JAVA INHERITANCE

📘 What is Inheritance?

Inheritance in Java is a mechanism where one class (child or subclass) inherits the properties and behaviors (fields and methods) of another class (parent or superclass). It helps in code reuse and polymorphism.

🔧 Why Use Inheritance?

- To **reuse** existing code
- To **organize** classes logically
- To support **runtime polymorphism**
- To make the code **easier to maintain**

📐 Basic Syntax

```java
class Parent {
    void display() {
        System.out.println("This is the parent class.");
    }
}

class Child extends Parent {
    void show() {
        System.out.println("This is the child class.");
    }
}
```

```java
Child obj = new Child();
obj.display(); // from Parent
obj.show();    // from Child
```

🧱 Types of Inheritance in Java

1. **Single Inheritance** (One parent, one child)

```java
class A {
    void msg() {
        System.out.println("Hello from A");
    }
}
class B extends A {
    void greet() {
        System.out.println("Hello from B");
    }
}
```

2. **Multilevel Inheritance** (A → B → C)

```java
class A {
    void msg() { System.out.println("A"); }
}
class B extends A {
    void greet() { System.out.println("B"); }
}
class C extends B {
    void hello() { System.out.println("C"); }
}
```

3. **Hierarchical Inheritance** (One parent, multiple children)

```java
class Animal {
    void sound() { System.out.println("Animal sound"); }
}
class Dog extends Animal {
    void bark() { System.out.println("Dog barks"); }
}
class Cat extends Animal {
    void meow() { System.out.println("Cat meows"); }
}
```

4. **Interface-based Inheritance** (Multiple inheritance via interfaces)

```java
interface A {
    void methodA();
}
interface B {
    void methodB();
}
class C implements A, B {
    public void methodA() { System.out.println("A"); }
    public void methodB() { System.out.println("B"); }
}
```

❗ **Important Points**

- Java supports **single, multilevel, and hierarchical** inheritance with classes.
- Java **does not support multiple inheritance with classes** (to avoid ambiguity).
- **Interfaces** provide a way to achieve **multiple inheritance**.

🧱 Inheritance allows one class to **acquire properties and methods** of another class.

- **Parent/Superclass** → Base class
- **Child/Subclass** → Derived class