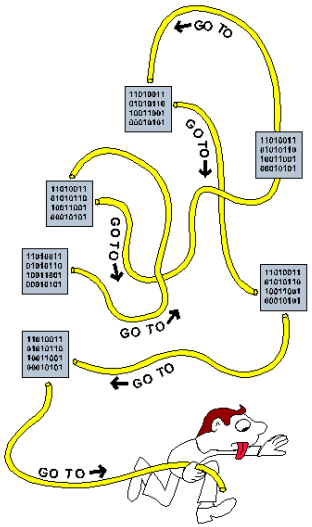
Python: The Easy Way

Lecture 3

Object Oriented Python

Intro



Speghatti Level

Procedural Level

+ Functions

Modular Level

+ Modules

Object Oriented Level

Intro

height = 175 cm
weight = 76 kg

Properties

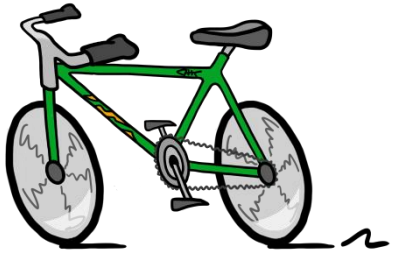
velocity = 200 m/s
brakes = 2

walk()
speak()

Methods

stop()
move()

ride(BikeObj)



Man Object

Bike Object

OOP Keywords

Class

A **class** is a template definition of an object's properties and methods.

```
class Human:
    pass
```

Object

An Object is an instance on a Class.

```
class Human:
      pass

man = Human()
```

Human Class

Man Object

Constructor

Constructor *is a method called at the moment an object is instantiated.*

```
class Human:

    def __init__(self):
        print("Hi there")

man = Human()
```

Output:

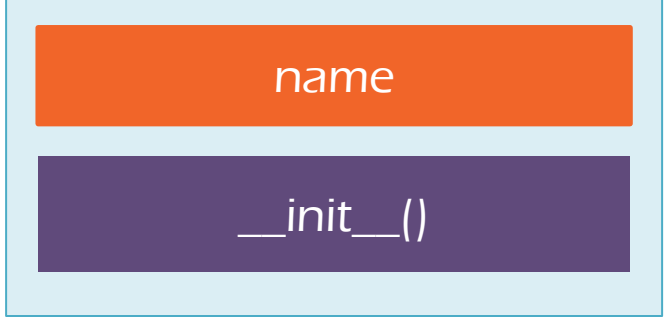
```
Hi there
```

Man Object

Instance Variable

Instance Variable is an object characteristic, such as name.

```
class Human:

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


man = Human("Ahmed")
```



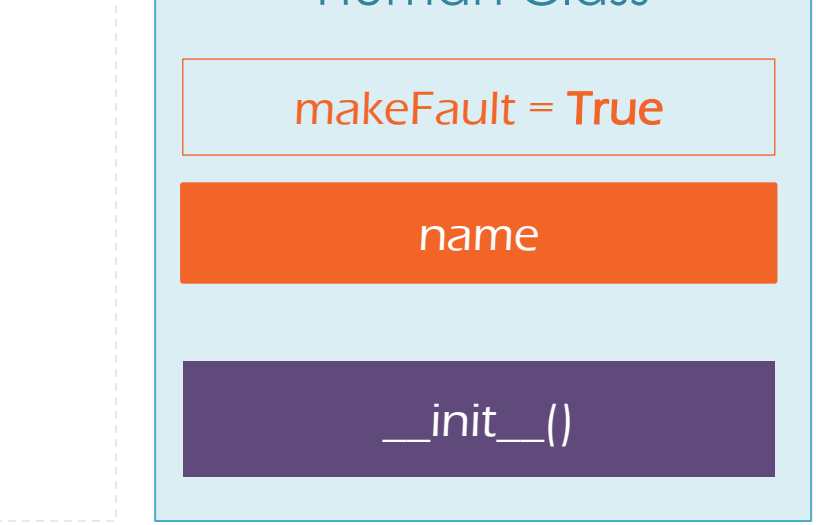
Name is Ahmed

Man Object

Class Variable

Class Variable is the variable that shared by all instances.

```
class Human:

        makeFault = True

        def __init__(self, name):
                self.name = name;

man = Human("Ahmed")
man2 = Human("Mohamed")
```



Name is Ahmed

He makes faults

Name is Mohamed

He makes faults

Class Variable

```
class Human:
        faults = 0
        def __init__(self, name):
                self.name = name;

man = Human("Ahmed")
man2 = Human("Mohamed")

man.faults = 1
print("Man :", man.faults)
print("Man 2:", man2.faults)
print("Human:", Human.faults)
Human.faults = 2
print("Man 2:", man2.faults)
print("Human:", Human.faults)
print("Man :", man.faults)
```

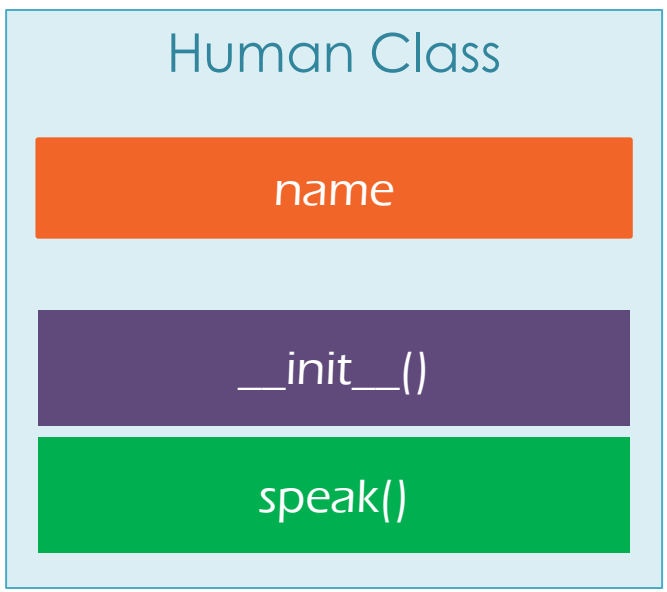
Output:

```
Man : 1

Man2 : 0

Human : 0

Man2 : 2

Human : 2

Man : 1
```

Instance Method

Instance Method is an object capability, such as walk.

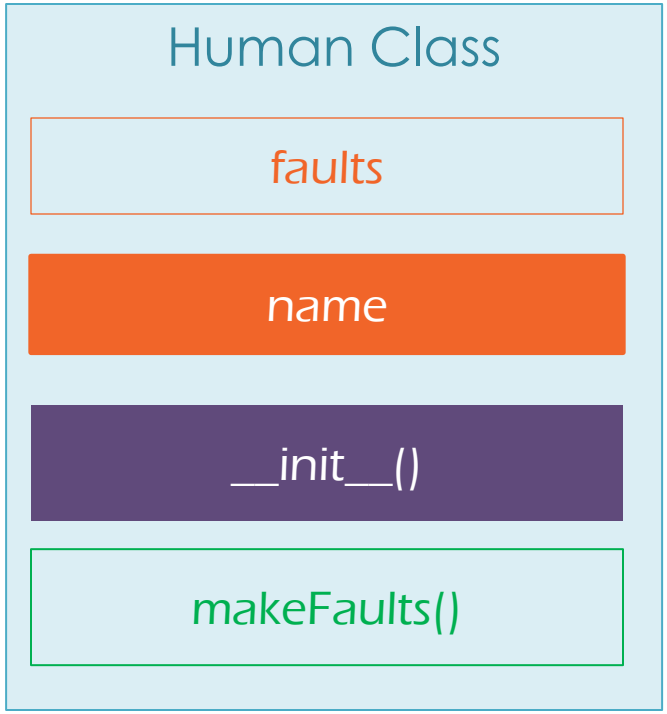
```
class Human:
    def __init__(self, name):
        self.name = name

    def speak(self):
        print("My Name is "+self.name)

man = Human("Ahmed")
man.speak()
```



Class Method

Class Method *is a method that shared by all instances of the Class*

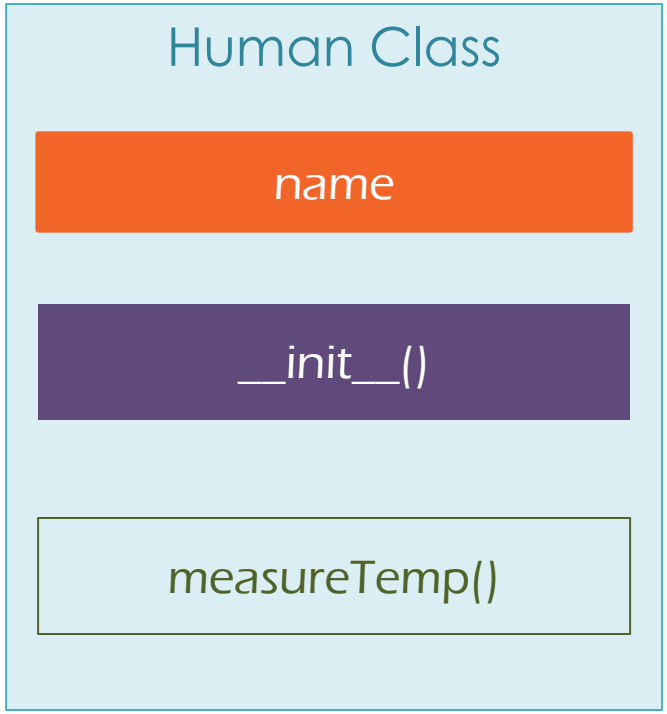
```
class Human:
    faults=0
    def __init__(self, name):
        self.name = name
    @classmethod
    def makeFaults(cls):
        cls.faults +=1
        print(cls.faults)
Human.makeFaults()  #1
man = Human("Ahmed")
man.makeFaults()    #2
```



Static Method

Static Method *is a normal function that have logic that related to the Class*

```
class Human:
    def __init__(self, name):
        self.name = name

    @staticmethod
    def measureTemp(temp):
        if (temp == 37):
            return "Normal"
        return "Not Normal"

Human.measureTemp(38)  # Not Normal
```



Static vs Class Methods

Class Method

```
# cls(Class) is implicity passed to class method like self(instance) in instance method.

# Class Method is related to the class itself.

class Human:
    @classmethod
    def walk(cls):
        print("Walk …")

Human.walk()
```

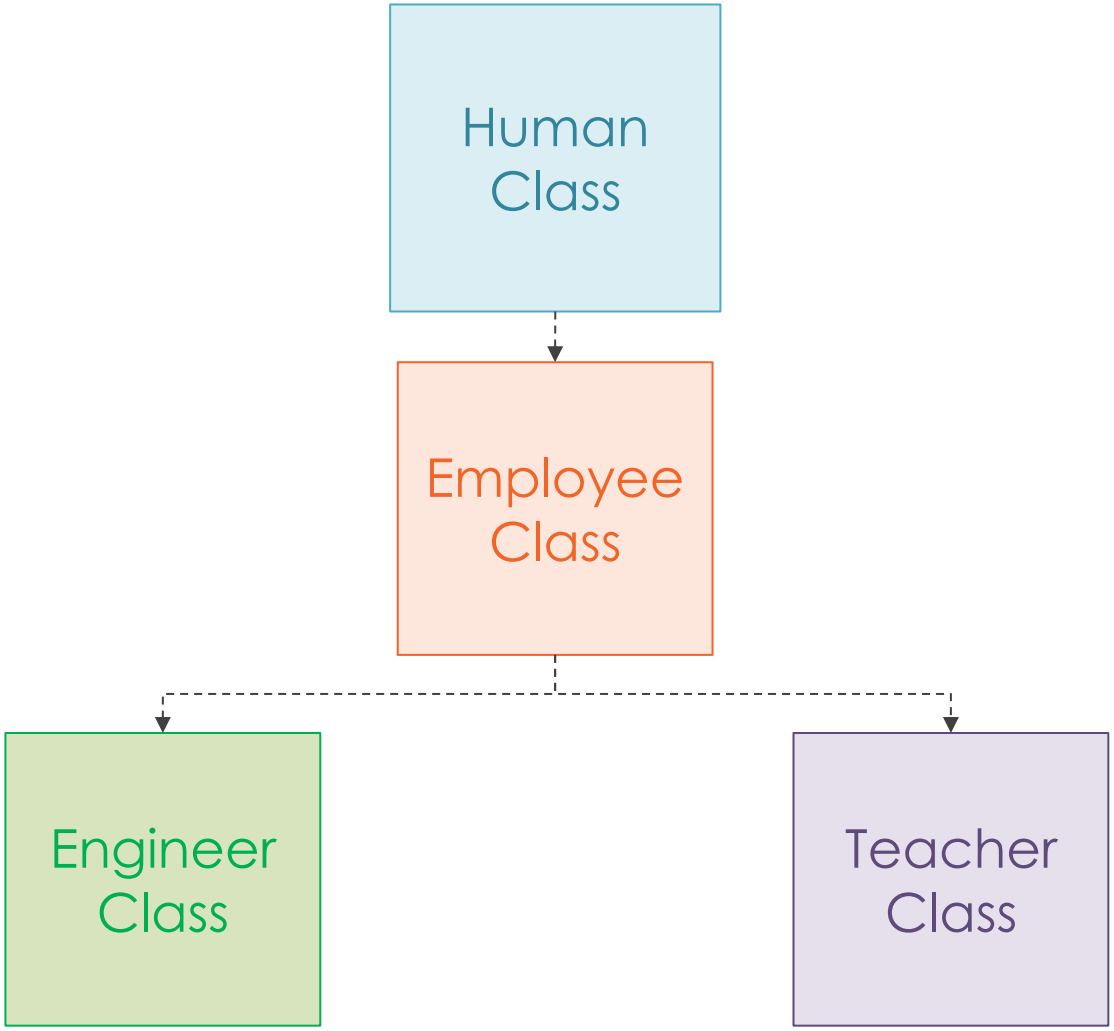
Static Method

```
# Static Method is like a normal function but we put it in the class because it have logic that related to the class.

# We call it Helper Method

class Human:
    @staticmethod
    def sleep():
        print("whoa")

Human.sleep()
```

OOP Concepts

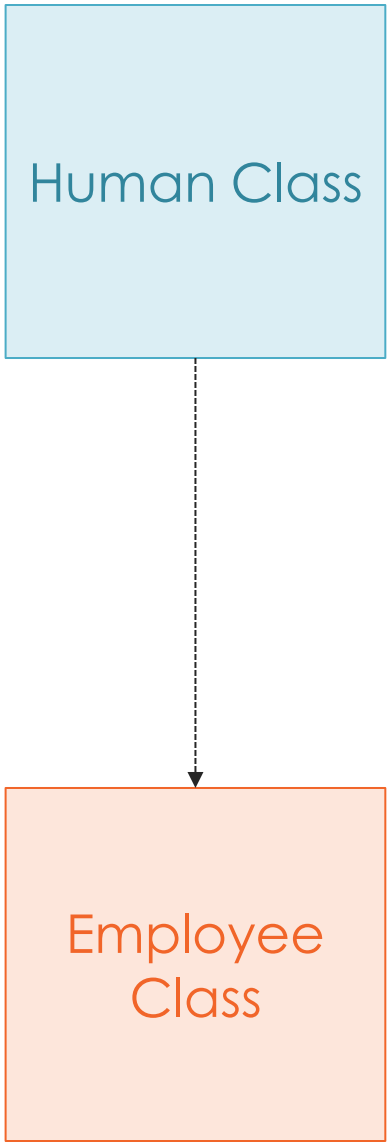
Inheritance

Intro



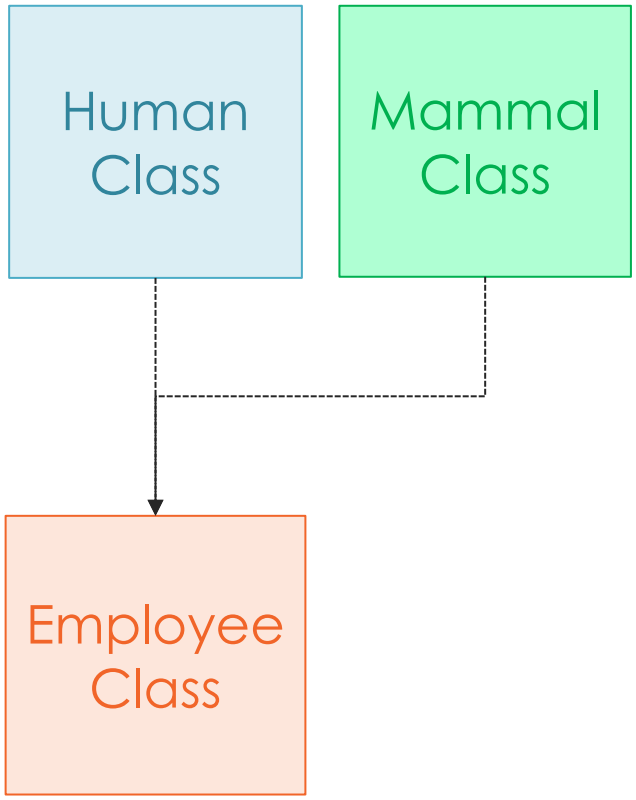
Example

```
class Human:
    def __init__(self, name):
        self.name = name
    def speak(self):
        print("My Name is "+self.name);
class Employee(Human):
    def __init__(self, name, salary):
        super(Employee, self).__init__(name)
        self.salary = salary
    def work(self):
        print("I'm working now");
emp = Employee("Ahmed", 500)
emp.speak()
emp.work()
```



Multiple Inheritance

Python supports Multiple Inheritance



Report**:

1- How super Function handle Multiple Inheritance.

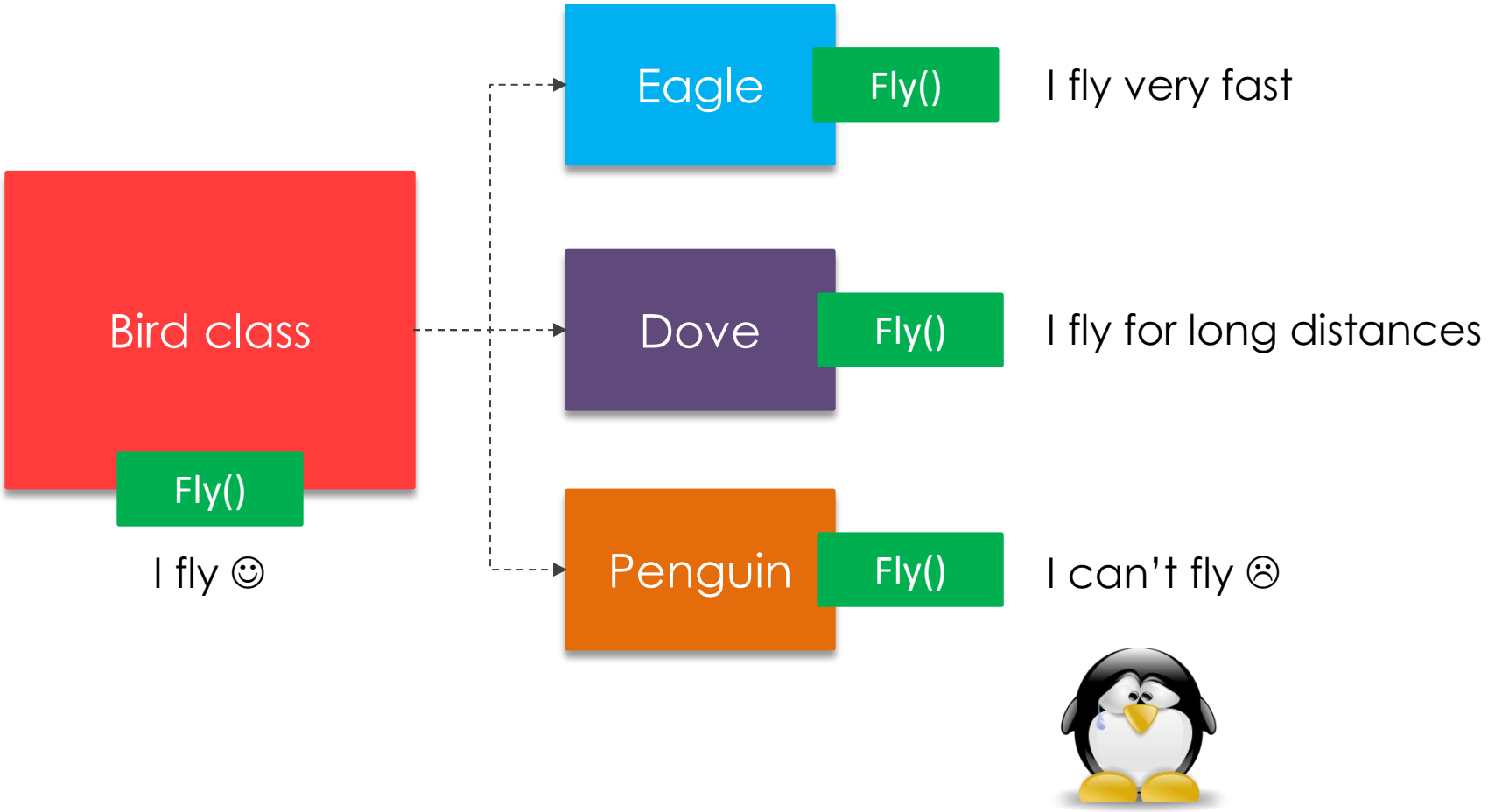
2- If Human and Mammal Have the same method like eat but with different Implementation. When Child [Employee] calls eat method how python handle this case.

**Prove your opinion with examples.

Polymorphism

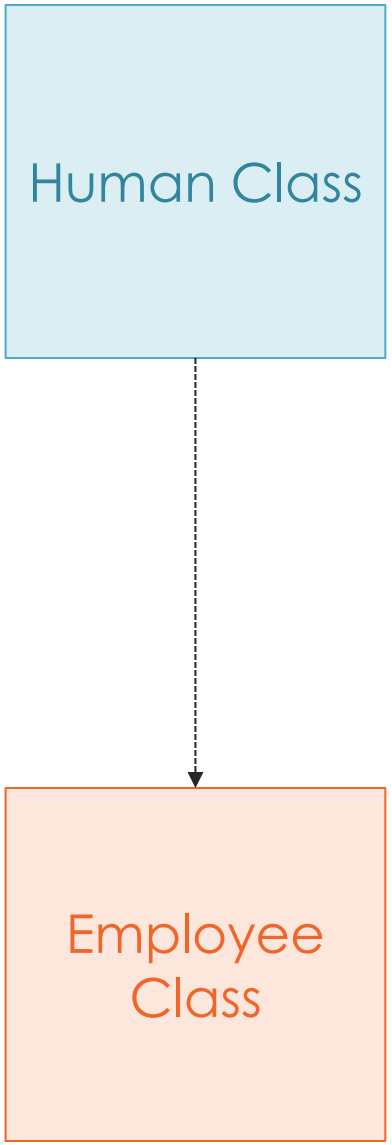
Intro

Poly means "*many*" and **morphism** means "*forms*". Different classes might define the same method or property.



Method Overriding

```
class Human:
    def __init__(self, name):
        self.name = name
    def speak(self):
        print("My Name is "+self.name);
class Employee(Human):
    def __init__(self, name, salary):
        super(Employee, self).__init__(name)
        self.salary = salary
    def speak(self):
        print("My salary is "+self.salary);
emp = Employee("Ahmed", 500)
emp.speak() #My Salary is 500
```



Method Overloading

Report**:

Can we do overloading in Python ?

If Yes, Tell me **How??**

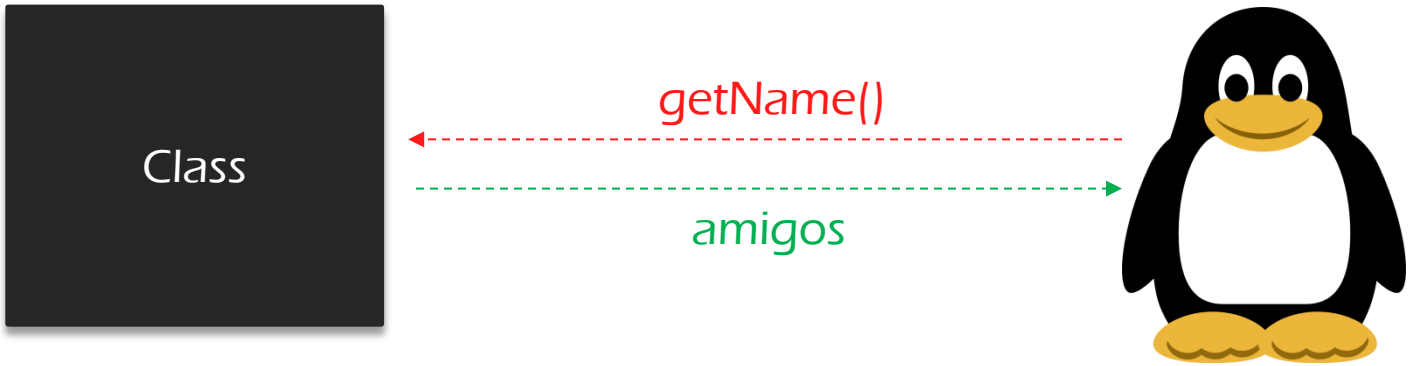
If No, Tell me **Why??**

** Support Your Answer by Examples.

Encapsulation

intro

Encapsulation is the packing of data and functions into one component (for example, a class) and then controlling access to that component .



Example

```
class Human:
    def __init__(self, name):
        self.__name = name
    def getName(self):
        return self.__name

man = Human("Mahmoud")
print(man.__name)
AttributeError: 'Human' object has no attribute '__name'

print(man.getName())
#output: Mahmoud
```

@property

```
class Human:
    def __init__(self, age):
        self.age = age

    @property
    def age(self):
        return self.__age

    @age.setter
    def age(self, age):
        if age > 0:
            self.__age = age
        if age <= 0:
            self.__age = 0

man = Human(23)
print(man.age)  # 23
man.age = -25
print(man.age)  # 0
```

Special Methods

__str__

Special Method that controls how Object treats as printable

```
class Human:
    def __init__(self, name):
        self.name = name

    def __str__(self):
        return "Hi, I'm Human and my name is "+ self.name

man = Human("Ahmed")
print(man)
#output: <__main__.Human object at 0x000000FD81804400>
print(man)
#output: Hi, I'm Human and my name is Ahmed
```

__call__

Special Method that controls how Object can show as callable

```
class Human:
    def __init__(self, name):
        self.name = name

    def __call__(self):
        print("You called me !")

man = Human("Ahmed")
man()
#output: TypeError: 'Employee' object is not callable
man()
#output: You called me !
```

__len__

Special Method that controls when measure the Object length

```
class Animal:
    def __init__(self, legs):
            self.legs = legs

    def __len__(self):
        return self.legs

dog = Animal(4)

len(dog)
#output: TypeError: 'Employee' object has no len()

len(dog)
#output: 4
```

Tips and Tricks

Lambda Expressions

Lambda Expressions are used to make anonymous functions

```
lambda input:output
```

Example

```
lmdaFn = lambda x:x+4
lmdaFn(3)   #7
def sumFn(n):
        return lambda x:x+n
sumFn(5) #<function ….>
sumFn(5)(4) #9
```

Iterators (iter and next)

iter is used to generate an iterator from iterable.

next is used to return the next iteration from iterators.

Example

```
l = ["JavaScript", "Python", "Java"]            # iterable
it = iter(l)                    # convert iterable to iterator
next(it)
#output: "JavaScript"
next(it)                        #output: "Python"
next(it)                        #output: "Java"
```

Generators

It is used to generate iterators

Example

```
def nonGenFn():
        for i in range(5):
                return i

ng = nonGenFn()
```

```
next(ng)

TypeError: 'int' object is
not an iterator
```

```
def genFn():
        for i in range(5):
                yield i

g = genFn()
```

```
next(g)      #output: 0
next(g)      #output: 1
```

map Function

```
map(function, sequence)
```

Map function are used to make iterables from apply the given function on every item in the given sequence

Example

```
it = map(lambda x:x+4, [1,3,5])
for i in it:
        print(i)
# 4
# 7
# 9
```

filter Function

filter(*condfunction*, *sequence*)

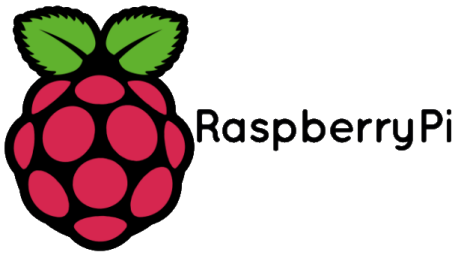
Filter function are used to make iterables from filter each item in the given sequence by the given function

Example

```
it= filter(lambda x:x%5==0, [-15, -8, -5, 3, 5, 9, 25])
for i in it:
      print(i, end=", ")
# -15, -5, 5, 25
```

What's Next ?

Frameworks and Libraries



Thank You