# 44-542 Lab Activities

# Lab Activity: Inheritance and Polymorphism

The driver class and the input text file for this exercise will be provided to you. You have to define the classes and their relationships from the below given UML diagram. Write comments for all constructors, methods, and generate Java docs.

**Note:** The name of the project will be your “*Lastname*\_Lab05InheritanceAndPolymorphism”. For example “Smith\_ Lab05InheritanceAndPolymorphism”.

All classes must be placed in a package named “**shape**”

**Exercise 1:**

1. Define the classes shown in the UML diagram below. Following the diagram are some details regarding the behavior of the methods.



**Information about the classes and methods follow. Some of the methods are self-explanatory and are not discussed here.**

**Shape** class**:**

* Methods: Methods are described below.
  + **calcArea()**: Returns a double value. This method always returns 0.0
  + **calcPerimeter()**: Returns a double value. This method always returns 0.0

**Rectangle** class**:**

Represents a Rectangle, with two private variables length and breadth of double type.

* Constructor: The two-arg constructor is used to initialize the length and breadth of the Rectangle.
* Constructor: The no-arg constructor sets the length and breadth values to 0.0 and 0.0 respectively.
* Methods: The setter does not return any values. All the other methods return the type double, except for the toString method.
  + **toString()**: This method returns a String representing the Rectangle. An example of the required format is shown below:

Length= 12.50, Breadth= 25.00

**Note:** Limit all the values to two decimals. Hint: Use “String.format()” for formatting.

**Square** class**:**

Represents a square.

* Constructor: Default constructor sets the length and breadth to (0.0, 0.0).
* Constructor: Constructor with a single parameter sets the length and breadth values. Note that for a square, length and breadth must be equal, so we are passing only one value using the constructor.
* Methods: The setters do not return any values.
  + **setLength(double lengthIn):** This method does not return any value. This method Overrides **setlength** method in class **Rectangle**. Only one parameter is required from the user to set the two fields. If the length is set to a value, breadth must be set to the same value.
  + **setBreadth(double breadthIn):** This method does not return any value. This method Overrides **setBreadth** method in class **Rectangle**. Similarly, if the breadth is set to a value, length must be set to the same value.
  + **toString()** returns a **String** representing the square. An example of the required format is shown below:

Length= 22.00

**Note:** Limit all the values to two decimals. Hint: Use “String.format()” for formatting.

**Circle** class**:**

Represents a circle which has one private variable radius of double type.

* Constructor: Default constructor sets the radius value to 0.0
* Constructor: The one-arg constructor is used to initialize the radius of the circle.

Method **toString** returns a **String** representing the circle. An example of the required format is shown below:

Radius= 4.50

**Note:** Limit all the values to two decimals. Hint: Use “String.format()” for formatting.

**Sample Output**:

Rectangle: Length= 12.50, Breadth= 25.00; Area: 312.50; Perimeter: 75.00

Square: Length= 24.00; Area: 576.00; Perimeter: 96.00

Circle: Radius= 4.50; Area: 63.62; Perimeter: 28.27

Rectangle: Length= 20.00, Breadth= 23.00; Area: 460.00; Perimeter: 86.00

Square: Length= 22.00; Area: 484.00; Perimeter: 88.00

Circle: Radius= 5.50; Area: 95.03; Perimeter: 34.56

Rectangle: Length= 35.00, Breadth= 32.00; Area: 1120.00; Perimeter: 134.00

Square: Length= 20.00; Area: 400.00; Perimeter: 80.00

Circle: Radius= 6.50; Area: 132.73; Perimeter: 40.84

Rectangle: Length= 32.00, Breadth= 30.00; Area: 960.00; Perimeter: 124.00

Square: Length= 19.00; Area: 361.00; Perimeter: 76.00

Circle: Radius= 7.50; Area: 176.71; Perimeter: 47.12

Rectangle: Length= 21.00, Breadth= 22.00; Area: 462.00; Perimeter: 86.00

Square: Length= 10.00; Area: 100.00; Perimeter: 40.00

Circle: Radius= 2.00; Area: 12.57; Perimeter: 12.57

Rectangle: Length= 40.00, Breadth= 33.00; Area: 1320.00; Perimeter: 146.00

Square: Length= 24.00; Area: 576.00; Perimeter: 96.00

Circle: Radius= 4.00; Area: 50.27; Perimeter: 25.13