

1. Submit your **report** as a **Microsoft Word** file on Canvas before the deadline.
2. **Annotate** all your answers in your submission using the following **format**:

Answer to Question X

3. Include your **Python code** in your **report**.
4. Name your file in following format: **Lab1_SID_LastName_FirstName**
5. Type your **name** and **student ID** on the first page of your report.

10 marks

Q1) In this question, you will write a **Python function** to modify the elements of a **square matrix**.

The input to the function should be a matrix. The code should check whether the input matrix is square or not. If it is not square, the Python function should print “the matrix is not square”. If the matrix is square, the Python function should modify the elements of the matrix as follows.

- a) If an element of the matrix is **even**, that element is multiplied by 5.
- b) If an element of the matrix is **odd and a multiple of 5**, that element is divided by 5.
- c) Other elements of the matrix are not modified.
- d) Use for loops for modifying the elements of the matrix.
- d) The function should return the modified matrix.

1- Include your code in your report.

2- Call your function with the following matrix as input. Include the result in your report.

$$A = \begin{bmatrix} 1 & 3 & 4 \\ 3 & 4 & 1 \end{bmatrix}$$

3- Call your function with the following matrix as input. Include the result in your report.

$$A = \begin{bmatrix} 2 & 5 \\ 3 & 8 \end{bmatrix}$$

Hint: You can use the “**shape**” function from the **numpy module** to find the size of a matrix. The matrix should be defined using the “**array**” function. Here is an example:

```
import numpy as np
A=np.array([[1,2]],float)
B=A.shape # The first element of B is the number of rows. Its second element is the number of columns
print(B[0])
print(B[1])
```

Answer:

```
def M(A):
```

```
    D=A.shape
```

```
    if D[0]!=D[1]:
```

```
        print(A, 'is not a square matrix')
```

```
        return
```

```
    if D[0]==D[1]:
```

```
        for i in range(0,D[0]):
```

```
            for j in range(0,D[1]):
```

```
                if A[i,j]%2==0:
```

```
                    A[i,j]=A[i,j]*5
```

```
                if A[i,j]%2!=0 and A[i,j]%5==0:
```

```
                    A[i,j]=A[i,j]/5
```

```
    return A
```

```
import numpy as np
```

```
A=np.array([[2,5],[3,8]],float)
```

```
M(A)
```

Checks whether the input is a square matrix

Modifies the elements of the matrix

Q2: In this question, you will write a **Python function** to compute the **sum of two matrices**. That is, each entry of the sum matrix is equal to the sum of its corresponding entries of the input matrices. Here is an example:

$$\mathbf{A} + \mathbf{B} = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{bmatrix} + \begin{bmatrix} b_{11} & b_{12} & \cdots & b_{1n} \\ b_{21} & b_{22} & \cdots & b_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ b_{m1} & b_{m2} & \cdots & b_{mn} \end{bmatrix}$$

$$= \begin{bmatrix} a_{11} + b_{11} & a_{12} + b_{12} & \cdots & a_{1n} + b_{1n} \\ a_{21} + b_{21} & a_{22} + b_{22} & \cdots & a_{2n} + b_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} + b_{m1} & a_{m2} + b_{m2} & \cdots & a_{mn} + b_{mn} \end{bmatrix}$$

Write a **Python function** to compute the sum of two matrices as follows.

- The inputs to the function are two matrices.
- The function should check whether the two matrices have the same size. If not, it should print “The input matrices are not of the same size”.
- If two matrices are of the same size, the function computes the sum and returns the answer.
- Use for loop function to compute the sum. **You are not allowed** to use the available Python functions to compute the sum of matrices.

1- Include your code in your report.

2-Call your function with the following matrices as input. Include the result in your report.

$$A = \begin{bmatrix} 1 & 3 & 4 \\ 3 & 4 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 & 6 \\ 3 & 8 \end{bmatrix}$$

3-Call your function with the following matrix as input. Include the result in your report.

$$A = \begin{bmatrix} 1 & 6 \\ 3 & 8 \end{bmatrix}, B = \begin{bmatrix} 2 & 4 \\ 1 & 5 \end{bmatrix}$$

Answer:

```
def sum(A,B):  
    Da=A.shape  
    Db=B.shape  
    if Da!=Db:  
        print('The input matrices are not of the same size')  
        return  
    if Da==Db:  
        C=np.zeros(Da,float)  
        for i in range(0,Da[0]):  
            for j in range(0,Da[1]):  
                C[i,j]=A[i,j]+B[i,j]  
        return C  
  
import numpy as np  
  
A=np.array([[1,1],[3,4]],float)  
B=np.array([[5,6],[4,8]],float)  
sum(A,B)
```

Checks whether the two matrices are of the same size

Computes the Hadamard product