Lecture 3:

Getting started with MATLAB

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Learning objectives

- Identify key components of the MATLAB interface
- Declaring and clearing variables
- Arithmetic operators
- Entering numbers using scientific "e" notation
- Writing a script

Key components of the MATLAB interface

- Command Window
- Workspace
- Working Directory
- Current Folder
- Status Bar

Entering commands in the Command Window

- Type the following into the Command Window:

```
>> 10 + 3
```

Note: Code will be written in a fixed-width font

- Press **Enter** to run (execute) the command

```
ans =
    13
```

Variables

In computer programming, variables are named containers of data

Creating variables in MATLAB

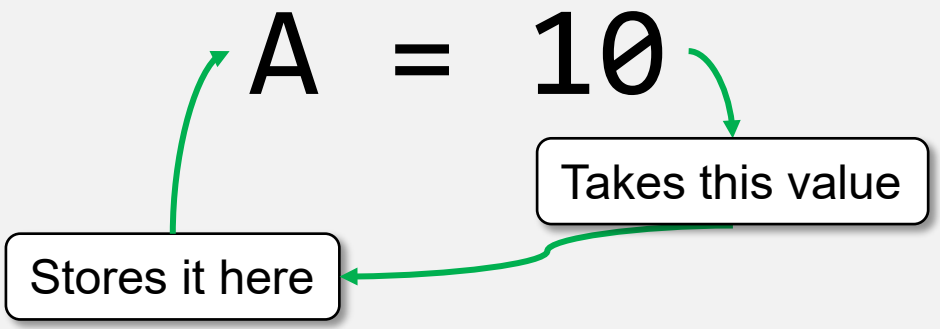
- Run the following in the Command Window:

```
>> A = 10
```

- Check that the variable `A` was created in the Workspace

The assignment operator (=)

- The assignment operator takes the value on its right and stores it in the variable on the left



The assignment operator (=)

- Assigning a value to an existing variable will overwrite it

- Run the following commands:

```
>> A = 10
>> A = 20
```

- What is the final value of A?

Note: You can print the value of a variable by typing its name in the Command Window:

```
>> A
```

Variable naming rules

- Must start with a letter
- Can only contain letters, numbers, and underscores (_)

Clearing variables in the Workspace

- Run the following command:

```
>> clearvars
```

- Check that all variables have been removed from the Workspace

Note: Trying to refer to a cleared variable will result in an error:

```
Unrecognized function or variable 'A'.
```

Arithmetic operations in MATLAB

- Run the following command:

```
>> A = 10 + 3
```

- What is the value of `A`?

Note: The commands on the right side of the assignment operator are executed first before the final value is stored.

Arithmetic operators in MATLAB

Operation	Operator
Addition	+
Subtraction	-
Multiplication	*
Division	\
Power	^

Practice

- Which of the following commands computes the equation shown below?

$$Y = 10x^2 + 5$$

A. `Y = 10x^2 + 5`

B. `Y = 10 * x ^ 2 + 5`

C. `Y = 10 * x ** 2 + 5`

D. I don't know

Using variables in commands

- Run the following commands:

```
>> A = 10
>> B = A * 3
```

Unassigned outputs – the ans variable

- Enter the following:

  >> 10 + 2

- What variable(s) were created in the Workspace?

Unassigned outputs – the ans variable

- MATLAB creates the variable `ans` if the output of a command is not explicitly assigned to a variable.

Caution: This variable can easily be overwritten (e.g., if you run multiple commands without assigning a variable).

Best practice states that you should never use `ans` in your commands or code.

Scientific "e" notation

- When entering very large or very small numbers, you can use scientific "e" notation

$$3.587 \times 10^{12} = 3.587e^{12}$$

Operator precedence

Rules which determine which operators are evaluated first

Operator precedence

^ followed by */ followed by +-

Example of operator precedence

- Enter the following command:

```
>> A = 5 + 2 / 2
```

- How does operator precedence explain the result?

Note: The order of operations goes

```
5 + 2 / 2
  5 + 1
  5 + 1
    6
```

Control the order of operation using parentheses ( )

- Run the following command:

```
>> A = (5 + 2) / 2
```

Note: The order of operations goes

```
(5 + 2) / 2
7 / 2
7 / 2
3.5
```

Writing a script

- In MATLAB, scripts are named files which contain commands

- All scripts have the `.m` extension (they also called m-files)

- Scripts are (typically) executed one line at a time, from top to bottom

Creating a script

- Click on New > Script under the Home tab

- Or type in `edit <script name>`:

```
>> edit lec3_example.m
```

Note: This command creates a script in the current working directory.

Naming a script

- Scripts have the same naming rules as variables
- Must start with a letter
- Can only contain letters, numbers, and underscores

Comments

- Comments are lines of code that are not executed by MATLAB

- They start with the percent symbol (%):

```
%This is a comment
A = 10; %This is also a comment
```

Note: Comments can be on their own line, or they can be inserted after a command (but not before a command).

Practice

- Write a script that computes the area of a circle with a radius of 10

$$A = \pi r^2$$

Note: The constant π can referred to using the function `pi`

Example of a script:

areaofcircle.m

```
%Calculate area of a circle
radius = 10; %cm
area = pi * radius^2;
```

Running a script

- To run a script, you can either click on the Run button in the Editor window

- Or type the script name in the Command Window:

```
>> areaofcircle
```

Note: The script must exist in the current directory or on the MATLAB path (more on this later).

Best practices when scripting

- Scripts should be self-contained code (i.e., they should declare or load all the data they need)
- Consider starting scripts with the `clearvars` command – this avoids mistakes where variables were misnamed or modified in the Command Window
- Name your scripts something descriptive
- Use comments to explain what you are doing

Practice Questions

What does the Workspace do?

A. Where you type in commands

B. Tells you if MATLAB is doing work

C. Tells you what variables have been declared

D. Displays files and folders

E. I don't know

What is the assignment operator?

A. +

B. =

C. /

D. \

E. :

Without using MATLAB, what is the value of the following command?

```
Y = 1 + 2 ^ 3 / 2
```

A. 5

B. 4.5

C. 3.8

D. 1

Announcement on Problem Sets

- First problem set (homework) will be assigned on Canvas today
- Please separate the optics and the MATLAB questions
- For the MATLAB homework, please include a printout of your code (with comments)
- If you need help, schedule a meeting with me before next Friday: https://calendly.com/jiantay