# Python Chapter 7 OOP Activities

## Contents



Time required: 90 minutes

## DRY

Don't Repeat Yourself

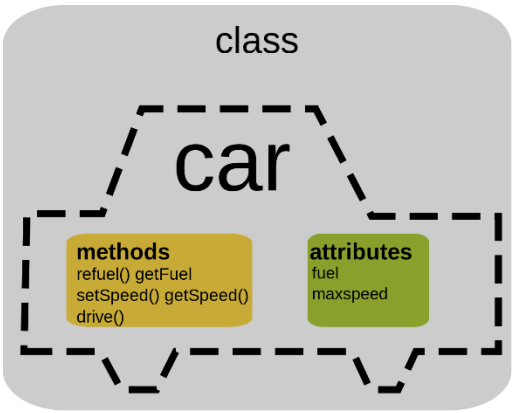
## Online Tutorials

Go through the following tutorials.

- LearnPython.org Classes and Objects
- Python Classes and Objects
- Python Inheritance

## Object Oriented Programming (OOP)

Object-Oriented Programming (OOP) is a programming paradigm that organizes code into objects, which are instances of classes.




**Objects and Classes:**

- **Objects:** Think of them as real-world entities. For example, a car, a person, or a book.
- **Classes:** These are like blueprints or templates for creating objects. They define the properties (attributes) and behaviors (methods) that the objects will have.

**Attributes and Methods:**

- **Attributes:** These are the characteristics or properties of an object. For a car, attributes could be its color, model, and year.
- **Methods:** These are the actions or behaviors that an object can perform. For a car, methods could include starting the engine or honking the horn.

**Encapsulation:**

- This is like putting everything related to an object in one place. It keeps the data (attributes) and the methods that operate on the data together in a class. This makes the code more organized and easier to manage.

## Tutorial 1: A Car with Class

**Objects:**

- Objects represent real-world entities.
- Example: Defining a Car class to model different cars.

**Classes:**

- Classes act as blueprints for objects.

Create a Python file named **car.py**

```python
# Define a class named 'Car'
class Car:
    # Constructor method to initialize object attributes
    def __init__(self, model, year):
        # Set 'model' attribute to the provided model parameter
        self.model = model
        # Set 'year' attribute to the provided year parameter
        self.year = year


# Create an instance of the 'Car' class with model "Toyota" and year 2022
my_car = Car("Toyota", 2022)

# Print a formatted string using the 'model' and 'year'
# attributes of the 'my_car' instance
print(f"My car is a {my_car.model} from {my_car.year}.")
```

- **class Car: -** Defines a blueprint for creating objects of type Car.
- **def __init__(self, model, year): -** Constructor method initializes the object with model and year attributes.
- **self.model = model** and **self.year = year -** Sets the attributes of the object to the provided values.
- **my_car = Car("Toyota", 2022) -** Creates an instance of the Car class named 'my_car' with model "Toyota" and year 2022.
- **print(f"My car is a {my_car.model} from {my_car.year}.") -** Prints a formatted string using the 'model' and 'year' attributes of the 'my_car' instance. Outputs a descriptive sentence about the car.

Example run:

```
My car is a Toyota from 2022.
```

## Tutorial 2: A Person with Class

**Attributes:**

- Attributes store data within a class.
- Example: Extending the Person class with additional attributes.

**Methods:**

- Methods perform actions within a class.
- Adding a greet method to the Person class.

Create a Python program file named **person.py**

```python
# Define a class named Person
class Person:
    # Constructor method (called when creating an object)
    def __init__(self, name, age):
        # Initialize object attributes (name and age)
        self.name = name
        self.age = age

    # Method to greet and provide information
    def greet(self):
        return f"Hello, my name is {self.name} and I'm {self.age} years old."

# Create an instance (object) of the Person class with name "Alice" and age 25
individual = Person("Alice", 25)

# Call the greet method of the individual object and print the result
print(individual.greet())
```

- **class Person:** - Defines a blueprint for creating objects of type Person.
- **def __init__(self, name, age): -** Constructor method initializes the object with a name and age.
- **self.name = name** and **self.age = age:** - Sets the attributes of the object to the provided values.
- **def greet(self): -** Defines a method within the class to generate a greeting.
- **return f"Hello, my name is {self.name} and I'm {self.age} years old."** - Returns a formatted greeting string using the object's attributes.
- **individual = Person("Alice", 25)** - Creates an instance of the Person class named "Alice" with an age of 25.
- **print(individual.greet()) -** Calls the greet method of the individual object and prints the result. Outputs the personalized greeting.

Example run:

```
Hello, my name is Alice and I'm 25 years old.
```

## Tutorial 3: Encapsulation by Book

Encapsulation organizes code by bundling data and methods. This prevents direct access to the attributes.

Example: Implementing encapsulation in a **Book** class.

**Access Modifiers:**

- Public and private access modifiers.
- Example: Creating private attributes in a **Book** class.

Create a Python program named **book.py**

```python
# Define a blueprint for creating Book objects
class Book:
    # Constructor method initializes object with title and author parameters
    def __init__(self, title, author):
        # Each attribute use a single underscore for a private attribute
        # Set '_title' attribute to the provided title parameter
        self._title = title
        # Set '_author' attribute to the provided author parameter
        self._author = author

    # Method to get the title attribute
    def get_title(self):
        return self._title

    # Method to get the author attribute
    def get_author(self):
        return self._author


# Create an instance (object) of the Book class with
# title "To Kill a Mockingbird" and author "Harper Lee"
book = Book("To Kill a Mockingbird", "Harper Lee")

# Print a formatted string using the 'get_title'
# and 'get_author' methods of 'book'
print(f"{book.get_title()} by {book.get_author()}")
```

- **class Book: -** Defines a blueprint for creating objects of type Book.

- **def __init__(self, title, author): -** Constructor method initializes the object with title and author attributes.
- **self._title = title** and **self._author = author -** Sets the attributes of the object to the provided values, using a single underscore _ to indicate that these attributes are intended to be private.
- **def get_title(self): -** Method to retrieve the title attribute of the book.
- **def get_author(self): -** Method to retrieve the author attribute of the book.
- **book = Book("To Kill a Mockingbird", "Harper Lee") -** Creates an instance of the Book class with title "To Kill a Mockingbird" and author "Harper Lee".
- **print(f"{book.get_title()} by {book.get_author()}") -** Prints a formatted string using the 'get_title' and 'get_author' methods of 'book'. Outputs the title and author of the book. Note the addition of parentheses to correctly call the methods.

Example run:

```
To Kill a Mockingbord by Harper Lee
```

## Assignment 1: Online Video Game Store

Objective:

Build a basic online video game store using Python. Create three game objects within the class. This is a proof of concept.

Requirements:

- Create a Store class to represent the online store.
- Attributes: _title, _price
- Methods: **display_game()**
- Create three sample game titles.
- Display the available games.

Example run:

```
The Legend of Zelda for $15.99
Minecraft for $29.99
FIFA 22 for $39.99
```

## Assignment Submission

1. Attach the pseudocode.
2. Attach the program files.
3. Attach screenshots showing the successful operation of the program.
4. Submit in Blackboard.