

Introduction to MATLAB



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MATLAB



- Launch Matlab

- Go to: My Computer > Q drive > Matlab
- Double click MATLAB R2010b
- Be patient it takes time for the application to start



MATLAB Desktop

Command Window: a big calculator

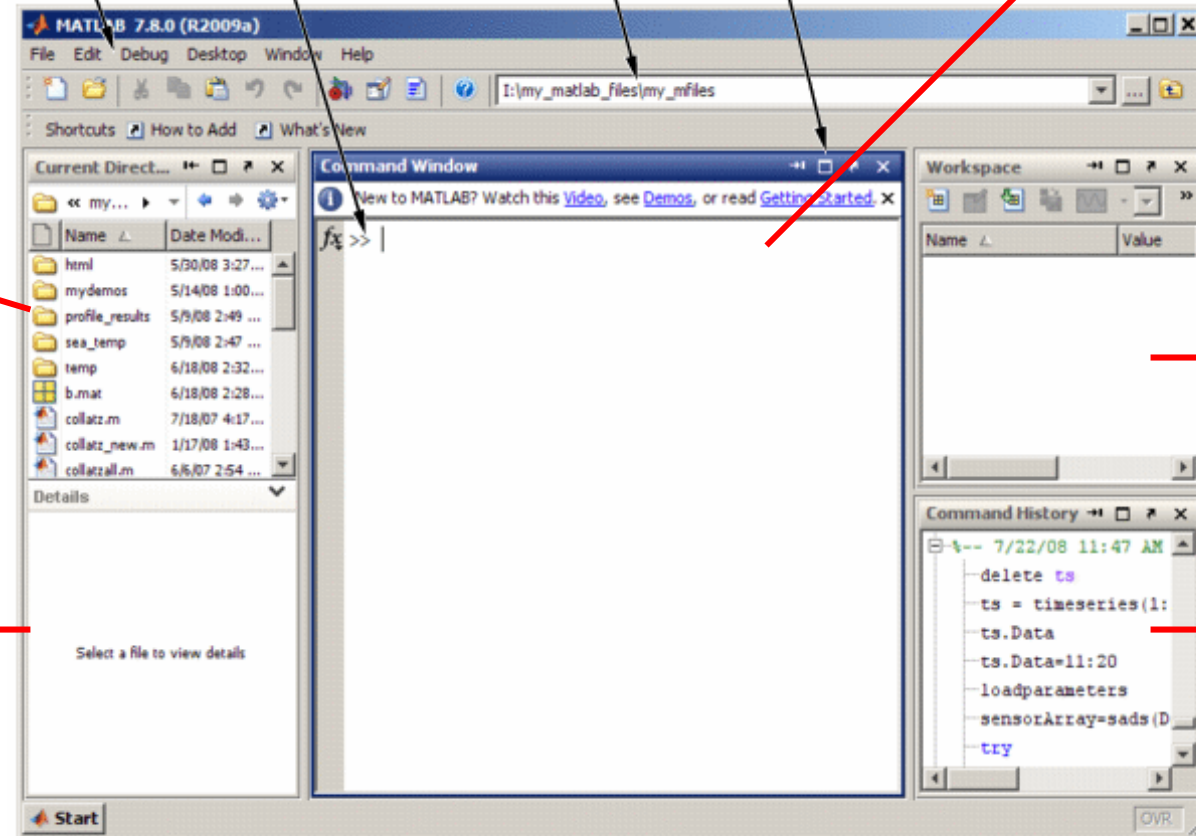


Menus change, depending on the tool you are using.

Enter MATLAB statements at the prompt.

View or change the current directory.

Move or resize the Command Window.



Current Directory

Details

Workspace

Command History



Matlab Calculations



- Basics:
 - Add : +
 - Subtract: -
 - Divide: /
 - Multiply: *

- Try:

$$6 - 5 + 4 * 3$$

Question: Does Matlab follow the order of operations?



Order of Operations



- Matlab does not follow the order of operations.
 - Multiplication and division are computed before subtraction and addition.
- $6 - 5 + (4 * 3)$ -> This is what Matlab computes!
- Suggestion: Use parenthesis.



Some Matlab Commands



- Try
sqrt(121)
sqrt(100);
abs(-10)
2^2
2^3

Question: What are sqrt, abs, and ^ ?



Matlab Help

- doc: displays information
- Type
doc sqrt
doc abs



Variables/Numbers



- It is good to name numbers.

Example :

$$a = 20.2$$

$$b = 10.1$$

$$c = 3 * a + b$$

We call a , b and c "variables".



Arrays

- Matlab is designed to work with large set of numbers.
- A variable can point to a set of numbers.
- If the variable is a list of numbers, it is called an ARRAY.

- Array Example:

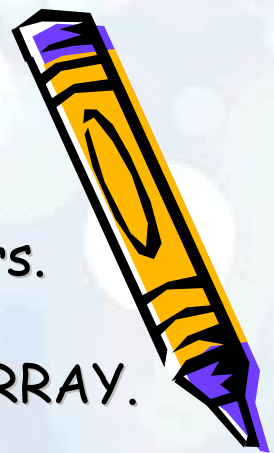
```
x = [1, 3, 5, 6,9];
```

- We can reach each element of array by using its order number in the array.
 - Example:

```
x(4)
```

This will print 6. Let's change its value to 7.

```
x(4) = 7
```



Add/Remove Numbers



- Add a number to the beginning of the array:

$x = [-1 \ x]$

- Add a number to the end of the array:

$x = [x \ 12]$

- Remove a number from the array:

- Example: Remove 3rd element

$x(3) = []$



Arrays and Scalars



- Scalar - Array Operation

- $y = 2 * x$

- The right format for scalar-array operation is using a dot before the operation:

- $y = 2 .* x$

- Array - Array Operation

- $z = x + y$



Graphs: Plots



- To open a plot window:
 - `figure()`
- Plot x vs. y
 - `plot(x,y)`
- Title of your plot
 - `title('My Test Plot')`
- Label axes
 - `xlabel('x'); ylabel('y')`



Plotting Multiple Data Sets

- Plot x vs. y and x vs. z in one graph.
 - `plot(x,y,'b',x,z,'g')`
 - `xaxis('x')`
 - `yaxis('y')`
 - `title('My Test Plot')`
 - `legend('x vs y','x vs z')`
 - `legend('x vs y', 'x vs z', 'Location', 'SouthEast')`
 - `grid`



Graph Properties



- Can you increase the line-width of the previous graph?
 - Try
 - doc plot





- `plot(x,y,'b',x,z,'g','LineWidth',2)`



Measures of Central Tendency



- Matlab makes it easy to calculate the measures of central tendency:
 - `mean(z)`
 - `median(z)`
 - `mode(z)`
 - `range(z)`
- Other useful measures
 - `sum(z)`
 - `min(z)`
 - `max(z)`



Data with Constant Intervals



- If data set has fixed intervals between each number, then it is easier to create arrays using:
 - `x = begin:interval:end`
- If interval = 1, then you can skip the interval value entry
 - `x = begin:end`
- Examples:
 - `x = 0:20`
 - `x = 0: 3: 50`



Example

- Grand Canyon rain fall

Month	rain fall (inches)
- January	1.58
- February	1.67
- March	1.95
- April	1.07
- May	0.63
- June	0.47
- July	1.96
- August	2.04
- September	1.40
- October	1.35
- November	1.28
- December	1.10



Exercise



- Create an array to hold months.
- Create an array to hold rain-fall.
- Plot the data.
- See what `bar` command does.
 - Use: `doc bar`
- Have a title for your graph.
- Label the axes.
- Which month has the maximum rain fall?
- Find annual rain fall.
- Find the mean value of data.



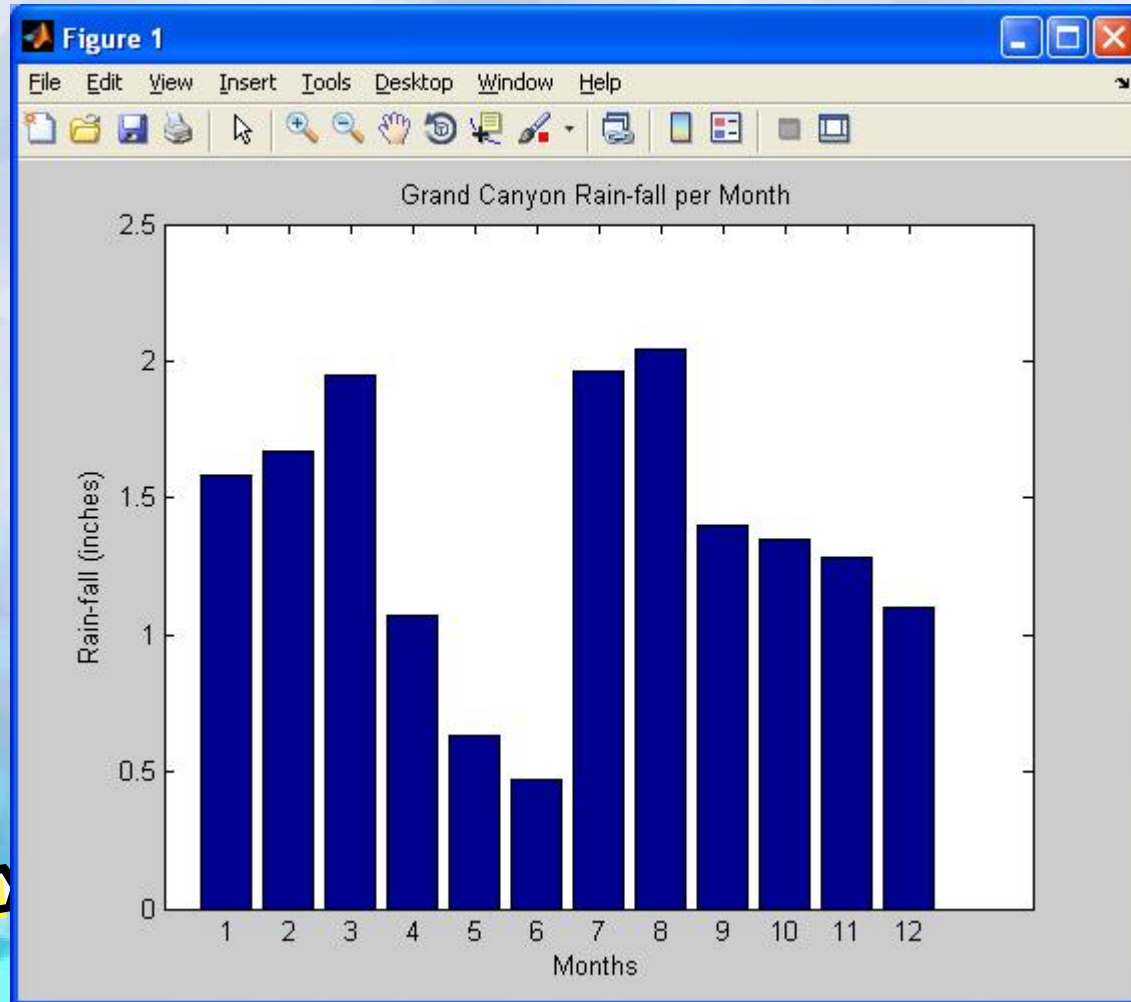
Matlab commands for the example



- `bar`: plots bar graph
- `months = 1:12`
- `rainfall = [1.58, 1.67, 1.95, 1.07, 0.63, 0.47, 1.96, 2.04, 1.40, 1.35, 1.28, 1.10]`
- `figure()`
- `title('Grand Canyon Rain-fall per Month')`
- `xlabel('Months')`
- `ylabel('Rain-fall (inches)')`



Bar Graph



Matlab Introduction

Exercise 1

Create an x array that holds numbers 1, 2, 3, ..., 11. Create variable y where y can be expressed as:

$$y = x^2$$

Create a basic plot. You don't need to put title and labels. Write down your steps.

Exercise 2

Following lists the data for monthly amounts of rainfall in inches for the year of 2008 in Grand Canyon.

Month	Rainfall (inches)
January	1.58
February	1.67
March	1.95
April	1.07
May	0.63
June	0.47
July	1.96
August	2.04
September	1.40
October	1.35
November	1.28
December	1.10

Plot this data to display amount of rainfall per months. A bar graph can represent this data in a better way than a plot.

Your tasks are:

- Create an array to hold months.
- Create an array to hold rain-fall.
- Plot the data.
- Create a bar graph.
 - Use: `doc bar`
- Have a title for your graph.
- Label the axes.
- If your bar graph looks right, print it.
- Which month has the maximum rain fall? *Write down both the line of Matlab command and answer here.*
- Find annual rain fall. *Write down both the line of Matlab command and answer here.*
- Find the average annual rainfall. *Write down both the line of Matlab command and answer here.*