

Python Program to Multiply Two Matrices

- Level: Easy

Given two matrices. The task is to write a Python program to multiply these two matrices.

Examples:

```
Input : X = [[1, 7, 3],
             [3, 5, 6],
             [6, 8, 9]]
          Y = [[1, 1, 1, 2],
             [6, 7, 3, 0],
             [4, 5, 9, 1]]
```

```
Output : [55, 65, 49, 5]
         [57, 68, 72, 12]
         [90, 107, 111, 21]
```

Multiply two matrices using nested loops

The most straightforward way to multiply two matrices is to use nested loops to iterate through each row and column. Below is the Python program to multiply two matrices using nested loops:

Code

```
1 #py
2 # 3x3 matrix A
3 A = [[1, 2, 3],
4       [4, 5, 6],
5       [7, 8, 9]]
6
7 # 3x4 matrix B
8 B = [[10, 11, 12, 13],
9       [14, 15, 16, 17],
10      [18, 19, 10, 21]]
11
12 result = [[0, 0, 0, 0],
13           [0, 0, 0, 0],
14           [0, 0, 0, 0]]
15
16 # iterate by row of A
17 for i in range(len(A)):
18     # iterate by coloum of B
19     for j in range(len(B[0])):
20         # iterate by rows of B
21         for k in range(len(B)):
22             result[i][j] += A[i][k] * B[k][j]
23
24 for r in result:
25     print(r)
26 ###
```

Matrix multiplication using nested lists

The zip is used. Below is the Python program to multiply two matrices using nested lists:

Code

```
27 #py
28 # 3x3 matrix A
29 A = [[1, 2, 3],
30       [4, 5, 6],
31       [7, 8, 9]]
32
33 # 3x4 matrix B
34 B = [[10, 11, 12, 13],
35       [14, 15, 16, 17],
36       [18, 19, 10, 21]]
37
38 # result is 3x4
39 result = [[sum(a * b for a, b in zip(A_row, B_col))
40            for B_col in zip(*B)]
41            for A_row in A]
42
43 for r in result:
44     print(r)
45 ###
```

Matrix multiplication using vectorized implementation

The most convenient way to multiply matrices is using vectorized implementation. In order to implement vectorized multiplication numpy library must be used. The code is given below:

Code

```
46 #py
47 import numpy as np
48 # 3x3 matrix A
49 A = [[1, 2, 3],
50       [4, 5, 6],
51       [7, 8, 9]]
52
53 # 3x4 matrix B
54 B = [[10, 11, 12, 13],
55       [14, 15, 16, 17],
56       [18, 19, 10, 21]]
57
58 # result is 3x4
59 result = [[0, 0, 0, 0],
60            [0, 0, 0, 0],
61            [0, 0, 0, 0]]
62
63 result = np.dot(A, B)
64
65 for r in result:
66     print(r)
67 ###
```