



Algorithmic and Data Structures1 (ASD1)

Exercise Series N° 3

Exercise 1.

Consider the following algorithm:

```

ALGORITHM CALUL
VARIABLES
    a, b, c, p: integer
Begin
    c ← 0
    p ← 1;
    write("enter a nbr < 64\n");
    read(a);
    b ← a mod 8;
    a ← a div 8;
    c ← c + b*p;
    p ← p*10;
    b ← a mod 8;
    a ← a div 8;
    c ← c + b*p;
    p ← p *10;
    write( c);
end

```

1. Run the algorithm for : a= 14 and for a=37
2. What does the algorithm do?
3. Rewrite the display result statement to better display the result.
4. What happens if the value of "a" exceeds 64?
5. Translate the algorithm into a C program. (TP)

Exercise 2.

A lead ball is dropped from the top of a building and falls in free fall. After a time  $t$  (expressed in seconds), the ball has descended a height (in meters):  $h = \frac{1}{2}gt^2$  with  $g = 9.81$  (expressed in  $(m.s^{-2})$ )

Write an algorithm which calculates the height descended after a time  $t$  entered on the keyboard.

Example  $t=4$  seconds  $\rightarrow h = 78.48$  meters

Exercise 3.

Write an algorithm that gives a temperature in degrees Celsius from a temperature in Fahrenheit.

$$C = (5/9) * (F - 32)$$

Example : Temperature = 85 °F  $\rightarrow$  29.44°C

Exercise 4.

We have an unlimited number of coins of 50, 20, 10, 5 and 1 dinar. We wish, given a sum  $S$ , to know with which coins the payer is so that the number of coins used is minimal. For example, the sum of 96 Dinars is paid with one 50 Dinar coin, two 20 Dinar coins, one 5 Dinar coin and one 1 Dinar coin.

Write a program asking the user to enter a value between 0 and 99. Then, display the details of the coins to use to constitute the entered sum with a minimum number of coins.

Example :  $S=198$  dinar  $\rightarrow$  To pay it, you will need 3 coins of 50 DA , 2 coins of 20 DA , 1 coin of 5 DA, 3 coin of 1 DA

Practical Work

Exercise 1.

Write an algorithm that reads a positive number of seconds and converts it to hours, minutes, and seconds.

Example : 15394 seconds = 4 hours , 16 minutes and 34 seconds

Exercise 2 .

Write a program that converts a given number in bits into Bytes, Kilobytes, Megabytes.

Example : 8426240 bits  $\rightarrow$  = 1053280 Bytes = 1028.59 Kilobytes = 1.004 Megabytes

Exercise 3.

Write a program which solves a first degree equation  $ax+b=0$  knowing that  $a \neq 0$

Example :  $a= 3$  ,  $b= -7 \rightarrow x= 2.33$