

## Algorithm

### Algorithm A4.1: MATMUL(A,B)

Here A and B both are of order  $n \times n$ .

```
1.  For i = 0 to n-1
2.    For j = 0 to n-1
3.      C[i][j] = 0
4.        For k = 0 to n-1
5.          C[i][j] = C[i][j] + A[i][k]*B[k][j]
6.        End for
7.    End for
8.  End for
9.  Return
```

## Exercises

a) Implement the above algorithm in Python.

```
1  #DSA lab4
2  def MATMUL(A,B):
3      row_A = len(A) #number of rows in A
4      col_A = len(A[0]) #number of columns in A
5      row_B = len(B) #number of rows in B
6      col_B = len(B[0]) #number of columns in B
7      if col_A != row_B:
8          print("Matrices cannot be multiplied")
9          print("Number of columns in A must be equal to number of rows in B")
10         return
11     c = []
12     for i in range(row_A):
13         row = []
14         for j in range(col_B):
15             row.append(0)
16         c.append(row)
17     # Multiplying matrices
18     for i in range(row_A):
19         for j in range(col_B): # for each column of B
20             for k in range(col_A): # for each row of A
21                 c[i][j] += A[i][k] * B[k][j] # multiply and add
22     return c
23
```

- b) Considering A is of order  $r_A \times c_A$ , and B is of order  $r_B \times c_B$ , revise the above algorithm and implement it in Python.  $c_A = r_B$ , but  $r_A$ ,  $r_B$  and  $c_B$  can be different quantities.



```
1  #DSA lab4
2  def MATMUL(A,B):
3      row_A = len(A) #number of rows in A
4      col_A = len(A[0]) #number of columns in A
5      row_B = len(B) #number of rows in B
6      col_B = len(B[0]) #number of columns in B
7      if col_A != row_B:
8          print("Matrices cannot be multiplied")
9          print("Number of columns in A must be equal to number of rows in B")
10         return
11     c =[]
12     for i in range(row_A):
13         row= []
14         for j in range(col_B):
15             row.append(0)
16         c.append(row)
17     # Multiplying matrices
18     for i in range(row_A):
19         for j in range(col_B): # for each column of B
20             for k in range(col_A): # for each row of A
21                 c[i][j] += A[i][k] * B[k][j] # multiply and add
22     return c
23
24  A = [[1,2,3],
25        [4,5,6],
26        [7,8,9]]
27
28  # [row of A = column of B] But [row of A != row of B and != column of B]
29
30  B =  [[1,4,7],
31        [6,5,4],
32        [3,2,1]]
33  C = MATMUL(A,B)
34  for row in C: # use to print matrix in row format
35      print(row)
36
37  Output:
38
39  [30, 24, 18]
40  [84, 69, 54]
41  [138, 114, 90]
```