Data Analysis Lab
Degree in Information Technology
2º Semester 2022/2023

Worksheet 1

Goals:

- Introduction/Revision to Python
- Consolidate Python knowledge to be applied in data analysis

Exercises

Part I

Import the math library and do the following exercises:

```
import math
```

1- Write a function to calculate a sphere volume knowing that:

$$\frac{4}{3} * \pi * r^3$$

2- Calculate the result of the following polynomial for: x = 1.1; x= 5; and x = 2/3

$$x^4 + x^3 + 2 * x^2 - x$$

3- Create the function `smaller (number, list)` to count how many elements in a list (`list`) are lesser than one reference element (`number`), *e.g.*,

```
>>> smaller (6, [2, 3, 6, 5])
3
```

4- Create a function that receives a list of values and returns the final average after removing the lowest and highest value, e.g.,

```
>>> average([12,23,1,15,18,33])
17.0
```

5- Write a function that receives a list of integers and returns the result of its sum alternating between positive and negative. For example, the result of `[5,3,8,4]` is `6 (5-3 + 8-4)`.

```
>>> sum_minus([5,3,8,4] )
6
```

6- Create a list with the grades of 20 students. Using list comprehension, identify:
   a. The grades higher than the average.
   b. The grades lower than the average.
   c. How many students got a negative grade.
   d. Knowing that students with grades between 11 and 13 need an oral exam, identify how many students will take the oral exam.

7- Write a function that counts the number of lowercase letters that appear after the %. If % does not exist, it counts only the lowercase letters in the sentence. For example:
   - "Journey Before% Destination" returns 10 ("estination");
   - "abCDe" returns 3;
   - "Testing, testing, 123%" returns 0.

```
>>> countS("Journey Before% Destination")
10
```

8- Two words are anagrams if you can rearrange the letters of one to spell the other. Write a function that uses two strings and returns `True` if they are anagrams or `False` otherwise.
The function should consider uppercase and lowercase letters as being the same letters. For example, if you receive 'iracema' and 'america' you should return True.

```
>>> anagrams("iracema","america")
True
```

Part II

Import the following libraries for the next exercises. If the libraries are not installed, include them into the python environment.

- File -> Settings -> Project nameProject -> Python Interpreter
- Add matplotlib and numpy

```
import matplotlib.pyplot as plt
import numpy as np
```

1. Create an array 2×2 with float elements and check the size.
2. Modify the position [1,1] to 10.
3. Create an array 2×2 with float elements equal to 1
4. Create an array that starts at 2 and goes to 50 in steps of 2. Check its size.
5. Create an array 10×10 with 0s. Set the rows 3 to 6 and columns 5 to 7 with 1.
6. Use the following matrixes: [[1., 2., 3.], [4., 5., 6.]] and [[1., 5., 2.], [6., 4., 2.]] and do: sum and element multiplication of these matrixes.
7. Transform matrix B into a dimension vector 1×6.
8. Create an array of 9 elements and then transform it into an array of 3×3.
9. Let array A be created randomly `A = np.random.randint (1, 10., 5)`. Obtain the maximum, minimum and the corresponding positions. Then, calculate the average.

10. Consider the following array:

```
np.array([[3 ,6, 9, 12],
[15 ,18, 21, 24],
[27 ,30, 33, 36],
[39 ,42, 45, 48],
[51 ,54, 57, 60]])
```

a) Print only the even rows and the odd columns.

b) Print the maximum elements per row and per column.

11. Create a matrix 8×3 from a range between 10 and 34. The difference between each element is 1. Then, split the matrix into four sub-matrices of equal size.

12. Consider the following arrays and print the positions which hold equal values.

```
a = np.array([1,2,3,2,3,4,3,4,5,6])
b = np.array([7,2,10,2,7,4,9,4,9,8])
```

13. Create a function to print the exponential function graph given an x vector with values in the range [-10, 10].