Python Classes and Objects

A class is a user-defined blueprint or prototype from which objects are created. Classes provide a means of bundling data and functionality together. Creating a new class creates a new type of object, allowing new instances of that type to be made. Each class instance can have attributes attached to it for maintaining its state. Class instances can also have methods (defined by their class) for modifying their state.

Some points on Python class:

- Classes are created by keyword class.
- Attributes are the variables that belong to a class.
- Attributes are always public and can be accessed using the dot (.) operator. Eg.: Myclass.Myattribute

Class Definition Syntax:

```
class ClassName:
    # Statement-1
    .
    .
    .
    # Statement-N
```

Defining a class –

 # This program to demonstrate defining a class

```
class Dog:
  pass
```

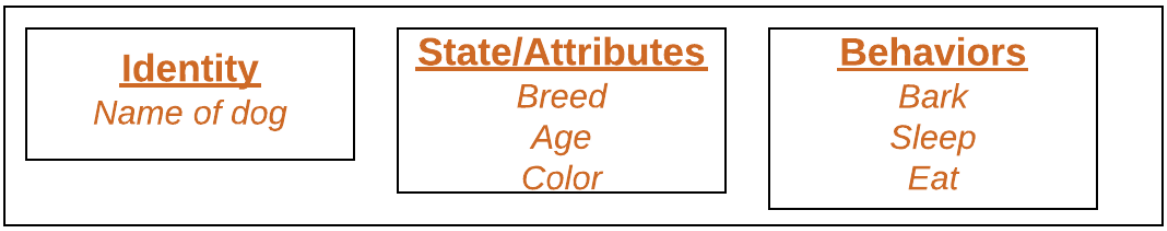
In the above example, the class keyword indicates that you are creating a class followed by the name of the class (Dog in this case). If the class doesn't have any attributes and methods , then we can use pass keyword.

Class Objects

An Object is an instance of a Class. A class is like a blueprint while an instance is a copy of the class with *actual values*.

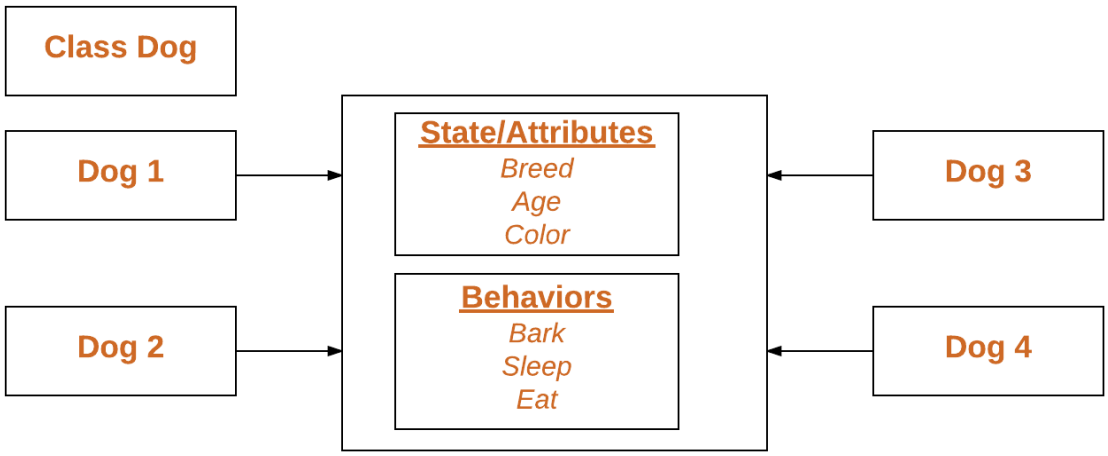
An object consists of :

- **State:** It is represented by the attributes of an object. It also reflects the properties of an object.
- **Behavior:** It is represented by the methods of an object. It also reflects the response of an object to other objects.
- **Identity:** It gives a unique name to an object and enables one object to interact with other objects.



Declaring Objects (Also called instantiating a class)
When an object of a class is created, the class is said to be instantiated. All the instances share the attributes and the behavior of the class. But the values of those attributes, i.e. the state are unique for each object. A single class may have any number of instances.

Example:



Declaring an object –

 # This program to demonstrate defining a class

```
class Dog:

    # A simple class
    # attribute
    attr1 = "mammal"
    attr2 = "dog"

    # A sample method
    def fun(self):
        print("I'm a", self.attr1)
        print("I'm a", self.attr2)
```

```
# Driver code
# Object instantiation
Rodger = Dog()

# Accessing class attributes
# and method through objects
print(Rodger.attr1)
Rodger.fun()
```

Output:

```
mammal

I'm a mammal

I'm a dog
```

__init__ method

The __init__ method is similar to constructors. Constructors are used to initializing the object's state. Like methods, a constructor also contains a collection of statements(i.e. instructions) that are executed at the time of Object creation. It runs as soon as an object of a class is instantiated. The method is useful to do any initialization you want to do with your object.

```
# A Sample class with init method
class Person:

    # init method or constructor
    def __init__(self, name):
        self.name = name

    # Sample Method
    def say_hi(self):
        print('Hello, my name is', self.name)

p = Person('Nikhil')
p.say_hi()
```

Output:

```
Hello, my name is Nikhil
```

Class and Instance Variables

Instance variables are for data, unique to each instance and class variables are for attributes and methods shared by all instances of the class. Instance variables are variables whose value is assigned inside a constructor or method with self whereas class variables are variables whose value is assigned in the class.

- Defining instance variable using a constructor.

```
# This program to show that the variables with a value
# assigned in the class declaration, are class variables and
# variables inside methods and constructors are instance
# variables.

# Class for Dog
class Dog:

    # Class Variable
    animal = 'dog'

    # The init method or constructor
    def __init__(self, breed, color):

        # Instance Variable
        self.breed = breed
        self.color = color

# Objects of Dog class
Rodger = Dog("Pug", "brown")
Buzo = Dog("Bulldog", "black")

print('Rodger details:')
print('Rodger is a', Rodger.animal)
print('Breed: ', Rodger.breed)
print('Color: ', Rodger.color)

print('\nBuzo details:')
print('Buzo is a', Buzo.animal)
print('Breed: ', Buzo.breed)
print('Color: ', Buzo.color)

# Class variables can be accessed using class
# name also
print("\nAccessing class variable using class name")
print(Dog.animal)
```

Output:

```
Rodger details:

Rodger is a dog

Breed:  Pug

Color:  brown
```

```
Buzo details:
Buzo is a dog
Breed:  Bulldog
Color:  black

Accessing class variable using class name
dog
```