মেট্রোপলিটন ইউনিভার্সিটি
Metropolitan University

Department of Computer Science and Engineering

Course Code: CSE222	Credits: 1.5
Course Name: Object Oriented Programming Lab	Faculty: FRS

Lab 03 – Inheritance

Task 1: Create a class hierarchy to model different types of vehicles. Start with a base class called "Vehicle" that has attributes "makeBy" and "makingYear", along with a method to display vehicle information. Then, create two subclasses "Car" and "Motorcycle" that inherit from the Vehicle class. Add specific attributes and methods for each subclass. Finally, create instances of both Car and Motorcycle classes, and demonstrate the inheritance and method overriding.

```
public class Main {
    public static void main(String[] args) {
        Car car = new Car("Toyota", 2022, 4);
        Motorcycle motorcycle = new Motorcycle("Harley-Davidson", 2021, true);

        car.displayInfo();
        motorcycle.displayInfo();
    }
}
```

Output:

Car Information:

Make: Toyota

Year: 2022

Number of doors: 4

Motorcycle Information:

Make: Harley-Davidson

Year: 2021

Has sidecar: true

Task 2: Create a class hierarchy to model different types of animals. Start with a base class called "Animal" that has attributes "name" and "age", along with a method to make the animal sound. Then, create two subclasses "Dog" and "Cat" that inherit from the Animal class. Add specific attributes and methods for each subclass. Finally, create instances of both Dog and Cat classes and demonstrate the inheritance and method overriding.

```
public class Main {
    public static void main(String[] args) {
        Dog dog = new Dog("Buddy", 3);
        Cat cat = new Cat("Whiskers", 2);


        dog.makeSound();
        cat.makeSound();
    }
}
```

Output:

Dog:

The dog barks.

Cat:

The cat meows.

Task 3: Create a class hierarchy for geometric shapes. Start with a base class called "Shape" that has an abstract method to calculate area. Then, create two subclasses "Rectangle" and "Circle" that inherit from the Shape class. Implement the area calculation methods for each subclass. Finally, create instances of both Rectangle and Circle classes and calculate their areas.

```
public class Main {
    public static void main(String[] args) {
        Rectangle rectangle = new Rectangle(5, 3);
        Circle circle = new Circle(4);


        System.out.println("Rectangle Area: " + rectangle.calculateArea());
        System.out.println("Circle Area: " + circle.calculateArea());
    }
}
```

Output:

Rectangle Area: 15.0

Circle Area: 50.26548245743669

Task 4: Create a class hierarchy for employees in a company. Start with a base class called "Employee" with attributes "name", "employeeId", and "salary". Then, create two subclasses "Manager" and "Developer" that inherit from the Employee class. Add specific attributes and methods for each subclass. Finally, create instances of both Manager and Developer classes and display their information.

```
public class Main {
    public static void main(String[] args) {
        Manager manager = new Manager("Alice", 101, 80000, "HR");
        Developer developer = new Developer("Bob", 201, 70000, "Java");


        manager.displayInfo();
        developer.displayInfo();
    }
}
```

Output:

Manager Information:

Name: Alice

Employee ID: 101

Salary: $80000.0

Department: HR

Developer Information:

Name: Bob

Employee ID: 201

Salary: $70000.0

Programming Language: Java

Task 5: Create a class hierarchy to model different types of electronic devices. Start with a base class called "Device" with attributes "brand" and "powerUsage", along with a method to display device information. Then, create two subclasses "Phone" and "Laptop" that inherit from the Device class. Add specific attributes and methods for each subclass. Finally, create instances of both Phone and Laptop classes and demonstrate the inheritance and method overriding.

```
public class Main {
    public static void main(String[] args) {
        Phone phone = new Phone("Apple", 5.0, "iOS");
        Laptop laptop = new Laptop("Dell", 40.0, 15.6);


        phone.displayInfo();
        laptop.displayInfo();
    }
}
```

Output:

Phone Information:

Brand: Apple

Power Usage: 5.0 watts

Operating System: iOS

Laptop Information:

Brand: Dell

Power Usage: 40.0 watts

Screen Size: 15.6 inches

Task 6: Create a class hierarchy to model different types of beverages. Start with a base class called "Beverage" with attributes "name" and "price", along with a method to display beverage information. Then, create two subclasses "Coffee" and "Soda" that inherit from the Beverage class. Add specific attributes and methods for each subclass. Finally, create instances of both Coffee and Soda classes and demonstrate the inheritance and method overriding.

```
public class Main {
    public static void main(String[] args) {
        Coffee coffee = new Coffee("Espresso", 3.5, 80);
        Soda soda = new Soda("Coca-Cola", 1.99, false);


        coffee.displayInfo();
        soda.displayInfo();
    }
}
```

Output:

Coffee Information:

Name: Espresso

Price: $3.5

Caffeine Level: 80 mg

Soda Information:

Name: Coca-Cola

Price: $1.99

Diet: No