Assignment:5

Title:

Implement a Java program to demonstrate single and multilevel inheritance.

Objective:

To understand and implement the concepts of **single inheritance** and **multilevel inheritance** in Java by creating a program that demonstrates these principles.

Theory:

Inheritance is a fundamental concept of Object-Oriented Programming (OOP) that allows a class (child/subclass) to derive properties and behaviors from another class (parent/superclass).

Types of Inheritance in Java:

Single Inheritance:

1. A subclass inherits from a single superclass.
2. Example: Class B extends Class A (B inherits properties of A).

Multilevel Inheritance:

1. A subclass inherits from another subclass, forming a chain.
2. Example: Class C extends Class B, and Class B extends Class A.

Key Concepts:

- extends keyword is used to implement inheritance.
- The child class has access to public and protected members of the parent class.
- The constructor of the parent class is invoked before the child class constructor.

Algorithm:

1. Define a **Base class (Parent Class)** with attributes and methods.
2. Create a **Derived class (Child Class)** that extends the base class (Single Inheritance).
3. Create another class that extends the derived class to demonstrate **Multilevel Inheritance**.
4. In the main method, create objects and call the methods of each class to show inheritance in action.

Implementation: Java Program

```
// Parent class: Animal
class Animal {
    void eat() {
        System.out.println("This animal eats food.");
    }
}

// Single Inheritance: Mammal extends Animal
class Mammal extends Animal {
    void walk() {
        System.out.println("Mammals can walk.");
    }
}

// Multilevel Inheritance: Dog extends Mammal
class Dog extends Mammal {
    void bark() {
        System.out.println("Dogs can bark.");
    }
}

// Main class to test inheritance
public class InheritanceDemo {
    public static void main(String[] args) {
        // Object of Dog class (inherits from Mammal and Animal)
        Dog dog = new Dog();

        // Calling methods from different levels of inheritance
        dog.eat();  // From Animal class
        dog.walk(); // From Mammal class
        dog.bark(); // From Dog class
    }
}
```

Explanation:

Class Animal **(Base class):**

- Defines a method eat().

Class Mammal **(Derived from** Animal **- Single Inheritance):**

- Inherits eat() from Animal.
- Defines walk().

Class Dog **(Derived from** Mammal **- Multilevel Inheritance):**

- Inherits both eat() and walk().
- Defines bark().

Main Method (InheritanceDemo**):**

- Creates an instance of Dog.
- Calls methods from all three levels to demonstrate inheritance.

Output:

This animal eats food.
Mammals can walk.
Dogs can bark.

Conclusion:

- Single and multilevel inheritance allows reusability of code.
- The subclass can access properties and methods of its parent class.
- Java does not support **multiple inheritance** (inheriting from multiple classes) to avoid ambiguity.
- This example successfully demonstrates both **single** and **multilevel** inheritance in Java.