Ahmadu Bello University
Department of Mathematics
First Semester Examinations – April 2016
COSC211: Object Oriented Programming I

Attempt *Four* questions   Time: 120 mins

1. (*a*) Design a class called `Author` that contains the following.

    (*i*)   Three *private instance variables*: name (`String`), email (`String`), and gender (`char` of either 'm' or 'f').
    (*ii*)   One *constructor* to initialize name, email and gender with given values.
    (*iii*)   Public *getters* and *setters*: `getName()`, `getEmail()`, `setEmail()`, and `getGender()`. There are no setters for name and gender, as these attributes cannot be changed.
    (*iv*)   A `toString()` method that returns "author-name (gender) at email", eg, "Aliyu Garba (m) at galiyu@abu.edu.ng".

    (*b*) Write a test program called `TestAuthor` to test the constructor and the public methods. Try changing the email of an author.

2. (*a*) Write a complete program that will calculate and display the sum of the squares of the first *n* positive integers: $1^2 + 2^2 + 3^2 + ... + n^2$. Use a `for()` loop.

    (*b*) Examine the following code.

    ```
    do
        System.out.print("Enter a number (1 to 9): ");
        number = input.nextInt();
    while (number < 1 || number > 9);
    ```

    What is the purpose of this code? Explain how it works. Assume that `input` has been declared as a `Scanner` object.

3. Write a program called `GradesStatistics`, which reads in an array of n grades (of `int` between 0 and 100, inclusive) and displays the average, the minimum, the maximum, and the standard deviation. Your program shall check for valid input. You should keep the grades in an `int[]` and use a method for each of the computations. Your output shall look like the following.

```
Enter the number of students: 4
Enter the grade for student 1: 50
Enter the grade for student 2: 51
Enter the grade for student 3: 56
Enter the grade for student 4: 53
The average is 52.5
The minimum is 50
The maximum is 56
The standard deviation is 2.29128784747792
```

Hint: The formula for calculating standard deviation is: $\sqrt{\dfrac{1}{n}\sum(x-\mu)^2}$,

where μ is the mean of the marks x.

4. (*a*) Examine the following code and answer the questions that follow.

```
1.  // Record.java
2.
3.  import java.io.*;
4.
5.  public class Record {
6.      public static void main(String[] args)
7.              throws IOException {
8.          File txtFle = new File("record.txt");
9.          PrintWriter output = new
10.             PrintWriter(txtFle);
11.         output.println("Mohammed Ali");
12.         output.println("Heavyweight boxer");
13.         output.println("Olympic Medalist");
14.         output.close();
15.     }// end of main()
16. }// end of class Record
```

(*i*)   Explain the need of the statement on line seven.
(*ii*) Explain the effect of lines nine and ten.
(*iii*) If, after running this program, the file 'record.txt' was opened in a text editor, what would we see?

(*b*)   Write a program that will prompt the user to enter the size of a circle's radius, and will display its area.

5. (*a*) Explain the meaning of *method overloading* with an example.

(*b*) What will be the output of each of the two programs given below

```
public class DemonstrateMethod {
    static int methodOne(int i) {
        return methodTwo(i *= 11);
    }

    static int methodTwo(int i) {
        return methodThree(i /= 11);
    }

    static int methodThree(int i) {
        return methodFour(i -= 11);
    }

    static int methodFour(int i) {
        return i += 11;
    }

    public static void main(String[] args) {
        System.out.println(methodOne(11));
    }
}// end of class DemonstrateMethod

public class MethodOverloading {
    public static int average(int n1, int n2) {
        return (n1+n2)/2;
    }
    public static double average(double n1,
        double n2) {
```

```
        return (n1+n2)/2;
    }
    public static int average(int n1, int n2,
            int n3) {
        return (n1+n2+n3)/3;
    }

    public static void main(String[] args) {
        System.out.println(average(1, 2));
        System.out.println(average(1.0, 2.0));
        System.out.println(average(1, 2, 3));
        System.out.println(average(1.0, 2));
    }// end main
}// end class
```

6. (*a*) T-shirts are available in three sizes; small, medium and large. They may be white or coloured. White T-shirts cost ₦1000, ₦1100 and ₦1200 for the small, medium and large sizes respectively. Coloured T-shirts cost 10% more in each category.

Write a program that will ask for the size of a T-shirt (S/M/L) and its colour (W/C), and display the cost.

(*b*) Examine the following code and answer the questions that follow.

```
switch (number) {
case 2:
    System.out.println("It is an even prime");
    break;
case 3:
case 5:
case 7:
    System.out.println("It is an odd prime");
    break;
case 4:
case 9:
    System.out.println("It is a perfect square");
    break;
```

```
case 6:
case 8:
    System.out.println("It is even");
    break;
default:
    System.out.println("It is outside the range");
}
```

(*i*) Explain the use and purpose of the break statement.
(*ii*) Explain, with an example, the meaning of the term *fall through* in the context of the switch structure.
(*iii*) Explain the effect of the above code when number is assigned the value 5.