



## Tutorial N° 02: Simple Sequential Algorithm

### Exercise 01: Sum and Average

Write an algorithm that reads **three integers**, calculates their **sum** and their **average**, and then displays the results.

**Exercise 02:** Write an algorithm called swap which first allows you to read two integers **a** and **b**. Then, to swap their values (so that the value of a goes to b and the value of b goes to a). And finally, to display the two new values.

### Exercise 03:

Write an algorithm in which you have at first to read three **variables a, b** and **c**. And then, to transfer the value of b to a, the value of c to b and the value of a to c. Obviously, display the new values.

### Exercise 04:

Write an algorithm that asks the user for **a number**, then calculates and displays the **square** of that number.

### Exercise 05:

Write an algorithm that asks the user for the **width** and the **length** of a rectangle and then calculates and displays the **perimeter** and the **area** of this rectangle.

### Exercise 06: Convert Celsius to Fahrenheit

Write an algorithm that reads a **temperature** in **Celsius** and converts it to **Fahrenheit** using the formula:

$$F = C \times 5/9 + 32$$

**Exercise 07 :** Consider the following C program.

```
#include<stdio.h>
main(){
    int n2;
    float n1, average, sumSq;
    printf("Please enter two numbers \n");
    scanf("%f%i",&n1,&n2);
    average=(n1+n2)/2;
```

```

sumSq=n1*n1+n2*n2;
printf("The average of %f and %i = %f and the sum of their squares is %f", n1,n2,average,
sumSq);
}

```

- 1- If n1 is equal to 5 and n2 is equal to 2, what is displayed on the screen after running this program?
- 2- What does this program do?
- 3- If we declare n1 to be integer, what is the result in this case? And what changes should be made to the program ?
- 4- Give the algorithm and the flowchart of the previous program.

**Exercise 08:** Write an algorithm that reads the first name and last name of a student, then displays the following message “Your name is [student\_last\_name] [student\_first\_name]”.

### Additional Exercises

#### Exercise 09: Simple Interest

Write an algorithm that reads the **principal amount**, the **interest rate**, and the **time** in years, then calculates and displays the **simple interest**.

$$\text{Formula : } SI = (\text{Principal} \times \text{Rate} \times \text{Time})/100$$

#### Exercise 10:

Write an algorithm that calculates and displays the **diameter**, **area** and **Circumference** of a circle. The algorithm must ask the user to enter the value of radius r.

$$\text{Diameter} \quad d = 2 \times r$$

$$\text{Circumference} \quad c = \pi \times d = 2 \times \pi \times r$$

$$\text{The area of a circle} \quad a = \pi \times r^2$$

#### Exercise 11:

To obtain the price including all taxes (TTC) of an item, from a price excluding taxes (HT), the following formula is used:

$$\text{price including tax} = \text{price excluding tax} \times (\text{VAT rate} + 1),$$

where VAT is the Value Added Tax

Write an algorithm that reads:

- the price excluding tax of an item.
- the number of items, and
- the VAT rate,

Then calculates and displays the **total price including tax**.

#### Exercise 12:

Give the algorithm, the flowchart and the C program for the following task.

Calculate and display the volume of a sphere.

The value of the radius  $r$  must be entered by the user. **Note:**  $v = (4\pi/3) \times r^3$

## Solution exercise 7:

1-

```
1 #include <stdio.h>
2 int main() {
3
4
5     int n2;
6     float n1, average, sumSq;
7     printf("Please enter two numbers \n");
8     scanf("%f%i", &n1, &n2);
9     average=(n1+n2)/2;
10    sumSq=n1*n1+n2*n2;
11    printf("The average of %f and %i = %f and the sum of their squares is %f", n1,n2,average,sumSq);
12    return 0;
13 }
14
15 "D:\les exo en C\exercice 5 tutorial 2\bin\Debug\exercice 5 tutorial 2.exe"
16 Please enter two numbers
17 5
18 2
19 The average of 5.00 and 2.00 = 3.50 and the sum of their squares is 29.00
20 Process returned 0 (0x0)   execution time : 6.184 s
21 Press any key to continue.
```

2- This program calculates and display the average of  $n1$  and  $n2$ , and, the sum of their squares.

3- If we declare  $n1$  as an integer and we don't change anything,

```
#include <stdio.h>
int main() {
    int n1, n2;
    float average, sumSq;
    printf("Please enter two numbers \n");
    scanf("%i%i", &n1, &n2);
    average=(n1+n2)/2;
    sumSq=n1*n1+n2*n2;
    printf("The average of %f and %i = %f and the sum of their squares is %f", n1,n2,average,sumSq);
    return 0;
}
Sélection "D:\les exo en C\exercice 5 tutorial 2\bin\Debug\exercice 5 tutorial 2.exe"
Please enter two numbers
5
2
The average of 0.000000 and 2 = 542113792.000000 and the sum of their squares is 4.000000
Process returned 0 (0x0)   execution time : 5.813 s
Press any key to continue.
```

4-

But if we modify the necessary the decimal part of the average will be lost because integer division produces an integer result.

```
1 #include <stdio.h>
2 int main() {
3     int n1, n2;
4     float average, sumSq;
5     printf("Please enter two numbers \n");
6     scanf("%i%i", &n1, &n2);
7     average=(n1+n2)/2;
8     sumSq=n1*n1+n2*n2;
9     printf("The average of %i and %i = %f and the sum of their squares is %f", n1,n2,average,sumSq);
10    return 0;
11 }
12
13 "D:\les exo en C\exercice 5 tutorial 2\bin\Debug\exercice 5 tutorial 2.exe"
14 Please enter two numbers
15 5
16 2
17 The average of 5 and 2 = 3.000000 and the sum of their squares is 29.000000
18 Process returned 0 (0x0)   execution time : 4.746 s
19 Press any key to continue.
```

Declare both n1 and n2 as floats, and adjust the scanf , printf format as follows:

```
#include <stdio.h>
int main() {
    float n1,n2,average, sumSq;
    printf("Please enter two numbers \n");
    scanf("%f%f",&n1,&n2);
    average=(n1+n2)/2;
    sumSq=n1*n1+n2*n2;
    printf("The average of %f and %f = %f and the sum of their squares is %f", n1,n2,average,sumSq);
    return 0;
}
```

### Solution of exercise 11:

#### Algorithm Calculate\_TTC

##### Variables

price\_ht, vat\_rate , price\_ttc, total\_ttc : real  
quantity : INTEGER

##### begin

write ("Enter the price excluding tax (HT): ");  
read (price\_ht);  
write ("Enter the number of items: ");  
read (quantity);  
write ("Enter the VAT rate // (e.g., 0.19 for 19%): ");  
read (vat\_rate);  
price\_ttc ← price\_ht \* (1 + vat\_rate);  
total\_ttc ← price\_ttc \* quantity;  
write ( "The total price including tax (TTC) for ", quantity, " item(s) is: ", total\_ttc);

##### End