THE UNIVERSITY OF AUCKLAND

FIRST SEMESTER, 2012
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 spaces 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** (/18)	**Q7** (/5)	**Q10** (/5)
Q2 (/10)	**Q5** (/16)	**Q8** (/7)	**Total** /100
Q3 (/10)	**Q6** (/10)	**Q9** (/7)	

ID: .....

Question 1 (12 marks)

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

```
int a = 13 / 2;
int b = 13 % 2;
int c = 2 / 13;
int d = 2 % 13;
System.out.println("a: " + a);
System.out.println("b: " + b);
System.out.println("c: " + c);
System.out.println("d: " + d);
```

```
a:

b:

c:

d:
```

(4 marks)

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

```
double e = 13 / 2;
double f = 13 / 2.0;
int g = (int) 3.1416;
System.out.println("e: " + e);
System.out.println("f: " + f);
System.out.println("g: " + g);
```

```
e:

f:

g:
```

(3 marks)

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

```
System.out.println( 3 + 9 / 4 * 3 + "21");
System.out.println( "3 + 9" + 4 * 3 + 21);
```

(2 marks)

continued

ID: .....

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

```
int a = 4;
int b = 5;
int c = 6;

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

```
a:

b:

c:
```

(3 marks)

ID: .....

Question 2 (10 marks)

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

```
String greeting = "how are you";
int x = greeting.indexOf('o');
x++;
System.out.println("x: " + x);

char y = greeting.charAt(x);
System.out.println("y: " + y);

x = x + 4;
char z = greeting.charAt(x);
System.out.println("z: " + z);
```

```
x:

y:

z:
```

(3 marks)

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

```
String word = " A B C D ";
int x = word.length();
System.out.println("1: " + x);

int y = word.trim().length();
System.out.println("2: " + y);

System.out.println("3: " + word.substring(x - y + 1, y + 1));
```

```
1:

2:

3:
```

(3 marks)

continued

ID: .....

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

```
String a = "A B C D E F";
String b = a.toLowerCase();
String c = "a b c d e f";

System.out.println("1: " + ( a == b ));
System.out.println("2: " + ( a.equals(b) ));
System.out.println("3: " + ( b == c));
System.out.println("4: " + ( b.equals(c) ));
```

```
1:

2:

3:

4:
```

(4 marks)

continued

ID: .....

Question 3 (10 marks)

Parts a), b), c) and d) refer to the following section of code.

```
private int methodA(int x) {
    x++;
    return x * 2;
}

private int methodB(int x, String y) {
    x++;
    return x + y.length();
}

private int methodC(String y, int x) {
    y = y + "s";
    y = y.substring(x);
    return y.length();
}

private int methodD(int x, String y, boolean z) {
    if (z) {
        return y.length()/2;
    } else {
        return x;
    }
}
```

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

```
int a = 3;

System.out.println("1: " + methodA(a));
System.out.println("2: " + a);
```

```
1:

2:
```

(2 marks)

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

```
int a = 3;
String b = "Word";

System.out.println("1: " + methodB(a, b));
System.out.println("2: " + a);
System.out.println("3: " + b);
```

continued

ID: .....

```
1:

2:

3:
```

(3 marks)

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

```
int a = 3;
String b = "Word";

System.out.println("1: " + methodC(b, a));
System.out.println("2: " + a);
System.out.println("3: " + b);
```

```
1:

2:

3:
```

(3 marks)

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

```
int a = 3;
String b = "Word";
boolean c = true;

System.out.println("1: " + a);
a = methodD(a, b, c);
System.out.println("2: " + a);
```

```
1:

2:
```

(2 marks)

continued

ID: .....

Question 4 (18 marks)

Parts a), b) and c) Give the output produced when the code is executed.

a)
```
int value = 44;
boolean result = value > 10 && value < 50 && value != 30;
System.out.println(result);
```

(2 marks)

b)
```
boolean result1 = true;
boolean result2 = ! result1;
boolean result3 = (result1 == false) || (result2 != result1);
System.out.println(result3);
```

(2 marks)

c)
```
int value = 21;
boolean result = value % 2 == 0 || value < 0 ;
System.out.println(result);
```

(2 marks)

continued

ID: .....

Parts d), e) and f) Complete the output produced when the following program is executed.

```
public class Program {

    private void start() {
        System.out.println("d)");
        lotsOfIfs(4);

        System.out.println("e)");
        lotsOfIfs(9);

        System.out.println("f)");
        lotsOfIfs(-4);
    }

    private void lotsOfIfs(int value) {
        if (value > 0 && value % 3 == 0) {
              System.out.print("1 ");
              if (value % 2 == 0) {
                    System.out.print("2 ");
              } else {
                    System.out.print("3 ");
              }
              value = 10;
              System.out.print("4 ");
        } else if (value > 7 || value < 0) {
              System.out.print("5 ");
              value = 4;
        } else {
              System.out.print("6 ");
        }

        System.out.print("7 ");
        System.out.println();
        System.out.println();
    }
}
```

```
d)


e)


f)


```

(6 marks)

continued

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g) Complete the `askMe()` method which is passed an integer as a parameter and returns a String. The String returned by the method is one of the following:

- "YES" if the parameter is an even number less than 50,
- "NO" if the parameter is a number between 50 and 60 inclusive or greater than or equal to 80,
- "PERHAPS" in all other cases.

When the following program is executed using the completed `askMe()` method the output is:

1. NO
2. PERHAPS
3. YES

```
public class Program {

    public void start() {
        String answer = askMe(80);
        System.out.println("1. " + answer);

        answer = askMe(65);
        System.out.println("2. " + answer);

        answer = askMe(30);
        System.out.println("3. " + answer);
    }

    private String askMe(int number) {
```

(6 marks)

```
    }
}
```

ID: .....

Question 5 (16 marks)

a) Complete the output produced by the following code.

```
int x = 3;

while(x < 29) {
      x = x + 5;
}

System.out.println("x: " + x);
```

```
x:
```

(3 marks)

b) What is the **LAST** number printed by the following code?

```
int x = 13;

while(x >= 4) {
      if (x % 2 == 1) {
            System.out.println(x);
      }

      x = x - 3;
}
```

(3 marks)

continued

ID: .....

c) Give the output produced by the following code.

```
int number1 = 14;
int number2 = number1;
int sum;

while(number1 < 30 && number2 > 4) {
      sum = number1 + number2;
      System.out.println(sum);
      number1 = number1 + 3;
      number2 = number2 - 3;
}
```

(3 marks)

d) Give **THREE DIFFERENT** possible outputs which could be printed by the `printRandoms()` method.

```
private void printRandoms() {
      int number;
      int i = 0;
      while(i < 4) {
            number = (int) (Math.random() * 3);
            System.out.print(number + " ");
            i++;
      }
}
```

Possible output 1

Possible output 2

Possible output 3

(3 marks)

continued

ID: .....

e) Complete the `getValidUserNumber()` method. This method keeps prompting the user for a number, either 1, 2 or 3, until the user enters a valid number. The method returns the valid number entered by the user. For example, TWO possible executions of the following program using the completed `getValidUserNumber()` method are shown below (the user input is shown in bold larger print):

Possible program execution 1:

Enter valid number (1, 2 or 3): **0**
Enter valid number (1, 2 or 3): **4**
Enter valid number (1, 2 or 3): **5**
Enter valid number (1, 2 or 3): **3**

User number is 3

Possible program execution 2:

Enter valid number (1, 2 or 3): **1**

User number is 1

```
public class Program {

    public void start() {
        int number = getValidUserNumber();
        System.out.println();
        System.out.println("     User number is " + number);
    }

    private int getValidUserNumber() {

        int number = 0;









        return number;

    }
}
```

(4 marks)

continued

ID: .....

Question 6 (10 marks)

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

```
int a = 12 ;
int b = 7;
int c = a % b;
int d = c + b / c;
int result = a – c * d;

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

```
Result:
```

(2 marks)

b) Write a Java `boolean` expression which tests whether the String variable, `name`, contains the letter 'e'.

(2 marks)

c) Write a Java `boolean` expression which tests whether the value of the `int` variable, `age`, is between 30 and 39 inclusive.

(2 marks)

continued

ID: .....

d) Complete the output produced by the following code.

```
int result = 1;
for (int i = 2; i < 5; i++) {
      result = result * i;
}
System.out.println("result is: " +  result);
```

```
result is:
```

(2 marks)

e) Complete the output produced by the following code.

```
int[] nums1 = {1, 2, 3, 4, 5};

int[] nums2 = {6, 7, 8, 9, 10};

nums1[2] = nums2[4];
nums2[4] = nums1[2] / nums2[4];
System.out.println("1: " + nums2[4]);

nums2 = nums1;
nums1[4] = nums2[2] / nums2[4];

System.out.println("2: " + nums2[4]);
```

```
1:

2:
```

(2 marks)

continued

ID: .....

Question 7 (5 marks)

Convert the following `for` loop into the corresponding `while` loop structure (without changing the meaning of the code).

```
int[] input = { 23, 45, 67 };
for (int i = 0; i < input.length; i++) {
    System.out.println(input[i]);
}
```

(5 marks)

continued

ID: .....

Question 8 (7 marks)

Complete the definition of the following `increaseArraySize()` method, which returns an array twice the size of the parameter array. The method returns a new array with the same data as the parameter array but with twice the number of elements. The second half of the array which is returned by this method contains elements with the value 0.

```
private int[] increaseArraySize(int[] a) {
    int[] b;




    return b;
}
```

(7 marks)

Question 9 (7 marks)

Complete the definition of the following `findName()` method which searches for a particular name in an array of names. The method returns the **index number** of the first matching name (from left to right) in the `names` array. If the name is not found in the array, the method returns -1.

```
private int findName(String[] names, String name) {




}
```

(7 marks)

continued

ID: .....

Question 10 (5 marks)

What output is produced by the following program?

```
public class Program {

    public void start() {
        int[] nums = { 35, 90, 5, 45 };

        for(int i = nums.length; i > 0; i--){
              bubble(nums, i);
        }

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

    private void bubble(int[] a, int n){
        int temp = 0;
        for (int i = 0; i < (n-1); i++) {
              if (a[i] > a[i+1]) {
                    swapElements(a, i, i+1);
              }
        }
    }

    private void swapElements(int[] a, int pos1, int pos2){
        int temp = a[pos1];
        a[pos1] = a[pos2];
        a[pos2] = temp;
    }
}
```

(5 marks)

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