CSC 1051 Algorithms and Data Structures I

Final Examination
May 8, 2013

Name:______________________________

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<thead>
<tr>
<th>Question</th>
<th>Value</th>
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<td><strong>TOTAL</strong></td>
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</table>

Please answer questions in the spaces provided. If you make a mistake or for some other reason need more space, please use the back of pages or the extra blank page at the end and clearly indicate where the answer can be found. Good luck and best wishes for a happy and productive summer!
1. (_____/ 10) What gets printed?
Please show output as it will appear, or indicate “NO OUTPUT”, or show some of the output followed by “INFINITE LOOP.”

```java
int a = 0;
while (a > 0)
{
    a = a + 2;
    System.out.println(a);
}
```

```
int a = 5;
do{
    a--;
    System.out.println(a);
}while (a > 5)
```

```
for (int a = 0; a >= 0; a+=2)
    System.out.println(a);
```

```
int[] a = {10, 30, 45};
for (int num: a)
    System.out.println(num*10);
```
2. (_______ / 10) Rewrite the following code fragments as directed:

a) Use if/else instead of conditional operator:

Scanner scan = new Scanner(System.in);
String a = scan.nextLine();

int b = ((a.length() < 5) ? 1: -1);

b) Use if/else instead of switch statement:

Scanner scan = new Scanner(System.in);
char a = scan.nextLine().charAt(0);

switch(a)
{
    case "y": case "Y":
        System.out.println("Positive");
        break;
    case "n": case "N":
        System.out.println("Negative");
        break;
    default:
        System.out.println("Not sure");
}

b) Use while instead of for statement:

double value = 235.67;
for (int i = 10; i>=1; i--)
{
    System.out.println(value);
    value = value/2;
}
3. (_____/ 10) Draw diagrams showing the contents of the arrays after execution of the following code fragment:

a)
```java
int[] a = {3, 5, 2};
int[] b = new int[6];

for (int i=0; i<a.length; i++)
    b[i] = a[i];

for (int i=b.length; i >= a.length; i--)
    b[i] = 100+i;
```

b)
```java
int[][] table = new int[4][5];
for (int i=0; i < 3; i++)
    table[i][i+1] = i + 10;
```

c)
```java
char[][] table = new char[4][4];
String sample = "Relax. Exams can be fun. ";
int count = 0;
for (int i=0; i < 4; i++)
    for (int j=0; j < 4; j++)
    {
        table[i][j] = sample.charAt(count);
        count++;
    }
```
4. (_____/ 5) Write a Java method zeroOne() with one int parameter n that creates and returns an array of int consisting of alternating 0’s and 1’s. The method should not print anything.
Example: After invoking the method like this:

```java
int[] list = zeroOne(7);
```

the contents of list should be a {0, 1, 0, 1, 0, 1, 0}. 
5. (_____ / 5) What does this program do? Explain in your own words and show what gets printed with the file contents shown below.

```java
// SomethingToDoWithFiles.java       Author: MAP
import java.util.Scanner;
import java.io.*;

class SomethingToDoWithFiles {
    public static void main (String[] args) throws IOException {
        String line;
        Scanner fileScan, otherScan;

        File myFile = new File("sample.inp");
        fileScan = new Scanner(myFile);

        while (fileScan.hasNext()) {
            line = fileScan.nextLine();
            otherScan = new Scanner(line);
            int sum = 0;
            for (int i=0; i<3; i++) {
                int num = otherScan.nextInt();
                sum = sum + num;
            }
            System.out.println(sum);
        }
        System.out.println("All done");
    }
}
```

a) Show output:

```
Output:
```

b) Explain in your own words what the program does:

```
sample.inp
42 3 2
3 17 10
5 5 4
```
6. (_____/ 10) Suppose you look up a class in the Java API and find something that looks like the following (NOTE: this is a made-up class.):

```java
java.bogus

Class Awesome

java.lang.Object
decorated by java.bogus.Awesome

public class Awesome extends Object

This is a made-up class. It does not matter what it actually does, I am just trying to see if you know how to use it.

### Constructor Summary

<table>
<thead>
<tr>
<th>Awesome(int x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creates a new Awesome object of size x.</td>
</tr>
</tbody>
</table>

### Method Summary

<table>
<thead>
<tr>
<th>int compute(boolean x, char y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mystery method 1.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>void updator(int x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mystery method 2.</td>
</tr>
</tbody>
</table>

a) What import statement do you need to include in your program in order to use this class?

b) Write some code to declare variables for two objects of this class, named thing1 and thing2 (use any values of the appropriate type in the constructor).
(Question 6, continued)
c) For each of the methods listed in the method summary, state its name, return type and the number and types of parameters it requires.

<table>
<thead>
<tr>
<th>Method name:</th>
<th>Method return type:</th>
<th>Required parameters for the method: (how many? of what type(s)?)</th>
</tr>
</thead>
<tbody>
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</table>

d) Suppose you are writing a driver class that uses Awesome and you have already declared and instantiated objects thing1 and thing2. For each of the following, check the appropriate box to indicate whether it represents a valid Java statement.

<table>
<thead>
<tr>
<th>Valid Java statement?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awesome.updator (5);</td>
<td></td>
<td></td>
</tr>
<tr>
<td>thing1.updator (int x);</td>
<td></td>
<td></td>
</tr>
<tr>
<td>thing1.computate (boolean x, char y);</td>
<td></td>
<td></td>
</tr>
<tr>
<td>thing1.computate (false, “a”);</td>
<td></td>
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<tr>
<td>thing2.updator();</td>
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</tr>
<tr>
<td>thing2.updator(0);</td>
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<tr>
<td>if (thing2.computate(true, “a”) &gt; thing1.computate(true, “a”)) System.out.println(“ok”);</td>
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<tr>
<td>thing1.computate (false, “z”);</td>
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<tr>
<td>thing2.updator(1) = 2;</td>
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<tr>
<td>System.out.println(thing1.computate(false, “b”));</td>
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7. (_____/ 10) Review the program and answer the questions below:

```java
import java.awt.*;
import javax.swing.JApplet;

public class FinalApplet extends JApplet {
    public void paint(Graphics page) {
        Color myColor = new Color(0, 0, 100); // what color is this?
        page.setColor(myColor);
        page.fillRect(0, 0, 200, 100);
        page.setColor(Color.red);
        page.drawLine(0, 100, 200, 200);
        page.setColor(Color.yellow);
        page.fillOval(-50, 0, 100, 100);
    }
}
```

a) For each identifier listed in the table, specify what it refers to – choose one of the following:

```
Class .... Method....... Object....... Package
(Note: some of these may occur more than once)
```

<table>
<thead>
<tr>
<th>java.awt</th>
<th>JApplet</th>
<th>Graphics</th>
<th>page</th>
<th>Color</th>
<th>myColor</th>
<th>setColor</th>
<th>fillOval</th>
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b) What do you think the `myColor` looks like? _______________________

c) Draw a sketch of the image displayed by the applet – indicate the color of each figure or line. Be sure to label the coordinate system.
8. (_____ / 10) Suppose you have a Die class defined as follows:

```java
//*********************************************************
//  Die.java       Author: Lewis/Loftus
//  Represents one die with faces showing values between 1 and 6.
//********************************************************************
import java.awt.*;
public class Die
{
    private final int MAX = 6; // maximum face value
    private int faceValue; // current value showing on the die

    // Constructor: Sets the initial face value.
    public Die()
    {
        faceValue = 1;
    }

    // Rolls the die and returns the result.
    public int roll()
    {
        faceValue = (int)(Math.random() * MAX) + 1;
        return faceValue;
    }

    // Face value mutator.
    public void setFaceValue (int value)
    {
        faceValue = value;
    }

    // Face value accessor.
    public int getFaceValue()
    {
        return faceValue;
    }

    // Returns a string representation of this die.
    public String toString()
    {
        String result = Integer.toString(faceValue);
        return result;
    }
}
```

On the facing page, write the Java code for a driver class that uses the Die class to determine how likely it is to roll “snake eyes”, i.e., two ones. Use the following approach:

- Declare and instantiate two Die objects, die1 and die2
- Roll them 10,000 times (or some sufficiently large number, specified by a constant in your program) while keeping track of how many times you rolled ones on both dice
- In the end, print how many times the dice were rolled, the number of snake eyes, and proportion of snake eyes (i.e., probability). Careful: use a cast when dividing integers!
9. (_______/ 20) Write a complete Java program consisting of a class AmazonItem and a driver class named Wishlist. The AmazonItem class should contain instance variables representing information such as the following:

Example:

- Shipping Weight: 1 pounds
- ASIN: B000IMZX2U
- Average Customer Review: 3.3
- Price: $31.95

The AmazonItem class should have a constructor, accessor and mutator methods for the average customer review score, and a toString() method. Do not write code for any additional methods (no need to write accessors and mutators for all instance variables).

The driver class Wishlist should implement the following algorithm:

- Instantiate three variables of the AmazonItem class named item1, item2, item3 (make up values for the data)
- Print the info of item1, item2, item3
- Change the average customer review score for item2 (make up a new value)
- Print the info of item1, item2, item3

Write the complete code for the two classes in the next two pages. It is NOT necessary to include comments with your code, but be sure to use good indentation.
10. (_____/ 10) **Construct an algorithm that inputs 10 positive numbers and prints the maximum of these numbers.**

**Example:** If the numbers input are 44 7 31 22 53 16 21 48 72 60, the output should be: 
max = 72

**Directions:**
Write your algorithm by rearranging and structuring elements chosen from the list below, using indentation to show structure. Do not use anything else and note that not all of these are needed, but you may use one of them more than once, if necessary.

```plaintext
num = 0
count = 0
count = 1
max = 0
count = count + 1
num = max
max = num
print "max = " num
input num
in max
if (num > max)
if (count < max)
else
while (count <= 10)
while (count < 10)
while (num < max)
while (num != max)
```