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### **ASSIGNMENT NO. 1(c)**

**Title:** Perform matrix addition subtraction and multiplication using NumPy

Library.

**Aim:** Perform matrix addition subtraction and multiplication using NumPy

Library.

#### **Topic Theory:**

##### **NumPy:**

NumPy, short for Numerical Python, is essential for scientific computing in Python. It provides powerful tools for working with arrays, along with efficient operations and mathematical functions. NumPy also facilitates integration with other programming languages and libraries. It supports a variety of mathematical operations, including functions for statistics, algebra, and trigonometry.

#### **Basic Operations with NumPy:**

##### **1. Installing NumPy:**

- Use the command `pip install numpy` to install the library.

##### **2. Importing NumPy:**

- Import NumPy with the alias `np` by using `import numpy as np`.

##### **3. Creating Arrays:**

- Create arrays by initializing them, for example: `array1 = np.array([1, 2, 3, 4])`.

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#### **Algorithm:**

**STEP 1:** Begin.

**STEP 2:** Import the NumPy library using the alias `np`.

**STEP 3:** Define two NumPy arrays, `arr1` and `arr2`.

- Example: `arr1 = np.array([[1, 2, 3], [4, 5, 6], [7, 8, 9]])`
- Example: `arr2 = np.array([[7, 8, 9], [4, 5, 6], [1, 2, 3]])`

**STEP 4:** Perform element-wise addition of the two arrays.

- Use the + operator to add corresponding elements.
- Display the result neatly.

**STEP 5:** Perform element-wise subtraction of the arrays.

- Use the - operator to subtract elements.
- Display the result in a formatted way.

**STEP 6:** Execute matrix multiplication on the arrays.

- Use the function `np.dot(arr1, arr2)` to perform matrix multiplication.
- Display the result neatly.
- Note: Ensure the number of columns in the first array matches the number of rows in the second array for matrix multiplication.

**STEP 7:** End.

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## **Mathematical Background:**

### **Matrix in Python:**

A matrix is a two-dimensional array made up of rows and columns, which can be easily handled using the NumPy library in Python.

### **Matrix Operations:**

#### **1. Matrix Addition:**

- Add two matrices by summing corresponding elements.
- Syntax: `result = np.add(matrix1, matrix2)`

#### **2. Matrix Subtraction:**

- Subtract one matrix from another by subtracting corresponding elements.
- Syntax: `result = np.subtract(matrix1, matrix2)`

#### **3. Matrix Multiplication:**

- Perform the dot product between rows of the first matrix and columns of the second.
- Syntax: `result = np.dot(matrix1, matrix2)`
- **Note:** The number of columns in the first matrix must equal the number of rows in the second matrix for multiplication to work.

## **CODE:**

```
1 import numpy as np
2 # creating first matrix
3 A = np.array([[5, 6], [7, 8]])
4 # creating second matrix
5 B = np.array([[1, 2], [3, 4]])
6 print("Printing elements of first matrix")
7 print(A)
8 print("Printing elements of second matrix")
9 print(B)
10 # subtracting two matrix
11 print("Subtraction of two matrix")
12 print(np.subtract (A, B))
```

```
1 Printing elements of first matrix
2 [[5 6]
3  [7 8]]
4 Printing elements of second matrix
5 [[1 2]
6  [3 4]]
7 Subtraction of two matrix
8 [[4 4]
9  [4 4]]
```

```
1 # importing numpy as np
2 import numpy as np
3 # creating first matrix
4 A = np.array([[1, 2], [3, 4]])
5 # creating second matrix
6 B = np.array([[4, 5], [6, 7]])
7 print("Printing elements of first matrix")
8 print(A)
9 print("Printing elements of second matrix")
10 print(B)
11 # multiplying two matrix
12 print("Multiplication of two matrix")
13 print(np.dot(A, B))
```

```
1 Printing elements of first matrix
2 [[1 2]
3  [3 4]]
4 Printing elements of second matrix
5 [[4 5]
6  [6 7]]
7 Multiplication of two matrix
8 [[16 21]
9  [36 47]]
```