THE UNIVERSITY OF AUCKLAND

SUMMER SEMESTER, 2010
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 (/10)	**Q4** (/10)	**Q7** (/18)
Q2 (/10)	**Q5** (/12)	**Q8** (/15)
Q3 (/15)	**Q6** (/10)	**Total** /100

ID: .....

Question 1 (10 marks)

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

```
System.out.println(3 + 5 + " + " + 2 + " * " + 8 + (2 + 1));
```

```
8 + 2 * 83
```

(2 marks)

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

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

```
A"nB
\nZ
```

(2 marks)

c) Complete the output produced by the following code.

```
int num = Math.min(Math.max(Math.min(3, 6), 5), 4);
System.out.println("num: " + num);
```

```
num: 4
```

(2 marks)

ID: .....

d) Complete the output produced by the following code:

```
int a = 3;
int b = 4;
int c = a + b;
b = c - b;
a = a + a;

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

```
a: 6   b: 3    c: 7
```

(2 marks)

e) Complete the output produced by the following code:

```
int a = 8 / 3;
int b = 8 % 3;
double c = 8 / 3;

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

```
a: 2   b: 2    c: 2.0
```

(2 marks)

ID: .....

Question 2 (10 marks)

a) The `int` variable, `number`, has the value 9. Complete the output produced by the following code:

```
boolean result;
result = (number == 3 || number <= 0) && number!= 4;

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

```
result: false
```

(2 marks)

b) The `int` variable, `number`, has the value 9. Complete the output produced by the following code:

```
boolean result = !(number < 0) && number >= 3;

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

```
result: true
```

(2 marks)

c) Write a boolean expression which tests whether the `int` variable, `number`, contains a value between 5 and 10 (inclusive).

```
number >= 5 && number <=10
```

(2 marks)

ID: .....

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

```
int value1 = 8;
int value2 = 6;

System.out.print("A ");

if (value1 < value2) {
      System.out.print("B ");
      value1 = 10;
} else if (value2 < 10) {
      System.out.print("C ");

      if(value1 < 20) {
         System.out.print("D ");
      }
      value2 = value2 / 2;
}

System.out.println(value1 + " " + value2);
```

A C D 8 3

(2 marks)

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

```
int value1 = 5;
int value2 = 6;

System.out.print("A ");

if (value1 < value2) {
      System.out.print("B ");
      value1 = 10;
}
if (value2 < 10) {
      System.out.print("C ");
      if(value1 < 20) {
         System.out.print("D ");
      }
      value2 = value2 / 2;
}

System.out.println(value1 + " " + value2);
```

A B C D 10 3

(2 marks)

ID: .....

Question 3 (15 marks)

a) Complete the output produced by the following code. The user input is outlined and in bold.

```
String prompt = "Enter a single digit positive number: ";

System.out.print(prompt);
int num = Integer.parseInt(Keyboard.readInput());
int tries = 1;

while (num > 9) {
      System.out.print(prompt);
      num = Integer.parseInt(Keyboard.readInput());
      tries++;
}

System.out.println("Tries: " + tries + " Num: " + num);
```

Enter a single digit positive number: **21**

Enter a single digit positive number: **345**

Enter a single digit positive number: **10**

Enter a single digit positive number: **7**

Tries: **4** Num: **7**

(3 marks)

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

```
for(int i = 0; i < 12; i = i + 3) {
      System.out.print(i + " ");
}
```

0 3 6 9

(3 marks)

ID: .....

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

```
for(int i = 9; i > 5; i--) {
      System.out.print(i + " ");
}
```

```
9 8 7 6
```

(3 marks)

d) Consider the following array:

```
int[] goals = {3, 2, 3, 0, 4, 2, 5, 3, 1};
```

Complete the output produced by the following code.

```
goals[1] = goals[6];
goals[0] = goals[goals.length - 1];


System.out.println("goals[0]: " + goals[0]);
System.out.println("goals[1]: " + goals[1]);
```

```
goals[0]: 1


goals[1]: 5
```

(3 marks)

e) Consider the following array:

```
int[] goals = {3, 2, 3, 0, 4, 2, 5, 3, 1};
```

Complete the output produced by the following code.

```
int howMany = 0;

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

      if (goals[i] > 3) {
         howMany++;
      }

}

System.out.println("Number: " + howMany);
```

```
Number: 2
```

(3 marks)

ID: .....

Question 4 (10 marks)

a) Complete the output produced by the following code.

```
String phrase = new String("Fancy free");

char c1 = phrase.charAt(1);
char c2 = phrase.charAt(8);

System.out.println("c1: " + c1 + ", c2: " + c2);
```

```
c1: a   c2: e
```

(2 marks)

b) Complete the output produced by the following code.

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

String part1 = word.substring(1, 4);
String part2 = word.substring(9);

System.out.println("part1: " + part1);
System.out.println("part2: " + part2);
```

```
part1: cru

part2: us
```

(2 marks)

c) Complete the output produced by the following code.

```
phrase = new String("Beyond the words");

int position1 = phrase.indexOf("d");
int position2 = phrase.indexOf("woo");

System.out.println("position1: " + position1);
System.out.println("position2: " + position2);
```

```
position1: 5

position2: -1
```

(2 marks)

d) Complete the assignment statement in the code below so that the output is 'line 1'.

```
String language1 = new String("Italian");
```

```
String language2 = language1;
```

```
if (language1 == language2) {
      System.out.println("line 1");
} else if (language1.equals(language2)) {
      System.out.println("line 2");
}
```

(2 marks)

ID: .....

e) Complete the assignment statement in the code below so that the output is 'line 2'.

```
String country1 = new String("India");
```

```
String country2 = new String("India");
```

```
if (country1 == country2) {
      System.out.println("line 1");
} else if (country1.equals(country2)) {
      System.out.println("line 2");
}
```

(2 marks)

ID: .....

Question 5 (12 marks)

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

a) The method, `methodA()`, is called in the following way:

```
double result1 = methodA("23.5");
```

```
private double methodA (String word) {

    double n = Double.parseDouble(word);
    n++;
    return n;

}
```

(3 marks)

b) The method, `methodB()`, is called in the following way:

```
String result2 = methodB("cat", 10);
```

```
private  String methodB ( String word,
                          int num) {
    num++;
    return num + " " + word;

}
```

(3 marks)

c) The method, `methodC()`, is called in the following way:

```
methodC(3, 33, "5, 9, 12");
```

```
private void methodC (int num1, int num2,
                      String list1 ) {

    String list2 = num1 + ", " + list1 + "," + num2;
    System.out.println(list2);
}
```

(3 marks)

d) The method, `methodD()`, is called in the following way:

```
boolean result4 = methodD(true);
```

```
private boolean methodD (boolean
                         wantsEven ) {

    int ceiling = 20;
    int n = (int)(Math.random() * ceiling);
    if (n % 2 == 0 && wantsEven) {
         return true;
    }

    return false;
}
```

(3 marks)

ID: .....

Question 6 (10 marks)

Give the output when the following program is executed.

```
public class MyProgram {

     public void start() {

          System.out.print("1 ");

          methodOne();

          System.out.print("2 ");

          methodTwo();

          System.out.print("3 ");

          methodThree();

          System.out.println("4 ");
     }

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

     private void methodTwo() {
          System.out.print("6 ");
          methodThree();
     }

     private void methodThree() {
          System.out.print("7 ");
     }
}
```

```
                              //Show output here


     1 5 2 6 7 3 7 4
```

(10 marks)

ID: .....

Question 7 (18 marks)

a) Complete the method, `getRandomMessage()`, which returns a String. The method returns either the String `"Think about it first"` or the String `"Do it now"` or the String `"Don't do it"`. Each of the three Strings has an equal chance of being returned by the method.

Note: You will need to use `Math.random()` in this question.

```
private String getRandomMessage() {

    String mess1 = "Think about it first";
    String mess2 = "Do it now";
    String mess3 = "Don't do it";

    int n = (int)(Math.random() * 3);

    if (n == 0) {
        return mess1;
    }
    if (n == 1) {
        return mess2;
    }

    return mess3;

}
```

(6 marks)

b) Complete the method, `printSum()`, which is passed two `int` values as parameters. The method prints the two values with a " + " sign between them followed by the " = " sign and the sum of the two numbers. For example, the following three lines of code:

```
printSum(11, 9);
printSum(5, 7);
printSum(2, 6);
```

would print:

```
11 + 9 = 20
5 + 7 = 12
2 + 6 = 8
```

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

    String problem;

    problem = num1 + " + " + num2 + " = "
                          + (num1 + num2);

    System.out.println(problem);
}
```

(6 marks)

c) Complete the method, `addSIfNeeded()`, which is passed two parameters, an `int` and a String. The method should return the concatenation of the two parameters and the method should add an 's' if the `int` parameter is not equal to the value, 1. For example, the following code:

```
String words = addSIfNeeded(1, "dog");
System.out.println(words);

words = addSIfNeeded(3, "cat");
System.out.println(words);

words = addSIfNeeded(16, "elephant");
System.out.println(words);
```

should print:

```
1 dog
3 cats
16 elephants
```

```
private String addSIfNeeded(int num, String word) {


    if (num == 1) {
        return num + " " + word;
    }

    return num + " " + word + "s";
}
```

(6 marks)

ID: .....

Question 8 (15 marks)

a) Complete the method, `printIfTrue()`, which is passed an `int` array and a `boolean` array as parameters. Both the parameter arrays have the same number of elements. The method prints the values of the `int` array only if the corresponding `boolean` element has the value `true`. The method does not print the `int` array value if the corresponding `boolean` element is `false`. For example, executing the following code with the completed method:

```
int[] nums = {9, 4, 7, 3, 2, 1};
boolean[] valid = {true, false, true, true, false, true };

printIfTrue(nums, valid);
```

gives the output:

```
9 7 3 1
```

```
private void printIfTrue(int[] a1, boolean[] a2) {


   for(int i=0; i<a1.length; i++) {

        if (a2[i] == true) {
           System.out.print(a1[i] +  " ");
        }
    }

    System.out.println();


}
```

(7 marks)

b) Complete the method, `getMaxArray()`, which is passed two `int` arrays as parameters. Both the parameter arrays have the same number of elements. The method creates a new array of the same size as the parameter arrays and fills each element of the new array with the maximum of the two corresponding elements of the parameter arrays. For example, executing the following code with the completed method:

```
int[] nums1 = {13, 18, 49, 9, 51, 25, 23, 4 };
int[] nums2 = {33, 23, 41, 9, 17, 51, 13, 45 };

int[] maxA = getMaxArray(nums1, nums2);

printArray(maxA);
```

gives the output:

```
maxA:  { 33, 23, 49, 9, 51, 51, 23, 45 }
```

Note: the `printArray()` method is not shown here

```
private int[] getMaxArray(int[] a1, int[] a2) {
    int[] maxA = new int[a1.length];

    for(int i=0; i<a1.length; i++) {

        maxArray[i] = Math.max(a1[i],
                               a2[i]);
    }

    return maxArray;
}
```

(8 marks)

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