Common Confusion 02
Scalar vs. Vector vs. Matrix
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To someone new to programming, the different definitions of the terms scalar, vector, and matrix can be confusing. While they are often used somewhat interchangeably, they do each have their own unique meaning.

A scalar is a singular number. Something like '-1', '0', '1', '100', or '0.95' are all considered scalars. In MATLAB, creating a scalar would look like the following examples:

'X = 1' or 'X = [1]' or 'X = {1}'

The first two examples create an integer variable 'X' storing '1', which is a scalar. The third example creates a cell array with one cell in it containing '1', which is a scalar. In all cases, the examples are considered scalars.

A vector is a list of numbers and is often referred to as an array. Something like '-1, 0, 1, 2, 3' or '0.95, 1, 4.53, 5, 9.0210' are both considered vectors. A vector can be a row or column vector. In MATLAB, creating a vector would look like the following examples:

'X = [1, 2, 3, 4]' or 'X = [1 2 3 4]' or 'X = [5; 6; 7; 8]'

The first two examples create a row vector 'X' storing '1', '2', '3', and '4'. When creating a row vector, you can either put commas between the elements or just a space. The third example creates a column vector 'X' storing '5', '6', '7', and '8'.

A matrix is a multidimensional array containing a set number of rows and columns with an element at each intersection of rows and columns. Something like the following is considered a matrix:

'1 2 3 4
5 6 7 8'

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The above matrix has two rows and four columns. For something to be considered a matrix, it must have more than one row and more than one column. If it only has one row *or* one column, it is considered a vector. If it only has one row *and* one column, it is considered a scalar. In MATLAB, creating a matrix would look like the following example:

'X = [1, 2, 3, 4; 5, 6, 7, 8]'

This example creates a matrix 'X' storing '1', '2', '3', and '4' on the first row and '5', '6', '7', and '8' on the second row. This is visualized below:

'1 2 3 4
5 6 7 8'

In general, these terms are often used interchangeably. This is especially true for vector, array, and matrix. While it is important to be aware of the different definitions of each term, it is not a big deal to use the incorrect term. The important part is you understand when each tool is used and how to use it.