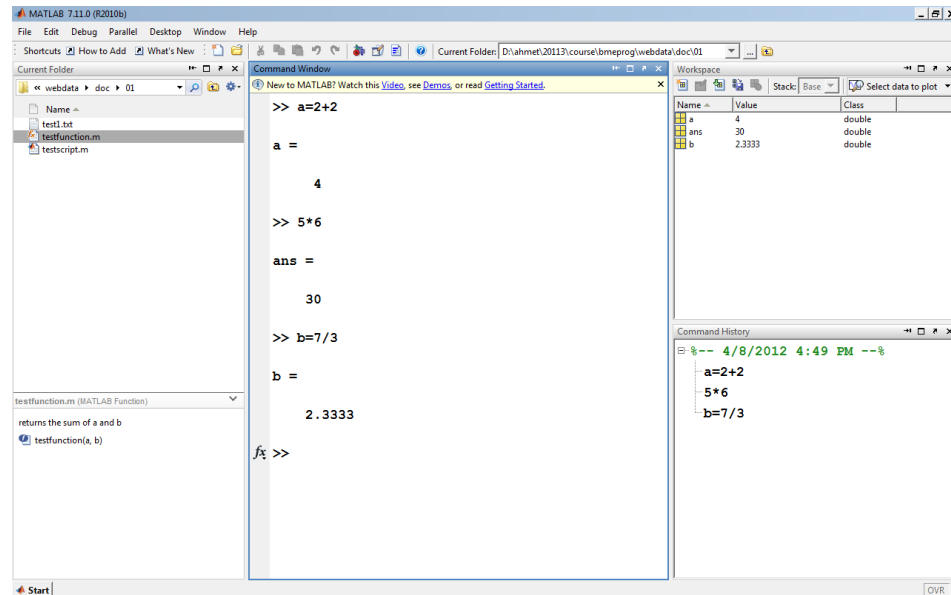


Introduction to Matlab

Matlab GUI, Variables, Printing,
Scripts and Functions

Matlab Desktop Environment

- Command Window
 - Command prompt
- Command History
- Workspace
- Current Directory
- Help
- Dock/Close windows
 - Home->Layout to get them back.



Variables

- `apple='b';`

apple	char
'b'	

contents:



address:



variable name:

apple

Variables

- letter[letter|digit|underscore]*
- names are CaSe SeNsItIvE
- Can be anything
 - Use short, meaningful names
 - reflect what they store
 - avoid using names of existing functions
- who, whos
- ans
- exist('apple','var')
- clear('apple')

Expressions & Assignments

- `variablename = expression ;`
- Semicolon at the end is optional.
- `a=2*sin(1.4)`

`a =`

`1.9709`

- `A=2+2;`

Exercise

- Let a and b be two variables
- Swap the contents of a and b .
- As example, if $a=5$, $b=3$ to start with, your code should end up with a having 3, b having 5.

Printing Numbers

- `fprintf('***%5d***%05d***%c***%.3f***\n',2,2,2,2)`
- `sprintf('$%.2f',6.234)`
- `format [short | long | short e | long e | hex | rational]`

Operators

- Unary operators: -
- Binary operators: + - * / \ ^
- Operator precedence:
 - () ^ unary - * / \ + -
- Exercise: What are the results of the following expressions?
 - $4^2 - 1$
 - $4^{(2 - 1)}$
 - $2 \setminus 3$
 - $4 * 2 - 9 / 3$
 - $5 - - 3$
 - $5 - - - 3$

Exercise 1.7

- The combined resistance of three resistors in parallel is given by:
 - $$R_T = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}}$$
- Create variable R1, R2, and R3 containing 1,2,3, respectively. Write an expression to calculate R_T in terms of R1,R2, and R3.

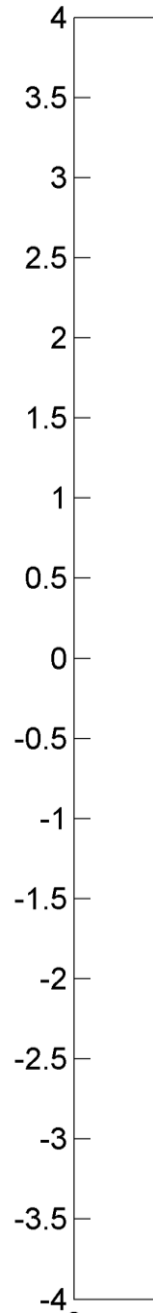
Built-in functions and help

- doc mod
- help mod

- `a = abs(-4)`
 - *call, argument, return*
- `rem(13,5)` vs. `rem(5,13)`
- `abs, sign, floor, ceil, round, fix`

Rounding Functions

- floor, ceil, round, fix
- floor(3.5)
- ceil(3.5)
- fix(3.5)
- round(3.5)
- round(2.5)
- floor(-3.5)
- ceil(-3.5)
- fix(-3.5)
- round(-3.5)
- round(-2.5)



Constants

- pi
- i
- j
- inf
- NaN
- Exercise: find the result of:
 - $10 / 0$
 - $0 / 10$
 - $10 / 0 * 0$
 - $inf * 0$
 - $0 / 0$
 - $inf + 1$
 - $inf + inf$
 - $inf - inf$

Data Types

- http://www.mathworks.com/help/techdoc/matlab_prog/f2-43934.html
- Numeric
 - Floating-Point: `double`, `single`, `realmax()`, `realmin()`, `zeros()`, `ones()`, `rand()`, `randi()`, `eye()`
 - Integer: `int8`, `int16`, `int32`, `int64`, `uint8`, `uint16`, `uint32`, `uint64`, `intmax('int8')`, `intmin('int8')`, `isinteger()`
 - Complex: `complex()`, `real()`, `imag()`
- Logical: `true`, `false`
- Char
- `class()`, `whos()`, `isa(x, 'uint32')`
- Data Conversion: `implicit`, `explicit`

Exercises

- Why would you use integer type instead of double?
- `intmin('int8')` =?
- `intmax('int8')` =?
- `int8(200)` =?
- `int8(-130)` =?

Floating Point Representation & Anomalies

- *significant bits * base^{exponent}*
- Special Values
 - `inf()`, `isinf()`
 - `NaN()`, `isnan()`
- Round-Off Errors:
 - $1 - 3 * (4/3 - 1)$
 - $0.1 + 0.1 + 0.1 \neq 0.3$
 - $(2^{53} + 1) - 2^{53}$
 - `sin(pi)`

Characters & Encoding

- `int8('a')`
- `'a'+1`
- `char('a'+1)`
- `double('abcd')`
- Shifting by 1:
- `char('abcd')+1`

- Note: when parentheses is omitted from a function call, the arguments (if any) are assumed to be strings.
 - `int8 abcd`

Random Numbers

- `rand()`
- `rng('shuffle')`
- Exercise:
 - Generate a random number between 0 and 10.
 - Generate a random number between *low* and *high*. (e.g., test for *low*=7, *high*=10).
 - Generate a random integer between 1 and 10.

Scripts and Functions

- Anything you write on the Command window can be included in a script, which is a text file with ".m" extension. Scripts share the same Workspace as the Command window.
- Functions (can optionally) accept input arguments and (can optionally) return output values. Functions have their own Workspace.

Exercise

- Write a function named `sumofsquares.m` that returns the sum of the squares of its two input arguments.
 - edit `sumofsquares.m`
- Do not ask the user for input.
- Your final answer should not use `fprintf`.
- Your final answers should not have any printing (due to not using semicolon).

Comments, code-blocks, multiple lines

% this is a single line of comment

{

this is a
multiline comment

}

%% this is a code-block

1+2 ...

*3+4