Institut de Mathématiques et de Sciences Physiques – IMSP

In2Py-01 – Conditionals & For loops

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1 Summations and Products

1. Compute the following expressions for a natural number n chosen by the user:

   (i) $\sum_{\substack{i=0 \\ i \text{ is odd}}}^{n-1} (i+3)$.

   (ii) $\prod_{\substack{i=0 \\ i \text{ is even}}}^{n-1} (i+3)$.

2. Write a program that reads the number of the day of the week (from 0 to 6). If it is a working day, then the program will write the name of the corresponding day. Otherwise, it will write the word "Weekend".

3. Make a program that, given a month number (from 0 to 11), indicates how many days it has (28, 30 or 31), ignoring the leap years.

4. Write two versions of python code that displays your name 3 times. One version with a "for loop" and another version with a "while loop".

5. Given two numbers a_0 and a_1, the Fibonacci sequence they generate is constructed from the recursion formula $a_{n+1} = a_n + a_{n-1}$. Calculate the first 15 terms of a Fibonacci sequence, asking the user the initial values.

6. Compute the first 30 terms of the sequence defined by $2x_{n+2} - x_{n+1} - 6x_n = 0$ sequence, given any two initial values x_0 and x_1

7. a) Write python code to determine whether or not a year is a leap year. Be sure you know what a leap year is.

   b) Write the code using only logical operators, i.e. no conditional branching.

8. a) Write python code that computes the sum of the square of the first n natural numbers. One version with a "for loop" and another version with a "while loop".

   b) Write python code that prints, for a natural number M, the smallest natural number n such that $1^2+2^2+\cdots+n^2 \geq M$. One version with a "for loop" and another version with a "while loop".

9. a) Write python code that prints all the divisors of a given natural number.

   b) Read an integer number input by the user and calculate its prime factors. This will just be some of its divisors.

10. Read an integer number between n 0 and 9 and print its multiplication table up to N where N is another another natural number read by the program.

11. Write a program that prints all the numbers between 0 and 40 that are multiples of 3, 7 or 11.

12. Write python code that prints the **floor** of a float x. Recall that the floor of a float x is the largest integer value less than or equal to x, i.e. if $E[x]$ is the floor of x, then it satisfies,

$$E[x] = 1 + E[x-1]$$

    PS: On Friday, you will be asked to write a recursive version of the above program.

13. Given a point in the plane by its Cartesian coordinates, determine in which quadrant it is (1st, 2nd, 3rd, 4th), if it lies on an axis, or if it is the origin. Do this for several points in the same execution of the program until the user quits.

14. Ask for an integer number between 0 and 9, denoted x. Once the user has entered a correct number (that is one in the range [0..10)) the program asks for a second integer number between 0 and 255, denoted max. The program continues asking for the number until it is correct (that it is in the range [0..256)). When this is done, show all multiples of x that are between 0 and max. Then, ask the user whether he/she wants to continue; if in the affirmative, ask for another couple of numbers, otherwise finish.