Week 1 MATLAB Activities

Contents

How Does Typing in a Code Tutorial Help with Learning?

Typing in a code tutorial can significantly enhance learning in several ways:

- **Active Engagement**: Typing the code yourself forces you to actively engage with the material, rather than passively reading or watching. This active participation helps reinforce the concepts being taught.
- **Muscle Memory**: Repeatedly typing code helps build muscle memory, making it easier to recall syntax and structure when you write code independently.
- **Error Handling**: When you type code, you're likely to make mistakes. Debugging these errors helps you understand common pitfalls and how to resolve them, which is a crucial skill for any programmer.
- **Understanding**: Typing out code allows you to see how different parts of the code interact. This deeper understanding can help you apply similar concepts to different problems.

- **Retention**: Studies have shown that actively doing something helps with retention. By typing out the code, you're more likely to remember the concepts and techniques.

🚦 No AI use

Time required: 90 minutes

How to Create Screenshots: Please use the Snipping Tool. Paste a screenshot of just the program you are working on. If you are snipping a virtual machine, make sure your focus is outside the virtual machine before you snip.

1. Press and hold down the **Windows key** & **Shift**, then type **S.** This brings up the on-screen snipping tool.
2. Click and Drag your mouse around whatever you want to snip.
3. Release the mouse button. This places the snip into the Windows Clipboard.

Go into a blank Word document or wherever you want to paste the snip. Hold down **CTRL**, then type **V** to paste the snip.

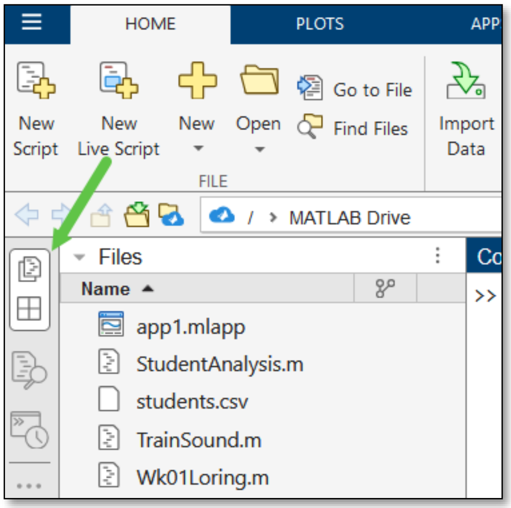
Reading

Matlab A Practical Introduction to Programming and Problem Solving (Stormy Attaway)

Sections 1.1, 1.2, 1.3, 1.4

MATLAB Assignment Script

1. Logon to www.mathworks.com → Click **MATLAB → Open MATLAB Online**.
2. Click the Files button.

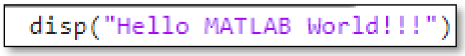


3. Click **New Script** → Save this MATLAB script as **Wk01Lastname.m**
4. Save all this weeks programs in this script.
5. Include your name and date at the top of the script file as comments.
6. Put a Section Break between each program.

Hello World!

Hello World is traditionally the first program some one writes in a new programming language.

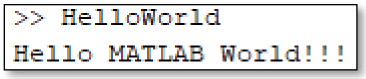
Insert the following code into your MATLAB script.



```
disp("Hello MATLAB World!!!")
```

- **disp()** – Display whatever is inside the () to the Command Window.
- "Hello" = This is a string of text to be displayed in the Command Window.

Example run:



```
>> HelloWorld
Hello MATLAB World!!!
```

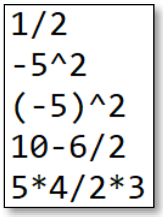
Practice 1.1

The following problem is all about the order of operations in math.

Remember from math class about the order of operations? If two operations have the same precedence, you proceed from left to right? Remember from math class the acronym PEMDAS? One of the more common "issues" students have with programming is order of operations ... only, compared to math class, there are many more operations to keep track of!

Instructions

1. Add the expressions below to your script.
2. Using the % comment symbol, explain step-by-step what YOU THINK is happening for each given expression. (if you're wrong, you will NOT be deducted)
3. Execute the script.
4. Compare your prediction to the result from MATLAB. If your prediction is different - can you now explain how the MATLAB result arises (using order of operations)?



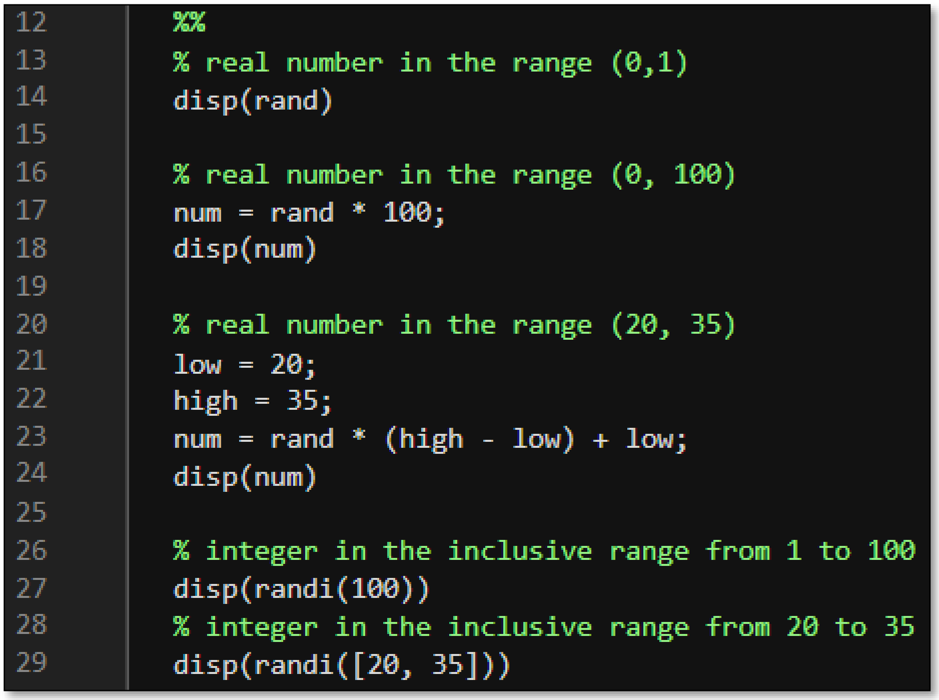
```
1/2
-5^2
(-5)^2
10-6/2
5*4/2*3
```

Sample answer script:

```
% Name: Your Name
% Filename:
% Practice Problem 1.1
3^2*2
% Prediction: 2*2 is 4. and 3^4 is 81
% Actual: 18
% Reflection:  I was treating the 2*2 as if they were in the exponent
together, but there were no parentheses!
% 3 to the power of 2 is 9, multiplying by 2 yields 18.  Got it!
```

Tutorial 1: Random Numbers

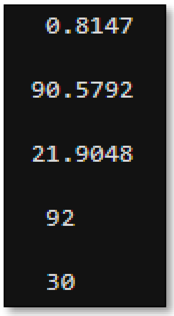
Let’s create some random numbers using the rand library.



```
%%
% real number in the range (0,1)
disp(rand)

% real number in the range (0, 100)
num = rand * 100;
disp(num)

% real number in the range (20, 35)
low = 20;
high = 35;
num = rand * (high - low) + low;
disp(num)

% integer in the inclusive range from 1 to 100
disp(randi(100))
% integer in the inclusive range from 20 to 35
disp(randi([20, 35]))
```

Example run:

These are random numbers. The results will be different each time.



```
  0.8147

 90.5792

 21.9048

  92

  30
```

Tutorial 2: Sine Wave Plot

The program gives a simple example of plotting data. Enter the following code.

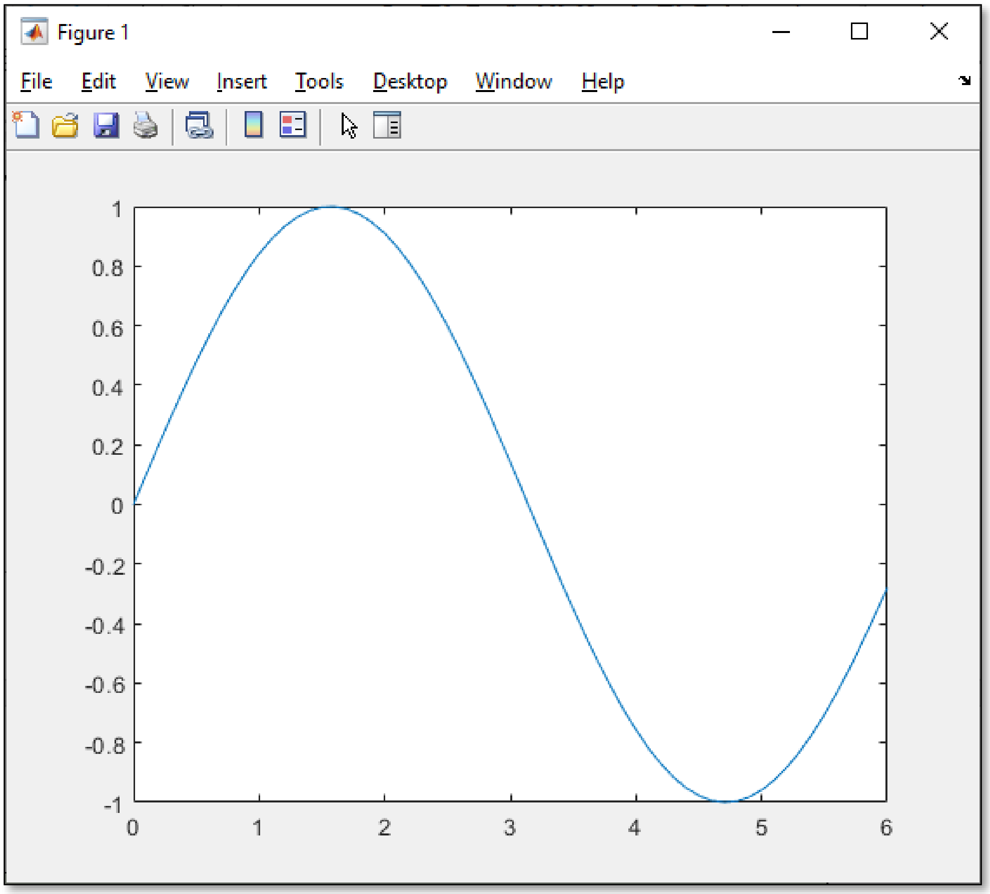
```
% Calculates and plot the function sin(x) for 0 <= x <= 6.

% Define the range of x values from 0 to 6 with increments of 0.1
% x = startValue:step:endValue;
% x = 0:0.1:6;
x = 0:0.1:6;

% Calculate the sine values for each x value
y = sin(x);

% Plot the sine function
plot(x, y);
```

This program calculates and plots the sin(x) function within the range of 0 <= x <= 6.

- **x = 0:0.1:6 -** Generates an array of values from 0 to 6 incremented by 0.1, representing the x-coordinates for the function.
  x = startValue:step:endValue;
- **y = sin(x)** - Computes the sine values for each element in the x array, resulting in the corresponding y-coordinates.
- **plot(x, y)** - Produces a plot of sin(x) against x based on the computed values.

This code generates and visualizes the sine function over the specified range.

Example run:



Include a screenshot of your plot with your assignment.

Tutorial 3: User Input and Output

Assignment 1: Age Calculation

Include comments in your code to explain each step.

1. Define a variable **yourAge**
2. Assign it your current age (as an integer).
3. Create a new variable **newAgeAfterAddition** that adds 5 to **yourAge**.
4. Generate another variable **newAgeAfterSubtraction** that subtracts 3 from **yourAge**

- Display the original age.

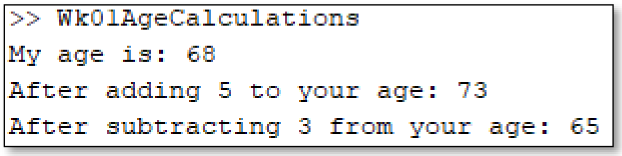
- Display the age after adding 5.

- Display the age after subtracting 3.

- Test your code by assigning your actual age to `yourAge`.

- Run the script and ensure it displays the correct results.

Example run:



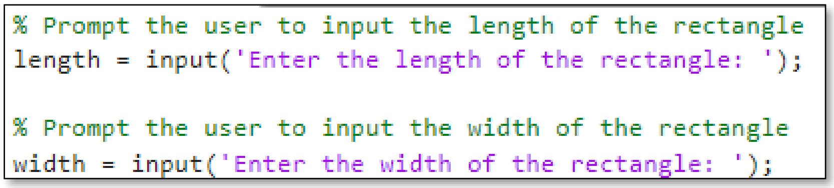
```
>> Wk01AgeCalculations
My age is: 68
After adding 5 to your age: 73
After subtracting 3 from your age: 65
```

Assignment 2: Rectangle Calculator with User Input

Include comments in your code to explain each step.

Let’s get some user input going with our programs.

The input function prompts the user for input, which can be assigned to a variable.



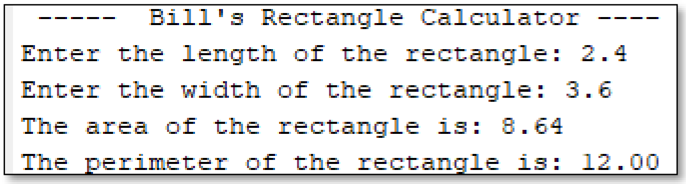
```
% Prompt the user to input the length of the rectangle
length = input('Enter the length of the rectangle: ');

% Prompt the user to input the width of the rectangle
width = input('Enter the width of the rectangle: ');
```

Use the following formulas to calculate and display the area and perimeter of a rectangle.

$A = l \times w$

$P = 2(l + w)$

Example run:



```
 -----  Bill's Rectangle Calculator ----
Enter the length of the rectangle: 2.4
Enter the width of the rectangle: 3.6
The area of the rectangle is: 8.64
The perimeter of the rectangle is: 12.00
```

Assignment Submission

1. Submit properly named and commented script files.

2. Attach a text file showing the successful execution of each script.

3. Attach all to the assignment in Blackboard.