# Python

## Object-Oriented Programming (OOP)

# About the Author

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# Icons Used

Questions

Tools

Hands-on Exercise

Coding Standards


Questions?

Reference

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Welcome Break

# PYTHON OBJECT-ORIENTED PROGRAMMING (OOP)

- Learn Python Object-Oriented Programming (OOP)
  By: Mohd Salman

# AGENDA

- 1. What is OOP?
- 2. Defining a Class
- 3. Creating Objects
- 4. Methods in Classes
- 5. Object Constructors (__init__)
- 6. Hands-on Labs
- 7. Assessment Quiz

# WHAT IS OBJECT-ORIENTED PROGRAMMING?

- Object-Oriented Programming (OOP) is a programming paradigm based on the concept of 'objects'.

- Key Concepts:
- - Class
- - Object
- - Method
- - Encapsulation
- - Inheritance
- - Polymorphism

- Python fully supports OOP principles.

# DEFINING A CLASS

A class is a blueprint for creating objects.

Syntax:

```
class ClassName:
    # class attributes and methods
    pass
```

Example:

```
class Car:
    def start(self):
        print('Car started')
```

# CREATING OBJECTS

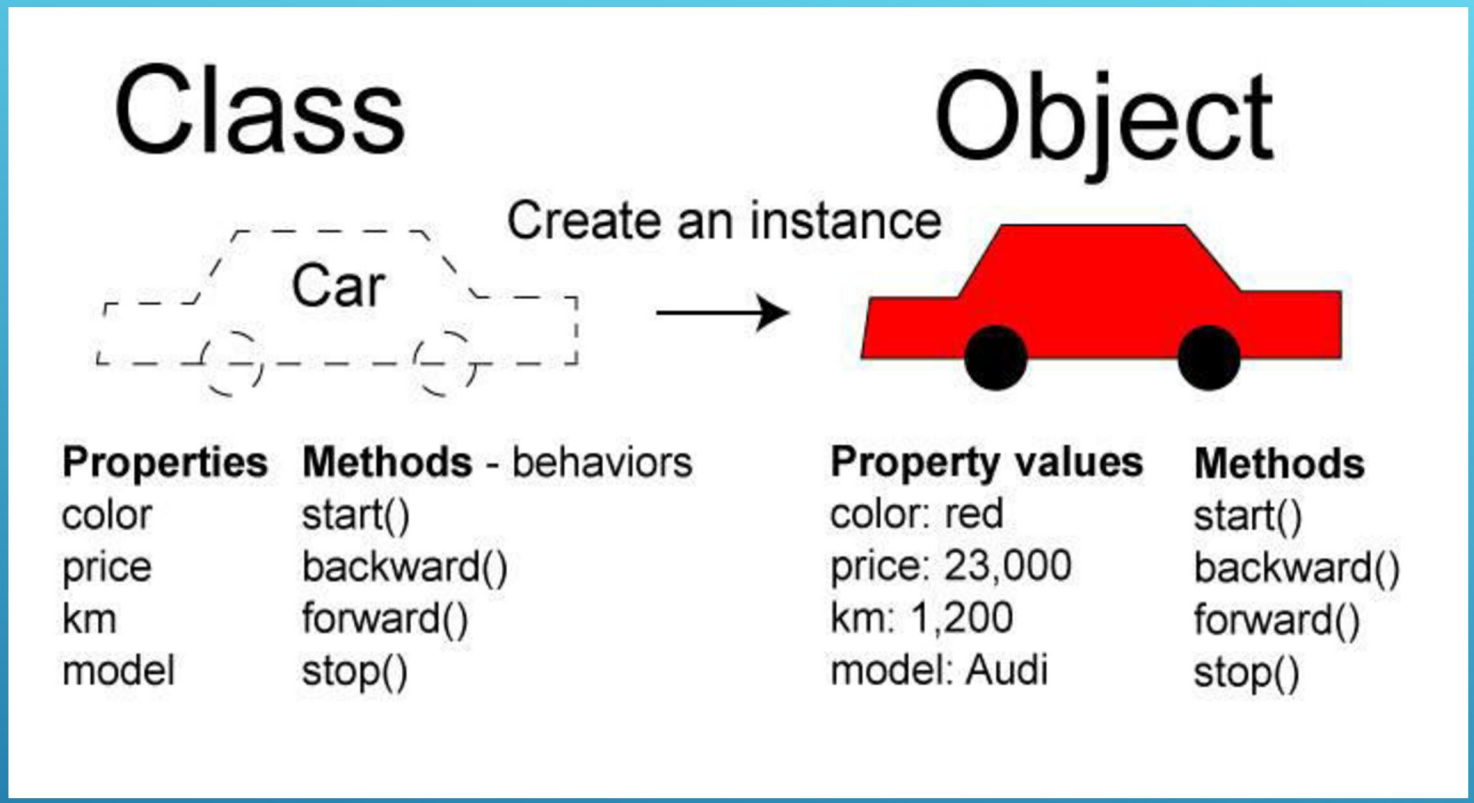
- Objects are instances of a class.

Example:

```
car1 = Car()
car1.start()
```

Output:

```
Car started
```




# CREATING OBJECTS

# METHODS IN CLASSES

- Methods are functions defined inside a class.
- They describe the behavior of objects.

- Example:

```
class Dog:
    def bark(self):
        print('Woof! Woof!')
d = Dog()
d.bark()
```

# OBJECT CONSTRUCTOR (__INIT__)

- The __init__() method automatically runs when an object is created.
- It is used to initialize object attributes.

Example:

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

s1 = Student('Alice', 22)
print(s1.name, s1.age)
```

# THE __STR__() METHOD

- **The string representation of an object WITH the __str__() method:**

```
class Person:
  def __init__(self, name, age):
    self.name = name
    self.age = age
  def __str__(self):
    return f"{self.name}({self.age})"
p1 = Person("John", 36)

print(p1)
```

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

    def display(self):
        print(f"Name: {self.name}")
        print(f"Age: {self.age}")
```

- stu1 = Student("Alice", 20) → creates an object
- .stu1.name = "Alicia" → modifies the existing object's attribute.
- del stu1 → deletes the object reference from memory
- del stu1.age removes only the age attribute from the object.

# OBJECT HANDLING

# REAL-WORLD EXAMPLE

Example: Bank Account

```
class BankAccount:
    def __init__(self, owner, balance=0):
        self.owner = owner
        self.balance = balance

    def deposit(self, amount):
        self.balance += amount
        print('Deposited:', amount)

    def display(self):
        print(f'Owner: {self.owner}, Balance: {self.balance}')
acc = BankAccount('John', 1000)
acc.deposit(500)
acc.display()
```

# KEY ADVANTAGES OF OOP

- Object-Oriented Programming (OOP) is a paradigm based on the concept of 'objects'.
- It focuses on data and the methods that operate on that data.

- Key Advantages:
- - Code Reusability
- - Better Maintainability
- - Scalability and Modularity

# DEFINING CLASSES AND CREATING OBJECTS

- A class is a blueprint for creating objects.

- Example:
- class Person:
- ```
      def __init__(self, name, age):
  ```
- ```
          self.name = name
  ```
- ```
          self.age = age
  ```

- p1 = Person('Sam', 25)
- print(p1.name, p1.age)
  ```

# METHODS AND CONSTRUCTORS

- Methods define behaviors of an object.
- __init__() is a special constructor method used to initialize objects.
- Example:
- class Employee:

```
    def __init__(self, name, salary):
        self.name = name
        self.salary = salary
    def display(self):
        print(f'Employee: {self.name}, Salary: {self.salary}')
```

# INHERITANCE

- Inheritance allows one class to derive properties and methods from another.

- Example:

```
class Animal:
    def speak(self):
        print('Animal speaks')

class Dog(Animal):
    def speak(self):
        print('Dog barks')

obj = Dog()
obj.speak()
```

# ENCAPSULATION

- Encapsulation restricts direct access to object data.
- We use private attributes and getter/setter methods.

- Example:

```
class Bank:
    def __init__(self, balance):
        self.__balance = balance

    def get_balance(self):
        return self.__balance
acc = Bank(1000)
print(acc.get_balance())
```

# POLYMORPHISM

- Polymorphism allows methods to have different implementations based on the object.

- Example:

```
class Bird:
    def fly(self):
        print('Bird is flying')
class Airplane:
    def fly(self):
        print('Airplane is flying')

for obj in [Bird(), Airplane()]:
    obj.fly()
```

# ADVANCED EXAMPLE: BANKING SYSTEM

```
class Account:
    def __init__(self, owner, balance=0):
        self.owner = owner
        self.__balance = balance
    def deposit(self, amount):
        self.__balance += amount
    def withdraw(self, amount):
        if amount <= self.__balance:
            self.__balance -= amount
        else:
            print('Insufficient funds')
    def display(self):
        print(f'Owner: {self.owner}, Balance: {self.__balance}')
```

# KEY TAKEAWAYS

- - OOP enhances code modularity and reusability.
- - Classes define the structure; objects bring them to life.
- - Inheritance promotes hierarchy and shared behavior.
- - Encapsulation ensures data protection.
- - Polymorphism enables flexible and scalable design.

# ASSESSMENT QUIZ

- 1. What is a class in Python?
- 2. What is the purpose of the __init__ method?
- 3. How does inheritance improve code reuse?
- 4. Give an example of encapsulation.
- 5. What is polymorphism? Provide a short example.

- A class is a blueprint or template for creating objects.
- It defines the attributes (data) and methods (functions) that describe the behavior of an object.
- You can think of a class as a blueprint, and an object as the actual thing built from that blueprint

# THANK YOU!