**Lab 02: Classes and Objects**

**Introduction**

The heart of object orientation are two concepts that we have to understand first: Objects and Classes, these form the basis of all programming in object-oriented languages. In this laboratory activity the student will practice how to create a Java class and define its elements such as attributes and methods. Also, it will teach the student on how to instantiate an object of a class using constructors.

**Objectives**

At the end of this practical session the student should be able to:

* Create a Java class and define its elements.
* Create multiple constructors to instantiate objects and to define attribute values.
* Call class methods using an objects.

**Tools/Software Requirements**

* NetBeans IDE 7.2 and above

**Description**

Objects are created from classes. The class describes the kind of object; the object represents individual instantiations of the class. In relation to this concept, your first task in this exercise is to test and run the given program below and answer the questions in **Table 1**. Comments are provided line of code to give a short description about the different parts of the program.

Program Example: Circle.java Class

This program shows the area of the circle base on the values assigned in each object by calling different constructor during instantiation of the object.

*See Page 2 and 3 for the complete program.*

**Program Example:**

//Class declaration  
public class Circle1 {  
 //Circle class field  
 double radius;  
   
 //Default constructor. Construct an object and initialize the radius to 1.  
 Circle1()  
 {  
 radius =1;  
 }  
   
 // Construct with arguments. Construct an object with a specified radius.  
 Circle1(double newRadius)  
 {  
 radius = newRadius;  
 }  
   
 // Return the area of this circle  
 //Math.PI is a Java Constant = 3.141592653589793  
 double getArea()  
 {  
 return radius \* radius \* Math.PI;  
 }  
   
 /\*\* Main method \*/  
public static void main(String[] args) {  
 // Create a circle with radius 1.0  
 Circle1 circle1 = new Circle1();  
 System.out.println("The area of the circle of radius "  
 +circle1.radius + " is " + circle1.getArea());  
  
 // Create a circle with radius 25  
 Circle1 circle2 = new Circle1(25);  
 System.out.println("The area of the circle of radius "  
 + circle2.radius + " is " + circle2.getArea());  
  
 // Create a circle with radius 125  
 Circle1 circle3 = new Circle1(125);  
 System.out.println("The area of the circle of radius "  
 + circle3.radius + " is " + circle3.getArea());

// Modify circle radius  
 circle2.radius = 100;  
 System.out.println("The area of the circle of radius "  
 + circle2.radius + " is " + circle2.getArea());  
}  
}

**TABLE 1: Provide the output for each row with the given input. (.5 each correct answer)**

|  |  |
| --- | --- |
| **Questions: Give the output of the given program statements below.** | **OUTPUT: Paste your answer for each row.** |
| Circle1 circle2 = new Circle1(30);  System.out.println("The area of the circle of radius "  + circle2.radius + " is " + circle2.getArea()); | **The area of the circle of radius 30.0 is 2827.4333882308138** |
| Circle1 circle3 = new Circle1(130);  System.out.println("The area of the circle of radius "  + circle3.radius + " is " + circle3.getArea()); | **The area of the circle of radius 130.0 is 53092.91584566751** |
| circle2.radius = 200;  System.out.println("The area of the circle of radius "  + circle2.radius + " is " + circle2.getArea()); | **The area of the circle of radius 200.0 is 125663.70614359173** |
| Circle1 circle2 = new Circle1(50);  System.out.println("The area of the circle of radius "  + circle2.radius + " is " + circle2.getArea()); | **The area of the circle of radius 50.0 is 7853.981633974483** |
| Circle1 circle3 = new Circle1(200);  System.out.println("The area of the circle of radius "  + circle3.radius + " is " + circle3.getArea()); | **The area of the circle of radius 200.0 is 125663.70614359173** |
| circle2.radius = 300;  System.out.println("The area of the circle of radius "  + circle2.radius + " is " + circle2.getArea()); | **The area of the circle of radius 300.0 is 282743.3388230814** |

**Lab Tasks**

For your laboratory assignment read and analyze the given problem below and write the Java program to solve the problem.

**Water Volume Calculator**

Create a Java program that will calculate the water volume of a swimming pool or pond. The basic formula for calculating the volume of water (in gallons) of is to use the following formula based on the shape of the pond.

* **Square/Rectangular/Oval shape**

Volume of water in gallons = L\*W\*D\*7.5

* + Where L is length, W is width and D is depth of a swimming pool/pond.
  + Length, Width and Depth should be input from the user.
* **Circular Shape**

Volume of water in gallons = 3.14\*R\*D\*7.5

* + Where R is radius and D is depth of the swimming pool/pond.
  + Radius and Depth should be an input from the user.

**Requirements**

* Name your Class WaterCalculator.
* Your program should have 2 constructors that will perform the following function.
  + First constructor should have 3 arguments (length, width and depth) that will be used to construct an object for a swimming pool/pond that has a Square/Rectangular/Oval shape.
  + The second constructor should have 2 arguments (radius and depth) that will be used to construct an object for a swimming pool/pond that has a Circular shape.
* You should have a methods that will return the water volume of a swimming pool/pond in gallons.
* In the main method of the program, you should instantiate 2 objects of the class WaterCalculator, name the first object rectvolume and use the first constructor to instantiate the object. The second object should be named circvolume and use the second constructor to instantiate the object.
* Test and run the program to confirm if you program is correct.
* Once done have your Instructor checked and verify your solution.

**Deliverables**

After your program is already checked by your instructor and provided you with your marks, you should upload the whole project in Edmodo in zip or rar format.

**public class WaterCalculator {**

**double length;**

**double width;**

**double depth;**

**double radius;**

**WaterCalculator(double L,double W,double D) {**

**length=L;**

**width=W;**

**depth=D;**

**}**

**WaterCalculator(double R,double D) {**

**radius=R;**

**depth=D;**

**}**

**public double getVolume() {**

**return length\*width\*depth\*7.5;**

**}**

**public double getCircularVolume() {**

**return 3.14\*radius\*depth\*7.5;**

**}**

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

**WaterCalculator rectvolume=new WaterCalculator(10,5,4);**

**System.out.println("Volume of rectangular shape of the swimming pool is "+rectvolume.getVolume());**

**WaterCalculator squarevolume=new WaterCalculator(6,2,9);**

**System.out.println("Volume of square shape of the swimming pool is "+squarevolume.getVolume());**

**WaterCalculator ovalvolume=new WaterCalculator(5,3,8);**

**System.out.println("Volume of oval shape of the swimming pool is "+ovalvolume.getVolume());**

**WaterCalculator circvolume=new WaterCalculator(7,5);**

**System.out.println("Volume of Circular shape of the swimming pool is "+circvolume.getCircularVolume());**

**}**

**}**