THE UNIVERSITY OF AUCKLAND

SEMESTER TWO, 2009
Campus: City

CompSci 101
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:	
Lab time:	

Q1 (/20)	**Q4** (/10)	**Q7** (/6)	**TOTAL**
Q2 (/20)	**Q5** (/18)	**Q8** (/6)	
Q3 (/12)	**Q6** (/8)		**(/100)**

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

Question 1 (20 marks)

a) What is the output when the following code is executed?

```
int num1 = 4;
int num2 = 3;
String exp = " a + b ";

System.out.println(num1 + num2 + exp + num1 * num2);
```

```
7 a + b 12
```

(2 marks)

b) Complete the output when the Q01B program is executed.

```
public class Q01B {

  public void start() {
      printAValue(20, 10, 30);
  }

  private void printAValue(int num1, int num2, int num3) {

      int a = Math.max(num1, num2);
      int b = Math.min(a, num3);

      System.out.println("Result: " + b);

  }
}
```

```
Result: 20
```

(2 marks)

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

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

```
String words1 = "super duper";

String words2 = "mish mash";

String words3 = words1.substring(1, 3) + "XX"
                                + words2.substring(4) + "XX";

System.out.println(words3);
```

upXX mashXX

(2 marks)

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

```
String words1 = "WISHY WASHY";

int pos1 = words1.indexOf(" ");
int pos2 = words1.indexOf("SH");
int pos3 = words1.indexOf("DISH");

System.out.println("pos1: " + pos1);
System.out.println("pos2: " + pos2);
System.out.println("pos3: " + pos3);
```

pos1: **5**

pos2: **2**

pos3: **-1**

(2 marks)

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

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

```
String words1 = "PING PONG";

char a = words1.charAt(3);
char b = words1.charAt(5);
char c = words1.charAt(8);

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

a: **G** b: **P** c: **G**

(2 marks)

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

```
int a = 4;
int b = a + 10;
int c = a + b;

a = a + 4;
b = b - a;
c = b + a + 1;

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

a: **8** b: **6** c: **15**

(2 marks)

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

g) Complete the output when the following section of code is executed.

```
int a = 9;
double b = a / 2;
double c = a / 2.0;

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

a: **9** b: **4.0** c: **4.5**

(2 marks)

h) Complete the output when the following section of code is executed.

```
int number = 1;
int value = Math.min(5, Math.max(number + 2, 4));

System.out.println("H: " + (value > 4) );
```

H: **false**

(2 marks)

i) Complete the output when the following section of code is executed.

```
boolean isAMatch;
int number = 38;
String numberString = "38";

isAMatch = (number == Integer.parseInt(numberString));

System.out.println("I: " + isAMatch);
```

I: **true**

(2 marks)

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

j) Complete the output when the following section of code is executed.

```
boolean result = (10 >= 5) != false;

System.out.println("J: " + result);
```

J: **true**

(2 marks)

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

Question 2 (20 marks)

a) When the following section of code is executed and the output is "Oranges",

```
if (x) {
    System.out.println("Oranges");
} else {
    System.out.println("Bananas");
}
```

what is the value of the boolean variable, `x`?

true

(2 marks)

b) Write a replacement for `/* condition */` which makes the code below execute correctly.

```
int x;
int y;
…

if (/* condition */) {
    System.out.println("x and y are 4 apart");
}
```

```
int x;
int y;
 …

if ( Math.abs(x - y) == 4 ) {

    System.out.println("x and y are 4 apart");

}
```

(2 marks)

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

c) What is the output when the following code is executed?

```
int x = 25;

if ( x < 10 || x > 30 ) {
      System.out.println("A");
} else if ( x < 15 || x > 25 ) {
      System.out.println("B");
} else if ( x < 28 ) {
      System.out.println("C");
} else if ( x > 20 ) {
      System.out.println("D");
} else {
      System.out.println("E");
}
```

C

(2 marks)

d) List all the possible numbers which can be generated by the following code.

```
int randomNumber = (int) (Math.random() * 2 + 3);

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

3, 4

(2 marks)

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

e) Rewrite the following while-loop as a for-loop.

```
int q = 1;

while (q < 256) {
      System.out.println(q);
      q = q * 2;
}
```

```
for( int q = 1; q < 256; q = q * 2) {
      System.out.println(q);
}
```

(2 marks)

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

```
int x = 10;
int y = 2;

while (x > y) {
    System.out.print("*");
    x--;
    y++;
}
```

```
****
```

(2 marks)

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

```
for (int i = 0; i < 10; i = i + 2) {
    System.out.print("*");
}
```

```
*****
```

(2 marks)

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

h) In the following while loop, identify the conceptual components of "initialisation", "condition", and "increment" by circling and labelling the respective parts of the code.

```
int x = 2560;          initialisation

int y = 200;


while ( x * x > 1000 ) {          condition

    System.out.println( x * y );

    x = x / 2;          increment

}
```

(2 marks)

i) Rewrite the following code so that the code compiles.

```
int x;

System.out.print("Enter a number between 1 and 10: ");
x = Integer.parseInt(Keyboard.readInput());

// Rewrite from here
for (int i=1; (i <= x) && (i < x * x / 2); i++) {
  if (x != i) {
      System.out.println(i);
  }
}

System.out.println("Loop stopped at i = " + i);
```

```
int x;

System.out.print("Enter a number between 1 and 10: ");
x = Integer.parseInt(Keyboard.readInput());
int i;
for(i = 1; i <= x && i < x * x / 2; i++) {
    if (x != 1) {
        System.out.println(i);
    }
}
System.out.println("Loop stopped at i = " + i);
```

(2 marks)

CONTINUED

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

j) Complete the countdown() method so that the output when the completed countdown() method is executed is:

```
10
9
8
7
6
5
4
3 – Ignition
2
1
0
Lift off!
```

```
private void countdown() {

    for (int i = 10; i >= 0; i--) {

      System.out.print(i);

      if (i == 3) {
        System.out.print(" - Ignition");
      }


         System.out.println();
    }

    System.out.println("Lift off!");

 }
```

(2 marks)

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

Question 3 (12 marks)

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

a) The getRandomNumber() method is called in the following way:

```
String number = getRandomNumber(40);
```

```
private String getRandomNumber ( int number ) {

    return (int)(Math.random() * number) + "";

}
```

(4 marks)

b) The compareNumbers() method is called in the following way:

```
boolean equal = compareNumbers("19", "16");
```

```
private boolean compareNumbers ( String first,
                                 String second) {

 return
    Integer.parseInt(first) == Integer.parseInt(second);


 }
```

(4 marks)

c) The printLetters() method is called in the following way:

```
printLetters("ABCDEFG", 2);
```

```
private void printLetters (String letters,
                           int position) {

    System.out.println(letters.substring(0, position));

 }
```

(4 marks)

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

Question 4 (10 marks)

a) Complete the following method which returns the minimum of four integer numbers.

```
private int getMinimum (int n1, int n2, int n3, int n4) {

int min1 = Math.min(n1, n2);
int min2 = Math.min(n3, n4);
return Math.min(min1, min2);



}
```

(5 marks)

b) The removeFirstNumber() method has a String parameter, numbers, which is made up of several numbers (1 or 2 digits for each number) with a single space between them and no space at each end, e.g., "3", "20 2", "3 5 7 9 11 13". This method removes the first number from the String parameter and return the rest of the numbers as a String with no leading or ending spaces.

```
private String removeFirstNumber (String numbers) {

int firstSpace = numbers.indexOf(" ");

if (firstSpace > -1 ) {
  return numbers.substring(firstSpace+1);
}

return "";



}
```

(5 marks)

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

Question 5 (18 marks)

a) Describe in your own words why the following section of code does not compile:

```
String[] cities;

cities = {"Auckland", "Wellington", "Christchurch" };

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

The single statement which declares, constructs and initialises an array cannot be split. The statement should be:

```
String[] cities = {"Auckland", "Wellington",
                                "Christchurch" };
```

(3 marks)

b) Give examples of two different ways of declaring and initialising an int array, `x`, which has three integer elements. [You may choose any **non-zero** int values for the three elements.]

1)

```
int[] x = { 1, 2, 3};
```

2)

```
int[] x = new int[3];
x[0] = 1;
x[1] = 2;
x[2] = 3;
```

(3 marks)

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

c) What is the output when the following section of code is executed?

```
int[] x = new int[5];

x[2] = 9;
x[3] = 5;
x[4] = 8;

System.out.println(x[x.length - 2] + x[1]);
```

5

(3 marks)

d) You want to create a copy, y, of an int array, x, so that you can modify the copy without affecting the original array x.

```
int[] y;
int[] x = { 2, 13, 4, 54, 6, 11, ... };

y = x;
```

Explain why the section of code above is not correct in this case.

In the code above the variable, y, points to the same array as the variable, x. Any changes made to the array, y, will also affect the array, x, since there is only one array and the variables, x and the variable, y, both point to this single array.

(3 marks)

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

e) The following method compiles. In some cases a runtime error (exception) occurs and in some cases it doesn't. What is the likely cause of the runtime error?

```
private void printArray(int[] x) {

  for(int i = 0; i < x.length; i++) {
      System.out.println(x[i]);
  }

}
```

The array, x, may be null

(3 marks)

f) Write a version of the method in the previous question, e) above, which fixes the problem.

```
private void printArray(int[] x) {

    if (x == null) {
        return;
    }

    for (int i = 0; i < x.length; i++) {
        System.out.println(x[i]);
    }


}
```

(3 marks)

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

Question 6 (8 marks)

Complete the Q06 program below. This program prompts the user for the number of transactions (an integer value), gets the value entered by the user, works out the cost of the transactions (each transaction costs 50 cents) and prints the number of transactions and the cost.

NOTE: the cost is truncated to the nearest whole number, e.g., if the cost is $11.50 it is truncated to $11.

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

```
Enter number of transactions:  23
Transactions: 23 Cost: $11
```

```
public class Q06 {

  public void start() {

      String input;
      int numTrans;
      int cost = 0;

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

      input = Keyboard.readInput();
      numTrans = Integer.parseInt(input);
      cost = (int) (numTrans * 0.5);

      System.out.println("Transactions: " +
                         numTrans + " Cost: $" + cost);



  }
}
```

(8 marks)

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

Question 7 (6 marks)

Complete the following append() method which is passed two parameters, a String array, words, and a String object, lastWord. The method creates a new array which contains all the elements of the parameter array and the String, lastWord, as the last element. The method returns the resulting array.

NOTE:
You may assume that the parameter array, words, has already been initialised outside the method **and contains no null elements.**

```
private String[] append(String[] words, String lastWord) {
    String[] words2 =
                new String[words.length + 1];

    for(int i = 0; i < words.length; i++) {
        words2[i] = words[i];
    }

    words2[words.length] = lastWord;
    return words2;









}
```

(6 marks)

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

Question 8 (6 marks)

What is the output when the Q08 program is executed?

```
public class Q08 {

     public void start() {
          methodTwo();

          methodOne();

          System.out.print("1, ");
     }

     private void methodOne() {
          System.out.print("2, ");
     }

     private void methodTwo() {
          methodOne();

          System.out.print("3, ");
     }

}
```

Show the output here:

```
2, 3, 2, 1,
```

(6 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)

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

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