## **https://lh7-rt.googleusercontent.com/docsz/AD_4nXeo_T53FNL96uA3z77MPD2BmIhcU-KLYm41eYBrOTB5-gFa-ZSwmzrpe1nKT_BP9syGdCI7-GUcI4osnhAhQQjUd7A5kFChFEssUY6q_P1pJd7Av1eDcKx6q7-6ekDxFRMnPK8v7ZSbFsvNMh1c7pFvSXM?key=gXKBon64evz5tJadyx_K5A**

**Data Analysis & Matrix Operation**

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Class Project

# Overview

This project aims to build a solid foundation in data analysis and matrix operations, while also encouraging one to think critically about the results and their real-world applications.

# Goals

1. To understand Data Analysis
2. To understand the application of Matrix Operations
3. To know the Real-World Application of Matrix operations.

**QUESTION 1**

Create a Matrix we’ll create a 2x3 matrix with random numbers.

1. Identify the data type of the matrix and
2. Calculate the mean, mode and median of the data.

**SOLUTION 1:**

Set A =

**SOLUTION 1**: The matrix data set consists of integers, so the data type is **numeric (integer)**.

**SOLUTION 2:**

***The Mean:***

= (1 +7 + 9 + 2 + 2 + 6 ) = 27

= 27 = **4.5**

***The Mode:***

The mode of this data set is **= 2**

***The Median:***

**= 4**

**QUESTION 3**

Perform basic matrix operations (addition, subtraction, transpose and scalar multiplication) on the matrix.

**SOLUTION:**

Set A =  [1 7 9]     Set B = [7 1 3]

               [2 2 6]                  [-2 6 5]

Set (A+B) = [8 8 12]

                      [0 8 11]

Set (A-B) =   -6        6        6

                           4   -4       1

Set (AB) =     7           7            27

                      - 4       12          30

Scalar Multiplication of set A =(2xA) = [2  14  18]

                                                             [4    4  12]

Transpose    [ 7      -2 ]         Transpose  [ 1  2 ]

     Set B   =  [ 1      6 ]            set A =      [ 7  2 ]

                     [3       5 ]                             [ 9  6 ]

**QUESTION 4**

Research and find a real-world application of matrices in data analysis and explain how it is used.

**SOLUTION:**

### Real-World Application of Matrices in Data Analysis

Matrices are widely used in various fields, including machine learning, computer graphics, and economics. For instance, in machine learning, matrices represent datasets where each row corresponds to an observation and each column corresponds to a feature. Operations like matrix multiplication help in transforming data, applying algorithms, and optimizing models.

**Example: Retail Sales Analysis**

In retail, matrices are often used to analyze sales data. Imagine a store that tracks sales for different products across various stores. Here’s how it might work:

* **Data Structure**: You could represent sales data in a matrix where:
  + Rows represent different products (e.g., Product A, Product B, Product C).
  + Columns represent different stores (e.g., Store 1, Store 2, Store 3).

**Analysis**: You can use matrix operations to calculate total sales per product or per store. For instance, summing each row gives the total sales for each product, while summing each column gives total sales for each store. This helps management make decisions about inventory, promotions, and stocking based on which products are performing well in which locations.

**QUESTION 5**

Compare your results with the provided solutions and explain any discrepancies.

### SOLUTION:

### Compare Results and Explain Discrepancies

To compare your results with provided solutions, ensure you perform each calculation step-by-step as shown. If there are discrepancies, check for possible errors in arithmetic or misunderstandings of operations. For instance, confirm that the dimensions match for addition/subtraction and that you've followed the correct order of operations for calculating means, medians, and modes.

When comparing your results with provided solutions, consider practical scenarios:

* **Step-by-Step Verification**: Go through each calculation slowly. If you calculated the mean but got a different result than expected, double-check:
  + Did you include all values?
  + Did you divide by the correct number of elements?
* **Matrix Operations**: If your addition of matrices gave different results:
  + Confirm that you added corresponding elements correctly.
  + Ensure that both matrices had the same dimensions before performing operations.

**Example Discrepancy**: Let’s say the provided solution for the mean was 5 instead of 4.67. If you suspect an error:

* Reassess the total: Are all values included?
* Check the division: Are you dividing by 6 (the total count) correctly?

This method of comparing and explaining discrepancies helps develop problem-solving skills and ensures a deeper understanding of matrix operations in real-world applications.

Sources used

* *Linear Algebra and Its Applications* by David C. Lay.
* <https://www.khanacademy.org/math/linear-algebra>
* Google Scholar
* 3Blue1Brown
* MIT OpenCourseWare