python

Programming Essentials

Day 8

Cyrel P. Nicolas

The + operator can be used to concatenate two or more tuples together.

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Review of OO Concepts

Object-oriented technology models real-world objects.
Real-world objects are things around you, such as: table, television, chair, etc.

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What is an object?

- Software objects, on the other hand, can represent real-world objects and other (living or non-living) entities.

  Game Characters
  Real Life People (Students, Employees, Ninja)
  Real Life Objects (Fruits, Table)

- The Python programming language uses objects and classes in building programs.

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What is an object?

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- An object has 2 characteristics:
  - State
  - Behavior

- Example:
  - A dog, as an object, has:
    - A name, color and breed. These attributes are the object dog's state.
    - The dog can bark, jump, roll-over. These are the object dog's behavior.

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What is a Class?

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- Objects with similar characteristics can fall under one class.
- Example:
    - Dog represents all breeds of dogs: bulldog, poodle, chihuahua, etc.
    - Each dog breed can be “derived” or “built from” a general class called Dog.

What is a Class?

- In object-oriented terms, the Dog class is the template or blueprint from which bulldog, poodle and chihuahua are derived.

- A class, therefore, is a template or a blueprint. An object is an instance of a class.

- A class is:
    - Made up of attributes and behavior.
        - State or Attributes of the class are represented by variables called fields.
        - Class behavior is revealed through methods.

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Class Example

Ninja

– Purpose / Behavior
- Physical Attack
- Magic Attack

– Attributes
- Name
- HP
- MP
- ATK
- LVL

class syntax

class classname:
attributes
purpose

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Define a Class in Python

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class Classname:
    statements.....

```
class Car:
    color = "red"
    model = "SUV"
    manufacturer = "Toyota"
```

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Class Members

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- Class members are declarations made inside the body of the class.

The following are class members:

- Fields
  - Also referred to as attributes.
  - These are data used by the class. They are variables declared inside the class body.

- Methods
  - Also referred to as the behavior(s).
  - These are program statements grouped together to perform a specific function.

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Creating Objects

Since classes are templates, they provide the benefit of reusability.

- A class can be used over and over to create many objects.

- An object created out of a class will contain the same variables that the class has. However, the values of the variables are specific to the object created.

- Creating an object out of a class is called class instantiation.

Creating Objects

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```
class Car:
    color = "red"
    model = "SUV"
    manufacturer = "Toyota"

truck = Car()
van = Car()
jeepney = Car()
```

Displaying Class properties in an Object

```
class Car:
    color = "red"
    model = "SUV"
    manufacturer = "Toyota"

truck = Car()
van = Car()
jeepney = Car()

print("The colour is: ", truck.color)
print("The Model is: ", truck.model)
print("The Manufacturer is: ", truck.manufacturer)

print("The colour is: ", jeepney.color)

van.color = "blue"
van.manufacturer = "Honda"
print("The colour is: ", van.color)
print("The Manufacturer is: ", van.manufacturer)
```

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Day 8 Act 1

Create a class called **Car**. The Car class has the following fields:

- color
- model
- manufacturer

Instantiate the Car class 5 times and display all properties
Modify the properties

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The __init__ function

The **__init__() function** is called automatically every time the class is being used to create a new object.

init (initialize) function is called when an object is created.

Constructor in other programming.

Syntax

```
class ObjectName:
        def __init__(self):
                #initialize code
```

Example

```
class Character:
        def __init__(self):
                print("Character Created")

char1 = Character()
```

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The __init__ function


```
class Employee:

        def __init__(self, name, email):
                self.myname = name
                self.myemail = email
```

The self parameter is a reference to the current instance of the class, and is used to access variables that belong to the class.

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Day 8 Act 2

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1. Create a Class called Employee

2. Use the init function to collect the employee information
    a. Name, email and mobile number

3. Instantiate the Employee class two times with different information

4. Display all the properties of the object.

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Access Modifiers

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Python uses '_' symbol to determine the access control for a specific data member or a member function of a class. Access specifiers in Python have an important role to play in securing data from unauthorized access and in preventing it from being exploited.

A Class in Python has three types of access modifiers:

- Public Access Modifier
- Protected Access Modifier
- Private Access Modifier

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Public Access Modifiers

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The members of a class that are declared public are easily accessible from any part of the program. All data members and member functions of a class are public by default.

```
class Person:
    # constructor
    def __init__(self, name, age):
        # public data mambers
        self.PName = name
        self.PAge = age

    def displayAge(self):
        # accessing public data member
        print("Age: ", self.PAge)
```

Private Access Modifiers

The members of a class that are declared private are accessible within the class only, private access modifier is the most secure access modifier. Data members of a class are declared private by adding a double underscore '__' symbol before the data member of that class.

```
#Private Access Modifier Sample
class Person:
    # constructor
    def __init__(self, name, age):
        # private data members
        self.__PName = name  #double underscore for Private
        self.PAge = age

    def displayAge(self):
        # accessing public data member
        print("Age: ", self.PAge)

    # creating object of the class
obj = Person("Naruto", 20)

print("Name: ", obj.__PName)

# calling public member function of the class
obj.displayAge()
```

```
AttributeError: 'Person' object has no attribute '__PName'
```

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Name Mangling of Private Variables

The name mangling process helps to access the class variables from outside the class.

Syntax:

object.class__variable

```
#Private Access Modifier Sample
class Person:
    # constructor
    def __init__(self, name, age):
        # private data members
        self.__PName = name  #double underscore for Private
        self.PAge = age
    def displayAge(self):
        # accessing public data member
        print("Age: ", self.PAge)

    # creating object of the class
obj = Person("Naruto", 20)
print(obj._Person__PName) #Name Mangling

# calling public member function of the class
obj.displayAge()
```

Protected Access Modifiers

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The members of a class that are declared protected are only accessible to a class derived from it. Data members of a class are declared protected by adding a single underscore '_' symbol before the data member of that class.

```
#Protected Access Modifer Sample
class Person:
    def __init__(self, name, age):
        self._PName = name
        self.PAge = age
    def displayAge(self):
        print("Age: ", self.PAge)

obj = Person("Naruto", 20)
print("Name: ", obj._PName)
obj.displayAge()
```

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Day 8 Act 3

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1. Create an app that computes students average
2. The user will input the following (Name, Math, Science and English Grade)
3. Create a Class called Students
4. Use the init function to collect the student information

a. Name, Math, Science and English Grade

5. Create a function that will perform the computation of the average
6. Create a function that will display the result
    a. Name: John
    b. Math: 90
    c. Science: 90
    d. English: 90
    e. Average: 90 (Passed)

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Inheritance

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- is when an object or class is based on another object using the same implementation or specifying a new implementation to maintain the same behavior

- Such an inherited class is called a subclass (Child) of its parent class or super class (Parent)

- Inheritance was invented in 1967 for Simula

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Types of Inheritance in Python

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- Single Inheritance
- Multiple Inheritance
- Multilevel Inheritance

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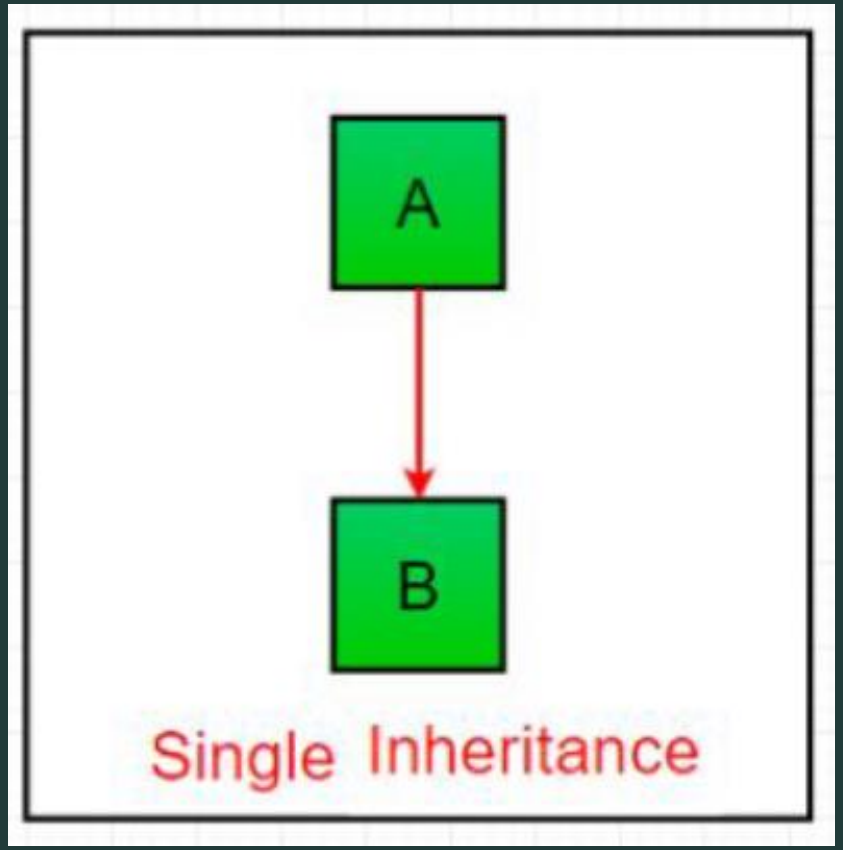
Single Inheritance

Single inheritance enables a derived class to inherit properties from a single parent class, thus enabling code reusability and the addition of new features to existing code.



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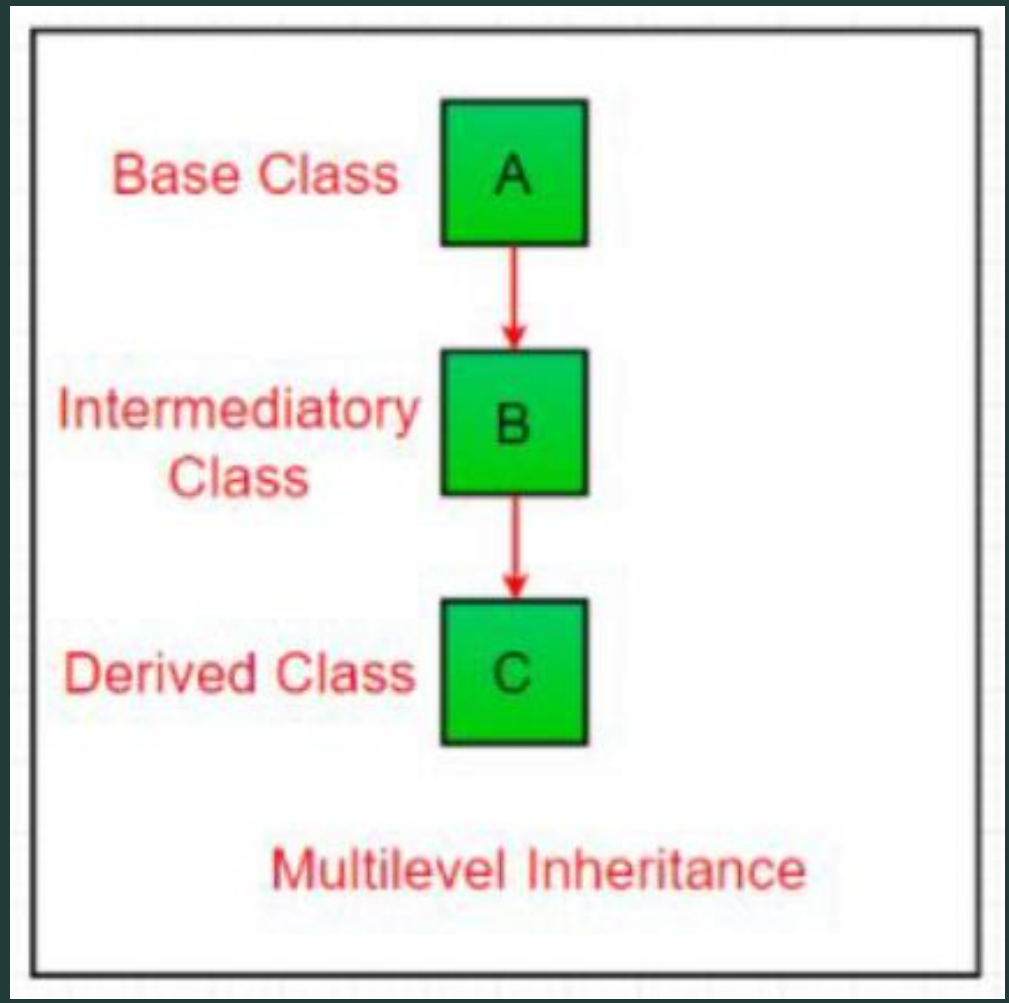
Multilevel Inheritance

In multilevel inheritance, features of the base class and the derived class are further inherited into the new derived class. This is similar to a relationship representing a child and grandfather.



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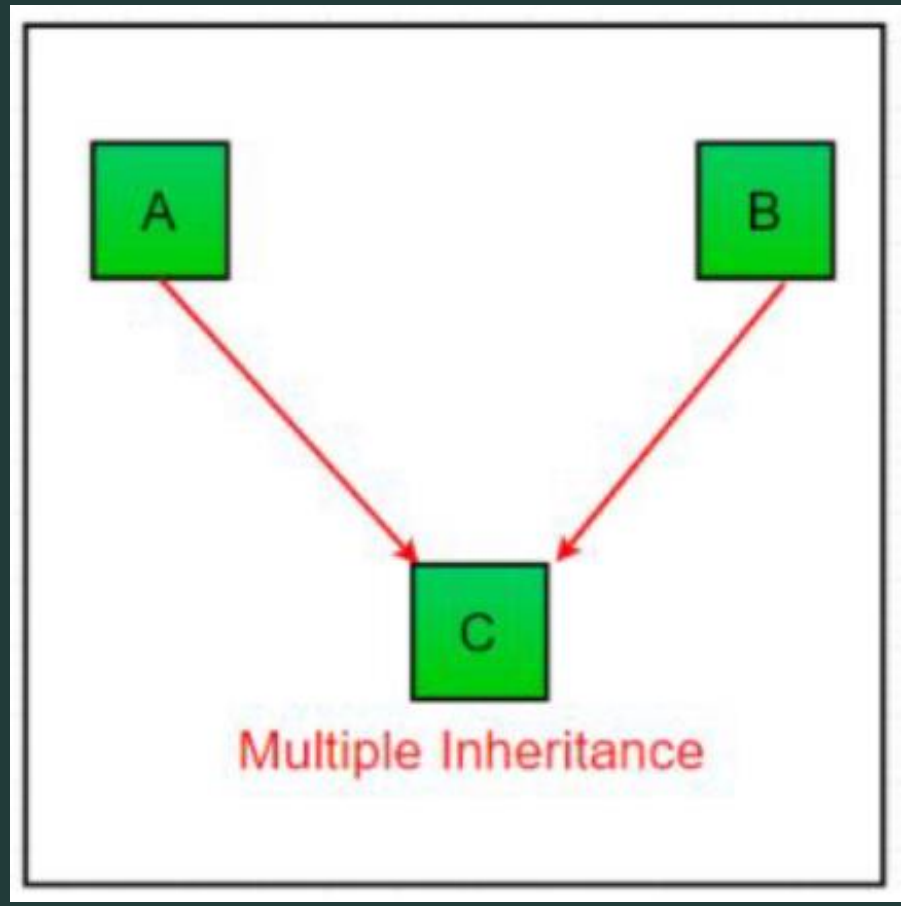
Multiple Inheritance

Multiple Inheritance: When a class can be derived from more than one base class this type of inheritance is called multiple inheritance. In multiple inheritance, all the features of the base classes are inherited into the derived class.



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Day 8 Act 4

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1. Create House Class with the following properties and methods
    a. floorSize
    b. noOfFloors
    c. noOfDoors
    d. switchOn()
    e. lightOpen()
    f. ovenOpen()
2. Create TownHouse Class inherit the House class
3. Modify the value of the following(noOfFloors and noOfDoors)
4. Instantiate the TownHouse Class once
5. Display all the properties
6. Calling the switchOn() will automatically execute lightOpen() and ovenOpen()