

Interrogation of Computer Science  
PCC-ASINSA-SCAN 1<sup>st</sup> year - January 2015



Total duration : 1h30.  
Allowed materials : None.

- The graduation can still change.
- The assignment is on 4 pages.
- All the questions are independant. If it is necessary to have solved A to solve B, then you can do as if you had solved A (and clearly indicate your assumption) to solve B.

## 1 Coding (4 points)

(Q1.1) Complete the following table :

	base 2	base 8	base 10	base 16
$1010\ 0101_2$	1010 0101			
$123_8$		123		
$224_{10}$			224	
$B2_h$				B2

(Q1.2) Give the result of the following operations on 8 bits :

$$0111\ 0111 + 0011\ 1100 = \quad (1)$$

$$0010\ 1101 \times 0000\ 0110 = \quad (2)$$

(Q1.3) Give the two's complement encoding on 6 bits of the following numbers :

$$-25 = \quad (3)$$

$$-32 = \quad (4)$$

## 2 GNU/Linux and Java environment

```
/home/vcheutet/  
  Documents/  
    JAVA/  
      Cours/  
        TPJava01/  
    OutilsNum/  
      Cours/  
        TPCalc/  
        TPWriter/  
  Perso/
```

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**(Q2.1) You are in the TPJava01 directory. What commands do you need to create a directory TPJava02 inside the JAVA directory, and then go inside the TPJava02 directory ?**

**(Q2.2) In the TPJava02 directory, you have created a file containing the source code of a java program. What must be the extension of this file ?**

**(Q2.3) Which commands do you need to compile and then execute the program of the class ProgTP2 ? Give a short explanation for each command.**

### **3 Program understanding I (3 points)**

**(Q3.1) What is displayed by the execution of the following program :**

```
public class Mix {
    public static void main(String[] arg) {
        int temp = 5;
        int res = method3(temp);
        System.out.println("program => " + res);
        method1(temp) ;
        System.out.println("program => " + temp);
    }

    public static void method1(int x) {
        int temp = 7 ;
        x = x + 1;
        System.out.println("m1 => " + temp + " and " + x);
    }

    public static boolean method2 (int y) {
        y = y + 1;
        System.out.println("m2 => 1st display : " + y);
        if (y > 5) {
            return true;
        } else {
            return false;
        }
    }

    public static int method3 (int z) { ;
        System.out.println("m3 => 1st display : " + z);
        if (method2(z) == true) {
            System.out.println("m3 => 2nd display : " + z);
        } else {
            z = z + 1;
            System.out.println("m3 => 3rd display : " + z);
        }
        return z;
    }
}
```

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## 4 Program understanding II (3 points)

In the following ExoIE1 class, the instruction `ReadKeyboard.readIntLn()` allows to read from the keyboard a value given by the user.

**(Q4.1) What is displayed by the program when the user enters the value 1294 ?**

**(Q4.2) Give a short explanation of what this program is doing.**

**(Q4.3) What happen when the user enters the value -10 ?**

```
public class ExoIE1 {
    public static void main(String[] arg) {
        int n;
        do {
            n=ReadKeyboard.readIntLn();
            System.out.println("n = " + n);
        } while (n<=0);

        int p=0;
        int k=1;
        while(k<n) {
            p=p+1;
            k=k*10;
        }
        System.out.println(p);
        System.out.println(k);

        for (int i=p;i>0;i--) {
            k=k/10;
            System.out.println(n/k);
            n=n/k;
        }
    }
}
```

## 5 Algorithm writing : pyramid (4 points)

The objective of this exercise is to write a method called `colEnV` taking an integer  $n$  as unique parameter. This method does not return anything. It must display a V made of stars (\*) and dash (-). The following example gives the result of the program for a value  $n = 5$ . Each line is composed of characters \* and -, and ends with the number of the line.

```
§
*-----* 1
**-----** 2
***-----*** 3
****-----**** 4
*****-----***** 5
```

- 
- (Q5.1) For a V of height  $n$ , how many characters compose each line ?
- (Q5.2) On the line  $i$ , what is the number of the first successive \* characters, then the number of - characters, and the number of trailing \* characters ?
- (Q5.3) Assuming that the characters of a line are numbered from 1 starting from the left, for the line  $i$ , what are the positions of the \* that are at the transition with the - (indicated by a v on the following example) ?

```
      v   v
*****---*****
```

- (Q5.4) Write the method `colEnV` that displays a pyramid with  $n$  lines. You should take particular attention to (1) the method signature (its header), (2) the choice of the iterative loops, (3) the indentation, (4) the displayed information. No justification is required for the choice of the algorithm.

## 6 Algorithm writing - just in time (4 points)

The `JustInTime` class allows the conversion of a duration given in hours, minutes, seconds into a duration expressed in decimal hours. For instance 2 h 30 min 36 sec corresponds to 2,51h.

- (Q6.1) Write the `convertDec` method that converts of a duration expressed in hours, minutes, seconds into a duration expressed in decimal hours. It takes as input three parameters corresponding to the hours, the minutes and the seconds. It computes and returns the corresponding duration in decimal hours.
- (Q6.2) Write the `conversionHMS` method that displays a duration in hours, minutes, seconds from a duration in decimal hours. It takes 1 parameter corresponding to the duration in decimal hours and does not return anything.
- (Q6.3) Write the main method that calls the two previous methods in order to compute and display in hours, minutes, seconds the duration corresponding to two times 2h 30min 36sec.

Be careful to the conversions between types.