African Institute for Mathematical Sciences – AIMS-SN


# InPy-02 – Functions & Recursions

September 9, 2019

1. Write a python script that asks the user for the values of $x$ and $y$ and uses these inputs to compute the numerical value of the expression

$$\frac{\sqrt{x^{2+y}}}{\frac{1}{x}+2\sin y}.$$

2. Write a function that given two integers $b$ and $n$ ($n$ is positive), calculates $b^n$ without using python's power operator. Name this function `ownpowerfn.py`.

   PS: What if we do not specify that $n$ has to be positive?

3. Write functions that do the following:

   a) Takes two arguments, and computes their arithmetic and geometric means. Name these functions `arithmetic_mean` and `geometric_mean` respectively.

   b) Converts degree Celsius to Fahrenheit and vice versa. Name these two functions `celcius_to_fahrenheit` and `fahrenheit_to_celcius` respectively.

   c) Converts angle in degrees to radians and vice versa. Name these two functions `degrees_to_radians` and `radians_to_degrees` respectively.

   d) Computes the circumference and the area of a circle given the radius.

4. Write functions that do the following:

   a) Given two numbers, compute their average and geometrical mean and prints them. Now write a program that performs this process 10 times, taking as input the means computed in the previous step. Name this function `avggeom`.

b) Write a function that computes the distance between two points in the plane. Use it in another program that computes the perimeter and the area of a triangle, given three points in the plane. Name this function `distancefn`.

5. Write a program that offers three options to the user:

   1.Evaluation of actorial

   2.Evaluation of a second degree equation

   3. Exit

   The user selects one of the options and then the program requests the data needed and calls the corresponding function to produce a result. The program then repeats the process until the user says he wants to exit. Name this function `fact2nddeg`.

6. For a fixed real number $x$ and a natural number $n$, we can define recursively $x^n$ using the relations:

$$x^0 = 1 \qquad \text{and} \quad x^{n+1} = x.x^n.$$

   Write a function `power(x,n)` that implements the above recursion.

7. Write code that implements the Fibonacci sequence. Test your program at 100.