Matrices

A Matrix is an array of numbers:


A Matrix
(This one has 2 Rows and 3 Columns)

We talk about one **matrix**, or several **matrices**.

There are many things we can do with them ...

Adding

To add two matrices: add the numbers in the matching positions:



These are the calculations:

|  |  |
| --- | --- |
| 3+4=7 | 8+0=8 |
| 4+1=5 | 6-9=-3 |

The two matrices must be the same size, i.e. the rows must match in size, and the columns must match in size.

Example: a matrix with **3 rows** and **5 columns** can be added to another matrix of **3 rows**and **5 columns**.

But it could not be added to a matrix with **3 rows** and **4 columns** (the columns don't match in size)

Negative

The negative of a matrix is also simple:



These are the calculations:

|  |  |
| --- | --- |
| -(2)=-2 | -(-4)=+4 |
| -(7)=-7 | -(10)=-10 |

Subtracting

To subtract two matrices: subtract the numbers in the matching positions:



These are the calculations:

|  |  |
| --- | --- |
| 3-4=-1 | 8-0=8 |
| 4-1=3 | 6-(-9)=15 |

*Note: subtracting is actually defined as the****addition****of a negative matrix: A + (-B)*

Multiply by a Constant

We can multiply a matrix by some value:



These are the calculations:

|  |  |
| --- | --- |
| 2×4=8 | 2×0=0 |
| 2×1=2 | 2×-9=-18 |

We call the constant a **scalar**, so officially this is called "scalar multiplication".

Multiplying by Another Matrix

To **multiply two matrices together** is a bit more difficult ... read [Multiplying Matrices](http://www.mathsisfun.com/algebra/matrix-multiplying.html) to learn how.

Dividing

And what about division? Well we **don't** actually divide matrices, we do it this way:

A/B = A × (1/B) = A × B-1

where **B-1** means the "inverse" of B.

So we don't divide, instead we **multiply by an inverse**.

And there are special ways to find the Inverse ...

... learn more about the [Inverse of a Matrix](http://www.mathsisfun.com/algebra/matrix-inverse.html).

Transposing

To "transpose" a matrix, swap the rows and columns. We put a "T" in the top right-hand corner to mean transpose:



Notation

A matrix is usually shown by a **capital letter** (such as A, or B)

Each entry (or "element") is shown by a **lower case letter** with a "subscript" of **row,column**:



|  |  |
| --- | --- |
| column | Rows and ColumnsSo which is the row and which is the column?* Rows go**left-right**
* Columns go **up-down**

To remember that rows come before columns use the word **"arc"**:**ar,c** |

Example:

|  |  |  |
| --- | --- | --- |
| **B =** |  | A Matrix |

Here are some sample entries:

b1,1 = 6 *(the entry at row 1, column 1 is 6)*

b1,3 = 24 *(the entry at row 1, column 3 is 24)*

b2,3 = 8 *(the entry at row 2, column 3 is 8)*