THE UNIVERSITY OF AUCKLAND

SUMMER SEMESTER, 2009
Campus: City

COMPUTER SCIENCE

TEST

Principles of Programming

(Time allowed: 75 MINUTES)

NOTE: Attempt **ALL** questions
Write your answers in the space provided
There is space at the back for answers that overflow the allotted space
No calculators are permitted

Surname:	
Forenames:	
Student ID number:	
Login name:	

Q1 (/40)	**Q3** (/20)	**Q5** (/10)	**Q7** (/10)
Q2 (/5)	**Q4** (/10)	**Q6** (/5)	**TOTAL** **(/100)**

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

Question 1 (40 marks)

a) What output is produced by the following code?

```
String sentence = "I LOVE SUMMER SCHOOL!";
String part = sentence.substring(7, 10);
System.out.println(part);
```

SUM

(2 marks)

b) What output is produced by the following code?

```
String sentence = "Summer school is intensive!";
int index = sentence.indexOf("x");
System.out.println(index);
```

-1

(2 marks)

c) What would be printed by the following?

```
String sentence = "Programming is fun!";
System.out.println(sentence.length());
```

19

(2 marks)

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

d) What output is produced by the following code?

```
String a, b;
a = new String("Hello World!");
b = a;
System.out.println(a + b.charAt(11));
```

Hello World!!

(2 marks)

e) List all possible values that could be generated by the following expression:

```
(int) (Math.random() * 4) + 3
```

3 4 5 6

(2 marks)

f) What would be printed by the following?

```
System.out.println(Math.min(5, Math.max(3, 7)));
```

5

(2 marks)

CONTINUED

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

g) What output is produced by the following code?

```
System.out.println(2 + 4 + "8" + 9 + (2 + 4));
```

6896

(2 marks)

h) What output is produced by the following code? Assume the user's input is 23.

```
System.out.println(Keyboard.readInput() + 7);
```

237

(2 marks)

i) What output is produced by the following code? Assume the user's input is 21.

```
System.out.print(9 + Integer.parseInt(Keyboard.readInput()));
```

30

(2 marks)

CONTINUED

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

j) Write a Java boolean expression which tests whether the value of the variable `score` is outside of the range 3 to 75 (inclusive) but is not equal to 99.

```
(score < 3 || score > 75) && score != 99
```

(2 marks)

k) What is printed by the following?

```
System.out.println(4 + "n\n6" + 3 * 1 + 1);
```

```
4n
631
```

(2 marks)

l) What is printed by the following?

```
System.out.println(2 + 2 + " 3 + 4 " + 3 + 1);
```

```
4 3 + 4 31
```

(2 marks)

CONTINUED

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

m) Will the following code compile? Tick the correct box.

```
public class MyProgram {

    public void start() {
      int number = 4;

      methodOne(number);

      System.out.println("1 Number: " + number);
    }

    private void methodOne(int value) {
      number = number + 2;

      System.out.println("2 Number: " + number);
    }
}
```

YES ☐ **NO** ☑

(2 marks)

n) What output is produced by the following code?

```
int a = 6;
int b = 5;
int c = 7;

System.out.print("CS101 is ");

if ( !(a < b) || a > c ) {
     System.out.println("fun.");
} else {
     System.out.println("great.");
}
```

```
CS101 is fun.
```

(2 marks)

CONTINUED

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

o) What output is produced by the following code?

```
int a = 4;
int b = 3;
int c = 2;

b = c;
c = a;
a = c;

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

```
4 2 4
```

(2 marks)

p) Complete the output:

```
int c = 27 % 10;

int d = 9 / 2;

System.out.println("c: " + c + "  d: " + d);
```

```
c: 7 d: 4
```

(2 marks)

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

q) Complete the output:

```
int a = (int) (4.6 + 1.2);

int b = (int)4.6 + (int)0.7;

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

```
a: 5 b: 4
```

(2 marks)

r) Consider the following code (notice the values assigned to variables `a`, `b` and `c` have been replaced with `???`):

```
int a = ???;
int b = ???;
int c = ???;

if (a < b && a < c) {
    System.out.println("correct");
}
```

Give one set of possible values that could be assigned to `a`, `b` and `c` so that the word "`correct`" is printed:

```
//This is one possible solution.  There are many
//possible solutions.

int a = 0;


int b = 1;


int c = 1;
```

(2 marks)

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

s) Complete the method header for the `getAge()` method (i.e. complete the first line of the method definition). The `getAge()` method is *called* in the following way:

```
int age = getAge("Emily");
```

```
private int getAge( String name ) {

    System.out.print(name + ", Enter your age: ");

    String age = Keyboard.readInput();

    return Integer.parseInt(age);
}
```

(2 marks)

t) Complete the method header for the `printSum()` method (i.e. complete the first line of the method definition). The `printSum()` method is *called* in the following way:

```
printSum(24, 33);
```

```
private void printSum ( int num1, int num2 ) {

    int sum = num1 + num2;

    System.out.println("Sum: " + sum);

}
```

(2 marks)

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

Question 2 (5 marks)

What is the output of the following program?

```
public class IfExample {

    public void start() {
        testOuput(32);
    }

    private void testOuput(int number) {

        boolean a = true;
        boolean b = false;

        if (a && number > 15) {

            if (number < 40 || number == 100) {
                System.out.println("line 1");
                System.out.println("line 2");
            } else {
                System.out.println("line 3");
                System.out.println("line 4");
            }

            if ( ! b ) {
                System.out.println("line 5");
            } else {
                System.out.println("line 6");
            }
        } else {
            System.out.println("line 7");
        }

        System.out.println("line 8");
    }
}
```

```
line 1
line 2
line 5
line 8
```

(5 marks)

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

Question 3 (20 marks)

a) Write a Java statement which declares an `int` array. Use the identifier, `numbers,` for the array variable.

```
int[] numbers;
```

(2 marks)

b) Write a Java statement which constructs the `numbers` array (that you declared in part (a) above) to be large enough to store exactly 9 `int`s.

```
numbers = new int[9];
```

(2 marks)

c) Write a Java statement which stores the `int`, 4, in position 0 of the `numbers` array.

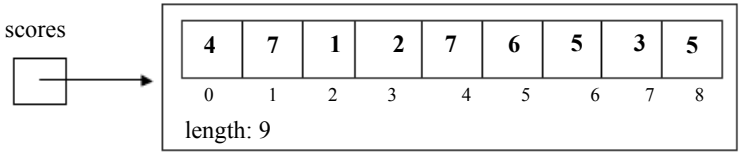
```
numbers[0] = 4;
```

(2 marks)

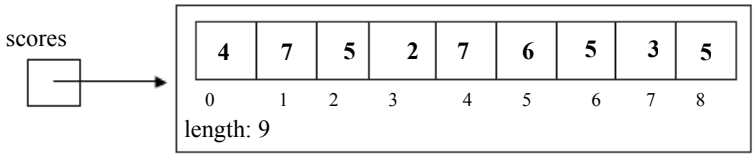
CONTINUED

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

For parts (d) to (g) below, assume that the `int` array, `scores,` has been created and contains the `int` values as shown in the diagram below.



d) Write a Java statement which assigns the value in position 6 of the `scores` array to the element in position 2 of the `scores` array. (After this statement is executed the `scores` array should contain the values shown in the diagram below.)




```
scores[2] = scores[6];
```

(2 marks)

e) What is the output when the following Java statement is executed?

```
System.out.println("1. " + scores.length);
```

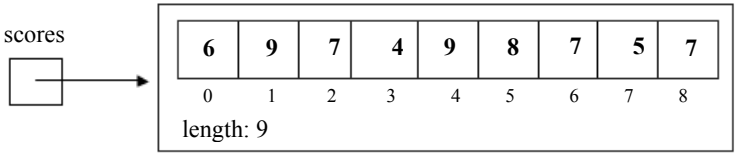
```
1. 9
```

(2 marks)

CONTINUED

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

f) Write a loop which adds 2 to each value of the `scores` array. (After the loop is executed the `scores` array should contain the values shown in the diagram below.)




```
for(int i=0; i< scores.length; i++) {
  scores[i] = scores[i] + 2;
}
```

(5 marks)

g) Add a Java loop to the code below. The loop should work out the sum of all the values in the `scores` array.

```
int sum = 0;



for(int i=0; i< scores.length; i++) {
    sum = sum + scores[i];
}



System.out.println("Sum: " + sum);
```

(5 marks)

CONTINUED

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

Question 4 (10 marks)

a) Convert the following `while` loop into a `for` loop:

```
int value;
String digits = "";

int pos = 3;
while (pos < 10) {
   value = (int) (Math.random() * 5);
   digits = digits + value;
   pos++;
}

System.out.println("Digits: " + digits);
```

```
int value;
String digits = "":



for (int pos = 3; pos < 10; pos++) {
    value = (int) (Math.random() * 5);
    digits = digits + value;
}









System.out.println("Digits: " + digits);
```

(5 marks)

CONTINUED

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

b) Write a loop which prints six random digits. Each digit is a random number between 3 and 6 inclusive. For example, executing the completed code could (the digits are random) give the output:

```
436543
```

```
int number;

for (int i = 0; i < 6; i++) {
    number = (int) (Math.random() * 4 + 3);
    System.out.print(number);
}

System.out.println();
```

(5 marks)

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

Question 5 (10 marks)

Complete the following method definitions.

a) Complete the `readNumber()` method which is called in the following way. This method returns a number entered by the user.

```
double number = readNumber();
```

```
private double  readNumber () {

     System.out.print("Enter a number: ");
     String input = Keyboard.readInput();



     return Double.parseDouble(input);

}
```

(5 marks)

b) Complete the `multiply()` method which is called in the following way. This method multiplies the two parameter numbers and returns the result.

```
double number = multiply(3.0, 5.0);
```

```
private double multiply ( double num1, double num2 ) {



    return num1 * num2;



}
```

(5 marks)

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

Question 6 (5 marks)

What is the output of the following program?

```
public class MethodExample {

        public void start() {
             method3();
        }

        private void method3() {
            System.out.println("Method 3");
            method1();
            method2();
        }

        private void method2() {
            System.out.println("Method 2");
            method1();
        }

        private void method1() {
            System.out.println("Method 1");
        }
    }
```

```
method 3
method 1
method 2
method 1
```

(5 marks)

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

Question 7 (10 marks)

Complete the definition of the `getCorrespondingGrade()` method. This method is passed an `int` parameter representing a mark out of 100 and, the method returns a String representing the corresponding grade. The grade ranges used for this method are:

A (80-100),
B (65-79),
C (50-64),
D (0-49).

For example, the following code:

```
String grade = getCorrespondingGrade(84);
System.out.println("Your grade is: " + grade);
```

produces the output:

```
Your grade is A
```

```
private String getCorrespondingGrade ( int mark ){


   if (mark >= 80) {
       return "A";
   }

   if (mark >= 65) {
       return "B";
   }

   if (mark >= 50) {
       return "C";
   }


     return "D";
```

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

}

(10 marks)

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

OVERFLOW PAGE

(If you have used this page, please indicate clearly under the relevant question that you have overflowed to this page)

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ROUGH WORKING (WILL NOT BE MARKED)

(You may detach this page from the answer booklet and use it for rough working)

CONTINUED

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

ROUGH WORKING (WILL NOT BE MARKED)

(You may detach this page from the answer booklet and use it for rough working)