



A First Program

1. Expressions

What is Expression in general?

The expressions consist of the various math functions like as arithmetic, trigonometric, logarithmic, exponential, constant term value, and so on. These functions have proper syntax.

Numbers, symbols, operators (arithmetic symbol such as : + , - , * , and /) grouped together and obtain the results.

For example : $7 + 3$ is an expression.

Let's suppose you want to calculate the expression, $2 + 4 * 5$. Type it in command window

```
>> 2 + 4 * 5  
ans = 22
```

Example the MATLAB expressions

- The expressions are given by:

$$1 + \frac{2}{3}4 - 5 \quad , \text{ in MATLAB} \quad 1 + 2/3*4-5$$

$$(((1/2)/3)/4) \quad , \text{ in MATLAB} \quad 1/2/3/4$$

$$(2 - 3 * 1) \frac{4}{5} \quad , \text{ in MATLAB} \quad (2 - 3 * (4 - 3)) * 4/5$$



2. Rules for Naming of Variables

The rules for naming variables in MATLAB can be summarized as follows:

- Variable names in MATLAB must start with a letter and can be up to a - z characters long. The trailing characters can be numbers, letters or underscores (some other characters are also available but in this text we shall stick to these).
- Variable names in MATLAB are case sensitive, so that (a) and (A) are two different objects.
- It is good programming practice to employ meaningful variable names.

Note that spaces are not important in MATLAB.

Example : Try to type the following assignment:

```
>> x = 2;  
>> y = 4;  
>> z = x*y  
z =  
8
```



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Trigonometric Symbol	Operation / Function
$\sin(t)$	Performs Sin operation on variable 't'.
$\cos(t)$	Performs cosine operation on variable 't'.
$\tan(t)$	Performs tangent operation on variable 't'.
$\text{asin}(t)$	Performs arc sin operation on variable 't' or Inverse of the sin function.
$\text{acos}(t)$	Performs arc cosine operation on variable 't' or Inverse of the cos function.
$\text{atan}(t)$	Performs arc tangent operation on variable 't' or Inverse of the tan function.

Exponential functions

Exponential Symbol	Operation
$\exp(t)$	Performs exponential operation on variable 't'.

Square functions

Symbol	Operation
\wedge	Power or Square
$\text{sqrt}(t)$	Performs square root operation on variable 't'.



Logarithm functions

Symbol	Operation
$\log(t)$	Performs a natural logarithmic operation on variable 't'.
$\log_{10}(t)$	Performs a common logarithmic operation on variable 't'.

Maximum & Minimum functions

Symbol	Operation
$\min(t)$	Finds minimum value from array 't'.
$\max(t)$	Finds maximum value from array 't'.

Writing Expressions with MATLAB

1- Consider the mathematical expression $a(b + c)$ which you might read as “a times b plus c”, the expression would appear to translate to the MATLAB command as $a*b+c$. Hopefully you can see that this actually is equal to $ab+c$. The correct MATLAB command for $a(b + c)$ is $a*(b+c)$.

2- The brackets have been used to force MATLAB to first evaluate the expression $(b+c)$ and then to multiply the result by a. We should avoid falling into the trap of assuming that commands are performed from left to-right, for instance $c+a*b$ is equal to $c + ab$ not $(c + a)b$ as if the addition was performed first).



3. Constants

Constant properties are used to define constant values that can be accessed by name. MATLAB comes with a set of predefined constant values. The following are some of the most common values:

Symbol / Constant	Associated Constant value
pi	The 'π' number = 3.14159...
i, j	The imaginary unit $\sqrt{-1}$
Inf	The infinity, ∞

4. Entering Matrices

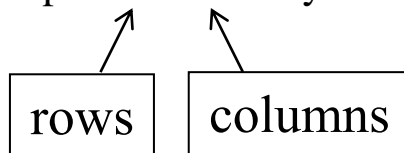
The definition of the Matrix is a two-dimensional array which consists of both the rows and columns. Matrices can be generated in several ways:

Vector : array with one dimension.

Matrix : array with more than one dimension

Size : array is specified by number of rows and number of columns.

For example : n x m array



In the MATLAB matrix, the rows and columns are created by using the commas (,) / line-spaces () and semicolon (;) respectively.

Let's look at the general representation of matrix with the row and column.



Row Matrix is $A = [x_1, x_2, x_3, \dots, x_n]$ or $[x_1 \ x_2 \ x_3 \ \dots \ x_n]$

This is $(1 \times n)$ vector i.e. a single row consisting the n th term elements.

Column Matrix is $A = [x_1; x_2; x_3; \dots; x_m]$

This is $(m \times 1)$ vector i.e. a single row consisting the m th term elements.

Note: Row matrix and column matrix are nothing but the vectors.

● More explanation

$$a = \begin{bmatrix} 2 & 6 \\ 8 & 3 \\ 4 & 7 \end{bmatrix} \quad 3 \times 2 \text{ matrix} \longrightarrow 6 \text{ elements}$$

$$b = [1 \ 2 \ 3 \ 4] \quad 1 \times 4 \text{ array} \longrightarrow 4 \text{ elements, row vector}$$

$$c = \begin{bmatrix} 1 \\ 4 \\ 6 \end{bmatrix} \quad 3 \times 1 \text{ array} \longrightarrow 3 \text{ elements, column vector}$$

How to generate or create $n \times m$ Matrix in MATLAB?

Solution: The 3×3 matrix must have 3 rows and 3 columns. These rows and columns are created with the help of space and semicolon.

For example: Matrix A is

```
>> A = [2 3 3; 1 2 8; 7 9 3]
```

A =

2 3 3

1 2 8 3 x 3 matrix \longrightarrow 9 elements

7 9 3