



Object Oriented Programming

Basic, Encapsulation and Data Abstraction

“ Programming paradigm which provides a means of structuring program so that **properties** and **behaviour** are bundled into individual **objects**. ”



Properties

- Color
- Length
- Width

Behavior

- Accelerate
- Break



Properties

- Fur
- Leg
- Tail

Behavior

- Make Sound
- Eat
- Jump

“ **Properties** determined by the values of its attributes ”

“ **Behavior** determined by how the objects acts or reacts to requests ”

OOP Fundamental Concept



Woof!



Meow!



Quack!



Encapsulation

Basic encapsulation analogy:

- Class
- Attributes
- Method



Encapsulation - Class

Class is a *"template"* or *"blueprint"* that is used to create object.

"Special code" template in Java to make object:

- Contain of:
 - Properties
 - Method
- Has an init method to initiate object

```
public class Cat { // Define class name using CamelCase
    private String name;
    private String color;
}
```


Make instance of Object

```
public class Cat {  
    private String name;  
    private String color;  
  
    // Constructor block  
    public Cat(String name, String color) {  
        this.name = name;  
        this.color = color;  
    }  
  
    // Setter getter method  
}  
  
public static void main(String[] args) {  
    Cat cat = new Cat("Peter", "White");  
    cat.getName(); // Peter  
    cat.getColor(); // White  
}
```

Cont...

An instance is a unique copy of a **Class** that representing an **Object**.

- All **classes** create **object**, and all **object** contain **characteristic** called **attribbutes**
- Use `new Object()` for creating new object in Java.

Note: You will never have to call the `new Object()` method; it gets called automatically when you create a new Cat object.

Attributes Type

```
public class Cat {  
    private String name;  
    private String color;  
  
    // Constructor block  
    public Cat(String name, String color) {  
        this.name = name;  
        this.color = color;  
    }  
  
    // Setter getter method  
}
```

Cont...

Modifier	Class	Package	Subclass	World
public	✓	✓	✓	✓
protected	✓	✓	✓	✗
<i>no modifier*</i>	✓	✓	✗	✗
private	✓	✗	✗	✗

Method and Function

```
public class Cat {  
    private String name;  
    private String color;  
  
    public Cat(String name, String color) {  
        this.name = name;  
        this.color = color;  
    }  
  
    public void setName(String name) {  
        this.name = name;  
    }  
  
    public String getName() {  
        return this.name;  
    }  
}
```

Cont...

Important things when creating **Method** or **Function**:

- Method name
- Parameters
- Returns

Data Abstraction

"Hiding background process from user"

Main Goal:

- Handle complexity by hiding unnecessary detail
- It should only reveal operations relevant for the other objects



Data Abstraction **Analogy**



You have just a few buttons and inputs to use.
What happens under the hood?
You don't have to know.



Data Abstraction - Setter Getter

```
public interface Motorcycle {  
    void startEngine();  
}  
  
public class Vario implements Motorcycle {  
    @Override  
    public void startEngine() {  
        System.out.println("Use electric starter!");  
    }  
}  
  
public class RXKing implements Motorcycle {  
    @Override  
    public void startEngine() {  
        System.out.println("Use kick starter!");  
    }  
}
```

Cont...

Setter & Getter make complex calculation in 1 function / method.

- Hide all unnecessary process in object calling itself
- Make simple calling from object variable
- Think of it as a small set of public methods which any other class can call without "**knowing**" how they work

Task

Define 5 classes freely related to the type of animal, plant or vehicle. Use encapsulation concepts such as public, protected and private according to analogy examples in the real world.

Example:

Cat, Fish, Flower, Car, etc.

Add instance variables and methods in each class created. Then create code to prove **encapsulation** is running as expected.

For example, can **Frog** access these **public**, **protected** or **private** variables? or other things that produce returns as expected.