# 1. Single Inheritance – Student-Grading System

### Problem Statement:

Develop a Java program to manage **student grading** using **Single Inheritance**.

- Define a **base class** **`Student`** with attributes: `name`, `rollNumber`, and `marks`.
- Create a **derived class** **`Result`** that inherits from `Student` and adds a method `calculateGrade()`, which assigns grades based on marks:
  - `90+` → "A"
  - `80-89` → "B"
  - `70-79` → "C"
  - Below `70` → "D"

### Expected Output:

```
Student: Alice
Roll Number: 101
Marks: 85
Grade: B
```

---

# 2. Multilevel Inheritance – E-commerce Order Processing

### Problem Statement:

Design a Java program for **E-commerce Order Processing** using **Multilevel Inheritance**.

- Create a **base class** **`Order`** with attributes: `orderID` and `customerName`.
- Create a **derived class** **`OnlineOrder`** that extends `Order` and adds `paymentMode`.
- Create another derived class **`ShippedOrder`** that extends `OnlineOrder` and adds `trackingNumber` and `deliveryDate`.
- Implement a method `displayOrderDetails()` at each level.

### Expected Output:

```
Order ID: 12345
Customer: John Doe
Payment Mode: Credit Card
Tracking Number: TRK98765
Delivery Date: 10-March-2025
```

---

# 3. Hierarchical Inheritance – Animal Kingdom

### Problem Statement:

Create a Java program to classify **animals** using **Hierarchical Inheritance**.

- Define a **base class `Animal`** with attributes: `name` and `species`.
- Create **subclasses `Mammal` and `Bird`** that inherit from `Animal`.
  - `Mammal` class should have an attribute `hasFur` (boolean).
  - `Bird` class should have an attribute `canFly` (boolean).
- Override a method `showDetails()` in each subclass to display relevant information.

### Expected Output:

```
Animal: Lion
Species: Panthera Leo
Has Fur: Yes

Animal: Eagle
Species: Aquila Chrysaetos
Can Fly: Yes
```

---

# 4. Single Inheritance – Banking System

### Problem Statement:

Develop a **Banking System** using **Single Inheritance**.

- Create a **base class `BankAccount`** with attributes: `accountNumber`, `accountHolderName`, and `balance`.
- Create a **derived class `SavingsAccount`** that extends `BankAccount` and adds `interestRate`.
- Implement methods `deposit()`, `withdraw()`, and `calculateInterest()`.

### Expected Output:

```
Account Holder: David
Account Number: 456789
Balance: $5000
Interest Earned: $250
```

---

# 5. Multilevel Inheritance – Smart Home System

### Problem Statement:

Implement a **Smart Home System** using **Multilevel Inheritance**.

- Create a **base class `Appliance`** with attributes: `brand` and `powerUsage`.
- Create a **derived class `SmartAppliance`** that extends `Appliance` and adds `wifiEnabled` (boolean).
- Further derive **`SmartLight`**, which extends `SmartAppliance` and adds attributes: `brightnessLevel` and `colorMode`.
- Implement a method `displayInfo()` to show appliance details at each level.

### Expected Output:

```
Brand: Philips
Power Usage: 10W
WiFi Enabled: Yes
Brightness Level: 80%
Color Mode: Warm White
```

---

# 6. Hierarchical Inheritance – Library Management

### Problem Statement:

Develop a **Library Management System** using **Hierarchical Inheritance**.

- Create a **base class `LibraryItem`** with attributes: `title` and `author`.
- Create **two subclasses `Book` and `Magazine`** that inherit from `LibraryItem`.
    - `Book` class should have an attribute `numberOfPages`.
    - `Magazine` class should have an attribute `issueNumber`.
- Implement a method `displayDetails()` to show item details.

### Expected Output:

```
Title: Data Science Handbook
Author: John Doe
Number of Pages: 350

Title: Tech Today
Author: Jane Smith
Issue Number: 12
```

---