __init__(self):
        self.species = 'mammal'
        print("Animal created")

    def whoAmI(self):
        print("Animal")

    def eat(self):
        print("Eating")

# ----------------------------------------------- #

class Dog(Animal):

    def __init__(self):
        Animal.__init__(self)    # call parent __init__
        self.sound = 'High'
        self.love_bones = True
        print("Dog created")

    def bark(self):
        print(f'Woof Woof with {self.sound} Sound')

    def eat(self):
        if self.love_bones:
            print('Love eating bones')
        else:
            print('Love meat')

# ----------------------------------------------- #


sam = Dog()
# Animal created
# Dog created

sam.species      # mammal
sam.love_bones   # True

sam.whoAmI()     # Animal
sam.eat()        # Love eating bones
sam.bark()       # Whao Whao with High Sound
```

Project 2 – Library system



Exceptions



```
try:
    lst = [1,2,3,4,5]
    print(lst[10])

except ZeroDivisionError:
    print('cant divide on zero')

except IndexError:
    print('you accessed non found index')

except ValueError:
    print('this is value error')

except Exception as e:
    print(type(e).__name__)

else:
    print('No Error')

finally:
    print('Printed if there is exception or no')
```

Check Python Error Types

https://docs.python.org/3/library/exceptions.html

Questions ?!

Thanks!

```
>_ Live long and prosper
```