

INVESTIGATION # 17

MATRICES

A matrix is an array of numbers.

Some examples of matrices are given below:

$$A = \begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix} \quad B = \begin{bmatrix} 0 & 1 \\ -2 & 4 \end{bmatrix} \quad C = \begin{bmatrix} 3 & -1 & 5 \end{bmatrix}$$

$$D = \begin{bmatrix} 2 \\ -3 \\ 1 \end{bmatrix} \quad E = \begin{bmatrix} 4 & 0 & -2 \\ 1 & 2 & -2 \\ 3 & 0 & -4 \end{bmatrix} \quad F = \begin{bmatrix} -2 & 5 & 1 \\ 0 & 1 & 6 \\ -1 & 2 & -2 \end{bmatrix}$$

Matrix A added to matrix B equals $\begin{bmatrix} 4 & 2 \\ 0 & 7 \end{bmatrix}$.

Matrix A multiplied by matrix B equals $\begin{bmatrix} -2 & 8 \\ -6 & 14 \end{bmatrix}$.

Investigate:

1. How matrix addition works.
2. How matrix multiplication works.
3. What is $E + F$?
4. What is $E \times F$?
5. Is $A + B = B + A$?
6. Is $A \times B = B \times A$?
7. What is $A \times E$?
8. What is $C \times D$?
9. Do these results apply to other matrices ?

ASSESSMENT TASK

MATRICES

A matrix is an array of numbers. Some examples of matrices are given below:

$$A = \begin{bmatrix} 3 & -2 \\ 5 & 2 \end{bmatrix} \quad B = \begin{bmatrix} -1 & 3 \\ -4 & 0 \end{bmatrix} \quad C = \begin{bmatrix} -2 & 4 & 3 \end{bmatrix}$$

$$D = \begin{bmatrix} 1 \\ -3 \\ 2 \end{bmatrix} \quad E = \begin{bmatrix} -3 & 2 & 5 \\ 1 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix} \quad F = \begin{bmatrix} 1 & -3 & 4 \\ 5 & 1 & 0 \\ 2 & -4 & -1 \end{bmatrix}$$

QUESTIONS:

1. [2] Find $E + F$

2. [4] Find $A \times B$

3. [2] Find $C \times D$

4. [4] Is $E + F = F + E$. Demonstrate your answer.

5. [2] Does this result apply to all matrices. Explain.
6. [4] Is $A \times B = B \times A$. Demonstrate your answer.
7. [2] Does this result apply to all matrices. Explain.
8. [4] What is $E \times F$?
9. [4] $C \times D$ is possible but $C + D$ is not. Explain when you can add matrices and when you can multiply matrices using C and D as examples.
10. [2] Is $C \times F$ possible ? Why/Why not ?

SOLUTIONS TO MATRICES TEST:

1.[2marks]
$$\begin{bmatrix} -2 & -1 & 9 \\ 6 & 1 & 1 \\ 2 & -6 & -4 \end{bmatrix}$$

2.[4marks]
$$\begin{bmatrix} 5 & 9 \\ -13 & 15 \end{bmatrix}$$

3.[2marks] [-8]

4.[4marks] Yes : must show example.

5.[2marks] Yes : matrix addition is commutative

6.[4marks] No : $A \times B = \begin{bmatrix} 5 & 9 \\ -13 & 15 \end{bmatrix}$, $B \times A = \begin{bmatrix} 12 & 8 \\ -12 & 8 \end{bmatrix}$

7.[2marks] Yes :matrix multiplication is NOT commutative.(There are exceptions to this rule - if any smart student comes up with an exception give them full marks)

8.[4marks]
$$\begin{bmatrix} 17 & -9 & -17 \\ 3 & -7 & 3 \\ -16 & 10 & 3 \end{bmatrix}$$

9.[4marks] Addition is possible when both matrices are the same size. eg. $C + D$ is NOT possible.
Multiplication is possible when the number of columns in the first matrix equals the number of rows in the second matrix. eg $C \times D$ is OK.

10.[2marks] Yes, $1 \times 3 \times 3 \times 3$ is OK.