**4.3 – Understanding Object**

**Oriented Programming Theory**

For this assignment we will be using A Guide to Programming in JAVA by Beth Brown. Please type your answers in this document. When you are done, upload the file to your GitHub account in a repo called “Assignment 4-3” available at:

<https://bbarrettchs.weebly.com/uploads/3/7/7/8/37782575/lvp_java_text.pdf>

**Who are you?**

0. What is your name? Mark Shen

**What is an Object?**

Read page 179-180 and answer the following questions:

1. The textbook describes an object as a collection of state and behaviour. What is meant by state and behaviour?

State is the value of the data stored by an object, and behaviour is how an object manipulates the data.

2. Define Encapsulation / Information Hiding.

An object protecting its data by hiding it from other objects.

3. Define client code.

A code that can access more than one classes. Client code cannot change the data stored in a class directly, but can access the methods in a class.

**Designing and Writing a Class**

Read page 180-182 and answer the following questions:

4. Define Functional Decomposition.

Breaking a class down into separate functions.

5. What three things does the class declaration contain?

Class declaration contain access level, the keyword “class”, and a class name.

6. What three things does the class body contain?

Class body contains constructors, variables, and methods.

7. Access levels: what does it mean to make a variable or method public? What does it mean to make a variable or method private?

Public methods/variables are visible to other classes and can be use by other classes. Private methods/variables are only visible to the class it is declared in and can only be used by that class. Private methods/variables are invisible to the client code.

8. What is an interface?

How client code can use the objects in a class.

9. Define accessor method, modifier method, and helper method. Which one of these types of methods is NOT part of the interface?

Accessor methods determine the value of a variable, mutator methods manipulate the value of a variable, and helper methods help complete a task. Helper methods have access level private.

10. Do the problem "Review: Circle - part 1 of 4" on page 182

/\*\* \* Circle class. \*/

public class Circle {

private static final double PI = 3.14;

private double radius;

}

public Circle() {

radius = 1;

}

public void setRadius(double newRadius) {

radius = newRadius;

}

public double area() {

double circleArea;

circleArea = PI \* radius \* radius; return(circleArea);

}

public double getRadius() {

return(radius);

}

public double circumference () {

double total = 0;

total += 2\*radius\*Circle.PI;

return total;

}

**Writing Constructors**

Read page 183 and answer the following questions:

11. What does it mean for an object to be instantiated?

Using a constructor to make an object.

12. What is a constructor method and what does it do?

Constructor methods are used to instantiate objects and initialize variables.

13. What two things are always true about constructor methods?

Constructor methods always have the same name as the class and they do not have a return type.

13. What does it mean to "overload" a constructor method?

Create more than one constructors with different parameters.

14. Do the problem "Review: Circle - part 2 of 4" on page 184

/\*\* \* Circle class. \*/

public class Circle {

private static final double PI = 3.14;

private double radius;

}

public Circle() {

radius = 1;

}

public Circle (double r) {

radius = r;

}

public void setRadius(double newRadius) {

radius = newRadius;

}

public double area() {

double circleArea;

circleArea = PI \* radius \* radius; return(circleArea);

}

public double getRadius() {

return(radius);

}

**Instance and Class Members**

Read page 184-185 and answer the following questions:

15. What is the difference between an instance variable and a class variable? How do you declare a variable as an instance variable? How do you declare a variable as a class variable? Give an example of each from the Circle class.

Instance variable are variables that each object has a copy and can manipulate them on its own. Class variables are shared by all instances of objects of a class. Class variables are declared with the keyword “static”.

private static final double PI = 3.14; (class variable)

private double radius; (instance variable)

16. What is the difference between an instance method and a class method? How do you declare a method as an instance method? How do you declare a method as a class method? Give an example of each from the Circle class.

Instance methods can only be called from an instance of a class and can change the state of an object. Class methods are called from the class to preform a task and contain the keyword “static”.

.displayAreaFormula(); (class method)

.area(); (instance method)

17. Do the problem "Review: Circle - Part 3 of 4" on page 185.

/\*\* \* Circle class. \*/

public class Circle {

private static final double PI = 3.14;

private double radius;

}

public Circle() {

radius = 1;

}

public void setRadius(double newRadius) {

radius = newRadius;

}

public double area() {

double circleArea;

circleArea = PI \* radius \* radius; return(circleArea);

}

public double getRadius() {

return(radius);

}

public static void displayAreaFormula() {

System.out.println(“The formula for the area of a circle is a circle is A = Pi\*r\*r);

}

}

public class TestCircle {

public static void main(String[] args) {

Circle spot = new Circle();

spot.setRadius(5);

System.out.println("Circle radius:" + spot.getRadius());

System.out.println("Circle area: " + spot.area());

Circle.displayAreaFormula();

}

}