

CSCI 1320

Computer Science I: Engineering Applications

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Announcements

- MATLAB make sure you have way to code this week
 - either install on your own computer or use computer lab
- **Assignment 0 (Picobot)** – interview grading happening this week
- **Assignment 1 (MATLAB intro)**
 - Due Sunday Sept. 9 by 6:00PM on Moodle
- **Interview Grading for Assignment 1**
 - Will be taking place next week.
 - Look for schedulers to appear on Moodle this Saturday. Make sure you use the scheduler for your section number.
- Quiz 1 due by end of week



Important:

- Interview grading is required for all homework assignment (unless otherwise stated).
- No points will be awarded if you miss your interview ☹.

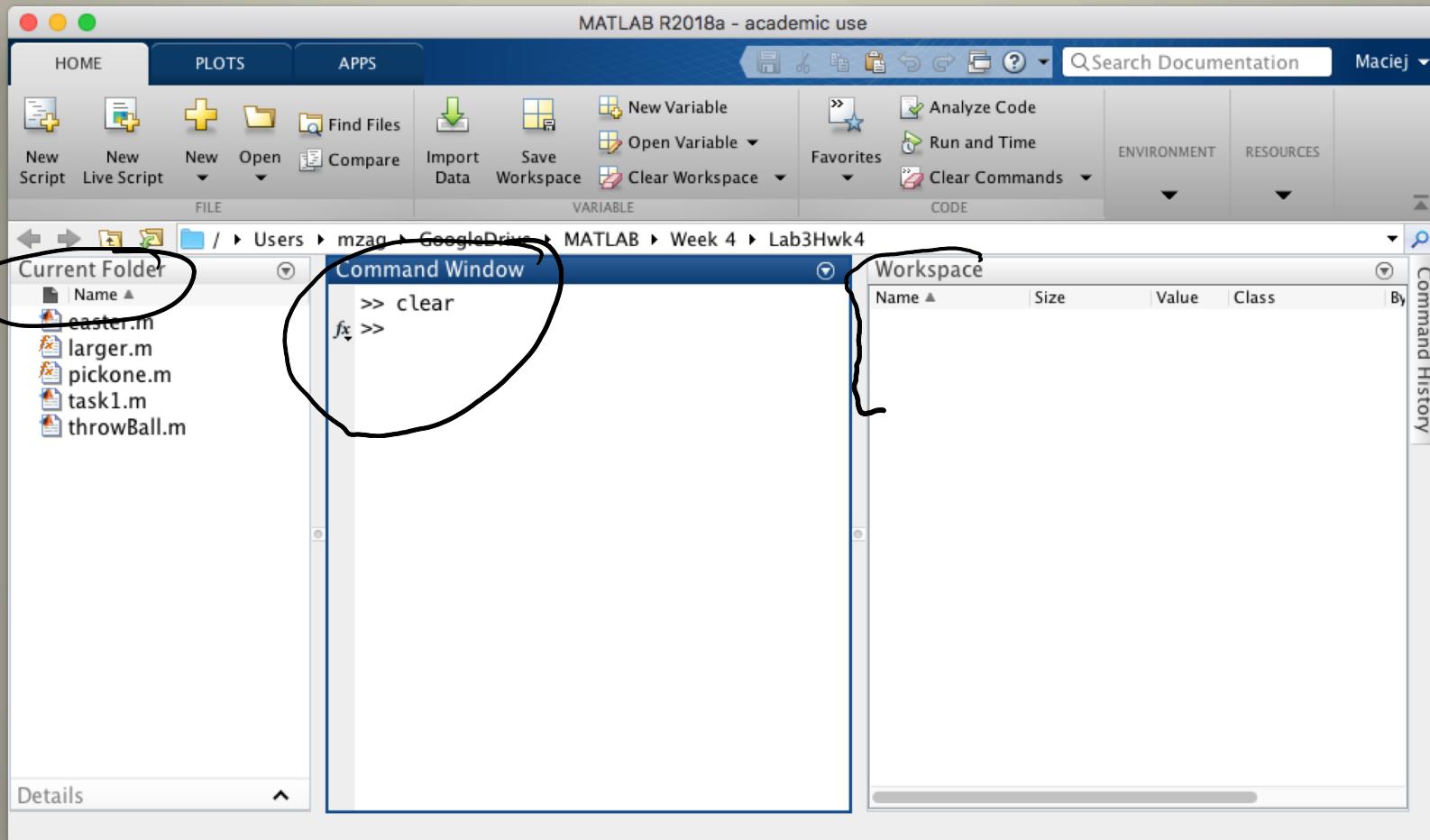


Today's Objectives:

- MATLAB recap:
 - Environment
 - Interactive vs Script mode
 - Variables and identifiers (names)
 - Assignment statements
- New:
 - Types
 - Relational expressions
 - Logical expressions



MATLAB Integrated Development Environment (IDE)



Intro to MATLAB

- Can be used in 2 ways
 1. Interactively
 - >> is the prompt
 - At the prompt, enter a command or expression
 - MATLAB will respond with a result
 2. As a scripted language
 - allows a sequence of commands to be executed
 - this is how you write an actual "program" in MATLAB
 - More on this later



MATLAB - identifiers

- Names are given to variables and functions (*celsius*, fahrenheit), functions (*main*, convert), etc.
 - These names are called *identifiers*
 - *Identifiers* are case sensitive.
 - Some names cannot be used
 - keywords: for, end, while
- >> iskeyword ('for')



Variables and Assignments

- Variable – used to store a value
- Assignment statement – used to put a value into a variable

variable \equiv expression

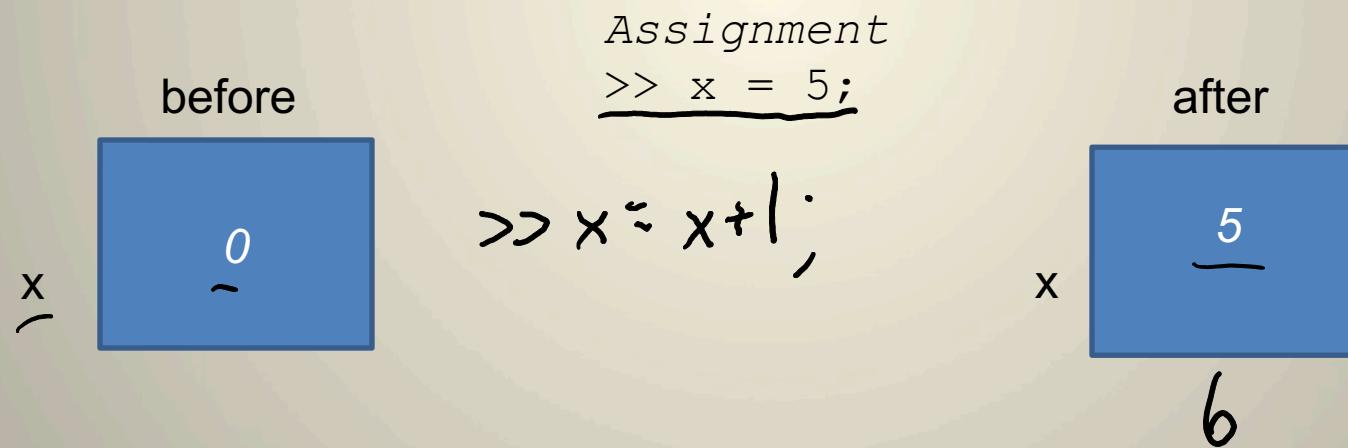


- *The order is important*
 - *variable name on the left*
 - *the assignment operator “=”*
 - *expression on the right hand side*



Assignment Statements

- Variables are like a box we can put values in.
- When a variable changes, the old value is erased and a new one is written in.



Math vs Code

Code might look like math, but it has different meaning.

	Math	MATLAB
<u>$x = 3$</u>	<i>Stating that x is equal to 3</i>	Assign 3 to var x
<u>$x = x + 3$</u>	<i>Invalid statement</i>	Increment x by 3
<u>$3 = x$</u>	<i>x is equal to 3</i>	Error: incorrect order
$x = y + 3$	<i>x is greater than y by 3</i>	Assign the value of $y+3$ to x
$x = 4$ $x = 6$	<i>Contradictory statements</i>	Assign 4 to x then Assign 6 to x



Types

- Every variable has a *type* (i.e. class)
 - single, double - real numbers
 - char - vector of characters
 - string - series of letters (or word)
 - logical - TRUE / FALSE 1/0
- The default type is double (for numeric)
-



Types

Integer types:

1 byte 2 byte 4 byte

- int8, int16, int32, int64

• signed integers (positive or negative)

- uint8, uint16, uint32, uint64

• unsigned integers (only positive)

8 bits is a byte

~~no int 7~~

Numbers in the names are the number of bits used to store a value of that type.



Types

Example: uint8 (*unsigned integer*)

Binary	Decimal
0000 0000	0 min
0000 0001	1
0000 0010	2
0000 0011	3
	:
1111 1111	255 max

2^8 possible combinations

$n = \#$ of bits

$$\text{max} = 2^n - 1$$

e.g. 8 bits

$$n = 8$$

$$\text{max} = 2^8 - 1 = 255$$



Types 2's complement

0 = positive
1 = negative

Example: int8 (signed integer)

Binary	Decimal
0000 0000	0
0000 0001	1
0000 0010	2
0000 0011	3
	:
0111 1111	<u>127</u>
1111 1111	-1
1111 1110	-2
1111 1100	-4
1000 0000	<u>-128</u>

2^8 possible combos

n = # of bits

$$\text{min} = -2^{(n-1)}$$

$$\text{max} = \underline{2^{(n-1)} - 1}$$

e.g. 8 bits

$$n=8$$

$$\text{min} = -128$$

$$\text{max} = 127$$



Types in MATLAB

- Verify integer range with intmin and intmax
 - e.g. intmin('int8') is -128, intmax('int8') is 127
'uint32' 'uint16'
- Converting from one type to another is called *casting* or type casting.

```
>> num = 6 + 3; % num var is double type  
>> numi = int32(num); % numi var is int32 type
```



Types

- Why worry about using different types?
 - Different types utilize different amounts of memory space
 - E.G. `uint8` is only 8 bits (or 1 byte), `double` is 64 bits or 8 bytes
 - Let's use the smallest type that will get the job done



Relational Expressions

- Used to compare two variables
- The relational operators in MATLAB are:

\equiv
 \geq
 $x = y$

Syntax	Meaning
$x \geq y$	greater than
$x < y$	less than
$x \geq y$	greater than or equals
$x \leq y$	less than or equals
$x == y$	equality
$x ~=~ y$	inequality



Math vs Code

Code might look like math, but it has different meaning.

	Math	MATLAB
$x < 3$	Stating that x is less than 3	
$3 > x$	Stating that 3 is greater than x	



Logical Expressions

- Operate on 2 logical values

Syntax	Meaning
<code>a b</code>	
<code>a && b</code>	
<code>~a</code>	
<code>xor(a,b)</code>	