No documentation of any type (AI such as ChatGPT, PDF, internet, ...) are allowed. Answers should be given into the left spaces between questions, and your name must be written on the first page, just below this box.

Name: _____

Question:	1	2	3	4	5	Total
Points:	2	2	2	2	4	12
Bonus Points:	0	0	0	0	0	0
Score:						

1 General concepts

1. (2 points) Could you explain what is vectorization in NumPy? Could you give an example of computation using vectorization and how you would do it in native python.

2 Basic manipulations

2. (2 points) Let's assume a NumPy array `a = np.array([[1, 2, 3], [4, 5, 6]])`. What would `a[a%2==0]` return?

3 Simplified code

3. (2 points) Write a simplified code shipper which opens a file ‘text.txt‘, computes and prints some statistics, namely the number of lines and the number of words per line.

4 Understanding and debugging code

4. (2 points) Give the result of the following code snippet:

```
import numpy as np
a = np.array( [[0 , 1 , 2 ] , [3 , 4 , 5 ] , [6 , 7 , 8 ]] )
selected = a > 5
print ( a[selected] )
a[selected] = a[selected]*10
print (a[1:, 0:-1])
```

5. (4 points) Find the mistakes (if any) and correct them in the following pyuthon function. This function takes a dataframe `df` and

   - loop over columns and for each of them;
   - for each column, compute the mean μ and the standard deviation σ;
   - compute the fraction of observations being in the interval $[\mu - \sigma, \mu + \sigma]$

```
import numpy as np
import pandas as pd
def fraction_at_one_sigma(df):
    for c in df.columns:
        Xs = df.c.values
        mean = np.mean(Xs, axis=1)
        std  = np.std(Xs, axis=1)
        in_one_sigma = (Xs<=mean+std) & (Xs>=mean-std)
        fraction = in_one_sigma / Xs.size()
        print(f'{c} have {fraction} observation in the 1 sigma interval'
 return
```