

**Ex.No-1****NUMPY****AIM:**

To calculate the values for the mathematical formulas using NumPy library

**INTEGRATED DEVELOPMENT ENVIRONMENT (IDE) REQUIRED:**

JUPYTER NOTEBOOK

**REQUIRED LIBRARIES FOR PYTHON:**

- Numpy

**PROCEDURE:****A) Euclidean distance**

The mathematical formula for calculating the Euclidean distance between 2 points in 2D space:

$$d(p, q) = \sqrt{(q_1 - p_1)^2 + (q_2 - p_2)^2}$$

**B) Dot Product**

$$u = \begin{bmatrix} 5 \\ 12 \end{bmatrix}, \quad v = \begin{bmatrix} 8 \\ 6 \end{bmatrix}$$

$$\begin{aligned} \text{Dot product is } u \cdot v &= u_1 \times v_1 + u_2 \times v_2 \\ &= 5 \times 8 + 12 \times 6 \\ &= 112 \end{aligned}$$

**C) Solving a System of Linear Equations**

A system of linear equations can be represented in matrix form as  $AX=B$ , where  $A$  is the matrix of coefficients,  $X$  is the column vector of variables, and  $B$  is the column vector of solutions. To solve for  $X$ , we can use:  $X=A^{-1} B$  assuming  $A$  is invertible.

**PROGRAM:****A) Calculating the Euclidean Distance Between Two Points**

```
import numpy as np
```

```
def euclidean_distance(p, q):
```

```
return np.sqrt(np.sum((q - p) ** 2))

# Example usage
p = np.array([1, 2])
q = np.array([4, 6])
distance = euclidean_distance(p, q)
print("Output for Calculating the Euclidean Distance Between Two Points is: ", distance)
```

### **B) Calculating the Dot Product of Two Vectors**

```
import numpy as np
A = np.array([1, 3, -5])
B = np.array([4, -2, -1])
dot_product = np.dot(A, B)
print("Output for dot product of two vectors A and B is ", dot_product)
```

### **C) Solving a System of Linear Equations**

```
import numpy as np
# Coefficients matrix A and result vector b
A = np.array([[3, 1], [1, 2]])
b = np.array([9, 8])
# Solve for x
x = np.linalg.solve(A, b)
print("Output solution of System of Linear Equations is ", x)
```

### **Output:**

A) Output for Calculating the Euclidean Distance between Two Points is: 5.0. Exercise 2 – B) Output for dot product of two vectors A and B is 3  
C) Output solution of System of Linear Equations is [2. 3.]

### **Result:**

The programs were run successfully