Python Program to Multiply Two Matrices

Python for Loop

In this article, you'll learn to iterate over a sequence of elements using the different variations of for loop.

Syntax of for Loop

for val in sequence:

loop body

Here, val is the variable that takes the value of the item inside the sequence on each iteration.

Loop continues until we reach the last item in the sequence. The body of for loop is separated from the rest of the code using indentation.

Python List

In this tutorial, we'll learn everything about Python lists: creating lists, changing list elements, removing elements, and other list operations with the help of examples.

## Create Python Lists

In Python, a list is created by placing elements inside square brackets [], separated by commas.

# list of integers

my\_list = [1, 2, 3]

A list can have any number of items and they may be of different types (integer, float, string, etc.).

# empty list

my\_list = []

# list with mixed data types

my\_list = [1, "Hello", 3.4]

A list can also have another list as an item. This is called a nested list.

# nested list

my\_list = ["mouse", [8, 4, 6], ['a']]

Python Matrices and NumPy Arrays

In this article, we will learn about Python matrices using nested lists, and NumPy package.

A matrix is a two-dimensional data structure where numbers are arranged into rows and columns. For example:

## Python Matrix

Python doesn't have a built-in type for matrices. However, we can treat a list of a list as a matrix. For example:

A = [[1, 4, 5],

[-5, 8, 9]]

We can treat this list of a list as a matrix having 2 rows and 3 columns.



Be sure to learn about [Python lists](https://www.programiz.com/python-programming/list) before proceed this article.

In Python, we can implement a matrix as nested list (list inside a list).

We can treat each element as a row of the matrix.

For example X = [[1, 2], [4, 5], [3, 6]] would represent a 3x2 matrix.

The first row can be selected as X[0]. And, the element in first row, first column can be selected as X[0][0].

Multiplication of two matrices X and Y is defined only if the number of columns in X is equal to the number of rows Y.

If X is a n x m matrix and Y is a m x l matrix then, XY is defined and has the dimension n x l (but YX is not defined). Here are a couple of ways to implement matrix multiplication in Python.

Source Code: Matrix Multiplication using Nested Loop

# Program to multiply two matrices using nested loops

# 3x3 matrix

X = [[12,7,3],

[4 ,5,6],

[7 ,8,9]]

# 3x4 matrix

Y = [[5,8,1,2],

[6,7,3,0],

[4,5,9,1]]

# result is 3x4

result = [[0,0,0,0],

[0,0,0,0],

[0,0,0,0]]

# iterate through rows of X

for i in range(len(X)):

# iterate through columns of Y

for j in range(len(Y[0])):

# iterate through rows of Y

for k in range(len(Y)):

result[i][j] += X[i][k] \* Y[k][j]

for r in result:

print(r)

[Run Code](https://www.programiz.com/python-programming/online-compiler)

Output

[114, 160, 60, 27]

[74, 97, 73, 14]

[119, 157, 112, 23]

In this program, we have used nested for loops to iterate through each row and each column. We accumulate the sum of products in the result.

This technique is simple but computationally expensive as we increase the order of the matrix.

For larger matrix operations we recommend optimized software packages like [NumPy](http://www.numpy.org/) which is several (in the order of 1000) times faster than the above code.