



Introduction to Object-Oriented Programming

Week 1



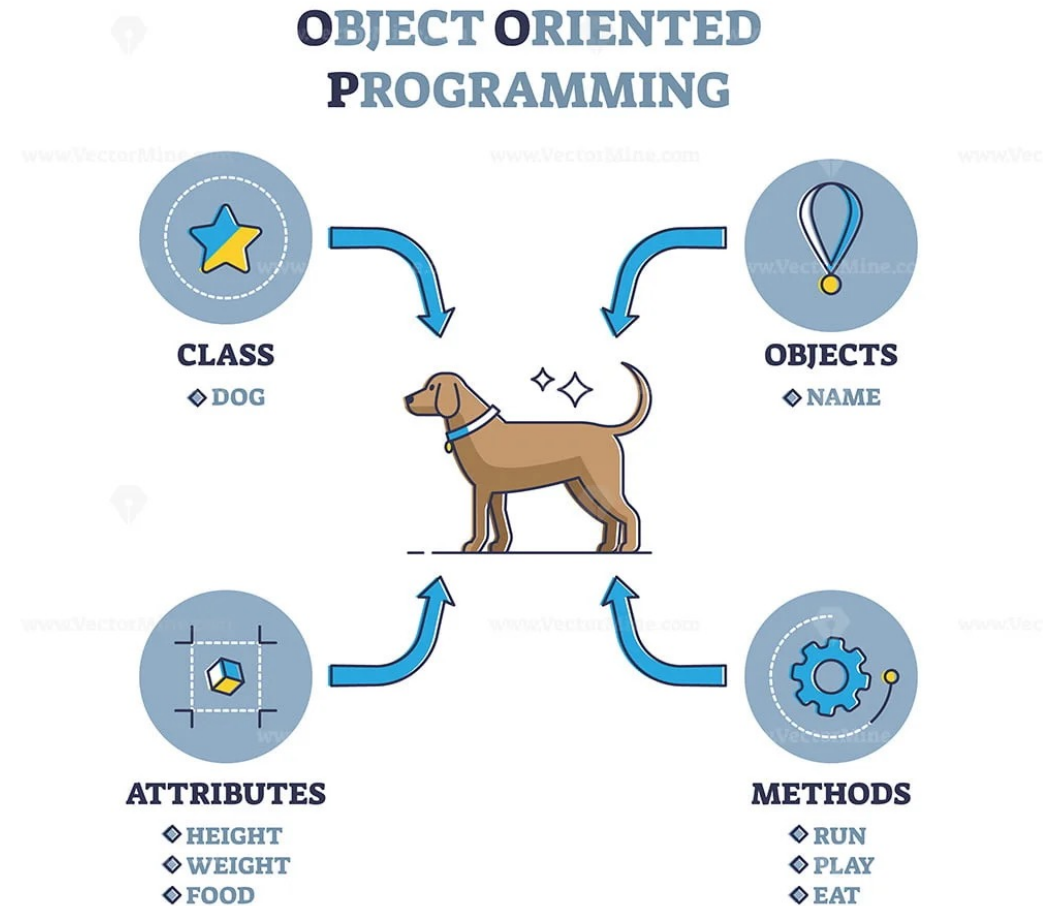
Trinity Walton Club

What is Object-Oriented Programming?

Object-oriented programming (OOP) is a way of writing programs that organizes the code into reusable pieces called "objects"

These objects represent real-world things.

They have both data (attributes) and actions (methods) associated with them.





<https://www.online-python.com>

Features of OOP

Classes & Objects

Classes

- Blueprint for creating objects, providing initial value (variables) and implementations of behaviour (methods)

Objects

- Instance of a class.
- Do not have to know all the internal details of the code.

```
1  class Rabbit:
2      |    pass
3
4  # Creating an instance of the Rabbit class
5  rabbit_instance = Rabbit()
```



Variables/Attributes

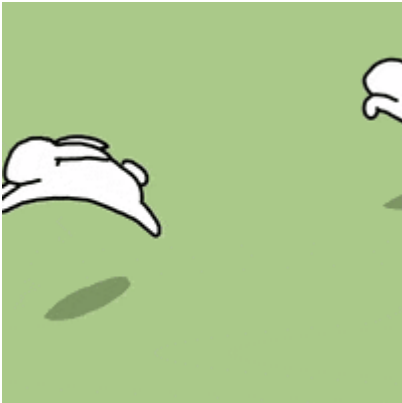


```
1  class Rabbit:
2      # Class attributes
3      tail = "fluffy"
4      ears = "long"
5
6      def __init__(self, name):
7          # Instance attributes
8          self.name = name
9
10     # Accessing class attribute
11     print(Rabbit.tail) # Output: fluffy
12     print(Rabbit.ears) # Output: long
13
14     # Creating instances and accessing instance attributes
15     bugs = Rabbit("Bugs")
16     print(bugs.name) # Output: Bugs
17
18     thumper = Rabbit("Thumper")
19     print(thumper.name) # Output: Thumper
```

- Characteristics of an object
- Passed in as arguments to an object
- For example, a Rabbit object has several pieces of information associated with it that a user can extract
 - A class attribute, which is the same for every rabbit, i.e. fluffy tail and long ears
 - An instance variable, i.e. name, which is unique to every rabbit

Methods/Procedures

- Equivalent to a function.
- E.g., the Rabbit object might have a method for running (hop).



```
1  class Rabbit:
2      # Class method
3      def run(self):
4          print("hop")
5
6      # Creating an instance of the Rabbit class
7      rabbit_instance = Rabbit()
8
9      # Accessing class method using the instance
10     rabbit_instance.run()
```

```
1 class Superhero:
2     def __init__(self, name, strength, power, costume, secret_identity, points, health):
3         self.name = name
4         self.strength = strength
5         self.power = power
6         self.costume = costume
7         self.secret_identity = secret_identity
8         self.points = points
9         self.health = health
10
11     def is_attacked(self):
12         #print self.health #uncomment print statements to see how variables are updated
13         self.health -= 1
14         return self.health
15
16     def heal(self):
17         #print self.health
18         self.health += 2
19         return self.health
20
21     def gain_points(self):
22         self.points += 1
23         return self.points
24
25 batman = Superhero("Batman", 3, "fight", "black", "Bruce Wayne", 3, 5)
```

Exercise

Task 1: Define the Dog Class

Create a Python class named Dog with the following specifications:

- Add a class attribute named attr1 and set its value to the string "mammal".
- Define an instance attribute name which will be initialised through the constructor.
- Implement a method named speak() which prints "My name is [dog's name]" where [dog's name] is replaced with the value of the name attribute.

Task 2: Create Dog Instances

Instantiate two objects of the Dog class with the following names:

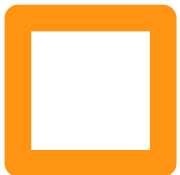
- Rodger
- Tommy

Task 3: Access Class Methods

Call the speak() method on each object created in Task 2.

Challenge: Create a new class

Create a new class (of your choosing)! And add in class attributes, instance attributes and methods that describe the class





Solution

```
1  class Dog:
2
3      # class attribute
4      attr1 = "mammal"
5
6      # Instance attribute
7      def __init__(self, name):
8          self.name = name
9
10     def speak(self):
11         print("My name is {}".format(self.name))
12
13     # Driver code
14     # Object instantiation
15     Rodger = Dog("Rodger")
16     Tommy = Dog("Tommy")
17
18     # Accessing class methods
19     Rodger.speak()
20     Tommy.speak()
```

Sources

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