High School Students Mentorship

AN INTRODUCTION TO MATHEMATICAL COMPUTING WITH PYTHON

What is a Function ?

A function relates an input to an output.

It is like a machine that has an input and an output.

And the output is related somehow to the input.

Application

Do you remember this equation ?

$$ax^2 + bx + c = 0$$

If yes, what was the objectives behind this equation ?

We will write a function which can solve this equation directly.

FUNCTIONS IN PYTHON

To define a function in Python, we use the following syntax :

```
def  nameOfTheFunction ( parameters ) :
        instructions
```

To return a result or an output coming from the function, we use the command line:

```
return value
```

PRACTICAL EXERCISE

Write a function which solves the second order equation or quadratic equation.

```
def quadratic(a,b,c):
        delta = b**2 – 4*a*c
        if delta = 0 :
                instruction
                return x
        …
```

THE LOOP IN PYTHON

In python we have the for loop and the while loop. During our traning, we will only focus on the for loop which is more easy to handle than the while loop. The syntax for the for loop is as follows :

```
for i in range (number of iteration):
    instructions
```

COMPUTATION OF SEQUENCES

Let consider the sequence defined by :

$$\begin{cases} U_0 = 2 \\ U_{n+1} = U_n + 3, \qquad n \geq 0 \end{cases}$$

Compute by hand the 5 first terms of this sequence, then use your computer to write a code using the for loop, in order to compute these terms and confirm.

PRACTICAL EXERCISE

Compute the value of S using a code that you will write down, defined by :

$$S = U_0 + U_1 + \cdots + U_{10}$$

We also define S by the following formula :

$$S = \sum_{k=0}^{10} U_k$$

EXERCISE

Let consider the sequence defined by :

$$\begin{cases} W_0 = 1 \\ W_{n+1} = 2W_n, \qquad n \geq 0 \end{cases}$$

Compute using your computer :

$$S = \sum_{k=0}^{10} W_k$$

ASSIGNMENT

Compute the value of T defined by :

$$T = \prod_{k=1}^{10} 2^k$$

Using your computer.

THANK YOU FOR YOUR KIND ATTENTION !!!!!!!.....