COMPSCI 101FC Principles of Programming

Test and Answer Book

Test - Thursday 18th April 6:30pm-8:00pm

Family name or surname

Given names

Lab Day and Time (e.g. Monday 9)

Instructions

This test constitutes 15% of your final grade for the course.

No one is to leave in the last 10 minutes.

The test is closed book.

No calculators are allowed.

There are 100 marks in this test. The marks for each question are shown.

Answer all questions in this booklet.

Write your UPI on every page.

You do **NOT** have to include JavaDoc comments unless the question asks for them.

Use good indenting and naming styles.

See page 15 for a list of methods you may find useful in your answers.

You may use pages 15 and 16 as extra space.

STUDENT UPI:

Student ID number

Student UPI (Login name)

Signature

Marks: (for markers use only)

Question	Mark	Question	Mark
1		9	
2		10	
3		11	
4		12	
5		13	
6		14	
7			
8			
		Total	

STUDENT UPI:

Question 1 (11 marks)

a) What would be printed out by the following code segment?

```
int i = 10;
double d = i / 3;
System.out.println(d);
```

(1 mark)

b) What is printed by the following?

```
System.out.println(7 + 7 + 7 + "7" + (7 + 7) + 7);
```

(1 mark)

c) Write an expression to generate a random integer between 8 and 13 (including 8 and 13) and assign it to the variable `i`.

```
int i =
```

(1 mark)

d) What is the output of the following code segment?

```
System.out.println("a");
System.out.print("a");
System.out.println("a");
System.out.print("a");
System.out.println("a" + "b");
System.out.println("a");
```

(2 marks)

e) What is the output of the following code segment?

```
double d = (int)(5.3 + 2.8);
System.out.println(d);
```

(1 mark)

f) What is the output of the following code segment?

```
System.out.println("\\n\"");
```

(1 mark)

g) What is the output of the following code segment?

```
int i1 = 2 + 2 - 2 * 2 / 2;
int i2 = 2 * 2 / 2 - 2 + 2;
System.out.println(i1 + "." + i2);
```

(1 mark)

h) What is the output of the following code segment:

```
int i = 9 - 8 - (7 * 6) / 5 + 4 - (3 + 2) * 2;
System.out.println(i);
```

(1 mark)

i) What is the output of the following code segment:

```
String s = "computer science";
String t = s.substring(3, 6);
System.out.println(s.length() - t.length() + t);
```

(2 marks)

Question 2 (8 marks)

Complete the following method which displays the question passed as a parameter and waits for the user to type a response. If the first character of the response is a "y" or a "Y" then the method should return `true`. In all other cases it should return `false`. You can assume that the `readInput()` method used in labs and assignments is available to return the `String` typed by a user.

```
public boolean askQuestion(String question) {









}
```

Question 3 (5 marks)

a) Consider the following piece of Java code. After this code has been executed are the following Boolean expressions `true` or `false`?

```
int a = 37;
int b = 6;
double x = b - 1.0;
int c = (int)(a/x);
boolean myCompare = c == a / b;
```

1. `(c > b) && (a % 2 == 1)`

2. `(x != 6.0) || myCompare`

3. `myCompare ^ (b < (a - c)/b)`

(3 marks)

b) Why is it not recommended to compare `double` values in the following manner?

```
double x = 0.2 + 0.2 + 0.2;
if (x == 0.6)
     System.out.println("We have a match!");
```

(2 marks)

Question 4 (5 marks)

Write a method called `minimumOf4()`, which is passed four integer parameters and returns the smallest of them.

For example, once you have completed this method, the output of the following code:

```
System.out.println(minimumOf4(4, -2, 1, 7));
System.out.println(minimumOf4(2, 3, 4, 5));
System.out.println(minimumOf4(7, 17, 27, 6));
```

would be:

```
-2
2
6
```

```
public int minimumOf4 (int a, int b, int c, int d) {









}
```

Question 5 (8 marks)

Write a program that prompts the user to enter 2 integers, and then displays the product of those 2 numbers. Example output is shown below, where the user has entered the value 11 and the value 7.

```
Enter number 1:  11
Enter number 2:  7
The product is:  77
```

Your program must produce output in exactly the same format as shown above. Complete the `go()` method. You can assume that the `readInput()` method used in labs and assignments is available to return the `String` typed by a user.

```
public class Products {

  public void go() {









}
```

Question 6 (6 marks)

What is the output of the following program, assuming the user enters the following:

```
Ian Michael Short
```

at the prompt "`What is your name?`".

```
public class Names {

  public void go() {

    System.out.print("What is your name? ");
    String name = readInput();

    int posOfSpace;

    String i1 = name.substring(0,1);
    posOfSpace = name.indexOf(" ");
    name = name.substring(posOfSpace + 1, name.length());
    String i2 = name.substring(0,1);
    posOfSpace = name.indexOf(" ");
    name = name.substring(posOfSpace + 1, name.length());

    System.out.println("Hello " + i1 + ". " + i2 + ". " + name);
  }
}
```

```
What is your name? Ian Michael Short
```

Question 7 (6 marks)

We wish to test whether `Math.random()` could simulate a coin toss. So we decide to call `Math.random()` 1000 times and count how many times it returns a value less than 0.5. Complete the code below by adding a while loop which executes 1000 times and counts how many of the calls to `Math.random()` are less than 0.5. At the end of the while loop the variable `lessThan5` should contain the number of calls to `Math.random()` which were less than 0.5.

```
int lessThan5 = 0;
int counter = 0;
```

Question 8 (8 marks)

Complete this piece of code to find the minimum and maximum values in an array of doubles using just one `while` loop. At the end of the `while` loop `minValue` should contain the minimum value in the `numbers` array and `maxValue` should contain the maximum value in the `numbers` array.

```
double minValue = numbers[0];
double maxValue = numbers[0];
int arrayIndex = 1;
```

Question 9 (10 marks)

a) Complete the following method with a `switch` statement. The method should compare `dayOfWeek` with the various day constants and set `dayType` to either `WEEKEND` or `WEEKDAY` depending upon its value. If `dayOfWeek` is not in the range from 0 to 6, it should set `dayType` to `INVALID`.

```
public int isWeekend(int dayOfWeek) {
  final int SUNDAY = 0;
  final int MONDAY = 1;
  final int TUESDAY = 2;
  final int WEDNESDAY = 3;
  final int THURSDAY = 4;
  final int FRIDAY = 5;
  final int SATURDAY = 6;

  final int WEEKEND = 0;
  final int WEEKDAY = 1;
  final int INVALID = -1;

  int dayType;









  return dayType;
}
```

(5 marks)

b) Rewrite the `switch` statement in part a) as a series of nested `if-else-if` statements which achieve the same result.

```
public int isWeekend(int dayOfWeek) {
  final int SUNDAY = 0;
  … same constants as above
  final int SATURDAY = 6;

  final int WEEKEND = 0;
  final int WEEKDAY = 1;
  final int INVALID = -1;

  int dayType;









  return dayType;
}
```

(5 marks)

Question 10 (5 marks)

Write JavaDoc comments for the following method. Ensure you describe each parameter as well as the return type. You should write a meaningful description of what the method accomplishes at the start of the JavaDoc.

```
/**




 */
```

```
public boolean boundedEvenInt(int testValue, int lowBound,
                                             int highBound) {
     return (testValue % 2 == 0) && (testValue >= lowBound) &&
                           (testValue <= highBound);
}
```

Question 11 (5 marks)

Rewrite the following code using the standard COMPSCI101 indenting method.

```
public class Triangle {
public void printStars(int stars) { int line = 0;
while (line < stars) { int number = 0;
while (number <= line) { System.out.print("*");
number++; } System.out.println(); line++; }}}
```

```
public class Triangle {




```

STUDENT UPI:

Question 12 (5 marks)

Use truth tables to determine whether the following two Boolean expressions are equivalent.

```
1. !(a && b)
2. !(a || (a && b)) && !b
```

a	b		
True	True		
True	False		
False	True		
False	False		

a	b					
True	True					
True	False					
False	True					
False	False					

Are the expressions equivalent?

Question 13 (10 marks)

There are 5 errors that prevent this program compiling successfully. Circle the errors and write the correction alongside.

```
/**
 * This class calculates the average of an array of numbers.
 /
public class Average {
    /**
     * The go method is the usual start method for COMPSCI 101.
     */
    public void go() {
        int[] numbersToAverage = {1.5, 2.7, 3.1, 4.29, 5.0};
        double result = average(numbersToAverage);
        System.out.Println(result);
    }

    /**
     * Calculates the average of an array of doubles.
     *
     * @param numbers the array of doubles
     * @return the average of the numbers in the array
     */
    public double average(double[] numbers) {
        double sum = 0;
        int index = 0;
        while (index < numbers.length)
            sum = sum + numbers[index];
            index = index + 1;
        }
        sum / numbers.length;
    }
}
```

Question 14 (8 marks)

Write a method that takes three integer values as its arguments and places these values into an array which is returned from the method. The method should be named `putInArray` and can be called in the following manner:

```
int[] arrayOf3 = putInArray(-4, 1024, 12);
```

The method has to create a new array of the appropriate size; assign the input parameters to the appropriate elements in the array; and return the array. Write the complete method below.

Methods page

String methods

```
public String substring(int beginIndex, int endIndex)
public boolean equals(Object anObject)
public char charAt(int index)
public boolean startsWith(String prefix)
public String toUpperCase()
public String toLowerCase()
```

Math methods

```
public static double random()
public static int max(int a, int b)
public static int min(int a,int b)
```

Integer method

```
public static int parseInt(String s)
```

Input method

```
private String readInput()
```

EXTRA SPACE FOR QUESTIONS