COE 212 – Engineering Programming

Welcome to Exam I
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Name: _____

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Instructions:

1. This exam is **Closed Book**. Please do not forget to write your name and ID on the first page.
2. You have exactly **120 minutes** to complete the 6 required problems.
3. Read each problem carefully. If something appears ambiguous, please write your assumptions.
4. Do not get bogged-down on any one problem, you will have to work fast to complete this exam.
5. Put your answers in the space provided only. No other spaces will be graded or even looked at.

Good Luck!!

Problem 1: Multiple choice questions (**20 minutes)** [16 points]

For each question, choose the **single** correct answer.

1) A Java object instantiation statement would contain:
   a. The `new` keyword
   b. The name of the object
   c. A constructor method
   d. All of the above
2) Calling a non-static method that belongs to another class requires which of the following items?
   a. An object created from the other class
   b. The dot operator (.)
   c. All of the above
   d. None of the above
3) What is the name of the values passed into a method during method invocation?
   a. Formal parameters
   b. Actual parameters
   c. Arguments
   d. None of the above
4) What type of methods allows a client program to assign values to the private instance variables of a helper class?
   a. Mutator methods
   b. Setter Methods
   c. All of the above
   d. None of the above
5) Consider the following Java statements:

```
String str = “”;
double val = 12.5;
```

   Which of the following can be used to store the value of the variable called `val` in `str`?
   a. `str += val;`
   b. `str = Double.parseDouble(Double.toString(val)) + “”;`
   c. All of the above
   d. None of the above
6) Which of the following expressions correctly computes $5 + \sqrt{2^5}$?
   a. `int result = 5 + Math.sqrt(Math.pow(2, 5));`
   b. `int result = 5 + Math.pow(Math.pow(2, 5), 0.5);`
   c. All of the above
   d. None of the above
7) Which of the following classes is part of the java.util package?
   a. `DecimalFormat`
   b. `Integer`
   c. `System`
   d. None of the above
8) Which of the following statements is an invalid expression in Java?
   a. `int result = ( (int) (19.0+4) – 5;`
   b. `int result = (14+9) * 5;`
   c. `int result = 10 % 2;`
   d. None of the above

9) Which of the following methods can be used to arrange a set of String values in alphabetical order?
   a. `equals`
   b. `equalsIgnoreCase`
   c. `compareto`
   d. None of the above

10) Which of the following data types allows only one of two possible values to be assigned to a variable?
   a. `char`
   b. `bool`
   c. `int`
   d. None of the above

11) Which of the following can be used to capitalize the first letter of a `String` called `st`?
   a. `st= st.charAt(0).toUpperCase()+st.substring(1,st.length());`
   b. `st= st.substring(0,1).toUpperCase()+st.substring(1,st.length());`
   c. All of the above
   d. None of the above

12) Let `b` a variable of type `float`. The compilation of which of the below statements would result in a compile-time error?
   a. `b++;`
   b. `b--;`
   c. `b = b + 1.5;`
   d. None of the above

13) What output is produced by the following Java statement: `System.out.print("////");`
   a. `///`
   b. `//`
   c. `////`
   d. None of the above

14) Consider having two `String` variables `str1` and `str2`. The statement `str1.equalsIgnoreCase(str2);` can be achieved using:
   a. `str1.toLowerCase.equals(str2.toLowerCase);`
   b. `str1.toUpperCase().equals(str2.toUpperCase());`
   c. All of the above
   d. None of the above

15) Which statement below can be used to simulate the process of selecting a card from a deck of 52 cards? Suppose `rnd` is a `Random` object.
   a. `Math.abs(rnd.nextInt()%52) + 1;`
   b. `(int) rnd.nextFloat()*52 + 1;`
   c. `rnd.nextFloat(52);`
   d. Both (a) and (b)

16) A variable whose scope is the entire class is known as a(n)
   a. parameter
   b. instance variable
   c. local variable
   d. None of the above

Problem 2: True or false questions (**10 minutes)** [10 points]

1. The output of the following statements is: `false`
```
String str1 = "Ofelia", str2 = new String("Ofel");
str2 = str2.concat(str1.substring(4, 5));
System.out.print(str1.equals(str2));
```
Answer: **True** False

2. The following code prints character 'r' on-screen:
```
String s = 'Constitution'; System.out.print(s.charAt(7));
```
Answer: True **False**

3. There are two different forms of comment statements in Java.
Answer: **True** False

4. Given that a single quote (') is used to mark the beginning or the end of an output character, it is not possible to print the single quote character (') using a `System.out.println` statement.
Answer: True **False**

5. Declaring a method with `private` visibility violates the encapsulation principle as all methods inside a class must be `public`.
Answer: True **False**

6. A proper way to enable access to instance variables is to make those instance variables `public`.
Answer: True **False**

7. The following assignment statement is a valid Java statement:
```
Char string = 'c';
```
Answer: True **False**

8. After running the code shown below, the value stored in the variable `y` is `4`
```
String str = "Exam is fun";
int y = str.replace('E','e').substring(0, 5).length();
```
Answer: True **False**

9. The output of the code shown below is: `8`
```
DecimalFormat fmt1 = new DecimalFormat("0.##");
DecimalFormat fmt2 = new DecimalFormat("0.#");
double val = Double.parseDouble(fmt1.format(8.876));
System.out.print(fmt2.format(val).charAt(2));
```
Answer: True **False**

10. The output of the statement below is a random value between 1 (inclusive) and 6 (exclusive).
```
System.out.print((int) Math.random() * 6 + 1);
```
Answer: True **False**

Problem 3: Long true or false question (**15 minutes)** [14 points]

In the following questions, check **all** the correct answers. There is at least one correct answer per question, but **there may be more**.

1. Which of the following are **false**:
    a. By convention, class names begin with an uppercase letter, but methods and variables begin with a lowercase letter.
    b. **Instance variables can be declared anywhere inside a class.**
    c. Instance variables exist before methods are called on objects, while the methods are executing and after the methods complete execution.
2. Which of the following are **true**:
    a. **Each object of the class contains the class's instance variables.**
    b. Most instance variable declarations are preceded with the keyword `public`, which is a visibility modifier.
    c. **Variables or methods declared with `private` visibility are accessible only to the methods of the class in which they are declared.**
3. Which of the following statements are **false**:
    a. The method's return type specifies the type of data returned to the calling method.
    b. **No parentheses following a method name indicate that the method does not require any parameters to perform its task.**
    c. **Classes often provide `private` methods to allow the class's client to `set` or `get` `public` instance variables.**
4. Which of the following are **false**:
    a. **A return type of `null` indicates that a method will perform a task but will not return any information.**
    b. **A method's parameters are local variables of the method, in the sense that they can be used outside the method.**
    c. Every method's body is delimited by a left and right braces { and }.
5. Which of the following are **false**:
    a. `Scanner` method `nextLine()` reads characters until a line separator is encountered, then returns the characters as a `String`.
    b. **To call a method of an object, follow the method name with a dot, the class name and finally a set of parentheses containing the method's arguments.**
    c. A constructor is a method that is called by the `new` operator to initialize an object's instance variables at the time the object is created.
6. Which of the following are **true**:
    a. Instance variables cannot be initialized inside a class's constructor.
    b. **A `String` object can be assigned an initial value of `null`.**
    c. **The types of actual parameters must be identical to the types of formal parameters.**
7. Which of the following are **true**:
    a. **A primitive data type like `double` does not offer methods.**
    b. **A primitive-type variable does not store an address.**
    c. A reference to an object is always required before invoking a class's methods.
8. Which of the following are **true**:
    a. If a class does not define constructors, the compiler generates a syntax error
    b. **If you declare a constructor for a class, the compiler does not create a default constructor for that class.**
    c. **Constructor methods can specify parameters but not return types.**

Problem 4: Code analysis (**15 minutes**) [10 points]

1) Consider the class given below, along with the driver class for it.

```
public class ClassA {
     private int x, y;
     public ClassA() {
          x = 5; y = 2;}
     public int first(int x){
          int temp = y+1;
          y = x;
          this.x = temp;
          return x;}
     public void second(int x, int y)
     { this.y = y+1 ; }
     public int getX(){return x;}
     public int getY() {return y;}
}
```

```
public class ClassADriver {

     public void doIt() {

       ClassA a=new ClassA();
       int x = a.first(2);
       a.second(2, x);
       x = a.getX();
       int y = a.getY();
       System.out.println(
       "Answer is: "+ (x+y));

     }
}
```

When running the method `doIt()` of the `ClassADriver` class, what output is produced?

a. `Answer is: 2`
b. `Answer is: 4`
c. `Answer is: 6`
d. It doesn't compile correctly
e. None of the above

2) Consider the class given below, along with a driver class for it.

```
public class ClassB {
     private int x;
     public ClassB() {
          x = 0;
          addValue(x);
     }
     private void addValue(int val){
          x = x+val;
     }
     public int getX() {
          return x;
     }
}
```

```
public class ClassBDriver {
     public void doIt() {
       int y = 6;

       ClassB b=new ClassB();
       b.addValue(y);

       System.out.println(
       "value is: "+ b.getX());
     }
}
```

When running the method `doIt()` of the `ClassBDriver` class, what output is produced?

a. `value is: 4`
b. `value is: 6`
c. `value is: 8`
d. It doesn't compile correctly
e. None of the above

Problem 5: Evaluating Java Expressions (**15 minutes**) [10 points]

For each of the following code fragments, what is the value of **x** after the statements are executed?

(1)
```
double u = 15.51;
double v = Math.floor(u*10);
int x = (int)(Math.ceil(v) - u/100);
```

Answer: x= 154

(2)
```
int a=5, b=12;
String str = "Good Morning Byblos";
String x = "\"+str.substring(a,b)+\"";
```

Answer: x= “ + str.subtring(a,b) + ”

(3)
```
DecimalFormat fmt = new DecimalFormat("00.##");
double a = 3.456;
double b = 10;
b = a++;
String x = fmt.format(b);
x += 10; (2 pts)
```

Answer: x= “03.4610”

(4)
```
String str = "Ignorance is ignorance itself";
str = str.replace('o', 'a');
String x = str.substring(str.indexOf('a'),
str.indexOf('s'));
```

Answer: x=”arance i”

(5)
```
Random rnd = new Random();
int y = rnd.nextInt(16)%3;
int x = (++y) * (int)rnd.nextFloat();
```

Answer: x= 0

(6)
```
int u = 3, v = 20;
double x = v++ / u-- + u++;
x += v / u; (2 pts)
```

Answer: x= 15.0

(7)
```
String str = "Ladies and Gents";
char x = str.charAt(str.length() -
str.substring(5).length());
```

Answer: x= ‘s’

Problem 6: Coding Problems (**45 minutes**) [40 points]

1) Write a Java program that reads the (x1, y1) coordinates of a first point from the user, then randomly generates (x2, y2) coordinate values between 0 (inclusive) and 100 (exclusive) for a second point. Your program should finally compute and print out the distance between the two points (x1, y1) and (x2, y2) using the following formula:

$$\text{Distance} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Sample output:
First point (user-supplied values):
Enter x1: 1
Enter y1: 0
Second point (randomly generated):
x2 = 0
y2 = 0
Distance between two points = 1.0

```
import java.util.Scanner;
import java.util.Random;
import java.util.Text;

public class DistanceCalculation
{
   public static void main (String[] args)
   {
      double x1, y1, x2, y2;
      double ManDist, EucDist;
        Scanner scan = new Scanner(System.in);

      System.out.println("First point (user-supplied values): ");

        System.out.print(" Enter x1: ");
      x1 = scan.nextDouble();

        System.out.print(" Enter y1: ");
      y1 = scan.nextDouble();

        Random rnd = new Random();
        x2 = rnd.nextFloat() * 100;
        y2 = rnd.nextFloat() * 100;

        DecimalFormat fmt = new DecimalFormat("0.##");
        System.out.println("Second point (randomly generated): ");
        System.out.println("x2= " + fmt.format(x2));
        System.out.println("y2= " + fmt.format(y2));

        EucDist = Math.sqrt( Math.pow(x1-x2, 2) + Math.pow(y1-y2, 2) );

      System.out.println ("Distance between two points = " + EucDist);
   }
}
```

2) Write a Java program that reads two integer values from the user and then prints out the average of their respective unit digits (i.e., rightmost digits).

Sample output:
Enter val1: 16
Enter val2: 23
The average of 6 and 3 is 4.5

```
import java.util.Scanner;

   public class UnitAverage {
      public static void main(String[] args) {

int digit1, digit2;
double average;
int val1, val2;

Scanner scan = new Scanner(System.in);

System.out.print("Enter Val1:");
val1 = scan.nextInt();
System.out.print("Enter Val1:");
val2 = scan.nextInt();

digit1 = val1 % 10;
digit2 = val2 % 10;
average = (digit1 + digit2)/2.0;
System.out.println("The average of " + digit1 + " and " + digit2 +
                   " is " + average);
    }
}
```

3) Write a Java program that reads a string from the user and then prints out a new string formed by the first three characters and the last 5 characters of the input string. We assume that the input string's length exceeds 8.

Sample output:
Enter a string: Android Programming
Output string: Andmming

```
import java.util.Scanner;
   public class StringManip {
      public static void main(String[] args) {

String S1, S2;


Scanner scan = new Scanner(System.in);

System.out.print("Enter a string:");
S1 = scan.nextLine();

S2 = S1.substring(0, 3) + S1.substring(S1.length()-5, S1.length());


System.out.println("Output string:" + S2);
     }
}
```

4) Write a Java program that reads two dates from the user, namely the current date and the user's date of birth. Your program should then compute the age of the user based on the input date values. Note that we assume that the date values entered by the user are formatted as follows: dd/mm/yyyy (as in 23/08/2014).

Sample output:
Enter the current date: 11/11/2014
Enter date of birth: 23/12/2009
You are 5 years old.

```
import java.util.Scanner;
   public class Age{
      public static void main(String[] args) {

String S1, S2;
int year1, year2, age;


Scanner scan = new Scanner(System.in);

System.out.print("Enter the current date:");
S1 = scan.nextLine();

System.out.print("Enter date of birth:");
S2 = scan.nextLine();

S1 = S1.substring(S1.length()-4, S1.length());
S2 = S2.substring(S2.length()-4, S2.length());

System.out.print(S1 + S2);

year1 = Integer.parseInt(S1);
year2 = Integer.parseInt(S2);
age = year1 - year2;

System.out.println("You are " + age + " years old");
     }
}
```