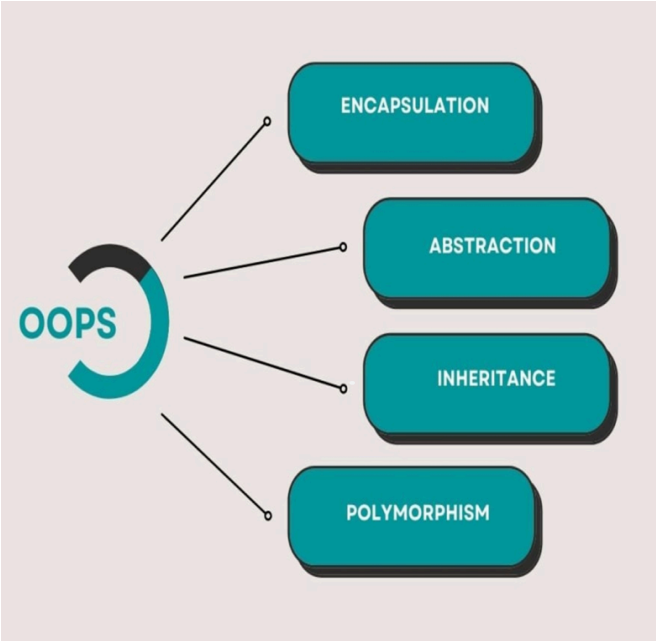
Principles of OOP in Java:-

05 July 2025 11:07

Principles of OOP's are

1. Abstraction
2. Encapsulation
3. Inheritance
4. Polymorphism



We will explore the four Principles of Object-Oriented Programming (OOP) through Six key parameters.

1. Meaning of Word
2. How to Achieve it
3. Perfect Definition
4. Real world Example
5. Advantages
6. Disadvantages

Abstraction:-

Meaning of Word

1. Hiding internal details and showing only essential information.

How to Achieve It

2. Using **abstract** classes and **interfaces** in Java.

How to Achieve It

3. Using abstract classes and interfaces in Java.

Real-world Example

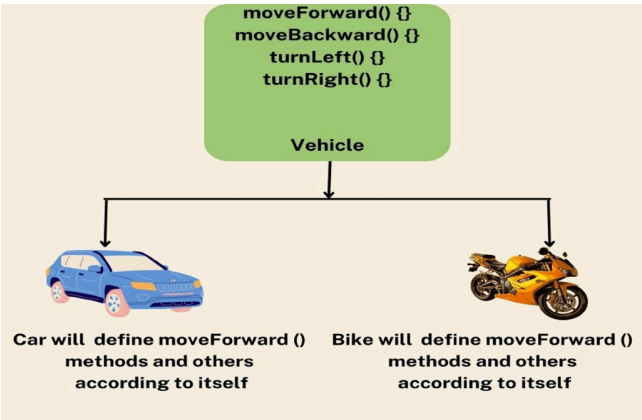
4. Driving a car – you use the wheel and pedals without knowing engine mechanics.

Advantages

1. 1. Reduces **complexity**
   2. **Increases security** by hiding sensitive code
   3. Improves maintainability

Disadvantages

1. Overuse may make the code **less understandable**
2. Requires careful design to define clear interfaces



Encapsulation:-

Meaning of Word,

- Wrapping data (variables) and code (methods) into a single unit.

How to Achieve It,

- Using classes, **private fields, and getter/setter methods.**

Perfect Definition,

- Encapsulation is the mechanism of restricting direct access to data by binding code and data together inside a class.

Real-world Example,

- A capsule that contains medicine – you only see the capsule, **not its internal contents.**

Advantages, -

1. Provides data security and control
2. Improves code **modularity**
3. Easy to modify code without affecting other parts

Disadvantages,

1. Too many **getters/setters** can break true encapsulation
2. Can lead to **less transparency** if not documented well

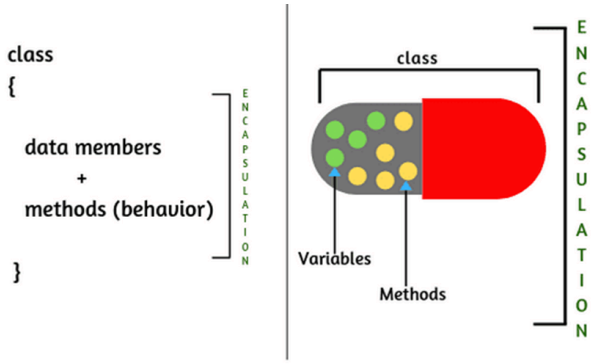


Fig: Encapsulation

Inheritance:-

Meaning of Word:-
- Inheriting properties and methods from another class.

How to Achieve It:-
- Using the extends keyword in Java to inherit from a superclass.

Perfect Definition:-
- Inheritance allows a class (child) to acquire the fields and methods of another class (parent), enabling code reuse and hierarchy.

Real-world Example:-
- A child inherits physical traits from their parents.

Advantages,
1. Promotes code reuse
2. Establishes natural hierarchy
3. Makes code easier to manage

Disadvantages,
1. Tight coupling between classes
2. Difficult to modify base class without affecting derived classes
3. Can lead to misuse through improper subclassing

Polymorphism:-

Meaning of Word,
- One name, many forms (poly = many, morph = form).

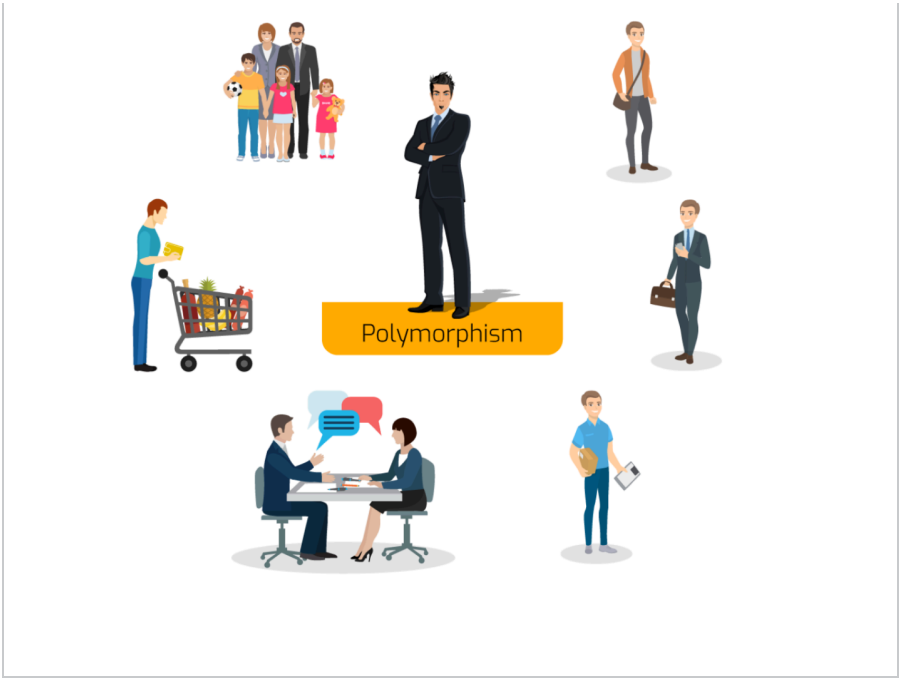
How to Achieve It,
- Compile-time: Method Overloading- Runtime: Method Overriding

Perfect Definition
- Polymorphism allows objects to take many forms by defining a single interface to represent different types or actions.

Real-world Example,
- The method draw() draws different shapes (circle, rectangle) depending on the object calling it.

Advantages,
1. Enhances flexibility and scalability
2. Reduces complexity via a common interface
3. Easier to add new behavior

Disadvantages
1. Can be confusing to debug
2. Runtime polymorphism adds slight overhead
3. Requires careful design to avoid unexpected behaviors


Polymorphism