Exercise 2 – Python, Part I

1. Welcome (0P)

In this session, you will do some simple exercises on Python basics. If required, please install Python and/or a development IDE on your computer.

2. Hello Python (5P)

Write a python script **hello_world.py** that **prints** the string **"Hello World"** to the screen. Execute that script from the command line.

3. Playing with lists (25P)

Write a Python script **lists.py** in which you do the following:

    i.   (5P) Store the values **'Python', 'C++'**, and **'Java'** in a list. Print each of these values out.

    ii.   (5P) Think of other programming languages. Then insert one new language at the beginning of the list, and another new language at the end of the list. Use different methods for the first and the second item. Finally print out your list of languages, including the index of each language in the list. The format should be as follows:

> 0 – Language 1
>
> 1 – Language 2
>
> …
>
> n – Language n

    iii.   (5P) Imagine you are Bart Simpson and have been instructed to write down the three middle elements of your list 100 times. Python offers a very simple way out of this dilemma, without having to use any loop-structures. To not overload your shell, only print out the elements 10 times.

    iv.   (5P) Because you only printed out your list 10 times, you have been told to write down the numbers from 1 to 1.000.000 instead. Make sure that you store all the numbers in a new list.

    v.   (5P) Use a list comprehension on the list obtained in **(iv)** to copy the numbers 1 to 1000 into a new list. Print out that list in a reversed order, each element in a new line. On the new list, also use another list comprehension to create another list that only contains those numbers that are multiples of 10. Print out the list.

4. Dictionaries (30P)

a) (10P) Wikipedia has a list of the tallest mountains in the world, with each mountain's elevation. Pick five mountains. In a python file **mountains.py**:
- i. Create a dictionary with the mountain names as keys, and the elevations as values.
- ii. Print out just the mountains' names.
- iii. Print out just the mountains' elevations.
- iv. Print out a series of statements telling how tall each mountain is: "Everest is 8848 meters tall."

b) (20P) A Gaussian (or normal) distribution is described by a **mean m** and a **standard deviation s**, which describes the "breadth" of the distribution around **m**. In a Gaussian distribution, the following properties hold:
1. 68.27% of all values fall within the range m +/- s
2. 95.45% of all values fall within the range m +/- 2s
3. 99,73% of all values fall within the range m +/- 3s

In Python, you can use the function `random.gauss(m,s)` to obtain a random number according to the Gaussian distribution defined by m and s. In a new file **histogram.py:**

- i. Import the Python module random. You can simply do that by typing `import random` as your first line of code.
- ii. Create 1000 random numbers according to a Gaussian distribution. Select **m** and **s** in a way that your distribution generates numbers between 0 and 10. Store the created numbers in a list.
- iii. With the help of a dictionary, count the number of occurrences of each number between zero and ten in your list.
- iv. Finally, print out a *normalized* histogram of the distribution of appearances of each of the numbers 0 to 10 in the list. Example:

```
0:
1:     ***
2:     *******
3:     ****************
4:     *************************
5:     **************************
6:     *********************
7:     ************
8:     ***
9:     *
10:
```