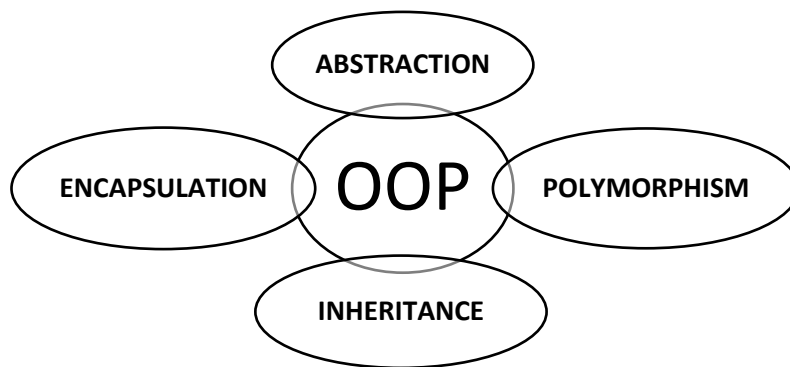


Object Oriented Paradigm

Concept :

- **Object** : represent an entity that can be physical.
- **Class** : description of a set of objects that share the same attributs (properties and operations)

Basic principles of the oriented object :



1. Abstraction

Abstraction is the process of **hiding complexity** by showing only the *essential* features of an object or system. **In programming**, you define what an object does, not *how* it does it. So the **Goal** of abstraction is to **simplify** how we understand or use something. without worrying about details.

2. Encapsulation

Encapsulation is the process of bundling data and methods that operate on that data, and restricting direct access to some of the object's components. **In programming** you use access modifiers like private, protected, and public. So the goal of abstraction is to protect data from unauthorized access and misuse.

Feature	Abstraction	Encapsulation حماية
Purpose	Hides <i>complexity</i> and unnecessary details	Hides <i>data</i> inside a protective shell
Focus	On <i>what</i> an object does	On <i>how</i> data is accessed or modified
Means	Achieved using abstract classes, interfaces	Achieved using access specifiers (private, public, protected)

3. Polymorphism :

Ability to process object differently depending on their class. For example you press the “Start” button on different devices :

- ✓ On a car, it starts the engine.
- ✓ On a computer, it boots the system.
- ✓ On a microwave, it starts heating food.

So polymorphism is : Same action name, different behavior. Like area() of circle and square, same name however the formula for finding the area is different:

- circle's area = $\pi * r^2$ (*r* is the *radius* of the circle).
- square's area = side*side

4. Inheritance (Generalisation) :

Inheritance is an OOP mechanism that allows one class (called **child** / **subclass** / **derived class**) to *reuse* and *extend* another class (called **parent** / **superclass** / **base class**). It forms an “is-a” relationship.