

**Armstrong State University**  
**Engineering Studies**  
**MATLAB Marina - Variables Primer**

**Prerequisites**

The Variables Primer assumes knowledge of the MATLAB IDE, MATLAB help, arithmetic operations, built in functions, and scripts. Material on these topics is covered in the MATLAB Marina Introduction to MATLAB module.

**Learning Objectives**

1. Be able to create and use MATLAB variables.

**Terms**

variable, assignment

**MATLAB Functions, Keywords, and Operators**

=, ans, clear, who, whos

**MATLAB Variables**

Variables are names referring to data stored in a computer's memory. Variables allow one to store values and refer to the values using meaningful names. MATLAB variables must start with a letter and can consist of up to 31 characters (letters, digits, underscores). MATLAB variable names are case sensitive. MATLAB variables are allocated in memory when they are first used in an expression. The equal sign (=) allows one to assign the result of the right hand side of an expression to a variable on the left hand side of the expression. Once a variable has a value, it can then be used in other expressions. Variables can be redefined by assigning a new value or set of values to them. MATLAB is an untyped language; the variable can hold whatever type results from the right hand side of an equation. Figure 1 shows an example of creating two variables named length and height and then computing the area of rectangle using the values held by the two variables.

```
>> length = 5.0;  
>> height = 2.7;  
>> rectangleArea = length * height;
```

Figure 1, Creating and Using Variables

When a variable is assigned the result of an expression, the right hand side of the expression is evaluated and the resulting value is assigned to the variable on the left hand side. If no variable is given for the result of an expression, MATLAB places the result in the default variable ans. Variables can be cleared (deleted) from the workspace with the clear command and the command window can be cleared and the cursor homed with the clc command. The first

command in Figure 2 will clear only the height variable and the second command will clear all variables in the workspace.

```
>> clear height;
>> clear all;
```

Figure 2, Clearing Workspace Variables

The MATLAB command `who` returns a list of all currently defined variables. The command `whos` returns the information from the `who` command plus the variable sizes, numbers of bytes used, and class. You can see the value stored by a particular defined variable by looking in the Workspace window or typing the variable name at the MATLAB command line.

### Special Variables and Reserved Words

MATLAB has some built in variables and predefined reserved words. Reserved words cannot be used as variables but the built in variables can be reassigned values. Generally redefining built in MATLAB variables is not a good idea.

MATLAB Reserved Words					
for	break	elseif	case	return	global
end	continue	else	otherwise	try	persistent
while	if	switch	function	catch	

Table 1, MATLAB Reserved Words

MATLAB Built in Variables	
Variable Name	Description
ans	Default variable name for results
beep	Make a sound
pi	Mathematical constant
eps	Smallest positive that can be subtracted from 0 to get a negative value
inf	Infinity
NaN	Not a number
i, j	Imaginary numbers, $\sqrt{-1}$
realmin, realmax	Smallest and largest positive real numbers
bitmax	Largest positive integer
nargin, nargout	Number of function in or out variables
varargin	Variable number of function in arguments
varargout	Variable number of function out arguments

Table 2, MATLAB Built in Variables

### Complex Numbers

MATLAB supports complex numbers and MATLAB's arithmetic operators and built in functions will operate on complex numbers if appropriate. The imaginary number  $\sqrt{-1}$  is represented by

the lower case characters *i* and *j*. The result of operations on complex numbers is typically also a complex number. The real and imaginary parts of a complex number can be extracted using the MATLAB commands `real` and `imag`. Also the magnitude and phase of a complex number can be found using the MATLAB commands `abs` and `angle`. The phase will be in radians. Figure 3 shows examples of entering and using complex numbers.

```
>> c1 = 2 + 3j;
>> c2 = 3 - 2j;
>> c3 = c1 + c2
c3 = 5.0000 + 1.0000i
>> real(c3)
ans = 5
>> imag(c3)
ans = 1
>> c4 = c1 * c2
c4 = 12 + 5i
>> abs(c4)
ans = 13
>> angle(c4)
ans = 0.3948
```

Figure 3, Complex Numbers in MATLAB

Either *i* or *j* can be used to represent the complex number although MATLAB will display the imaginary number using *i*. Complex numbers can also be entered using the form  $a+b*i$  or  $a+b*j$ .

Last modified Tuesday, September 09, 2014



This work by Thomas Murphy is licensed under a [Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License](https://creativecommons.org/licenses/by-nc-nd/3.0/).