

Test Book  
Date: \_\_\_\_\_  
Page: \_\_\_\_\_

# SUM OF TWO MATRICES

The sum of two matrices is obtained by adding the corresponding elements of the matrices.

## Condition for addition $\rightarrow$

Two matrices can be added only if they have the same order (same number of rows and columns).

If matrix A is of order  $m \times n$ , then matrix B must also be of order  $m \times n$ .

If

$$A = [a_{ij}] \quad \text{and} \quad B = [b_{ij}]$$

Then the sum is

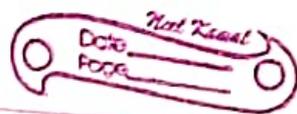
$$A + B = [a_{ij} + b_{ij}]$$

That means each element of matrix A is added to the corresponding element of matrix B.

Example  $\rightarrow$   
Let

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \quad B = \begin{bmatrix} 5 \\ 7 \end{bmatrix}$$

# SUM AND PRODUCT OF A FINITE SERIES



Here's a clear explanation of sum and product of a finite series (usually referring to a finite sequence of numbers)

## 1. Sum of a Finite Series →

If you have a finite sequence:

$$a_1, a_2, a_3, \dots, a_n$$

The sum is

$$S_n = a_1 + a_2 + a_3 + \dots + a_n$$

## Special cases →

### (A) Arithmetic Series →

An arithmetic sequence has a constant difference.

$$a, a + d, a + 2d,$$

The sum of first  $n$  terms

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

OR

$$S_n = \frac{n}{2} (a + l)$$

where

$$a = \text{First term}$$

$d =$  common difference  
 $l =$  last term  
 $n =$  number of terms

## (B) Geometric Series $\rightarrow$

A geometric sequence has a constant ratio:

$$a, ar, ar^2, \dots$$

The sum of first  $n$  terms

$$S_n = a \frac{1-r^n}{1-r}, \quad r \neq 1$$

where

$a =$  First term

$r =$  common ratio

$n =$  number of terms

## (2) Product of a Finite Series $\rightarrow$

The product of a finite sequence:

$$P_n = a_1 \cdot a_2 \cdot a_3 \dots a_n$$

This is often written using product notation.

$$\prod_{k=1}^n a_k$$

## Special case: Geometric series product

If terms are:

$$a, ar, ar^2, \dots, ar^{n-1}$$

Product

$$P_n = a^n \cdot r^{\frac{n(n-1)}{2}}$$

Example 2

For sequence

$$2, 4, 8, 16$$

Sum

$$2 + 4 + 8 + 16 = 30$$

Product

$$2 \times 4 \times 8 \times 16 = 1024$$

— x —

Since both are of order  $2 \times 2$  we can add them.

$$A+B = \begin{bmatrix} 1+5 & 2+6 \\ 3+7 & 4+8 \end{bmatrix} = \begin{bmatrix} 6 & 8 \\ 10 & 12 \end{bmatrix}$$

## Properties of matrix Addition

1. commutative property

$$A+B = B+A$$

2. Associative property

$$(A+B)+C = A+(B+C)$$

3. Additive identity

$$A+O = A$$

(O is the zero matrix)

4. Additive inverse

$$A+(-A) = O$$

conclusion  $\rightarrow$

The sum of two matrices is obtained by adding their corresponding elements, provided both matrices have the same order.