

## 3.6 Multiplying Matrices

A MATRIX IS A RECTANGULAR ARRAY OF NUMBERS ENCLOSED IN BRACKETS. ITS DIMENSIONS ARE DESCRIBED AS **ROW x COLUMN**. EACH VALUE IN A MATRIX IS CALLED AN **ENTRY**.

RULES FOR MULTIPLYING MATRICES:

1. The number of columns in the first matrix must be the same as the number of rows in the second matrix.
2. The product of  $m \times n$  and  $n \times p$  is a matrix with dimensions  $m \times p$ .

$A_{2 \times 3} = \begin{bmatrix} 3 & 5 & 7 \\ 4 & 1 & 2 \end{bmatrix}$ 
 $B_{3 \times 4} = \begin{bmatrix} 2 & 3 & 3 & 8 \\ 9 & 5 & 2 & 0 \\ 0 & 1 & 6 & 7 \end{bmatrix}$ 
 Dimensions of A and B:  $2 \times 3$  and  $3 \times 4$ . Answer should be \_\_\_\_\_.

matrix notation

Determine if it is possible to multiply the following matrices. If so, determine the dimensions of the resulting matrix.

$A = \begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix}$ 
 $B = \begin{bmatrix} 4 & 6 \\ 3 & 15 \end{bmatrix}$ 
 $C = \begin{bmatrix} 2 & 4 & 3 & 8 \\ 9 & 5 & -2 & 0 \\ 0 & 1 & -6 & 7 \end{bmatrix}$ 
 $D = \begin{bmatrix} 4 & 6 & 5 \\ 3 & 15 & 8 \end{bmatrix}$ 
 $E = \begin{bmatrix} 2 & 14 \\ 7 & -3 \\ 0 & 1 \end{bmatrix}$

1) AD

2) DA

3) CB

4) DC

5) ED

6) DE

To multiply matrices you multiply the 1<sup>st</sup> row in A by the 1<sup>st</sup> column in B! Add the sums of the products!

**GIVEN:**

$A = \begin{bmatrix} 0 & 4 & 9 \\ -3 & 3 & 2 \end{bmatrix}$ 
 $B = \begin{bmatrix} 5 & 1 \\ -2 & 7 \\ 6 & 0 \end{bmatrix}$ 
 $C = \begin{bmatrix} 11 & -1 \\ 12 & 10 \end{bmatrix}$

Find the following products, if possible.

1. AB

2. BC

3. CB

**NEED TO KNOW:**

A square matrix has the same number of rows and columns. The main diagonal is the diagonal from the upper left corner to the lower right corner.

$$\begin{bmatrix} 2 & 3 \\ 9 & 12 \end{bmatrix}$$

Square matrices are the only matrices that you can raise to a power!!

$$A = \begin{bmatrix} 7 & 1 \\ 2 & 0 \end{bmatrix} \text{ Find } A^2$$

$$C = \begin{bmatrix} 1 & 0 & 2 \\ 4 & 9 & 5 \end{bmatrix} \text{ Can you find } C^2? \text{ Why or why not?}$$