THE UNIVERSITY OF AUCKLAND

SECOND SEMESTER, 2003

COMPUTER SCIENCE

Principles of Programming

TEST

(Time allowed: 75 MINUTES)

Surname:	
Forenames:	
Student ID number:	
Login name (UPI):	

Lab Group (e.g. Mon 1-3):	

INSTRUCTIONS:

- Attempt **ALL** questions - write your answers in the box provided
- Calculators are **NOT** permitted

Question	Mark
1	(/15)
2	(/10)
3	(/5)
4	(/15)
5	(/15)

Question	Mark
6	(/5)
7	(/10)
8	(/10)
9	(/15)

TOTAL: (/100)

Question 1 (15 marks)

(a) Write a statement which declares a variable called x as a boolean variable.

boolean x;

(1 mark)

(b) Write an assignment statement which stores the value 34.0 in a variable called d.

d = 34.0;

(1 mark)

(c) What is the output produced by the following code:

```
System.out.println( Math.round( 4.7 ) );
```

5

(1 mark)

(d) What is the output produced by the following code:

```
System.out.println( 3/4.0 + "5" );
```

0.755

(1 mark)

(e) What is the output produced by the following code:

```
System.out.println( "5" + 3/4 );
```

50

(1 mark)

(f) What is the output produced by the following code:

```
System.out.println( 5.0 + 4 + "3" + 2.0 + 1 );
```

9.032.01

(2 marks)

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(g) What is the output produced by the following code:

```
int n = 12;
int m = 15;
n = m;
m = n;
System.out.println(n + "^" + m);
```

15^15

(2 marks)

(h) List all the identifiers which appear in the following code fragment.

```
public static int getRandomNumber(int a, int b){
      int number = (int)(Math.random()*(b-a+1))+a;
      return number;
}
```

getRandomNumber
a
b
number
Math
random

(2 marks)

(i) What is the output produced by the following code:

```
System.out.println( 11%5 + "^" + 5%11 );
```

1^5

(2 marks)

(j) What is the output produced by the following code:

```
System.out.println( "+\"+\"+" );
```

+"+"+

(2 marks)

Question 2 (10 marks)

The following code is supposed to read a number from the user and print out if the number is a prime number or not. However, the program contains a number of errors (both syntactical and logical), and will not compile nor would it produce the correct result if it did compile. Identify each of the errors by circling the relevant place in the code, and rewrite the line which contains the error in the space provided. One of the errors is corrected for you as an indication of what we expect. There are 10 errors remaining in the code. Note: You can assume that the `readInput()` method is included and that it contains no errors.

```
import Java.io.*;
import java.io.*;
```

Corrected code

```
public Class Error{
public class Error{

      public static main(String[] args){
      public static void main(String[] args){

            System.out.print(Enter a number: ");
            System.out.print("Enter a number: ");

            int n = Integer.parseInt(readInput);
            int n = Integer.parseInt(readInput());

            String isPrime = "is";

            if(n = 1)
            if(n == 1)

                  isPrime = "is not";

            i = 2;
            int i = 2;

            while(i<=n){
            while(i<n){

                  if(i%n == 0){
                  if(n%i == 0){

                        isPrime = "is not";

                  }

                  i++
                  i++;
            }

            System.out.printline( "Your number " + isPrime + " a prime number");
            System.out.println( "Your number " + isPrime + " a prime number");

      }

      private static String readInput() {
            //Assume this works correctly
      }
}
```

(10 marks)

Question 3 (5 marks)

Rewrite the following code using a `for` loop instead of a `while` loop

```
int value = 0;
int j = 11;
while (j > -2){
      value = value + j;
      j = j - 3;
}
System.out.println("value: " + value);
```

Write your solution here:

```
int value = 0;


for(j=11; j>-2; j=j-3)
   value = value + j;

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

(5 marks)

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

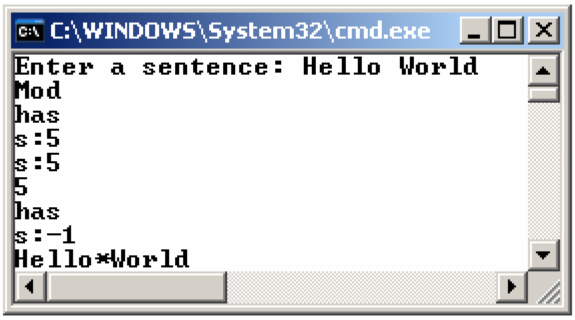
Question 4 (15 marks)

What is the output from the following code when the user enters "Hello World" at the prompt? You can assume that the code compiles and runs correctly.

```
import java.io.*;

public class Q4{
      public static void main(String[] args){
            System.out.print("Enter a sentence: ");
            String s = readInput();

            s = modify(s);
            System.out.println(s);
      }

      private static String modify(String s){
            System.out.println("Mod");
            while(has(s))
                  s = rep(s);
            return s;
      }

      private static boolean has(String s){
            System.out.println("has");
            return loc(s) >= 0;
      }

      private static int loc(String s){
            int i = s.indexOf(" ");       //single space
            System.out.println("s:" + i);
            return i;
      }

      private static String rep(String s){
            int i = loc(s);
            System.out.println(i);
            return s.substring(0,i) + "*" + s.substring(i+1);
      }

      private static String readInput() {
            try {
                  BufferedReader keyboard = new BufferedReader(
                        new InputStreamReader(System.in));
                  return keyboard.readLine();
            }
            catch (IOException e) {}
            return "";
      }
}
```

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

Enter your answer in the box below:



```
Enter a sentence: Hello World
Mod
has
s:5
s:5
5
has
s:-1
Hello*World
```

(15 marks)

Working for Question 04. This is NOT required, although partial credit may be given for working if the solution is incorrect.

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Question 5 (15 marks)

Convert the following English sentences into the appropriate Java statements. You may assume that we have declared variables `a, b, c, d, e, f, g` and `result` as integers. An example is included below:

English: *If g is equal to, or less than 4 then set result to 0*

Java:
```
if( g <= 4 )
      result = 0;
```

(a) If a is greater than 1 and b is less than 2 then set result to 1

```
if( a>1 && b<2)
     result = 1;
```

(1 mark)

(b) If either b is 2 or d is 3 then set result to 2

```
if(b == 2 || d ==3)
     result = 2;
```

(1 mark)

(c) If d is less than 3 and e is not 4 then set result to 3

```
if(d < 3 && e != 4)
     result = 3;
```

(1 mark)

(d) If c is not 4 and either b is 5 or d is 6 then set result to 4

```
if( c!= 4 && (b==5 || d ==6) )
     result = 4;
```

(1 mark)

(e) If b is not less than 7 and g is not equal to b then set result to 8

```
if( !(b<7) && g!=b)
     result = 8;
```

(1 mark)

(f) If either c is equal to d or both a is 7 and b is less then 10, then set result to 6

```
if( (c==d) || (a==7 && b<10))
     result = 6;
```

(2 marks)

(g) If d and e are both less than 7 and either f or g are equal to b, then set result to 9

```
if( d<7 && e <7 && (f==b || g==b))
     result = 9;
```

(2 marks)

(h) If both c and b are equal to 5 and neither e nor f are equal to 6 then set result to 5

```
if( (c==5 && b==5)&& !(f==6 || e==6))
     result = 5;
```

(2 marks)

(i) If a is less than 10, then set result to 7, unless b is greater than 10.

```
if(a<10 && !(b>10))
     result = 7;
```

(2 marks)

(j) If c is between a and b (inclusive), then set result to 10, unless c is equal to e or f

```
if( (c>=a && c<=b || c<=a && c>=b) && !(c==e||c==f))
     result = 10;
```

(2 marks)

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

Question 6 (5 marks)

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

```
int currentValue = 0;
int addOn = 5;

for(int i=0;  i<26;  i=i+addOn){
      System.out.println("i: " + i);
      if (i > 10){
            addOn++;
      }
      currentValue = currentValue + addOn;
}
System.out.println("Current Value: " + currentValue);
```

Write the output here:

```
i: 0
i: 5
i: 10
i: 15
i: 21
Current Value: 28
```

(5 marks)

Question 7 (10 marks)

Write the method, `sumDigits()`. This method is passed one parameter, a `String` of digits. The method returns the sum of the digits in the `String`.

For example, when the following code is executed with the completed `sumDigits()` method:

```
String numbersString = "314052";
System.out.println(numbersString);
System.out.println("Sum of Digits: "+ sumDigits(numbersString));
System.out.println();
numbersString = "839";
System.out.println(numbersString);
System.out.println("Sum of Digits: "+ sumDigits(numbersString));
```

the output is:

```
314052
Sum of Digits: 15

839
Sum of Digits: 20
```

```
private static int sumDigits(String numString){

     int sum = 0;
     char c;
     int digit;

     for(int i=0; i<numString.length(); i++){
          c = numString.charAt(i);
          digit = Integer.parseInt(""+c);
          sum = sum + digit;
     }

     return sum;

}
```

(10 marks)

Question 8 (10 marks)

Write the method, `arrangeNums()`. This method is passed one parameter, an array of `int`s. The parameter `int` array has all its elements filled with positive non zero values. The method returns a new `int` array containing the same numbers as the parameter array except that all the even numbers are at the beginning of the array and all the odd numbers are at the end of the array. The ordering of the numbers is not changed e.g. position 0 of the return array contains the first even number from the parameter array, position 1 of the return array contains the second even number from the parameter array, etc. Note: The following code makes use of a method called `printArray()`. This method is not shown below.

When the following code is executed with the completed `arrangeNums()` method:

```
int[] array1 = {2, 3, 6, 8, 1, 9, 6, 8, 1};
int[] array2 = arrangeNums(array1);
System.out.print("array1: ");
printArray(array1);
System.out.print("array2: ");
printArray(array2);
```

the output is:

```
array1: 2 3 6 8 1 9 6 8 1
array2: 2 6 8 6 8 3 1 9 1
```

```
private static  int[]  arrangeNums(int[] nums){
     int[] newNums = new int[nums.length];
     int upTo = 0;
     int end = nums.length-1;
     for(int i=0; i<nums.length; i++){
          if (nums[i]%2 == 0){
               newNums[upTo] = nums[i];
               upTo++;
          }
     }
     for(int i=0; i<nums.length; i++){
          if (nums[i]%2 == 1){
               newNums[upTo] = nums[i];
               upTo++;
          }
     }
     return newNums;

}
```

(10 marks)

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Question 9 (15 marks)

Complete the MoneyBalance class definition. This class stores the current balance for an account and a list of all the transactions made on that account. Each transaction is represented by an integer, positive for a deposit and negative for a withdrawal from the account. The balance and all the transactions are integer values.

When the following code is executed with the completed MoneyBalance class:

```
MoneyBalance moneyB1 = new MoneyBalance("Jim Bags",560);
MoneyBalance moneyB2 = new MoneyBalance("Jena Pots",230);
moneyB1.doTransaction(60);
moneyB1.doTransaction(-20);
moneyB1.doTransaction(200);
moneyB1.doTransaction(-40);
int amount = moneyB1.getBalance();
System.out.println();
System.out.println(moneyB1.getName()+" has $"+amount+" in bank.");

for(int i=0; i<7; i++)
      moneyB2.doTransaction(100);
moneyB2.doTransaction(-250);

System.out.println();
System.out.println(moneyB1.toString());

System.out.println();
System.out.println(moneyB2.toString());

System.out.println();
if (moneyB2.balanceIsBigger(moneyB1))
      System.out.println(moneyB2.getName()+" has more money.");
else if (moneyB1.balanceIsBigger(moneyB2))
      System.out.println(moneyB1.getName()+" has more money.");
else
      System.out.println(moneyB1.getName()+","+moneyB2.getName()+
                              " has the same money");
```

the output is:

```
Jim Bags has $760 in bank.

Jim Bags
4 transactions so far: 60 -20 200 -40
Current Balance: $760

Jena Pots
8 transactions so far: 100 100 100 100 100 100 100 -250
Current Balance: $680

Jim Bags has more money.
```

```
/**
 * Class which stores the current balance and a
 * list of transactions made on an account.
 * The balance can be adjusted by deposits and
 * withdrawals made on the account.
 *
 * Name: Adriana Ferraro
 * 2003
*/
public class MoneyBalance{
      private static final int MAX_TRANSACTIONS = 800;
                  //name of the account
      private String name;
                  //current balance of the account
      private int currentBalance;
                  //number of transactions made so far
      private int upToInArray;
                  //store an integer for each transaction
      private int[] transactions;

      public MoneyBalance(String name, int currBal){

                  name = n;
                  currentBalance = currBal;
                  upToInArray = 0;
                  transactions = new int[MAX_TRANSACTIONS];

      }

      public void doTransaction(int trans){

                  if(upToInArray>=MAX_TRANSACTIONS)
                        return;

                  transactions[upToInArray] = trans;
                  upToInArray++;
                  currentBalance = currentBalance + trans;

      }

      public String getName(){

                  return name;

      }

      public int getBalance(){

                  return currentBalance;

      }
      public   boolean  balanceIsBigger( MoneyBalance otherB  ){


            if (currentBalance > otherB.currentBalance)
                   return true;

            return false;

      }

      public String toString(){
             String str;


                  String str = name  +" \n"+upToInArray+
                                               " transactions so far: ";

                  for (int i=0; i<upToInArray; i++)
                        str += transactions[i]+" ";

                  str += "\nCurrent Balance: $"+getBalance();

                  return str;




      }
}
```