# **Matrices and Their Identities**

## **Introduction**

Matrices are foremost amongst the most prevalently used tables that exist in the heterogeneous world of mathematics, particularly seen in the field of geology, where they are used to conduct seismic surveys, as well as graphs, statistics and scientific research. One might see matrices, for instance, in demographics pertaining to populations, mortality rates, and so on – and with such an extensive subject naturally comes an extensive list of unique identities that matrices possess. This article scrutinizes the identities of matrices as well as their application in mathematical problems and real life alike.

Matrices are a way of recording lists of information where variables are separated into an indefinite number of rows and columns. Matrix-related problems often include algebraic operations (addition, subtraction, multiplication and inverse multiplication). These problems adhere to a restrictive set of rules that may not be applied elsewhere, which makes it especially important to familiarize oneself with such identities.

## Defining a Matrix

A matrix is a rectangular array of numbers, symbols, points, or characters each belonging to a specific row and column. A matrix is identified by its order which is given in the form of rows and columns. The numbers, symbols, points, or characters present inside a matrix are called the elements of a matrix. The location of each element is given by the row and column it belongs to.

For instance, a 2-by-2 matrix with the variables *w, x, y* and *z* would be represented as or . Below is used.

## Identities of a Matrix

The most straightforward property of a matrix is addition. Adding two matrices together can only be achieved when they are both of the same format – which is to say, they both have the same number of rows and columns. For example, a 2-by-2 matrix can be added together with another 2-by-2 matrix, whereas a 2-by-3 matrix cannot. In the addition of matrices, one should add each variable from a matrix with their corresponding positional values; in other words, in a 2-by-2 matrix, the variable in the upper right corner in the first matrix can only be added to the variable in the upper right corner of the second.

Similarly, subtraction of matrices must also be done under the circumstance that the matrices are of the same format. The process is also the same (owing to the fact that subtracting 2 numbers is simply adding the former by the latter’s opposite number), where one would subtract only the corresponding variables.

Multiplication proves to be slightly more complex. If a matrix is multiplied by an independent number (such as 3M, with M being the matrix), the number is multiplied to every variable in the matrix, regardless of its rows and columns. In the multiplication of two matrices with one another, the number of *columns* in the first matrix must be equal to the number of *rows* in the second. Therefore, the resulting product has the same number of columns as the first matrix and the same number of rows as the second. In this sense, we can also infer that the numbers of each column would multiply the numbers of each row, starting from up to down and left to right, correspondingly. This means that the first number in the top row in the first matrix is multiplied by the first number in the leftmost column of the second matrix, the second number in the top row in the first matrix is multiplied by the second number in the leftmost column of the second matrix, and so on, finally all these values are added up together to give the variable in the topmost row and leftmost column of the matrix product, and so on and so forth.

\*note: equations that don’t meet the requirements are marked as undefined.

## Specific Properties

Matrices, unlike independent terms, do *not* have commutative properties of multiplication owing to its unique process. However, it does have commutative properties of addition, as well as everything else in an independent term, including distributivity, identity, associativity, amongst others.

## Examples

An example of 2-by-2 matrix added by 2-by-2 matrixwould create the sum of 2-by-2 matrix.

A further example of 2-by-2 matrix subtracted by 2-by-2 matrix would create the difference of 2-by-2 matrix.

An example of 2-by-2 matrix multiplied by 2-by-2 matrix would create the sum of 2-by-2 matrix.

## Practice

Solve:

1. ]+[ ]
2. - ]
3. 3[ ]
4. x [

## Conclusion

In conclusion, matrices are an intricate matter in the world of mathematics that are applied in real life in various ways. It is crucial that one knows of matrices and its properties, not just for the sake of their exams, but also to know its application of real-world instances.

## Solutions

**矩阵的特征**

**简介**

矩阵是数学领域中最常用的工具之一，尤其在地质学、地震检测、统计分析和科学研究中扮演着重要角色。例如，在人口统计和死亡率分析等数据处理过程中，矩阵被广泛应用。由于其应用范围广泛，矩阵自然具有许多独特的性质。这篇文章会仔细研究矩阵的特征，和它们在数学问题和现实生活中的应用。

矩阵是一种以行和列的形式组织变量的数据结构。每个元素都位于特定的行和列交叉点上，这种结构使得矩阵非常适合表示多维数据和执行复杂的数学运算。与矩阵相关的操作包括但不限于加法、减法、乘法和求逆等代数运算。这些运算遵循一套严格的规则，而且有不适永的地方，熟悉这些规则对于正确使用矩阵至关重要。

**矩阵的定义**

矩阵是数字、符号、点或字符的矩形阵列，每个字符都属于特定的行和列。矩阵通过其行和列的顺序来识别。矩阵中的数字、符号、点或字符被称为矩阵的元素，每个元素的位置由它所在的行和列确定。

例如，具有变量 w、x、y 和 z 的 2×2 矩阵被表示为 或 。下面使用 。

**矩阵的特征**

矩阵最直接的属性是加法。两个矩阵只有格式相同才能相加 - 它们的行列数量需要相同。比如，一个 2×2 矩阵可以和另一个 2×2 矩阵相加，但不能和一个 2×3 矩阵相加。在矩阵加法中，应该把每个变量和对应的位置值相加。换句话说，在一个 2×2 的矩阵中，第一个矩阵右上角的变量需要和第二个矩阵右上角的变量相加。

同样，矩阵减法也必须在矩阵格式相同的情况下进行。过程相同（因为减去一个数就是加上它的相反数），而减去的也是相应的变量。

而乘法会稍微复杂一些。如果把矩阵和一个独立的数相乘（例如 3M，M 为矩阵），那么要把这个数和矩阵中的每个变量相乘，无论它有几行几列。两个矩阵相乘时，第一个矩阵的列数必须等于第二个矩阵的行数。得到的乘积就有第一个矩阵相同的列数和与第二个矩阵相同的行数。我们也可以推断出，每一列的数字会与每一行的数字相乘，从上到下，从左到右，依次进行。这意味着第一个矩阵顶行的第一个数字与第二个矩阵最左列的第一个数字相乘，第一个矩阵顶行的第二个数字与第二个矩阵最左列的第二个数字相乘，以此类推，最后将所有值加在一起，得到矩阵最顶行和最左列的乘积，依此类推。

\*注：不符合要求的方程式标记为未定义。

**特定属性**

矩阵和独立项不同，他不具有乘法交换律。但是，它具有加法交换律和独立项的所有其他性质，包括分配律、恒等律、结合律等。

**示例**

比如，2×2 矩阵 和 2×2 矩阵 相加，得到 2×2 矩阵 。

再比如，2×2 矩阵 和 2×2 矩阵 相减，得到 2×2 矩阵 。

最后，2×2 矩阵 和 2×2 矩阵 相乘，得到 2×2 矩阵 。

**练习**

计算：

1. ]+[ ]
2. -]
3. 3[ ]

**总结**

总之，矩阵是数学中一个较为复杂的问题，在现实生活中也有各种应用。了解矩阵的特征至关重要，这不仅是为了考试，更是为了解决它在现实世界中的诸多应用。

**答案**