THE UNIVERSITY OF AUCKLAND

SUMMER SEMESTER, 2011
Campus: City

COMPUTER SCIENCE

TEST

Principles of Programming

(Time Allowed: 75 minutes)

NOTE:
You must answer **all** questions in this test.
No calculators are permitted
Answer in the space provided in this booklet.
There is space at the back for answers that overflow the allotted space.

Surname	
Forenames	
Student ID	
Login (UPI)	
Lab Time	

Q1 (/12)	**Q4** (/10)	**Q7** (/7)	**Q10** (/8)
Q2 (/9)	**Q5** (/6)	**Q8** (/10)	**Q11** (/8)
Q3 (/12)	**Q6** (/8)	**Q9** (/10)	**Total** /100

SURNAME: ..... FORENAMES: .....

Question 1 (12 marks)

a) What is the output produced by the following code?

```
int a = 4;
int b = 6;
double c = b % a;

System.out.println(a + a + ", " + b * c + 1);
```

8, 12.01

(2 marks)

b) What is the output produced by the following code?

```
int a = 1;
double b = a + 0.1;

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

11.11

(2 marks)

SURNAME: ..... FORENAMES: .....

c) What is the output produced by the following code?

```
double factor = 0.99;
int max = 10;

int result = (int) factor * max + 2;

System.out.println(result);
```

2

(2 marks)

d) What is the output produced by the following code?

```
String letters = "ABCDEFGH";
int n1 = letters.indexOf('B');
int n2 = letters.indexOf('E');
int n3 = letters.length();

System.out.println(n1 + n2 + letters.substring(0, n2) +
                                                    n3);
```

5ABCD8

(2 marks)

SURNAME: ..... FORENAMES: .....

e) What is the output produced by the following code?

```
String a = new String("abcd");
String b = new String("aBcD");
String c = new String("ABCD");
String d = b.toLowerCase();

if ( a == d ) {
      System.out.println("1");
}

if ( a.substring(0,2).equals( d.substring(0,2) ) ) {
  System.out.println("2");
}

if ( b.substring(1,2).equals( c.substring(1,2) ) ) {
  System.out.println("3");
}
```

2
3

(2 marks)

f) What is the output produced by the following code?

```
int a = 1;
int b = 2;
String s = a + "(" + (a == b) + ")" + b;
System.out.println(s.length());
```

9

(2 marks)

SURNAME: ..... FORENAMES: .....

Question 2 (9 marks)

a) Complete the header for the `process()` method.

```
private String process (int a,  boolean b) {
    int c;

    if (b) {
       c = a / 2;
    } else {
       c = a * 2;
    }

    return c + "-" + b;
}
```

(3 marks)

b) Complete the header for the `process()` method.

```
public class Program {
   public void start() {
         if ( process(1, "2", '3') ) {
            //...
         }
   }
```

```
private boolean process (int a, String b,
                                          char c ) {

      // ....

}
```

```
}
```

(3 marks)

SURNAME: ..... FORENAMES: .....

c) Complete the output produced when the following code is executed.

```
public class Program {
   public void start() {
         int start = 10;
         int value = getResult(start);
         System.out.println("start: " + start +
                                          " value: " + value);}
   }

   private int getResult(int start) {
       start = start * 2;
       return start;
   }
}
```

```
start: 10  value: 20
```

(3 marks)

SURNAME: ..... FORENAMES: .....

Question 3 (12 marks)

a) Write a Java boolean expression which tests whether the `int` variable, `value`, contains a number between 3 and 16 (both inclusive).

```
value >= 3 && value <= 16
```

(2 marks)

b) Write a Java boolean expression which tests whether the String variable, `name`, is exactly 7 characters in length.

```
name.length() == 7
```

(2 marks)

c) Write a Java boolean expression which tests whether the `int` variable, `value`, is an even number which is not equal to the number 0..

```
value % 2 == 0 && value != 0
```

(2 marks)

d) Complete the output when the following code is executed.

```
boolean b = 4 < 2;
b = !b;
System.out.println("b: " + b);
```

```
b: true
```

(2 marks)

SURNAME: ..... FORENAMES: .....

e) Give the output when the following code is executed.

```
int value = 54;

if (value == 4 || value < 10 || value > 50) {
    System.out.print("A");
    if (value % 2 == 1) {
        System.out.print("B");
    }
} else if (value == 54) {
    System.out.print("C");
}
if (value % 2 == 0) {
    System.out.print("D");
}
```

AD

(2 marks)

SURNAME: ..... FORENAMES: .....

f) Give the output when the following code is executed.

```
String word1 = new String("PIP");
String word2 = new String("PIP");
String word3 = word1;

if (word1 == word2) {
      System.out.println("A");
} else if (word1.equals(word2) && word2 == word3) {
      System.out.println("B");
} else if (word2.equals(word3) && word1 == word3) {
      System.out.println("C");
}
```

C

(2 marks)

SURNAME: ..... FORENAMES: .....

Question 4 (10 marks)

a) Give the output when the following code is executed.

```
int num1 = 4;
int num2 = 3;
int num3 = 6;

System.out.println( Math.min( Math.max(num1,num2),
                              Math.min(num3, num1) ));
```

4

(2 marks)

b) Given the following code:

```
int number = (int) (Math.random() * 5 + 2);
System.out.println(number);
```

which of the following numbers could not have been produced by the above code?

i) 4
ii) 5
iii) 7
iv) 2
v) none of the above

iii) 7

(2 marks)

SURNAME: ..... FORENAMES: .....

c) Complete the output when the following code is executed.

```
System.out.print("i: ");

for (int i = 0; i < 25; i = i + 5) {
        System.out.print(i + " ");
}
```

```
i: 0 5 10 15 20
```

(2 marks)

d) Complete the output when the following code is executed.

```
int num = 32;
System.out.print("num: ");

while (num > 0) {
    num = num - 8;
    System.out.print(num + " ");
}
```

```
num: 24 16 8 0
```

(2 marks)

SURNAME: ..... FORENAMES: .....

e) Complete the output when the following code is executed.

```
int[] numbers = {1, 2, 3, 4, 5};
numbers[3] = numbers[1] + numbers[2];
numbers[numbers[1]]     = 6;

System.out.print("numbers: ");
for (int i = 0; i < numbers.length; i++) {
          System.out.print(numbers[i] + " ");
}
```

```
numbers: 1 2 6 5 5
```

(2 marks)

SURNAME: ..... FORENAMES: .....

Question 5 (6 marks)

Assume the following variables have been declared and initialised.

```
int value1 = 21;
double value2 = 23;
String name = "Jim";
String cNumber = "1234";
```

Each statement below has one error. Circle the error where it appears in the statement and write your correction underneath.

a)

```
System.out.println(cNumber + " "  name + " " + value1);
```

+

(1.5 marks)

b)

```
value1 =  value2 - 2;
```

(int)

(1.5 marks)

c)

```
value1 = Integer.parseDouble(cNumber);
```

parseInt(...)

(1.5 marks)

d)

```
name = "-" + Keyboard.readInput + "-";
```

readInput()

(1.5 marks)

SURNAME: ..... FORENAMES: .....

Question 6 (8 marks)

Complete the program below which implements a guessing game. The program generates a random number between 1 and 5 (both inclusive) and prompts the user for a guess. The program then either prints "Wow" if the user guess is the same as the computer number or prints "Computer number is: " followed by the computer number if the user did not guess correctly. Three example outputs using the completed program are shown below. (The user input is shown in bold and in a larger font.)

```
C:>Java Example
Your guess (1, 2, 3, 4 or 5): 3
Computer number is: 4

C:>Java Example
Your guess (1, 2, 3, 4 or 5): 5
Wow

C:>Java Example
Your guess (1, 2, 3, 4 or 5): 1
Computer number is: 2
```

```
public class Example {

   public void start() {

      int userNumber;
      int computerNumber;

      computerNumber = (int)(Math.random() * 5 +
                                                  1);

      System.out.print("Your guess (1, 2, 3, 4 or 5): ");

      userNumber = Integer.parseInt(
                                  Keyboard.readInput());
```

SURNAME: ..... FORENAMES: .....

```
    if (userNumber == computerNumber) {
        System.out.println("Wow");
    } else {
        System.out.println("Computer number is: "
                                        + computerNumber);
    }
```

```
}
```

```
}
```

(8 marks)

SURNAME: ..... FORENAMES: .....

Question 7 (7 marks)

Complete the program below which displays a row of stars. Firstly the program obtains the number of required stars (an `int`) by making a call to the `getNumberOfStars()` method. The program then prints the required number of stars in one row. Two example outputs using the completed program are shown below. (The user input is shown in bold and in a larger font.)

```
C:>Java Example
Enter the number of stars: 6
******

C:>Java Example
Enter the number of stars: 12
************
```

```
public class Example {
   public void start() {
```

```
    int number = getNumberOfStars();


    for (int i=0; i<number; i++) {
          System.out.print("*");
    }

    System.out.println();
```

```
   }
   private int getNumberOfStars() {
       System.out.print("Enter the number of stars: ");
        ... //rest of the code is not shown here
   }
}
```

(7 marks)

SURNAME: ..... FORENAMES: .....

Question 8 (10 marks)

a) Give the output when the following code is executed:

```
String word = "ABRACADABRA";

for (int i = 0; i < word.length(); i = i + 2) {
    System.out.print(word.charAt(i));
}
```

ARCDBA

(5 marks)

b) Complete the code which prints the letters of the String, `word`, in reverse order, i.e. the following completed code should print:

```
ARBADACARBA
```

```
String word = "ABRACADABRA";

for (int i = word.length()-1; i>= 0; i--) {
        System.out.print(word.charAt(i));
}
```

(5 marks)

SURNAME: ..... FORENAMES: .....

Question 9 (10 marks)

Give the output when the following program is executed.

```
public class MyProgram {
     public void start() {
          int a = 3;
          int b = first(a);
          System.out.println("1. " + b);
     }

     private int first(int a) {
          int b = 3;
          System.out.println("2. " + a);
          return second(a * b) + b;
     }

     private int second(double a) {
          System.out.println("3. " + a);
          return (int) (a / 2);
     }
}
```

```
                                //Show output here
2. 3
3. 9.0
1. 7
```

(10 marks)

SURNAME: ..... FORENAMES: .....

Question 10 (8 marks)

Complete the `getInitials()` method. The method is passed one parameter, a String consisting of **exactly** 2 words separated by ONE blank space. The method returns a String which is made up of the first letter of the first word followed by the first letter of the second word. The String which is returned by the method is in upper case characters.

For example when the following program is run with the completed `getInitials()` method the output is:

CS

```
public class Example {
   public void start() {
        String name = "computer science";
        String initials = getInitials(name);
        System.out.println(initials);
   }
```

```
 private String getInitials (String name) {

    String initials = "" + name.charAt(0);
    int position = name.indexOf(" ");
    initials = initials + name.charAt(position +
                                                1);

    return initials.toUpperCase();


 }
```

```
}
```

(8 marks)

SURNAME: ..... FORENAMES: .....

Question 11 (8 marks)

Write a method that accepts an array of integers as a parameter. The method creates a new array that is a copy of the original array, except that it only contains the even numbers from the parameter array. For example, for the input array:

```
{1, 2, 3, 4, 5, 6, 7, 8, 9 , 0},
```

another array of size 5 would be returned containing the values:

```
{2, 4, 6, 8, 0}.
```

Hint: you might need 2 passes over the original array: the first to determine the size of the final array, the second to copy over the positive values.

```
private int[] evensOnly (int[] n) {
      int[] evens;

      int size = 0;

      for (int i = 0; i < in.length; i++) {
         if (n[i] % 2 == 0) {
            size++;
         }
      }


      evens = new int[size];

      int pos = 0;
      for (int i = 0; i < in.length; i++) {
          if (n[i] % 2 == 0) {
              evens[pos] = n[i];
             pos++;
          }
      }

      return evens;

}
```

(8 marks)