S.N.R.Likhitha(AF0312909)

1.Create a class called Person with attributes such as name and age. Derive a class called Student from Person that adds an attribute studentId. Write a program to demonstrate single inheritance by creating objects of both classes and displaying their attributes.

Program:

```
package Inheritance;
public class Person {
      protected String name;
      protected int age;
      public Person(String name, int age) {
       this.name=name;
       this.age=age;
      }
      }
package Inheritance;
public class Student extends Person{
      //child class
    //common data field for Students Only.

      private String studentId;
       public Student(String name, int age, String studentId) {
       super(name,age);
       this.studentId = studentId;
       }
       public static void main(String []args) {
       //creating objects.
       Person p1 = new Person("Manny",21);
       Student s1 = new Student("Likhitha",21,"206N5A");

       //printing Person details
       System.out.println("Person Details");
       System.out.println("Person name "+p1.name);
       System.out.println("Person age"+p1.age);

       //printing the student details
       System.out.println("\nStudent Details");
       System.out.println("Student name "+s1.name);
       System.out.println("Student age "+s1.age);
       System.out.println("Student id "+s1.studentId);
}

}
```

Output:

```
Person Details
Person name Manny
Person age21

Student Details
Student name Likhitha
Student age 21
Student id 206N5A
```

2. Design a class called Shape with methods to calculate the area and perimeter. Derive classes like Circle, Rectangle, and Triangle from Shape. Write a program to create objects of these classes and compute their areas and perimeters.

Program:

```
package Inheritance;
public class Shape {
            public void calculateArea() {
            System.out.println("Area");
            }
            public void calculatePerimeter() {
            System.out.println("perimeter");
            }
            }
            class Circle extends Shape {
             private double radius;
             public Circle(double radius) {
             this.radius = radius;
             }
             @Override
             public void calculateArea() {
             System.out.println("circle area"+Math.PI * radius * radius);
             }
             @Override
             public void calculatePerimeter() {
             System.out.println("Circle perimeter"+(2 * Math.PI * radius));
             }
            }
            class Rectangle extends Shape {
             private double length;
             private double width;
             public Rectangle(double length, double width) {
             this.length = length;
             this.width = width;
             }
             @Override
             public void calculateArea() {
             System.out.println("\nRectangle area:"+length * width);
             }
             @Override
             public void calculatePerimeter() {
             System.out.println("Rectangle Perimeter"+2 * (length +
width));
             }
            }
            class Triangle extends Shape {
             private double side1;
             private double side2;
             private double side3;
             public Triangle(double side1, double side2, double side3)
            {
             this.side1 = side1;
             this.side2 = side2;
             this.side3 = side3;
             }
             @Override
             public void calculateArea() {
             double semiPerimeter = (side1 + side2 + side3) / 2;
```

```
            System.out.println("\nTriangle area"+ Math.sqrt(semiPerimeter
* (semiPerimeter - side1) *
                        (semiPerimeter - side2) * (semiPerimeter -
side3)));
            }
            @Override
            public void calculatePerimeter() {
            System.out.println("Triangle Perimeter"+(side1 + side2+
side3));
            }
           }
```

Output:

Circle area78.53981633974483

Circle perimeter31.41592653589793

Rectangle area:24.0

Rectangle perimeter20.0

Triangle area6.0

Triangle perimeter12.0

3. Create a base class called Animal with a method named sound(), which prints "Animal makes a sound." Derive classes Cat and Dog from Animal. Override the sound() method in each derived class to print "Cat meows" and "Dog barks" respectively. Write a program to demonstrate method overriding by creating objects of the derived classes and calling the sound() method.

Program:

```
package Inheritance;
public class Animal {
      public void sound() {
            System.out.println("Animal makes a sound.");
            }

}

package Inheritance;

public class Cat extends Animal {
      public void sound() {
            System.out.println("cat meows");
            }

}

public class Lion {
      public void sound() {
            System.out.println("Lion Roars...");
            }
```

```
}

public class Main {
public static  void main (String[]args) {
	Animal an = new Animal();
	an.sound();
	Cat cat = new Cat();
	cat.sound();
	Lion lion = new Lion();
	lion.sound();
	}
}
```

Output:

4. Design a class called Shape with a method named calculateArea(). Derive classes such as Circle, Rectangle, and Triangle from Shape and override the calculateArea() method in each derived class to compute the area specific to that shape. Write a program to create objects of these classes and invoke the calculateArea() method to calculate and display their respective areas.

Program:

```
package Inheritance;

abstract class Shape2 {

		public abstract double calculateArea();
		}


public class Circle2 extends Shape2 {
	private double radius;
	public Circle2(double radius) {
	this.radius=radius;
	}
	@Override
	public double calculateArea() {
	return ((3.14)*(radius*radius));
	}
	}

public class Triangle2 extends Shape2 {
	private double base;
	private double height;
	public Triangle2(double base,double height) {
	this.base=base;
	this.height=height;
	}
	@Override
	public double calculateArea() {
	return 0.5*height*base;
	}


}
```

```
public class Rectangle2 extends Shape2 {
	private double length;
	private double width;
	public Rectangle2(double length, double width) {
	this.length = length;
	this.width = width;
	}
	public double calculateArea() {
	return length*width;
	}

}
public class Main2 {
	public static void main(String[] args) {
		Circle2 cr = new Circle2(7);
		System.out.println("Circle2 Area:"+cr.calculateArea());
		Rectangle2 re = new Rectangle2(4.0,5.2);
		System.out.println("\nRectangle2 Area:"+re.calculateArea());
		Triangle2 tr = new Triangle2(4,5);
		System.out.println("\nTriangle2 Area:"+tr.calculateArea());
		}
}
```

Output:

Circle Area: 28.26

Rectangle Area: 20.8

Triangle Area: 10.0