OOP Core Concepts Example in Java

This example demonstrates all the core concepts of **Object-Oriented Programming (OOP)**: **Abstraction, Encapsulation, Inheritance, and Polymorphism**.

Java Code:

```java
// Abstract Class to demonstrate Abstraction
abstract class Animal {
    // Abstract method (no implementation)
    abstract void sound();

    // Non-abstract method
    void sleep() {
        System.out.println("This animal is sleeping.");
    }
}

// Inheritance and Encapsulation demonstration
class Dog extends Animal {
    // Encapsulation: Private field for storing dog breed
    private String breed;

    // Constructor to initialize Dog with a breed
    Dog(String breed) {
        this.breed = breed;
    }

    // Overriding the abstract method from Animal (Polymorphism)
    @Override
    void sound() {
        System.out.println("The dog barks.");
    }

    // Getter method to access the private field (Encapsulation)
    public String getBreed() {
        return breed;
    }

    // Setter method to set the private field (Encapsulation)
    public void setBreed(String breed) {
        this.breed = breed;
    }
}

class Cat extends Animal {
    // Overriding the abstract method from Animal (Polymorphism)
    @Override
    void sound() {
        System.out.println("The cat meows.");
    }
}

public class Main {
    public static void main(String[] args) {
        // Demonstrating Abstraction: Animal is an abstract class, so you cannot instantiate it directly
        Animal myDog = new Dog("Labrador");
        Animal myCat = new Cat();

        // Polymorphism: Dog's sound method is called (method overriding)
        myDog.sound();  // Output: The dog barks.
        myCat.sound();  // Output: The cat meows.

        // Encapsulation: Accessing private field through getter
        System.out.println("My dog breed is: " + ((Dog) myDog).getBreed());  // Output: My dog breed is: Labrador
```

```java
        ((Dog) myDog).setBreed("Bulldog");  // Setting a new breed using setter
        System.out.println("Updated dog breed: " + ((Dog) myDog).getBreed());  // Output: Updated dog breed: Bulldog

        // Inheritance: Dog and Cat are subclasses of Animal, and they both inherit the sleep method
        myDog.sleep();  // Output: This animal is sleeping.
        myCat.sleep();  // Output: This animal is sleeping.
    }
}
```