

Name: ..... ID Number: .....

## 1 NumPy Package

1. Import NumPy as np

2. Create a row vector

$$row\_vector = [0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9]$$

3. Create a column vector

$$column\_vector = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$

4. Create a  $3 \times 3$  matrix and transpose it

$$matrix = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}, matrix\_transpose = \begin{bmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{bmatrix}$$

5. Create a  $5 \times 5$  identity matrix

$$identity\_mat = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

6. Create a  $2 \times 3$  zeros matrix

$$\text{zeros\_mat} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

7. Create a  $3 \times 2$  ones matrix

$$\text{ones\_mat} = \begin{bmatrix} 1 & 1 \\ 1 & 1 \\ 1 & 1 \end{bmatrix}$$

8. Create a  $4 \times 4$  random matrix

$$\text{random\_mat} = \begin{bmatrix} 0.50927412 & 0.43994241 & 0.38670773 & 0.51429611 \\ 0.93325191 & 0.344963836 & 0.74652945 & 0.53674476 \\ 0.07711003 & 0.43815730 & 0.12890019 & 0.20120680 \\ 0.30808018 & 0.56342730 & 0.46073982 & 0.86335771 \end{bmatrix}$$

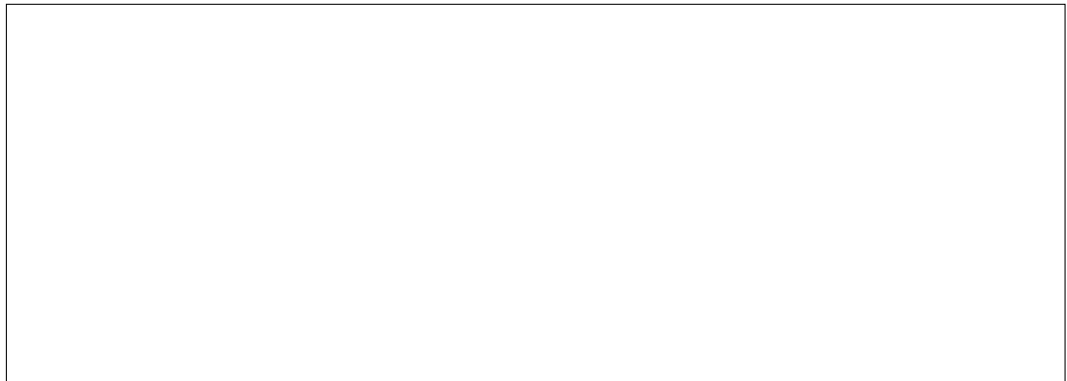
9. Create the following matrix by simply use the matrix created in question 3

$$\text{identity\_mat} = \begin{bmatrix} 1 & 2 & 3 & 1 & 2 & 3 & 1 & 2 & 3 \\ 4 & 5 & 6 & 4 & 5 & 6 & 4 & 5 & 6 \\ 7 & 8 & 9 & 7 & 8 & 9 & 7 & 8 & 9 \\ 1 & 2 & 3 & 1 & 2 & 3 & 1 & 2 & 3 \\ 4 & 5 & 6 & 4 & 5 & 6 & 4 & 5 & 6 \\ 7 & 8 & 9 & 7 & 8 & 9 & 7 & 8 & 9 \end{bmatrix}$$

10. There is a list of 50 DSBA.KMITL students containing their weight and height stored as vectors named “Weight” and “Height”, respectively. These vectors are randomly generated using seed number 10. The values of Weight and Height are integers that range from 30-100 kg and 160-200 cm, respectively. Your task is to calculate the BMI of the students:

$$BMI = \frac{Weight(kg)}{Height^2(m)}$$

- 10.1. Find the number of students who have BMI above the standard (the standard  $BMI = 22.9$ )



- 10.2. Find Mean, Median and Standard Deviation of BMI



11. The 50 DSBA.KMITL enrol in three courses in their third year as follows:

- Machine Learning 3-Credit
- Image Processing 1-Credit
- Natural Language Processing 2-Credit

After their examination, you are entitled to assign grade of A, B+, B, C+, C, D+, D, and F on their score according to Table 1.

Table 1: Reference score for grading

Grade	Point	Score
A	4.0	$\geq 80$
B+	3.5	$\geq 75$
B	3.0	$\geq 70$
C+	2.5	$\geq 65$
C	2.0	$\geq 60$
D+	1.5	$\geq 55$
D	1.0	$\geq 50$
F	0.0	$< 50$

The scores are stored in the following format:

Score(int) = [ Subject 1 Score, Subject 2 Score, Subject 3 Score ]

It is noted that these scores should be randomly generated using seed number 10 and range from 0 to 100.

Example:

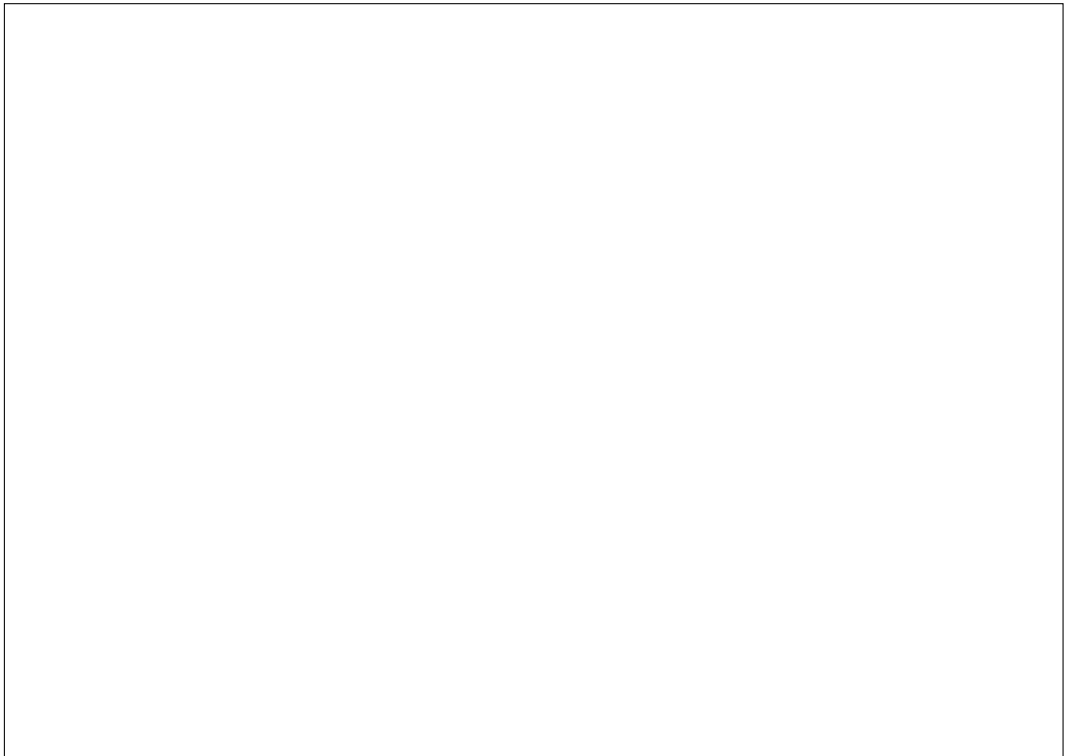
$$Score = \begin{bmatrix} 10 & 50 & 70 \\ 35 & 45 & 90 \\ 20 & 30 & 94 \\ \vdots & \vdots & \vdots \\ 50 & 75 & 53 \end{bmatrix} \begin{matrix} \text{Student 1} \\ \text{Student 2} \\ \text{Student 3} \\ \vdots \\ \text{Student 50} \end{matrix}$$

Your tasks are as follows:

- 11.1. Find maximum and minimum scores of each subject together with their indices. Furthermore, mean, and standard deviation of each subjects should be reported.

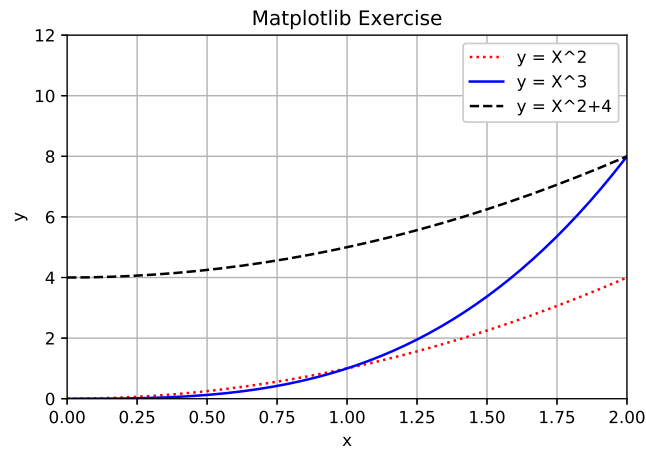


- 11.2. Calculate GPS of each student and report the number of students that achieved GPS greater than or equal to 2.0.



## 2 Matplotlib

1. Plot the following graph



2. Plot the following graph

