THE UNIVERSITY OF AUCKLAND

FIRST SEMESTER, 2009
Campus: City

TEST

COMPUTER SCIENCE

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)	**Q4** (/6)	**Q7** (/6)	**TOTAL**
Q2 (/9)	**Q5** (/5)	**Q8** (/8)	
Q3 (/10)	**Q6** (/6)	**Q9** (/10)	**(/100)**

ID: .....

Question 1 (40 marks)

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

```
int a = 2 + 1 * 7 - 4 / 5 * 8 + 1;
System.out.println(a);
```

```
10
```

(2 marks)

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

```
String a = 1 + 2 + "3 + 4" + 5 + 6;
System.out.println(a);
```

```
33 + 456
```

(2 marks)

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

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

```
A"
B\n"n
```

(2 marks)

ID: .....

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

```
String message1 = new String("OH HAPPY DAYS");

String message2 = message1.substring(1, 5);

System.out.println(message2);
```

H HA

(2 marks)

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

```
String word = new String("SUPERWOMAN");

int pos1 = word.indexOf("PER");
int pos2 = word.indexOf("T");

System.out.println(pos1 + " " + pos2);
```

2 -1

(2 marks)

ID: .....

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

```
String words = new String("LUCKY YOU");

char c1 = words.charAt(0);

words = words.substring(6);
words = words + c1;

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

YOUL

(2 marks)

g) The following statement assigns a random number to the variable, `a`. What are ALL the possible values which can be assigned to the variable, `a`?

```
int a = (int) (Math.random() * 3) + 5;
```

5, 6, 7

(2 marks)

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

```
int a = Math.max(Math.max(4, 5), Math.min(6, 7));
System.out.println(a);
```

6

(2 marks)

ID: .....

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

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

a = c + 1;
b = a + 2;
c = b + 3;

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

```
7, 9, 12
```

(2 marks)

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

```
String digits = "14";
System.out.println(3 + digits);
System.out.println(1 + Integer.parseInt(digits));
```

```
314
15
```

(2 marks)

k) What is the output of the following code?

```
int a = 10;
int b = 20;

if ( (a > b) && (b == 20) ) {
     System.out.println("A");
} else {
     System.out.println("B");
}
```

```
B
```

(2 marks)

CONTINUED

ID: .....

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

```
int a = 10;
int b = 20;

if ( (a > b) || (b == 20) ) {
     System.out.println("C");
} else {
     System.out.println("D");
}
```

C

(2 marks)

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

```
int a = 30;
int b = 20;

if (a - b == 20) {
    System.out.println("one");
}
if (a < b) {
    System.out.println("two");
}
if (a != b) {
    System.out.println("three");
}
if ((a + b) > 0) {
    System.out.println("four");
}

System.out.println("five");
```

three
four
five

(2 marks)

ID: .....

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

```
int a = 30;
int b = 20;

if (a - b == 20) {
     System.out.println("six");
} else if (a != b) {
     if (a < b) {
          System.out.println("seven");
     } else if ((a + b) > 0) {
          System.out.println("eight");
     }
} else {
     System.out.println("nine");
}

System.out.println("ten");
```

```
eight
ten
```

(2 marks)

o) If we have created the following array

```
int[] numbers = {2, 4, 6, 8, 10, 12, 14};
```

what is the output produced by the following code?

```
System.out.println(numbers[1]);
```

```
4
```

(2 marks)

ID: .....

p) What is the problem with the following code?

```
int[] numbers = {2, 4, 6, 8, 10, 12, 14};
System.out.println(numbers[7]);
```

indexOutOfBoundsException

(2 marks)

q) Write the expression for obtaining the length of an array, `numbers`.

numbers.length

(2 marks)

r) When we create an array, all the elements are initialised automatically to standard default values. What is the default value for each of the following types of array elements?

double - 0.0

boolean - false

(2 marks)

ID: .....

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

```
int[] numbers = {1, 2, 3, -2};
int sum = 0;

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

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

4

(2 marks)

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

```
int[] a = {2, 4, 6, 8, 10};

int[] b;
b = a;
b[2] = 5;

System.out.println(a[2]);
```

5

(2 marks)

ID: .....

Question 2 (9 marks):

Complete the method header for each of the following three methods (i.e. complete the first line of each method definition).

a) The `totalLength()` method is *called* in the following way:

```
int num = totalLength("Hello", "World");
```

```
private int totalLength ( String string1,
                          String string2 )   {
    return string1.length() + string2.length();
}
```

(3 marks)

b) The `average()` method is *called* in the following way:

```
System.out.println(average(12.6, 11.6));
```

```
private double average ( double  first,
                         double second )   {
    return 0.5 * (first + second);
}
```

(3 marks)

c) The `display()` method is *called* in the following way:

```
display("ADEFGIUB", 4);
```

```
private void display ( String   letters,
                       int pos )   {
    System.out.println(letters.substring(0, pos));
}
```

(3 marks)

CONTINUED

ID: .....

Question 3 (10 marks):

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

```
public class MyProgram {

   public void start() {
        changeString("Hey");
   }

   private void changeString(String word) {
        int length = word.length();
        int i = length - 1;

        while (i >= 0) {
             System.out.print(word.charAt(i));
             i--;
        }
   }
}
```

yeH

(5 marks)

b) Complete the `for` loop below so that the following method is equivalent to the `changeString()` method in part a) above

```
   private void changeString(String word) {
       int length = word.length();

        for (int i = length - 1 ; i >=0; i-- ) {

             System.out.print(word.charAt(i));

        }
   }
```

(5 marks)

CONTINUED

ID: .....

Question 4 (6 marks):

The `getExactMatches()` method is passed two **String** parameters which contain only uppercase characters. The `getExactMatches()` method should return how many of the characters in the two parameter Strings match exactly, i.e. are exactly the same character and in the same position.

For example, if you complete the method correctly, the output of the following code:

```
int numberExact = getExactMatches("ABDE", "ADCE");
System.out.println("Number of exact matches: " + numberExact);

numberExact = getExactMatches("AFCE", "ABCE");
System.out.println("Number of exact matches: " + numberExact);
```

would be:

```
Number of exact matches: 2
Number of exact matches: 3
```

Note:
You can assume that the `String` parameters both contain exactly 4 characters.
You can assume that the `String` parameters both contain only uppercase characters.

Complete the `getExactMatches()` method in the space provided below:

```
private __int__ getExactMatches( String word1, String word2 ) {

    int numExact = 0;
    for( int i = 0; i<word1.length(); i++) {

        if (word1.charAt(i) == word2.charAt(i)) {
            numExact++;

        }
    }


    return numExact;
```

ID: .....

```
}
```

(6 marks)

ID: .....

Question 5 (5 marks):

The `CalculateHouseSize` program shown below prints the size of a house as squares (1 square means 1 square metre).

The output of the `CalculateHouseSize` program is shown below:

```
HOUSE SIZE = 220 squares.
```

There are **5** mistakes or omissions in the source code. Locate and correct all of these so that the program would produce **exactly** the same output as shown above. **Circle** the errors where they appear in the code below and write the correction immediately below the circled error:

```
public class CalculateHouseSize {

   public void start  {                          () are missing

       int lengthInMetres = 20;

       String breadthInMetres = 11;              int breadthInMetres

       int squareMetres = lengthInMetres * breadthInMetres;

       System.out.print("HOUSE SIZE = ")         missing ;

       system.out.println(squareMetres  " squares.");

   }    System

                                                 missing +
}
```

(5 marks)

ID: .....

Question 6 (6 marks):

Complete the `CostOfRunningACar` program shown below. This program should prompt the user for the number of kilometres (an integer value), get the value entered by the user, work out the total cost (each kilometre costs 27.5 cents) and print the number of kilometres together with the cost.

Example output when the completed program is run (the value entered by the user is shown in bold), is shown below:

```
Enter number of kilometres: 10
Cost for a 10 kilometre trip: $2.75
```

```
public class CostOfRunningACar {

  public void start()  {
     final double COST_PER_KILOMETRE = 0.275;
     double totalCost;
     int numberOfK;

     System.out.print("Enter number of kilometres: " );
```

```
     numberOfK = Integer.parseInt(Keyboard.readInput());
     totalCost = COST_PER_KILOMETRE * numberOfK;

     System.out.print("Cost for a " + numberOfK);
     System.out.println(" kilometre trip: $" + totalCost);
```

```
  }
```

CONTINUED

ID: .....

```
}
```

(6 marks)

Question 7 (6 marks)

What is the output produced by the following program?

```
public class MyProgram {

     public void start() {
          methodTwo();
          System.out.print("1 ");
          methodOne();
          System.out.print("2 ");
     }

     private void methodOne() {
          System.out.print("3 ");
     }

     private void methodTwo() {
          System.out.print("4 ");
          methodOne();
          System.out.print("5 ");
     }
}
```

Show the output here:

```
4 3 5 1 3 2
```

(6 marks)

ID: .....

Question 8 (8 marks)

Complete the `numberTrue()` method below. This method is passed an array of `boolean` values as a parameter, and must return the number of elements in the array that have the value `true`.

For example, if you have written the method correctly, the code below:

```
boolean[] vals = {true, false, true, true, false, false, true};
int numberTrue = numberTrue(vals);
System.out.println(numberTrue);
```

should produce the output:

```
4
```

Note:
You may assume that the array of booleans passed to the method as the parameter, `bools`, always contains at least one element.

```
private int numberTrue(boolean[] bools) {
```

```
int count = 0;

for (int i=0; i<bools.length; i++) {
    if (bools[i]) {
        count++;
    }
}

return count;
```

```
}
```

(8 marks)

CONTINUED

ID: .....

Question 9 (8 marks):

What is the output produced by the following program?

```
public class MyProgram {

     public void start() {
          int a = 9;
          methodA(a + 1);
          System.out.println(a);
     }

     private void methodA(int a) {
          int b = a + 5;
          System.out.println(b);
          b = methodB(b + 2);
          System.out.println(b);
     }

     private int methodB(int c) {
          System.out.println(c);
          return c + c;
     }
}
```

Show the output here:

```
15
17
34
9
```

(8 marks)

CONTINUED