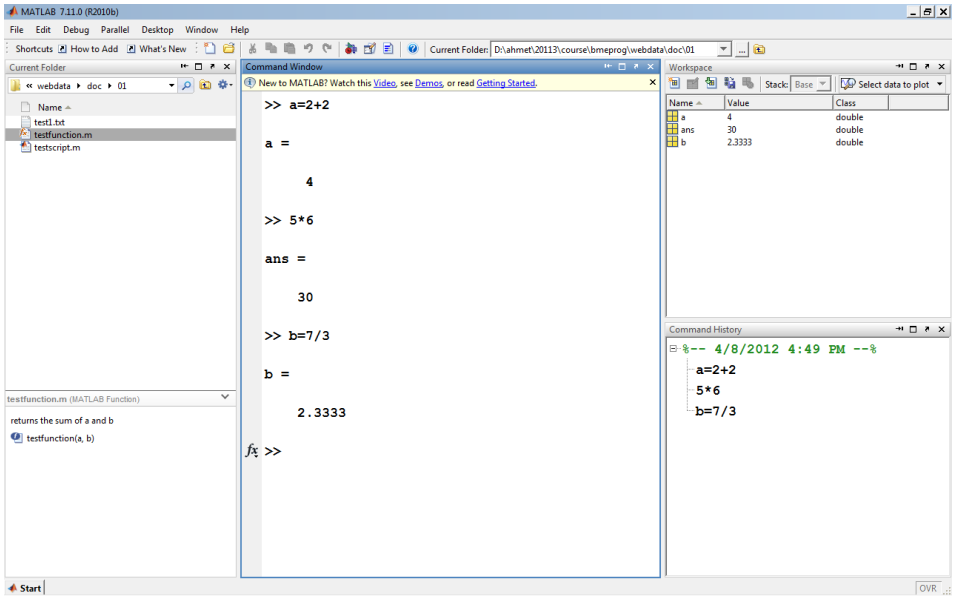
Introduction to Matlab

Matlab GUI, Variables, Printing, Scripts and Functions

Matlab Desktop Environment

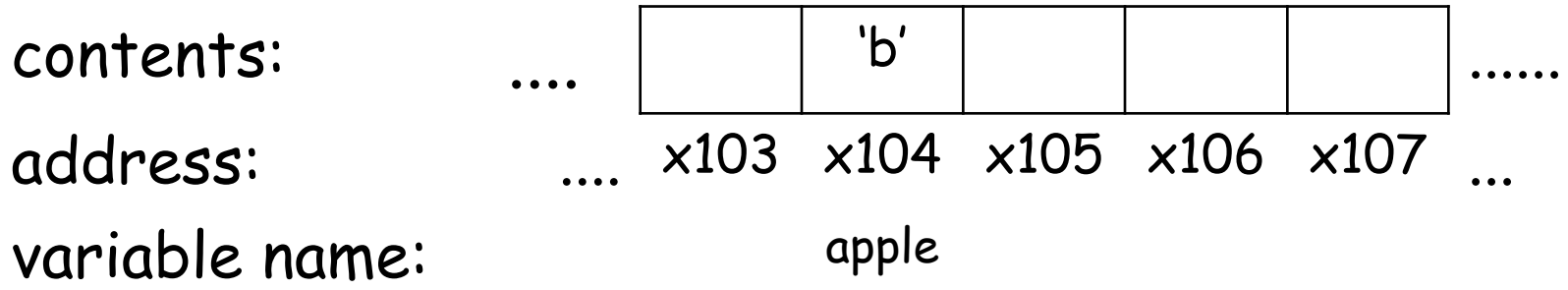
- Command Window
  - Command prompt
- Command History
- Workspace
- Current Directory
- Help
- Dock/Close windows
  - Home->Layout to get them back.



Variables

- apple='b';

apple	char
'b'	



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 \ 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.

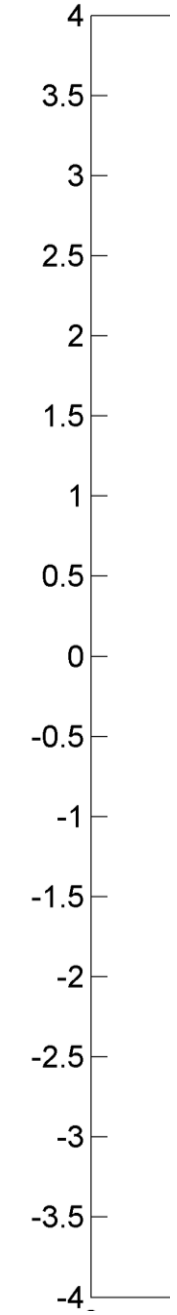
Built-in functions and help

- 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 == 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
```