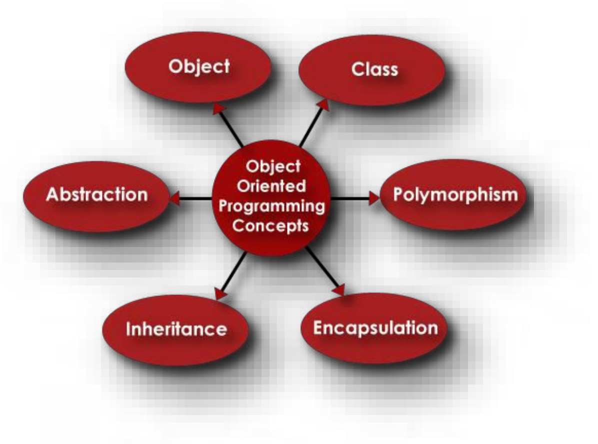
OOP'S CONCEPT IN JAVA

- **Object-oriented programming System**(OOPs) is a programming concept that is based on "**objects**".
- It allows users to create objects they want and create methods to handle those objects.
- The basic concept of OOPs is to create objects, re-use them throughout the program, and manipulate these objects to get results.
- The main principles of object-oriented programming are abstraction, encapsulation, inheritance, and polymorphism. These concepts aim to implement real-world entities in programs.

OOPs (Object-Oriented Programming System)

It simplifies software development and maintenance by providing some concepts:

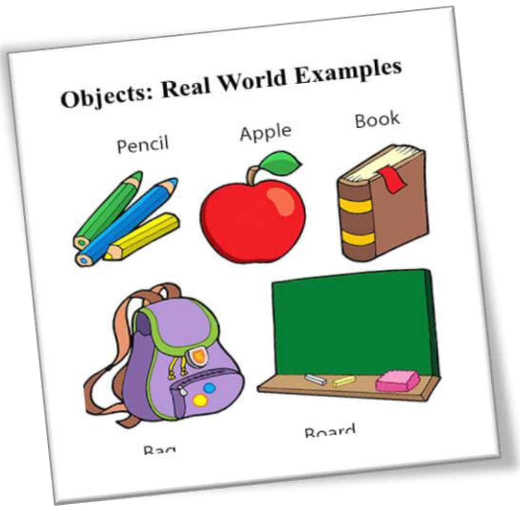
- **Object**
- **Class**
- **Inheritance**
- **Polymorphism**
- **Abstraction**
- **Encapsulation**



❖ Object

- Any entity that has state and behavior is known as an object.
- For example, a chair, pen, table, keyboard, bike, etc. It can be physical or logical.
- An Object can be defined as an instance of a class.
- An object contains an address and takes up some space in memory.
- Objects can communicate without knowing the details of each other's data or code.
- The only necessary thing is the type of message accepted and the type of response returned by the objects.

Example: A dog is an object because it has states like color, name, breed, etc. as well as behaviors like wagging the tail, barking, eating, etc.



❖ Class

- Collection of objects is called class. It is a logical entity.
- A class can also be defined as a blueprint from which you can create an individual object. Class doesn't consume any space.

❖ Inheritance

- When one object acquires all the properties and behaviors of a parent object, it is known as inheritance.
- It provides code reusability.
- It is used to achieve runtime polymorphism.

❖ Polymorphism

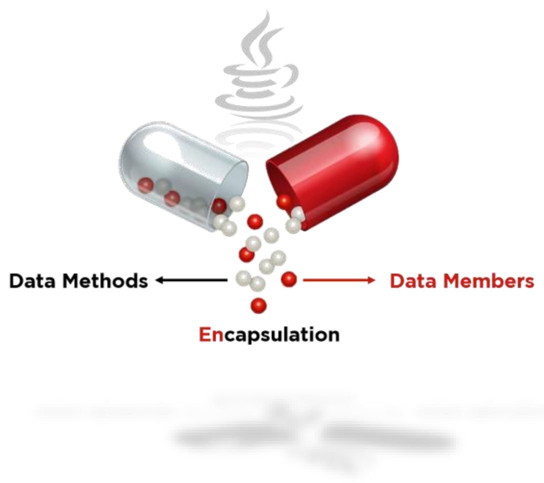
- If one task is performed in different ways, it is known as polymorphism. For example: to convince the customer differently, to draw something, for example, shape, triangle, rectangle, etc.
- In Java, we use method overloading and method overriding to achieve polymorphism.
- Another example can be to speak something; for example, a cat speaks meow, dog barks woof, etc.

❖ Abstraction

- Hiding internal details and showing functionality is known as abstraction. For example phone call, we don't know the internal processing.
- In Java, we use abstract class and interface to achieve abstraction.

❖ Encapsulation

- Binding (or wrapping) code and data together into a single unit are known as encapsulation. For example, a capsule, it is wrapped with different medicines.
- A java class is the example of encapsulation. Java bean is the fully encapsulated class because all the data members are private here.



❖ Coupling

- Coupling refers to the knowledge or information or dependency of another class.
- It arises when classes are aware of each other.
- If a class has the details information of another class, there is strong coupling. In Java, we use private, protected, and public modifiers to display the visibility level of a class, method, and field.
- You can use interfaces for the weaker coupling because there is no concrete implementation.

❖ Cohesion

- Cohesion refers to the level of a component which performs a single well-defined task.
- A single well-defined task is done by a highly cohesive method.
- The weakly cohesive method will split the task into separate parts.
- The java.io package is a highly cohesive package because it has I/O related classes and interface.
- However, the java.util package is a weakly cohesive package because it has unrelated classes and interfaces.

❖ Association

Association represents the relationship between the objects. Here, one object can be associated with one object or many objects. There can be **four types** of association between the objects:

- **One to One**
- **One to Many**
- **Many to One, and**
- **Many to Many**

❖ Aggregation

- Aggregation is a way to achieve Association.
- Aggregation represents the relationship where one object contains other objects as a part of its state.
- It represents the weak relationship between objects.
- It is also termed as a has-a relationship in Java.
- Like, inheritance represents the is-a relationship. It is another way to reuse objects.