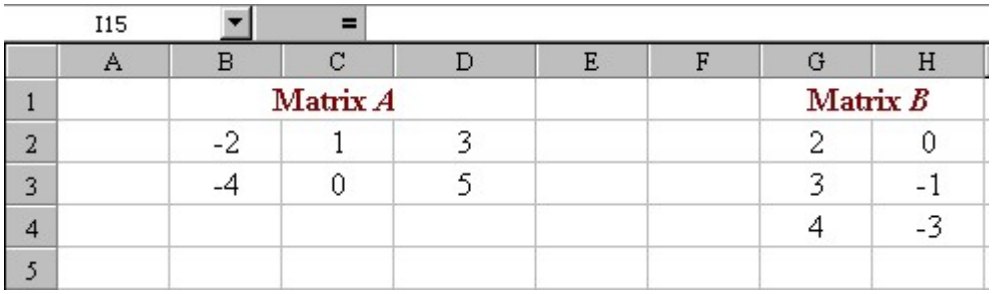
Using MS Excel in Matrix Multiplication

Example 1: If $A=\begin{bmatrix}-2 & 1 & 3\\ -4 & 0 & 5\end{bmatrix}$ and $B=\begin{bmatrix}2 & 0\\ 3 & -1\\ 4 & -3\end{bmatrix}$; Find *A.B* and name the resulting matrix as *E*

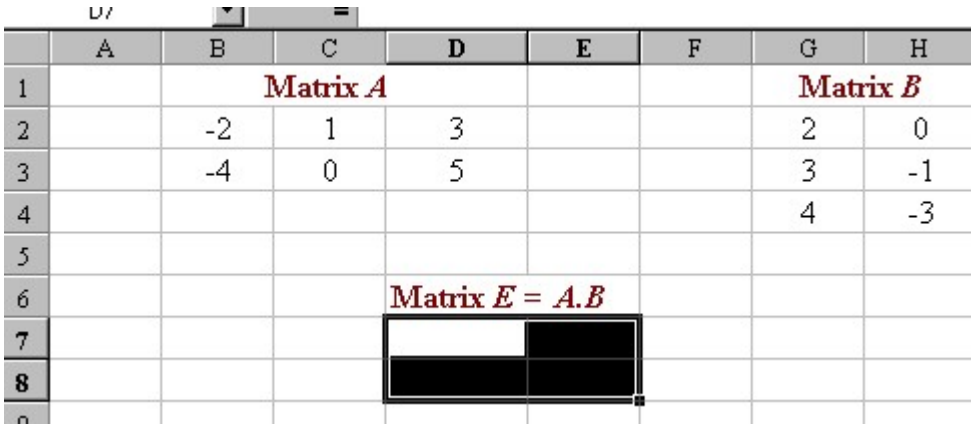
a) Enter the matrices *A* and *B* anywhere into the Excel sheet as:



	A	B	C	D	E	F	G	H
1		Matrix *A*					Matrix *B*	
2		-2	1	3			2	0
3		-4	0	5			3	-1
4							4	-3
5								

Notice that Matrix *A* is in cells **B2:D3,** and Matrix *B* in cells **G2:H4**

b) We multiply Row by Column and the first matrix has 2 rows and the second has 2 columns, so the resulting matrix will have 2 rows by 2 columns.. **Highlight** the cells where you want to place the resulting matrix *E*:



	A	B	C	D	E	F	G	H
1		Matrix *A*					Matrix *B*	
2		-2	1	3			2	0
3		-4	0	5			3	-1
4							4	-3
5								
6				Matrix *E* = *A.B*				
7								
8								

c) Once you have highlighted the resulting matrix, and <u>while it is still highlighted</u>, enter the following formula:

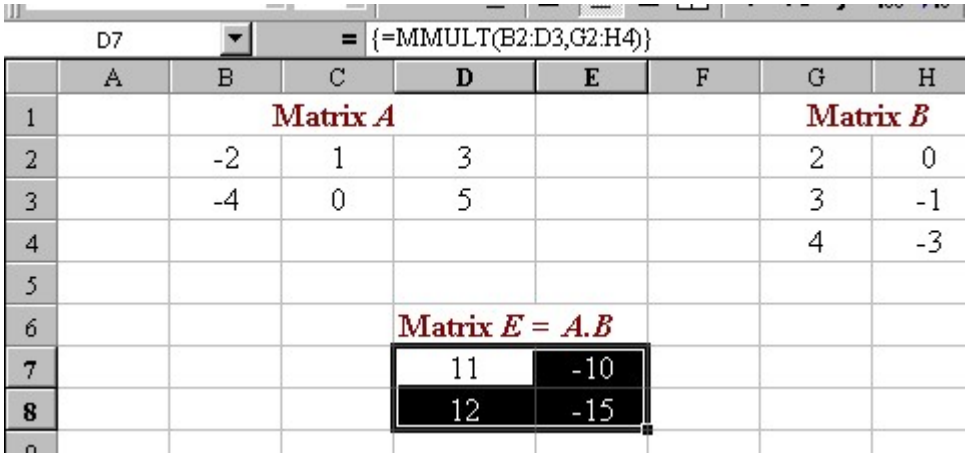
=MMULT(B2:D3,G2:H4)

d) When the formula is entered, press the **Ctrl** key and the **Shift** key <u>simultaneously</u>, then press the **Enter** key. This will change the formula you just wrote to:

{=MMULT(B2:D3,G2:H4)}

If you don't press these keys simultaneously (holding down Shift and Ctrl then press Return), the result will appear only in one cell or, you will get some error message).

e) The resulting matrix will be:



Example 2: Repeat the previous example, but this time find *B.A* and name the resulting matrix as *F*

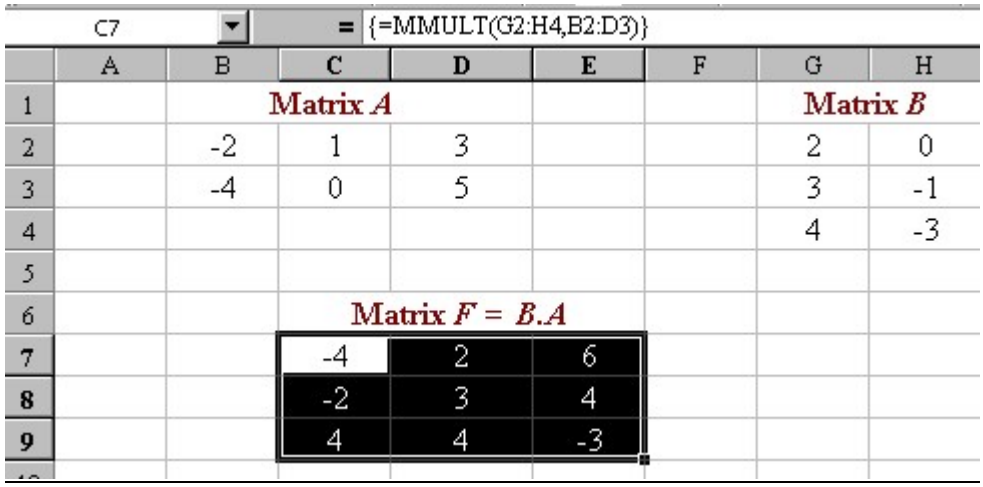
We multiply Row by Column but this time the first matrix has 3 rows and the second has 3 columns, so the resulting matrix will have 3 rows by 3 columns..

Once you have highlighted the resulting matrix, and while it is still highlighted, enter the following formula:

=MMULT(G2:H4,B2:D3)

When the formula is entered, press the **Ctrl** key and the **Shift** key simultaneously, then press the **Enter** key. This will change the formula you just wrote to:

{=MMULT(G2:H4,B2:D3)}



Example 3: If $A = \begin{bmatrix} 0.6 & 0.4 \\ 0.3 & 0.7 \end{bmatrix}$, find A^2, A^3, A^4 and A^8.

Since A has 2 rows and 2 columns and we are multiplying by itself, then the resulting matrices will also have 2 rows and 2 columns. Enter the matrices A anywhere into the Excel sheet as:

	A	B	C
1		Matrix A	
2		0.6	0.4
3		0.3	0.7

The answers can be found as:

$A^2 = A.A$

$A^3 = A^2.A$

$A^4 = A^2.A^2$

$A^8 = A^4.A^4$

	A	B	C	D	E	F
1		Matrix A				
2		0.6	0.4			
3		0.3	0.7			
4						
5		Matrix A^2			Matrix A^3	
6		0.48	0.52		0.444	0.556
7		0.39	0.61		0.417	0.583
8						
9						
10		Matrix A^4			Matrix A^8	
11		0.4332	0.5668		0.428609	0.571391
12		0.4251	0.5749		0.428543	0.571457

As we did before, highlight the resulting matrix, and while it is still highlighted, enter the formula.
When the formula is entered, press the **Ctrl** key and the **Shift** key simultaneously, then press the **Enter** key.

- $A^2 = A.A$ and the formula : =MMULT(B2:C3,B2:C3)
- $A^3 = A^2.A$ and the formula : =MMULT(B2:C3,B6:C7)
- $A^4 = A^2.A^2$ and the formula : =MMULT(B6:C7,B6:C7)
- $A^8 = A^4.A^4$ and the formula : =MMULT(B11:C12,B11:C12)