PGCert IT: Programming for Industry

Object-Oriented Programming

Download the source code for this lab, which is available on Canvas or Moodle.

Exercise One: Object references

1. After the following statements are executed, what are the values stored in each variable?

```
int a = 7;
int b = 1;
int c = a + 2;
a = b;
b = c;
c = c + 1;
```

```
a = 1
b = 9
c = 10
```

2. After the following statements are executed, what are the outputs? The method `setFruitName(String)` changes the fruit name and the method `getFruitName()` returns the fruit name of the object. You can find the `Fruit` class in the given source code for this lab.

```
Fruit apple = new Fruit("red apple");
Fruit orange = new Fruit("orange");
Fruit greenApple = apple;

System.out.println("The fruit is " + apple.getFruitName());
System.out.println("The fruit is " + orange.getFruitName());
System.out.println("The fruit is " + greenApple.getFruitName());

orange.setFruitName("navel orange");
greenApple.setFruitName("green apple");

System.out.println("The fruit is " + apple.getFruitName());
System.out.println("The fruit is " + orange.getFruitName());
```

```
System.out.println("The fruit is " + greenApple.getFruitName());
```

The output is:
The fruit is red apple
The fruit is orange
The fruit is red apple
The fruit is green apple
The fruit is navel orange
The fruit is green apple

Exercise Two: Method return types and parameters

Fill in the blanks below so that each method will compile.

1.
```
private ____char____ getRandomLetter(String ____word_____ ){
      int position = (int)(Math.random()*word.length());
      return word.charAt(position);
}
```

2.
```
private ___String__ getSurname(_____String_____ name) {
      int positionOfSpace = name.indexOf(" ");
      return name.substring(positionOfSpace + 1);
}
```

3.
```
private ___double____ getBMI(double __weight__, __double__ height){
      double bmi = weight / Math.pow(height,2);
      return bmi;
}
```

4.
```
private ___void___ printTemperature(int ____degrees____ ){
      System.out.println("The temperature is " + degrees);
}
```

Exercise Three: Using String methods

1. What output do you think would be produced by each of the following code fragments?

a. `System.out.println((int)2.9 * Double.parseDouble("4.5"));`
   `9.0`
b. `System.out.println("17" + Integer.parseInt("2") * 3.5);`
   `177.0`
c. `System.out.println("5 + 3" + 19 % 2 + 19 / 2);`
   `5 + 319`
d. `System.out.println(2 + 5 + "59" + 3 * 2 + (3 + 2));`
   `75965`

2. What is printed when the following start() method is executed?

```
public void start() {

        String colours, first, second, third;
        int position1, position2, position3, length;

        colours = "redorangeyellow";

        first = colours.substring(4, 9);
        second = colours.substring(0, 4);
        third = colours.charAt(0) + colours.substring(13);

        length = third.length();
        third = third.toUpperCase();

        position1 = colours.indexOf('A');
        position2 = colours.indexOf("el");
        position3 = colours.indexOf("or");

        System.out.println("first: " + first);
        System.out.println("second: " + second);
        System.out.println("third: " + third);
        System.out.println("length: " + length);
        System.out.println("position1: " + position1);
        System.out.println("position2: " + position2);
        System.out.println("position3: " + position3);
}
```

The output is:
first: range
second: redo
third: ROW
length: 3
position1: -1
position2: 10

position3: 3

Exercise Four: Debugging a simple program

The `CalculateVolume` program shown below is supposed to use the radius value entered by the user to calculate the volume of a sphere with the radius entered, then display the volume. The formula for the volume of a sphere is:

$$V = \frac{4}{3}\pi r^3$$

If, for example, a radius of 6.5 was entered at the prompt, the output should be:

```
"Volume of a Sphere"
Enter the radius: 6.5
Volume: 1150.3465099894624
```

There are **13** errors or omissions in the following source code. Locate and correct all of these so that the program would produce **exactly** the same output as above if a radius of 6.5 was entered. **Circle** the errors where they appear in the code below and write the corrected version:

```
public class CalculateVolume {

	public void start() {

		double radius;

		System.out.println("\"Volume of a Sphere\"");

		System.out.println("Enter the radius: ");

		radius = Double.parseDouble(Keyboard.readInput());

		double volume = (4.0 / 3.0) * Math.PI *
		                                Math.pow(radius,3);

		System.out.println("Volume: " + volume);
	}

	public static void main (String[] args) {
		new CalculateVolume().start();
	}
}
```