(LAB ASSESSMENT)

## 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.

**package** Std;

**public class** Person { **private** String name; **private int** age;

// Constructor

**public** Person (String name, **int** age)

{

**this**.name = name;

**this**.age = age;

}

// Display method

**public void** display () { System.***out***.println("Name: " + name); System.***out***.println("Age: " + age);

}

}

**package** tsgol;

**public class** student **extends** Person {

**private int** studentId;

// Constructor

**public** student (String name, **int** age, **int** studentId)

{

**super** (name, age);

**this**.StudentId = studentId;

}

// Display method (overrides the display method in Person class)

**public void** display () {

**super**.display();

System.***out***.println("Student ID: " + studentId);

}

}

**package** Std;

**public class** Main {

**public static void** main(String[] args) {

// Create a Person object

Person person = **new** Person("Mercy", 23);

// Display Person attributes System.***out***.println("Person Details:"); person.display();

// Create a Student object

student student = **new** student("Veronica", 22, 1987);

// Display Student attributes System.***out***.println("\nStudent Details:"); student.display();

}

}

# OUTPUT:

Person Details: Name: Mercy Age: 23

Student Details: Name: Veronica

Age: 23

Student ID: 1987

## 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.

**package** Std;

**public class** Shape {

**public double** calculateArea() {

**return** 0.0;

}

**public double** calculatePerimeter() {

**return** 0.0;

}

}

**package** Std;

**public class** Circle **extends** Shape {

**private double** radius;

**public** Circle(**double** radius) {

**this**.radius = radius;

}

**public double** calculateArea() {

**return** Math.***PI*** \* Math.*pow*(radius, 2);

}

**public double** calculatePerimeter() {

**return** 2 \* Math.***PI*** \* radius;

}

}

**package** Std;

**public class** Rectangle **extends** Shape {

**private double** length;

**private double** width;

**public** Rectangle(**double** length, **double** width) {

**this**.length = length;

**this**.width = width;

}

**public double** calculateArea() {

**return** length \* width;

}

**public double** calculatePerimeter() {

**return** 2 \* (length + width);

}

}

**package** Std;

**public class** triangle **extends** Shape {

**private double** sideA; **private double** sideB; **private double** sideC;

**public** triangle(**double** sideA, **double** sideB,

**double** sideC) {

**this**.sideA = sideA; **this**.sideB = sideB; **this**.sideC = sideC;

}

**public double** calculateArea() {

// Using Heron's formula to calculate the area of a triangle

**double** s = (sideA + sideB + sideC) / 2;

**return** Math.*sqrt*(s \* (s - sideA) \* (s - sideB) \* (s - sideC));

}

**public double** calculatePerimeter() {

**return** sideA + sideB + sideC;

}

}

**package** Std;

**public class** Main1 {

**public static void** main(String[] args) { Circle circle = **new** Circle(5); System.***out***.println("Circle Area: " +

circle.calculateArea());

System.***out***.println("Circle Perimeter: " + circle.calculatePerimeter());

Rectangle rectangle = **new** Rectangle(4, 6); System.***out***.println("Rectangle Area: " +

rectangle.calculateArea());

System.***out***.println("Rectangle Perimeter: " + rectangle.calculatePerimeter());

triangle triangle = **new** triangle(3, 4, 5); System.***out***.println("Triangle Area: " +

triangle.calculateArea());

System.***out***.println("Triangle Perimeter: " + triangle.calculatePerimeter());

}

}

# OUTPUT:

Circle Area: 78.53981633974483

Circle Perimeter: 31.41592653589793

Rectangle Area: 24.0

Rectangle Perimeter: 20.0

Triangle Area: 6.0

Triangle Perimeter: 12.0

## 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.

**package** tsgol;

**public class** Animal {

**public void** sound() { System.***out***.println("Animal makes a sound.");

}

}

**package** tsgol;

**public class** Cat **extends** Animal {

**public void** sound() { System.***out***.println("Cat meows.");

}

}

**package** tsgol;

**public class** Dog **extends** Animal {

**public void** sound() { System.***out***.println("Dog barks.");

}

}

**package** tsgol;

**public class** MAIN2 {

**public static void** main(String[] args) { Animal animal = **new** Animal(); animal.sound();

Cat cat = **new** Cat(); cat.sound();

Dog dog = **new** Dog(); dog.sound();

}

}

# OUTPUT:

Animal makes a sound. Cat meows.

Dog barks.

## Design a class called Shape with a method named calculate Area (). Derive classes such as Circle, Rectangle, and Triangle from Shape and override the calculate Area () 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 calculate Area () method to calculate and display their respective areas.

**package** tsgol;

**public class** Shape2 {

**public void** calculateArea() {

System.***out***.println("Calculating area of the shape");

}

}

**package** tsgol;

**public class** Circle2 **extends** Shape {

**private double** radius;

**public** Circle2(**double** radius)

{

**this**.radius = radius;

}

**public double** calculateArea()

{

**return** Math.***PI*** \* radius \* radius;

}

}

**package** tsgol;

**public class** Rectangle2 **extends** Shape {

**private double** length;

**private double** width;

**private double** height;

height)

**public** Rectangle2(**double** width, **double**

{

**this**.width = width;

**this**.height = height;

}

**public double** calculateArea()

{

**return** width \* height;

}

}

**package** tsgol;

**public class** Triangle2 **extends** Shape {

**private double** base;

**private double** height;

**public** Triangle2(**double** base, **double** height)

{

**this**.base = base;

**this**.height = height;

}

**public double** calculateArea()

{

**double** area = 0.5 \* base \* height; System.***out***.println("Area of the triangle: " +

area);

**return** area;

}

}

**package** tsgol;

**public class** Main3 {

**public static void** main(String[] args) { Circle circle = **new** Circle(6.0);

System.***out***.println("Circle Area: " + circle.calculateArea());

Rectangle2 rectangle2 = **new** Rectangle2(2.0, 4.0); System.***out***.println("Rectangle Area: " +

rectangle2.calculateArea());

Triangle2 triangle2 = **new** Triangle2(3.0, 9.0); System.***out***.println("Triangle Area: " +

triangle2.calculateArea());

}

}

# OUTPUT:

Circle Area: 113.09733552923255

Rectangle Area: 8.0

Area of the triangle: 13.5 Triangle Area: 13.5