Java Inheritance Assignments

# Assignment 1: Single Inheritance - Vehicle Management System

* \*\*Objective:\*\* Implement single inheritance using base and derived classes.

\*\*Description:\*\*

* Create a class `Vehicle` with properties: `brand`, `model`, and `year`.
* Create a class `Car` that extends `Vehicle` and adds properties like `fuelType`, `seatingCapacity`.
* Write a Java program to input and display car details.
* \*\*Goal:\*\* Understand how a subclass inherits from a superclass.

# Assignment 2: Multilevel Inheritance - Employee Salary Calculation

* \*\*Objective:\*\* Understand how inheritance can be extended in levels.

\*\*Description:\*\*

* Class `Person`: properties like `name`, `age`.
* Class `Employee` extends `Person`: adds `empId`, `department`.
* Class `Salary` extends `Employee`: adds `basicPay`, `HRA`, `DA`, `calculateSalary()` method.
* Write a Java program to display all information and total salary.
* \*\*Goal:\*\* Learn multilevel inheritance and method usage across levels.

# Assignment 3: Hierarchical Inheritance - University System

* \*\*Objective:\*\* Demonstrate hierarchical inheritance with multiple subclasses.

\*\*Description:\*\*

* Create a class `UniversityMember` with `name`, `id`.
* Create classes `Student`, `Professor`, `Staff` inheriting from `UniversityMember` and adding their own properties.
* Accept and display details of all 3 types.
* \*\*Goal:\*\* Explore reuse and extension across multiple subclasses.

# Assignment 4: Use of `super` Keyword - Customer Billing System

* \*\*Objective:\*\* Learn to use `super()` to access superclass members.

\*\*Description:\*\*

* Class `Customer`: contains `customerId`, `customerName`.
* Class `Billing` extends `Customer`: contains `billAmount`, `calculateDiscount()`.
* Use `super` to invoke superclass constructor and methods.
* \*\*Goal:\*\* Practice constructor chaining and field inheritance.

# Assignment 5: Method Overriding with Inheritance - Animal Sound System

* \*\*Objective:\*\* Understand polymorphism and overriding in inheritance.

\*\*Description:\*\*

* Create a base class `Animal` with a method `makeSound()`.
* Create subclasses `Dog`, `Cat`, `Cow`, etc., that override `makeSound()`.
* Use dynamic method dispatch to call the correct method at runtime.
* \*\*Goal:\*\* Practice overriding and polymorphism using inheritance.

# Assignment 6: Inheritance with Access Modifiers - Bank Account System

* \*\*Objective:\*\* Learn how inheritance works with different access modifiers.

\*\*Description:\*\*

* Class `Account`: `accountNumber`, `balance` (with appropriate access modifiers).
* Class `SavingsAccount` extends `Account`: adds `interestRate`.
* Class `CurrentAccount` extends `Account`: adds `overdraftLimit`.
* Ensure proper encapsulation with getters/setters and modifiers.
* \*\*Goal:\*\* Use inheritance while maintaining encapsulation.

# Assignment 7: Real-life Example - Library System using Inheritance

* \*\*Objective:\*\* Design a mini system to understand object modeling.

\*\*Description:\*\*

* Class `LibraryItem`: `title`, `publisher`, `year`.
* Subclasses: `Book`, `Magazine`, `Newspaper` with specific properties.
* Write a program to store and display information about each type.
* \*\*Goal:\*\* Apply real-world modeling using inheritance.