Object Oriented Analysis and Design with Java

UE19CS353

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UE19CS353: Object Oriented Analysis and Design with Java

Object Oriented Concepts

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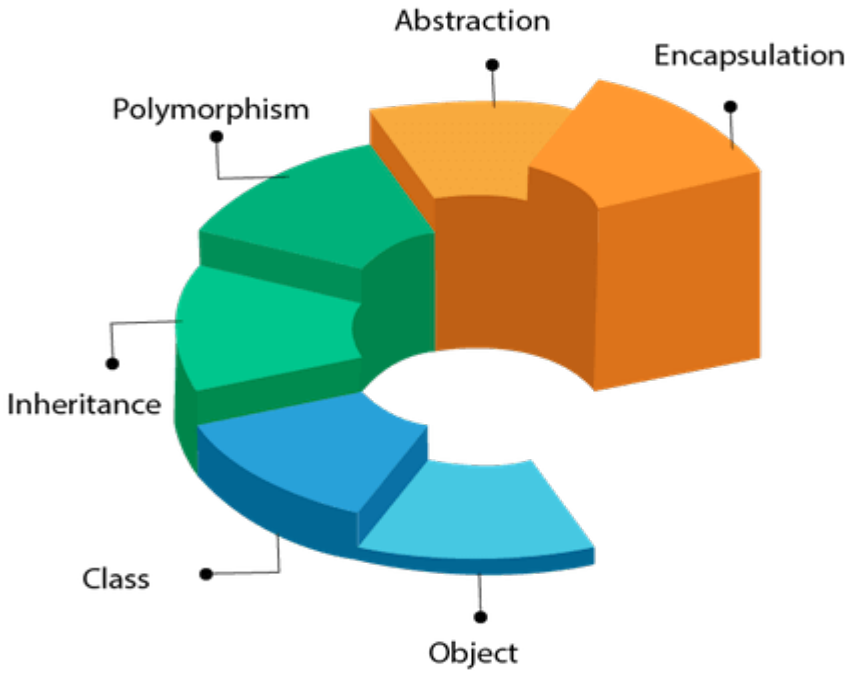
Agenda-

- Introduction to object-oriented concepts-Objects and Classes
- Four Pillars of Object Oriented programming
  - Inheritance,
  - Polymorphism
  - Abstraction,
  - Encapsulation



Concept: Introduction to Object Oriented Programming

- In the old style programming, you had:
  - data, which was completely passive
  - functions, which could manipulate any data.

In Object Oriented Programming

- An object contains both data and methods that manipulate that data
  - An object is *active,* not passive; it *does* things
  - An object is *responsible* for its own data
    - But: it can *expose* that data to other objects

Concept: Objects

- An object is a single unit having both data and the processes that operate on that data.
- An object is an entity which has some properties and behavior associated with it.
- Objects are the basic run time entities in an object oriented system.

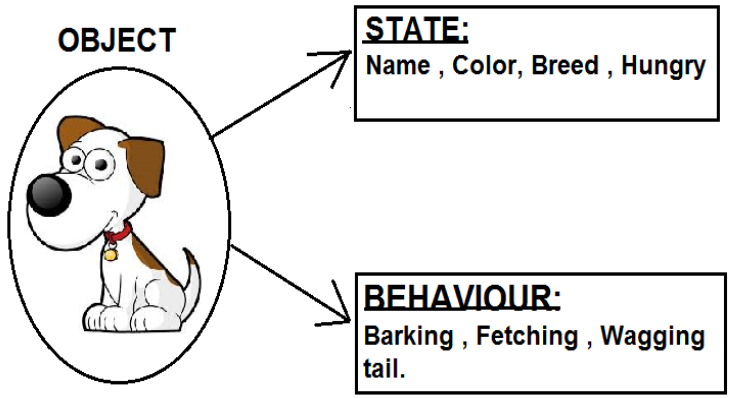
The main purpose of using objects are following.

- They correspond to the real life entities.
- They provide interactions with the real world.
- They provide practical approach for the implementation of the solution.

All the objects have a state, behavior and identity.

Concept: An object has behavior

- An object has Behavior that represents externally visible activities performed by an object in terms of changes in its state.
- Member functions - Member functions represent the code to manipulate the data. The behavior of the object is determined by the member functions



Concept: An object has State

- An object contains both data and methods that manipulate that data
  - The data members represent the state of the object
  - Data can also describe the relationships between this object and other objects

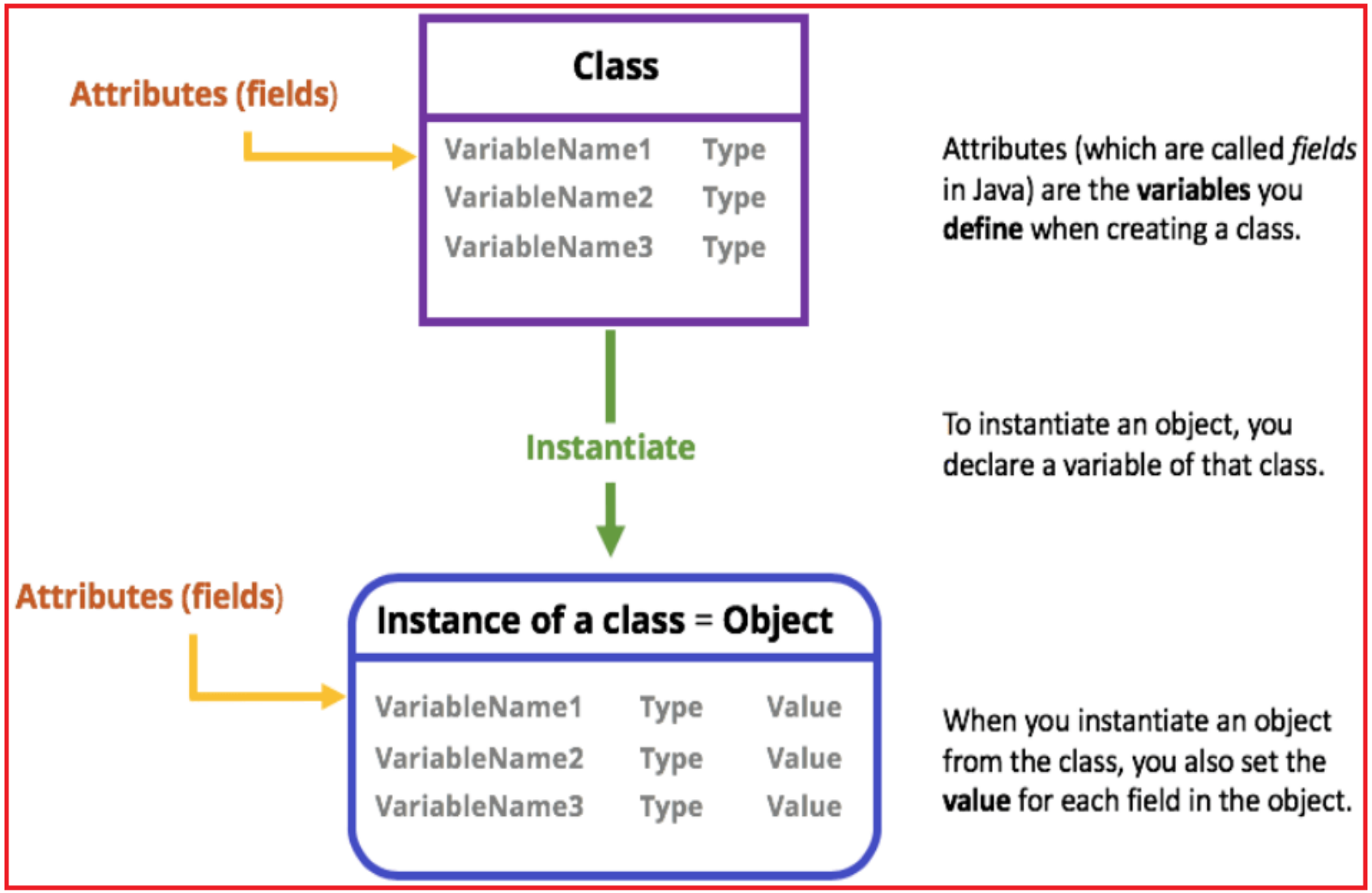
- Example: A CheckingAccount might have
  - A balance (the internal state of the account)
  - An owner (some object representing a person)

Concept: Classes describe objects

- In object-oriented programming, a class is a blueprint for creating objects (a particular data structure)
- Every object belongs to (is an instance of) a class
- An object may have fields, or variables
  - The class describes those fields
- An object may have methods
  - The class describes those methods
- A class is like a template

Object Oriented Analysis and Design with Java

Concept: Classes describe objects



Attributes (which are called *fields* in Java) are the **variables** you **define** when creating a class.

To instantiate an object, you declare a variable of that class.

When you instantiate an object from the class, you also set the **value** for each field in the object.

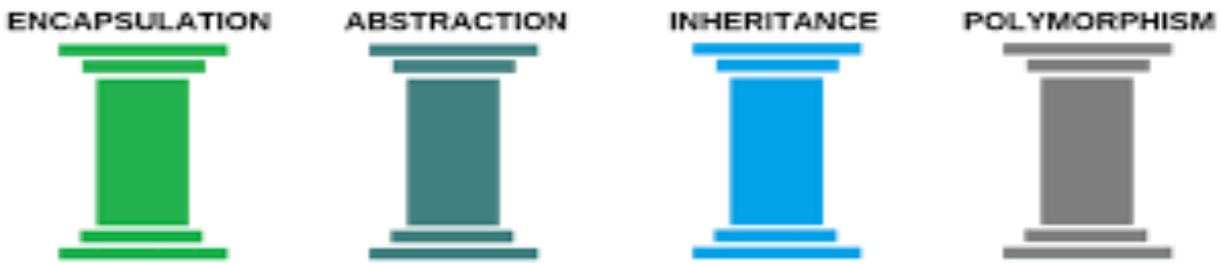
Concept: Classes form a hierarchy

- Classes are arranged in a tree like structure called a hierarchy
- A class, except Object, has a superclass
- A class may have several ancestors.
- When you define a class, you specify its superclass.

  Every class may have one or more subclasses

Concept: Pillars of OOPS

- In this section we will discuss briefly about the four pillars of OOPS.



Concept: Data Encapsulation

§ The wrapping up of data and functions into a single unit is known as encapsulation.

§ The data is not accessible to the outside world, only those function which are wrapped in can access it.

§ These functions provide the interface between the object's data and the program.

§ This insulation of the data from direct access by the program is called data hiding or information hiding.

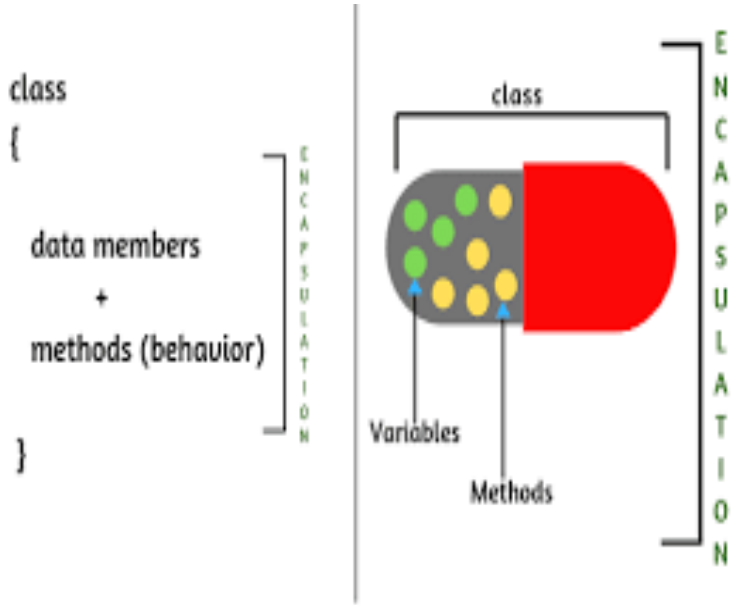
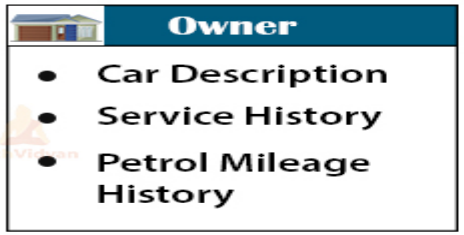


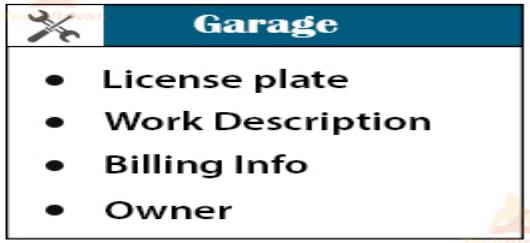
Fig: Encapsulation

Concept: Data Abstraction

§ Abstraction refers to the act of representing essential features without including the background details or explanations.

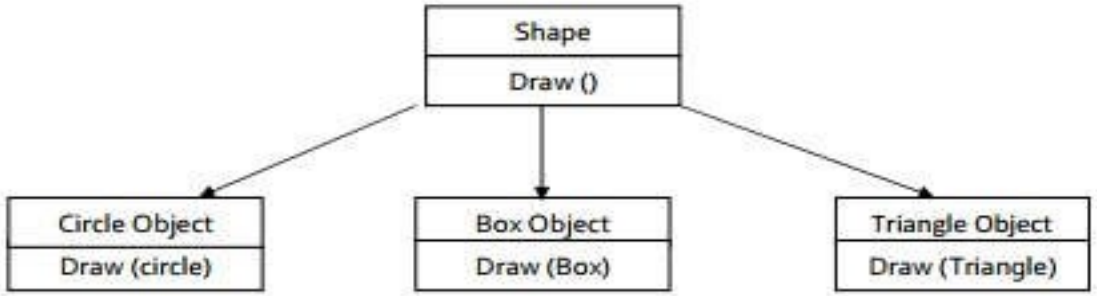
§ Since classes use the concept of data abstraction, they are known as **Abstract Data Types (ADT)**





Concept: Polymorphism

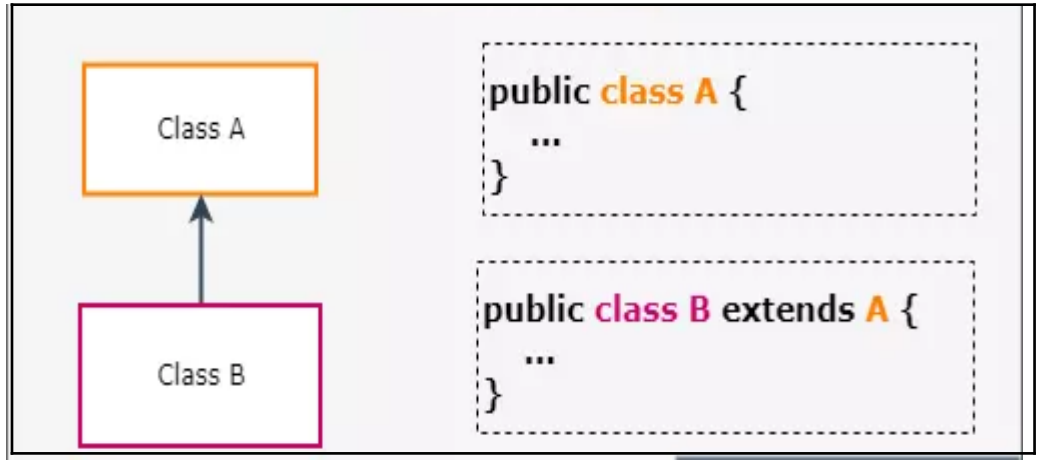
- **Polymorphism,** a Greek term means to ability to take more than one form.
- An operation may exhibits different behaviors in different instances. The behavior depends upon the type of data used in the operation.
- The process of making an operator to exhibit different behavior in different instances is known operator overloading. Java does not support operator overloading though.



Concept: Inheritance

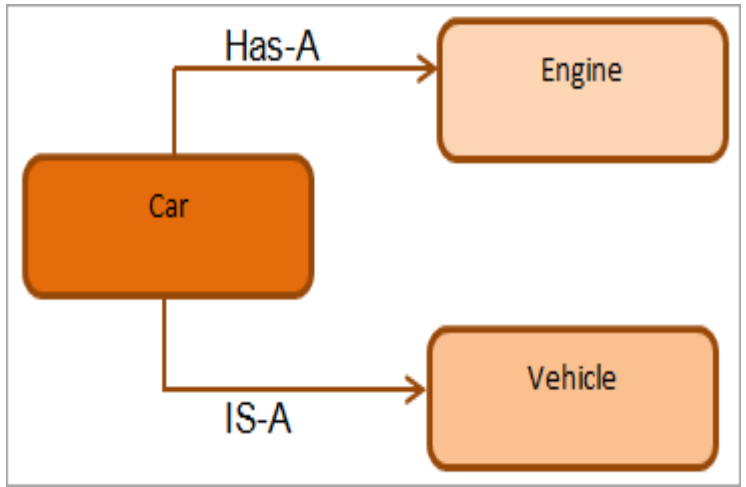
§ **Inheritance** is the process by which objects of one class acquire the properties of objects of another class.

§ In OOP, the concept of inheritance provides the idea of reusability. This means we can add additional features to an existing class without modifying it.



Concept: Composition

- The Composition is a way to design or implement the "has-a" relationship.
- Composition and Inheritance both are design techniques.
- The Inheritance is used to implement the "is-a" relationship. The "has-a" relationship is used to ensure the code reusability in our program.
- In Composition, we use an instance variable that refers to another object.



THANK YOU

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