CMPU 102-52 - Spring 2017
Review Questions for Final Exam
Exam will be given at 1 to 3 pm on Tuesday, May 23rd, in RH 203

Solutions are provided for some examples. For many, just try typing them in DrJava Interactions pane.

This review sheet provides examples of the type of questions that may appear on the exam.

Object Oriented languages and Java

1. Describe the functions of a constructor. **To initialize the values of global variables, particularly instance variables.**

2. T or F: Java is both a compiled and interpreted language. **TRUE**

3. Explain what is meant by the statement "Java is a portable language". **Java source code will run on any machine that has a JVM installed. The compiler is a much larger piece of code than the JVM, which is an interpreter of "byte code".**

4. Name the eight Java primitive types. **Too easy.**

5. Give 2 examples of static methods in the Java standard library. **Math.random, Integer.parseInt**

6. Name a static constant in the Java standard library. **Math.PI**

7. Be able to show, in the diagram of a class, the scope of variable and constant names declared at various locations (e.g., inside the body of a class but outside any methods, inside a method body, inside a compound statement body).

8. What is garbage collection in Java? **Clearing of memory on the heap when there is no longer a reference to an object.**

Basic Java Syntax

1. Correct the following code segments if there are errors. Explain your changes. **Write an answer and then try typing the lines in in DrJava to test your answer.**

```
String s = "1234567890";
int i = s.length;
int j = s.indexOf('5');
int k = s;
```


2. What is the output of the following code segment? Explain your answer. **Write an answer and then try typing the lines in in DrJava to test your answer.**

```
String s = "string1";
System.out.println(s.length());
```


3. What is the output of the following code segment? Explain. **Write an answer and then try typing the lines in in DrJava to test your answer.**

```
String s = "perseverance";
String t = s.substring(4,6);
String u = s.substring(3,8);
String v = s.substring(0,9);
System.out.println(t + u + v);
```

4. What is the output of the following code segment? Explain. **Write an answer and then try typing the lines in in DrJava to test your answer.**

```
String s = "abcd      ";
String t = "   abcd   ";
String u = "  ab   cd   ";
System.out.println(s.trim());
System.out.println(t.trim());
System.out.println(u.trim());
```

5. Write a program that prompts for and accepts a telephone number in the form ddd-ddd-dddd (where d is a digit in the range 0 through 9) and prints it out in the following format: (ddd)ddd-dddd

```
public class Phone {

  public static void formatPhone() {
    String ph =
      javax.swing.JOptionPane.showInputDialog
      ("Please enter a phone number in the form ddd-ddd-dddd: ");
    String output = "(";
    for (int i = 0; i < ph.length(); i++) {
      if (i == 3) { output += ")";
      } else output += ""+ph.charAt(i); }
    javax.swing.JOptionPane.showMessageDialog(null, output);
  }

  public static void main(String[] args) {
    Phone.formatPhone();
  }
}
```

6. What does the following program output? **Write an answer and then try typing the lines in in DrJava to test your answer.**

```
public class DisplayMotto {
  public static void main (String[] args) {
    System.out.println("We will not go it\nalone.");
  }
}
```

7. What does the method return type void indicate?

8. Write a single println() statement that displays the following output: **Write an answer and then try typing the lines in in DrJava to test your answer.**

```
JJ
Jenna
Hannah
```

9. Write a Java expression for the following math expression: **Supposed to be (1 / (1 + x)^2)**

```
   1
  ---
      2
  1+x
```

10. What does the modifier public indicate? **The code is visible to the world.**

11. Indicate whether the following names conform to the Java naming conventions. For those that follow a convention, indicate what a reader would expect them to be: method, class, final data field, or variable. Some may fit more than one convention, some may fit no naming conventions. Explain your answers.

       a) issquare **no**   e) mySquare **variable** or **method**   i) Drawing **class**
       b) IsSquare **class**   f) getToken **variable or method**   j) COLOR **constant**
       c) is_square **none**   g) _getToken **none**   k) gettoken **none**
       d) Square **class**   h) fillSquare **variable or method**   l) MAX_var **none**

The underlined parts signify that a variable is more likely to be a noun and a method is more likely to be a verb.

12. What is the output of the following code segment? **Write an answer and then try typing the lines in in DrJava to test your answer.**

```
int j = 4;
++j;
System.out.println("j is "+j);
```

13. What is the output of the following code segment? **Write an answer and then try typing the lines in in DrJava to test your answer.**

```
int j = 4;
int i = 4;
System.out.println("j is "+ ++j);
System.out.println("i is "+ i++);
System.out.println("j is "+ j);
System.out.println("i is "+ i);
```

14. Suppose a, b, and c are int variables initialized respectively to 1, 2, and 3. What values are assigned to e, f, and g? **Write an answer and then try typing the lines in in DrJava to test your answer.**

```
int e = ++a;
int f = b++;
int g = ++c + c++;
```

15. Consider the following code segment:
For each of the questions a-d, write an answer and then try typing the lines in in DrJava to test your answer.

```
if (i==j) {
    System.out.println("A");
}
else if ((i % j) < 3) {
    System.out.println("B");
}
else if (i > (j - 1)) {
    System.out.println("C");
}
else {
    System.out.println("D");
}
```

    a) if i is 9 and j is 4, what is the output? **Try it**

    b) if i is 4 and j is 9, what is the output? **Try it**

c) if i is 5 and j is 6, what is the output? **Try it**

d) if i is 5 and j is 9, what is the output? **Try it**

16. Write a code segment that sets integer k to 3 if the integer m is less than 5 and j is less than 0, otherwise, k should be changed to 1 if m is not less than k.

```
if ((m < 5) && (j < 0))
    k = 3
else if (!(m < k))
    k = 1
```

17. Write a method to print the following pattern:

```
********
*******
******
*****
****
***
**
*
```

Assume the number of rows and columns are equal and that this number is taken as an input parameter to the method. After coding this, try to code a lowerRight and upperRight triangle.

```
public class  UpperLeft{

    public static void printTriangle(int n) {
        String output = "";

        for (int i = n; i > 0; i--) {
            for (int j = i; j > 0; j--) {
                output += "*";
            }
            output+="\n";
        }
        System.out.print(output);
    }

    public static void main(String[] args) {
        UpperLeft.printTriangle(8);
    }
}

public class  LowerLeft{
    public static void printTriangle(int n) {
        String output = "";

        for (int i = 1; i <= n; i++) {
            for (int j = 0; j < i; j++) {
                output += "*";
            }
            output+="\n";
        }
        System.out.print(output);
    }

    public static void main(String[] args) {
        LowerLeft.printTriangle(8);
    }
}}
```

```java
public class  LowerRight{

   public static void printTriangle(int n) {
      String output = "";

      for (int i = 0; i < n; i++) {
         for (int j = 0; j < n-i; j++) {
            output += " ";
         }
         for (int j = 0; j < i+1; j++) {
            output += "*";
         }
         output+="\n";
      }
      System.out.print(output);
   }

   public static void main(String[] args) {
      LowerRight.printTriangle(8);
   }
}

public class  UpperRight{

   public static void printTriangle(int n) {
      String output = "";

      for (int i = 0; i < n; i++) {
         for (int j = 0; j < i; j++) {
            output += " ";
         }
         for (int j = i; j < n; j++) {
            output += "*";
         }
         output+="\n";
      }
      System.out.print(output);
   }

   public static void main(String[] args) {
      UpperRight.printTriangle(8);
   }
}
```

18. Transform the following while loop into:
   * a for loop (possibly other statements are needed too)
   * a do while loop (possibly other statements are needed too)

```java
int i = 1;
while (i < 20) {
  i++;
  System.out.println(i);
}

for (int i = 2; i <= 20; i++) {
   System.out.println(i);
}

int i = 2;
```

```
do {
    System.out.println(i);
     i++;

}while(i <= 20);
```

19. What, if anything, is wrong with the following code fragment?

   It is an infinite loop because count will never be <= 0.

```
count = 50;   // change to count = 0;  AND
while (count >= 0) {  // change to count <= 50
  System.out.println(count);  // OR
  count = count + 1;   // change to count = count - 1;
}
```

20. Trace the execution of the following loops by detailing the output of each: **Write your answer and then copy and paste each statement into DrJava**

a)
```
for (int i = 1; i < 10; i++) {
    System.out.println(i);
}
```

b)
```
for (int i = 1; i < 10; i = i + 2) {
    System.out.println(i);
}
```

c)
```
for (int i = 11; i < 10; i++) {
    System.out.println(i);
}
```

d)
```
int i = 1;
do {
    System.out.println(i);
    i++;
} while (i < 10);
```

e)
```
int i = 10;
do {
    i--;
    System.out.println(i);
} while (i > 10);
```

f)
```
int i = 2;
while (i < 10) {
    System.out.println("Happy, happy");
    i++;
}
```

g)
```
int i = 1;
while (i > 10) {
    System.out.println("joy, joy");
}
```

21. Using your intuition, describe what is wrong with the following code fragment. Rewrite this code so it produces correct output. **The else is matched with the wrong if due to lack of {}s.**

```
if (total == MAX)
    if (total < sum)
```

```
        System.out.println("total equals MAX and is less than sum.");
    else
      System.out.println("total is not equal to Max");
```

if (total == MAX) {
** if (total < sum) {**
**   System.out.println("total equals MAX and is less than sum.");**
** }}**
else {
** System.out.println("total is not equal to Max"); }**

22. How many times must the new operator be used to declare an array of n objects? **n + 1**

23. What is the lower and upper index of an array of n elements? **0 to n-1**

24. Identify the local variables, parameters, and global variables (instance variables) in the following class:

```
class Question1 {
  private int one;  //data members or data fields (global variables)
  private int four;  //ditto

  public double myMethod ( int one ) {  //local variable
    double two = 2;  //local variable
    int three = 3;  //local variable
    return one + two * four; //local variable, local variable, global variable
  }
}
```

25. Rewrite the following class, using the optional this wherever it is allowed.

```
class One {

  private int var1;
  private int var2;

  public One () {
    var1 = 20;
    m2(var1);
  }

  public void m2 (int x) {
    var2 = x * 2;
  }
}
```

class One {

** private int var1;**
** private int var2;**

** public One () {**
**   this.var1 = 20;**
**   this.m2(this.var1);**
** }**

** public void m2 (int x) {**
**   this.var2 = x * 2;**
** }**
}

26. Which of the following are valid declarations? Which instantiate an array object? Explain.

   a) int primes = {2, 3, 4, 5, 7, 11}; **invalid, should be int[]**

   b) double[] elapsedTime = {11.47, 12.04, 11.72, 13.88}; **valid**

   c) int[] scores = int[30]; **invalid, should be "new int[30];"**

   d) int[] primes = new {2, 3, 5, 7}; **invalid, can't use {2,3,5,7} in this context**

   e) int[] scores = new int[30]; **valid**

   f) char grades[] = {'a', 'b', 'c', 'd', 'f'); **valid**

   g) char[] grades = new char[]; **invalid, no size given**

   h) int[][] matrix = {{1,2,3,4},{2, 3}, {1,2,5,6,7}}; **valid**

27. Assume that a and b are one-dimensional int arrays that have been initialized and that i, j, and k are int variables that have been initialized.

   a) Write the statement that adds 6 to element k of a. **a[k] = 6;**

   b) Write the statement that copies element i of b to element k+1 of a. **a[k+1] = b[i];**

   c) Write the statement that sums elements i and k of a and places
      the result in element j+5 of b. **b[j+5] = a[i] + a[k];**

28. What is the output of the following code fragment? **Write your answer and then copy and paste statement into DrJava**

```
int[] a = new int[5];
a[0] = 0;
for (int i = 1; i <= 4; ++i) {
   a[i] = a[i-1] + i;
}
System.out.println(a[3]);
```

29. Given a two-dimensional array of char, defined and instantiated as an instance variable as follows,

```
char[][] map = {{'a','b','c','d'},
                {'e','f','g','h'},
                {'i','j','k','l'},
                {'r','s','t'}};
```

   Define a method to print the following:

   Contents of map = a b c d e f g h i j k l r s t   **use double nested for loops (Try it):**

```
System.out.println("Contents of map = ");
for (int i = 0; i < map.length; i++) {
   for(int j = 0; j < map[i].length; j++) {
        System.out.print(map[i][j]+" ");
}}
```

The exam will be cumulative but will stress material covered after exam 1.