THE UNIVERSITY OF AUCKLAND

SECOND SEMESTER, 2006
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:	

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

CompSci 101 Test Results

Question	Marks	Out of
Question 1		20
Question 2		8
Question 3		10
Question 4		8
Question 5		8
Question 6		6
TOTAL		**60**

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Question 1 (20 marks)

What is "printed" by each of the following pieces of Java program?

a)
```
System.out.print("a");
System.out.println("\\b");
```

```
a\b
```

(2 marks)

b)
```
System.out.println("X" + 2 + 3);
System.out.println((2 + 3) + "X");
```

```
X23
5X
```

(2 marks)

c)
```
int value = 13;
boolean big = (value > 54);
boolean little = (value < 20);
System.out.println(big || little);
System.out.println(big && little);
```

```
true
false
```

(2 marks)

d)
```
int i = 2;
int[] numbers = {4, 2, -7, 5, 1, 6, 3};
System.out.println (numbers[i]);
System.out.println (numbers[i+i]);
```

```
-7
1
```

(2 marks)

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e)
```
String word = "ABRACADABRA";
System.out.println(word.indexOf('R'));
System.out.println(word.indexOf("DAB"));
```

```
2
6
```

(2 marks)

f)
```
String name = "Procrastination";
System.out.println(name.substring(7, 11));
System.out.println(name.substring(9));
```

```
tina
nation
```

(2 marks)

g)
```
int i = 6, j = 10;
if (i < 8) {
     if (j > 15){
          System.out.println("Line 1");
     }
     else {
          System.out.println("Line 2");
     }
}
System.out.println("Line 3");
```

```
Line 2
Line 3
```

(2 marks)

h)
```
int x = Math.max(Math.min(5, 3), 4);
int y = Math.min(Math.max(5, 3), 4);
System.out.println(x);
System.out.println(y);
```

```
4
4
```

(2 marks)

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i)

```
int[] numbers = {3,4,10,6,-9,2,3,4};
int i = 0;
while ( numbers[i] > 0 ) {
     System.out.println( numbers[i] );
     i = i+1;
}
```

```
3
4
10
6
```

(2 marks)

j)

```
int[] numbers = {3,4,10,6,-9,2,3,4};
for (int i = 0; i < numbers.length; i++){
     if ( numbers[i]%3 == 0 )
          System.out.println( numbers[i] );
}
```

```
3
6
-9
3
```

(2 marks)

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

Question 2 (8 marks)

Complete the program given below. When the `start()` method is executed, the user should be prompted to enter two double values. The program should then calculate and display the harmonic mean of the two values entered. The harmonic mean of x and y is:

$$2 / (1/x + 1/y)$$

For example, the harmonic mean of 1 and 1 is 1, the harmonic mean of ¼ and ½ is ⅓, etc.

Look carefully at the two examples below. If you complete the `start()` method correctly, the output produced should be identical to that shown below:

```
Enter first number: 1
Enter second number: 3
Harmonic mean is 1.5

Enter first number: 0.25
Enter second number: 0.5
Harmonic mean is 0.333333333
```

Complete the `start()` method below. You can use the `Keyboard.readInput()` method for obtaining user input from the keyboard. Do not check for errors in the input. Assume that the user does not input a zero for either of the numbers.

```
public class HarmonicProgram {

    public void start() {


        System.out.println("Enter first number: ");
        String s1 = Keyboard.readInput();
        double d1 = Double.parseDouble(s1);

        System.out.println("Enter second number: ");
        String s2 = Keyboard.readInput();
        double d2 = Double.parseDouble(s2);

        double mean = 2.0/(1/d1 + 1/d2);
        System.out.println("Harmonic mean is " + mean);









    }
}
```

(8 marks)

CONTINUED

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Question 3 (10 marks)

Complete each of the methods below.

a)

```
// method to find the average of three numbers
private double average(int x1, int x2, int x3){

    return (x1+x2+x3)/3.0 ;


}
```

(2 marks)

b)

```
// method to decide whether an int is even
private boolean isEven(int n){

    return ((n%2) == 0);


}
```

(2 marks)

c)

```
// method to join two strings,
//      with a blank in between them
private String join(String s1, String s2){

    return (s1 + " " + s2);


}
```

(2 marks)

d)

```
// method to print "EQUAL" or "NOT EQUAL" depending on
// whether the two parameter strings have exactly the same
// sequence of characters
private void sayWhetherEqual(String s1, String s2){


    if (s1.equals(s2))
        System.out.println("EQUAL");
    else
        System.out.println("NOT EQUAL");


}
```

(2 marks)

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e)

```
// method to display the first parameter the number of
// times given by the second parameter, with no spaces
private void reiterate(String s, int n){

    for (int i=0; i<n; i++){
         System.out.print(s);
    }


}
```

(2 marks)

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Question 4 (8 marks)

a. Write a method called `sameFirstAndLast(String text)` which accepts a `String` parameter and returns a `boolean`. The method should return `true` if the last character of `text` is the same (including case) as its first character. If the characters are different, the method should return `false`. You may assume that `text` is never `null`, but if it is `""` the method should return `true`.

```
private  boolean  sameFirstAndLast(String text){

     if (text.length()==0)
          return true;

     char first = text.charAt(0);
     char last = text.charAt(text.length()-1);

     return (first==last);


}
```

(4 marks)

b. Using the `sameFirstAndLast()` method, complete the method `isStrictPalindrome()` that returns `true` if, and only if, the single `String` parameter is a strict palindrome (where both case and punctuation have to be matched correctly). You may test whether a string is a palindrome by seeing if the first and last characters are the same and, in that case, whether the string in between the first and last characters is also a palindrome. For example, "ATOYOTA" is a palindrome because the first and last characters are 'A' and "TOYOT" is a palindrome. Note that if `s` is a `String`, the `String` with first and last characters removed is `s.substring(1,s.length()-1)`

```
private  boolean  isStrictPalindrome (String text){
     String s = text; // now see if s is a palindrome
     while (s.length() > 1) {
          if (!sameFirstAndlast(s))
               return false;
          s = s.substring(1,s.length()-1);



     }
     return true;




}
```

(4 marks)

CONTINUED

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Question 5 (8 marks)

This question makes use of the `String` method `split()` to convert a sentence `String` into an array of word `Strings`. For example:

```
String[] words = "The fat cat".split("\\s+");
```

will produce an array `words`, of length 3, `words`, so that `words[0]` is `"The"`, `words[1]` is `"fat"` and `words[2]` is `"cat"`.

(a) Complete the method `getWord(String sentence, int i)` that will return the ith word of the parameter `String sentence`, counting from 0. If there are less than i+1 words in the string, return the empty `String ""`.

```
private String getWord(String sentence, int i){
     String words[] = sentence.split("\\s+");

     if (words.length < (i+1))
          return "";
     return words[i];



     }
```

(2 marks)

(b) Complete the method `censor()` that will take a parameter `String sentence` and produce a copy of `sentence` with all of the four-letter words replaced by `"****"`. You may assume that the words of the input `String` are separated by single blanks but there is no blank at its beginning or at its end.

```
private String censor (String sentence){
     String result = "";
     String[] words = sentence.split("\\s+");
     for (int i = 0; i<words.length; i++){
          if (words[i].length()==4)
                    result = result + "****";
          else
               result = result + words[i];
          if (i!=(words.length-1))
           result = result + " ";









     }
      return result;
}
```

(6 marks)

CONTINUED

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Question 6 (6 marks)

What is the output when the following program is executed? Note that the "helper" method `printArray()` just displays all of the elements of an array on one line.

```
// mystery program
public void start() {
     int[] numbers = {1,1,1,1,1};
     printArray(numbers);
     bump(numbers,1);
     printArray(numbers);
     bump(numbers,2);
     printArray(numbers);
     bump(numbers,3);
     printArray(numbers);
     bump(numbers,4);
     printArray(numbers);
}

// method to print an array of ints on one line
private void printArray(int[] a) {
     for (int j=0; j<a.length; j++)
          System.out.print(" " + a[j]);
     System.out.println();
}

// method to do something to an array of int numbers
private void bump(int[] nums, int limit) {
     for (int j=0; j<limit; j++) {
          nums[j] = nums[j] + nums[j+1];
     }
}
```

Show the output here:

```
1 1 1 1 1
2 1 1 1 1
3 2 1 1 1
5 3 2 1 1
8 5 3 2 1
```

(6 marks)

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ROUGH WORKING (WILL NOT BE MARKED)

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