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**Year 11 Mathematics Applications 2016**

**Investigation 1 – TAKE HOME SECTION**

**MATRICES**

**Student Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

A rectangular array of numbers is called a **matrix.**

We normally put rectangular brackets around the numbers in a matrix.

Examples :

A = B = C =

Matrices are usually denoted by upper-case letters such as A, B, C,….

The positions of the elements are of paramount importance.

Hence the matrix is different from despite the fact that the elements in the array are the same.

The **dimension** or **order** of a matrix is stated as:

Number of Rows x Numbers of Columns

A matrix with m rows and n columns is called an m x n matrix( read as m by n matrix)

Therefore the dimension of matrix A (dim A) above is 2 x 2 , dim B = 2 x 3 and dim C = 3 x 2.

The numbers in a matrix are called its **elements** or **entries** and are usually denoted by lower-case letters. Subscripts are used to indicate the positions of the entries in a matrix. So , for example, the element **aij** refers to entry in the i-th row and j-th column of a matrix and

**a12** refers to entry in row 1 and column 2.

**Exercise 1**

1. State the dimension of each of the following matrices

P = Q = R = S =

1. Given A = , state entries/elements :
2. a11 = iii) a13 =
3. a31  = iv) a23 =

**A matrix with only one row is called a row vector, eg**

**A matrix with only one column is called a column vector, eg**

**Equality of Matrices**

Two matrices A and B are equal if the dimensions of the two matrices are identical and the corresponding elements in each matrix are identical.

Example

If = then a = 4 and b = 6

= then a = 6, and -2+b = -3

i.e. b = -1

**Addition and Subtraction of Matrices**

The operation of addition and subtraction between two matrices can only occur if both matrices have identical dimensions. In such an instance, the corresponding elements are added or subtracted.

Example:

+ =

=

**Exercise 2**

1. Evaluate
2. + =
3. - =
4. + =
5. Solve :
6. + =
7. =

**Multiplication of a matrix by a number**

To multiply a matrix by a number α we multiply each entry by α

Example : If A = , then 3A = 3

=

**Multiplication of Matrices**

Matrix multiplication is not defined in the same way as matrix addition and subtraction.

The matrix product AB is possible only if the number of columns in A = the number of rows in B.

We start by defining the product of a row vector A and a column vector B with the same number of elements. The product AB is a 1 x 1 matrix whose single is the sum of the products of the corresponding entries of A and B.

Examples:

=

=

=

=

The rule for multiplying row vectors with column vectors is the key to the general procedure for multiplying matrices of any size. Each entry in a product of matrices is the product of a row of the first matrix and a column of the second matrix.

Ie ***The entry in the ith row and jth column of the product of two matrices is the product of the ith row of the first matrix and the jth column of the second matrix.***

The product AB is defined only if the number of columns of A is equal to the number of rows of B.

An easy way to remember this requirement is : if A is an mxn matrix and B is a pxq matrix,

ie we can write (mxn) x (pxq) , AB is defined if n = p.

Another way of remembering this requirement is (mxn) x (nxp) = (mxp)

Examples: 1. A = , B =

AB = = =

*3*x**2** **2**x*2* *3x2*

=

2. P = . Q =

QP = = =

2x1 1x2 2x2

Exercises

1. Given A = , and B = , find AB and BA.
2. Given A = and B = , find AB.

Is BA defined? Give a reason.

1. Given P = and Q = , find PQ.
2. Given that A2 = A X A , A = and B = , find
3. A2 ,
4. B2
5. (A+B)2