CISC 3250
Systems Neuroscience

Matlab

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JMH 328A

Commands
Symbols and keywords cause actions
• $b=2$ creates variable $b$ with value 2
• $d=b+5$ creates variable $d$ with value computed by adding 5 to value of $b$
• exit closes program

= operation
= assigns value on right to variable on left

• $b=5$ valid
• $5=b$ invalid

Variable names
• A variable name is any valid identifier
  – Starts with a letter, contains letters, digits, and underscores (_) only
  – Cannot begin with a digit
  – Case sensitive:
    username≠userName≠UserName
**Standard arithmetic**

Operators
- Addition: \( 5 + 2 \) evaluates to 7
- Subtraction: \( 5 - 2 \) evaluates to 3
- Multiplication: \( 5 \times 2 \) evaluates to 10
- Division: \( 4 \div 2 \) evaluates to 2
- Exponent: \( 5^2 \) evaluates to 25

**Be careful with variable names**

- NumSpikes=10

Variables are case-sensitive
- numspikes=5  **error, did not capitalize N and S**
- NumSpike=5  **error, forgot letter s at end**

**Logic**

Conditional behavior based on variable value
if \( x > 5 \)
  \( y=2; \)
else
  \( y=5; \)
end;

Basic syntax
if condition
  actions-if-true
else
  actions-if-false
end

Comparisons
- \( d<2, \ d>2 \)  **strict inequality**
- \( d\leq2, \ d\geq2 \)  **semi-inequality**
- \( d==2 \)  **equality**

Logic combinations
- \( d>5 \ \& \ d<8 \)  **the AND operation**
- \( d<5 \ \mid \ d>8 \)  **the OR operation**
Loop

Repeating similar action
for \( i = 1:4 \)
  \[ \text{disp}(i); \]
end;

Basic syntax
for \( \text{var} = \text{VarValues} \)
  \( \text{actions-to-repeat} \)
end

Output
1
2
3
4

Defining a vector

Vector is a list of numbers
- \( b=[42, 35, 68, -3] \)
- \( c=[-18 \ 12 \ 14] \)

Vector denoted by [ ] braces
Elements separated by commas , or blank spaces

Counting in Matlab

\( a:b \) creates a vector \( [a \ a+1 \ldots \ b-1 \ b] \)
- \( 3:6 \) \( \rightarrow \) \( [3 \ 4 \ 5 \ 6] \)

\( a:k:b \) creates a vector \( [a \ a+k \ a+2k \ldots \ b] \)
- \( 3:4:15 \) \( \rightarrow \) \( [3 \ 7 \ 11 \ 15] \)

Accessing vector elements

\( a=[2.2 \ 1.4 \ -5 \ 3.5 \ -7.8]; \)
- \( \text{name} \) accesses full vector \( a \)
- \( \text{name(index)} \) accesses single element \( a(4) \) \( \text{returns} \ 3.5 \)
- \( \text{name(index1: index2)} \) accesses set of elements \( a(2:4) \) \( \text{returns} \ [1.4 \ -5 \ 3.5] \)
- \( \text{name(end)} \) accesses final element