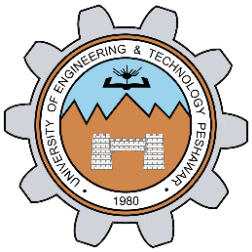
INTRODUCTION TO MATLAB

LAB # 01



Spring 2023

CSE301L Signals & Systems Lab

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Registration No. : **21PWCSE2059**

Class Section: **C**

"On my honor, as student of University of Engineering and Technology, I have neither given nor received unauthorized assistance on this academic work."

Submitted to:

Engr. Sumayyea Salahuddin

Date:

March 3, 2023

Department of Computer Systems Engineering

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Lab Objective(s):

Objectives of this Lab are;

- Introduction to MATLAB
- MATLAB Environment
- MATLAB Help
- Variable arithmetic
- Built in Mathematical Functions
- Input and display
- Timing functions
- Introduction to M-files

Task # 01:

a. Matlab stores numeric data as double-precision floating-point by default. To store data as an 8- bit integer, int8 (a conversion function) can be used. Type the sample code in MatLab command window:

```
>>      x = 26
>> whos
>> y = int8(x)
>> whos
```

What difference do you see? State your findings. (Also try uint16, uint32, uint64)

b. Take your name in the command window e.g. name = 'Ali'. Convert it into 8-bit integer format using the **int8** function.

c. Use the formatting commands present in MatLab to convert the system Clock to whole numbers rather than floating points.

Code:

Part a:

Part b:

Part c:

Output:

Task a:

Command Window

```
>> x = 26

x =

    26

>> whos
  Name        Size              Bytes  Class     Attributes

  x           1x1                   8  double

>> y = int8(x)
```

```
>> y = uint16(x)

y =

     26

>> y = uint32(x)

y =

          26

>> y = uint64(x)
```

Command Window

```
y =

     26

>> y = uint32(x)

y =

          26

>> y = uint64(x)

y =

                    26
```

```
Command Window
>> y = int8(x)

y =

   26

>> whos
  Name        Size                Bytes  Class     Attributes

  x           1x1                     8  double
  y           1x1                     1  int8
```

Task b:

```
Command Window
>> name = 'Ali Asghar'

name =

Ali Asghar

>> y = int8(name)

y =

   65   108   105    32    65   115   103   104    97   114

fx >>
```

Task c:

```
Command Window
>> clock

ans =

   1.0e+03 *

    2.0230    0.0030    0.0020    0.0140    0.0060    0.0114

>> y = int8(clock)

y =

  127    3    2   14    6   19
```

Task # 02:

Create an M-File to prove any five expressions from the following:

$\sin(\alpha+\beta)=\sin\alpha\cos\beta+\cos\alpha\sin\beta$ $\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta$ $\cos(\alpha+\beta)=\cos\alpha\cos\beta-\sin\alpha\sin\beta$ $\cos(\alpha-\beta)=\cos\alpha\cos\beta+\sin\alpha\sin\beta$	$\tan(\alpha+\beta)=\frac{\tan\alpha+\tan\beta}{1-\tan\alpha\tan\beta}$ $\tan(\alpha-\beta)=\frac{\tan\alpha-\tan\beta}{1+\tan\alpha\tan\beta}$
$\sin\alpha+\sin\beta=2\sin\left(\frac{\alpha+\beta}{2}\right)\cos\left(\frac{\alpha-\beta}{2}\right)$ $\sin\alpha-\sin\beta=2\cos\left(\frac{\alpha+\beta}{2}\right)\sin\left(\frac{\alpha-\beta}{2}\right)$	$\cos\alpha+\cos\beta=2\cos\left(\frac{\alpha+\beta}{2}\right)\cos\left(\frac{\alpha-\beta}{2}\right)$ $\cos\alpha-\cos\beta=-2\sin\left(\frac{\alpha+\beta}{2}\right)\sin\left(\frac{\alpha-\beta}{2}\right)$
$\sin\alpha\sin\beta=\frac{1}{2}[\cos(\alpha-\beta)-\cos(\alpha+\beta)]$ $\cos\alpha\cos\beta=\frac{1}{2}[\cos(\alpha-\beta)+\cos(\alpha+\beta)]$	$\sin\alpha\cos\beta=\frac{1}{2}[\sin(\alpha+\beta)+\sin(\alpha-\beta)]$ $\cos\alpha\sin\beta=\frac{1}{2}[\sin(\alpha+\beta)-\sin(\alpha-\beta)]$

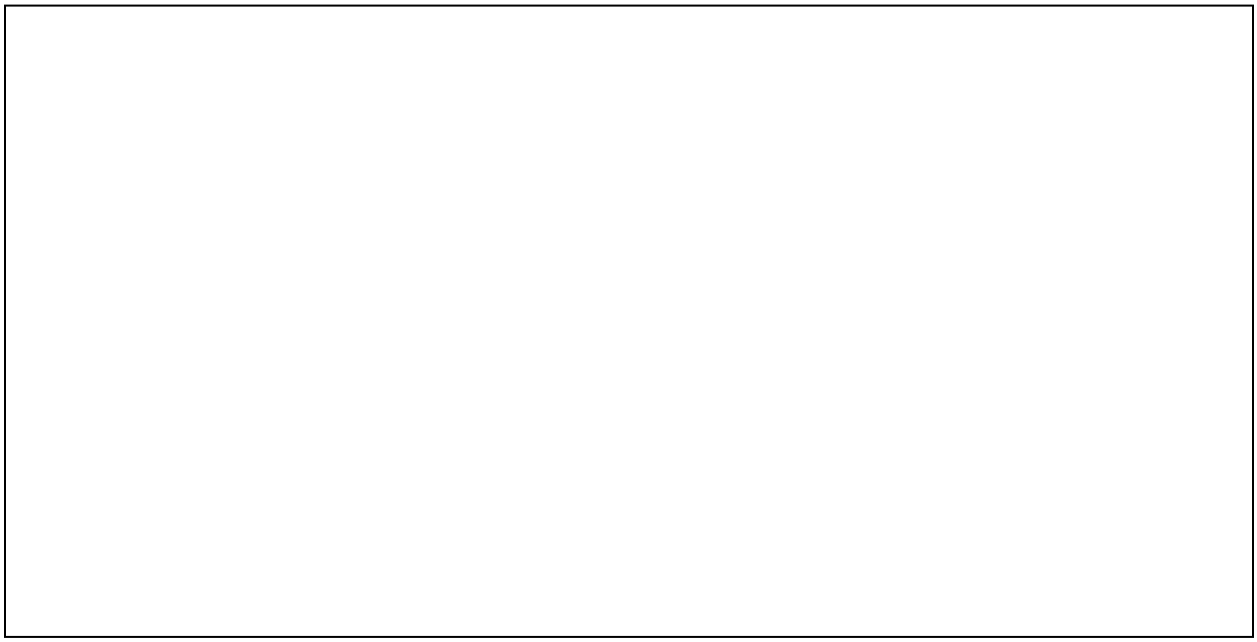
Use etime or tic toc functions to evaluate time taken for solving each of the five chosen expressions.

Code:

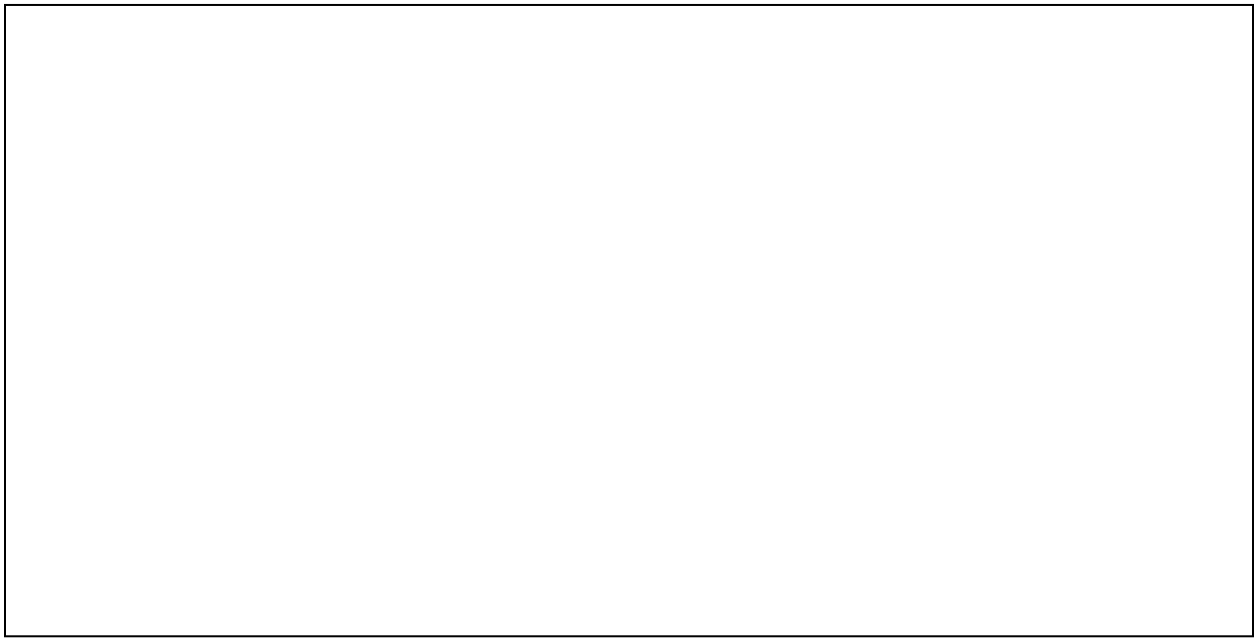
Equation 1:

Equation 2:

Equation 3:



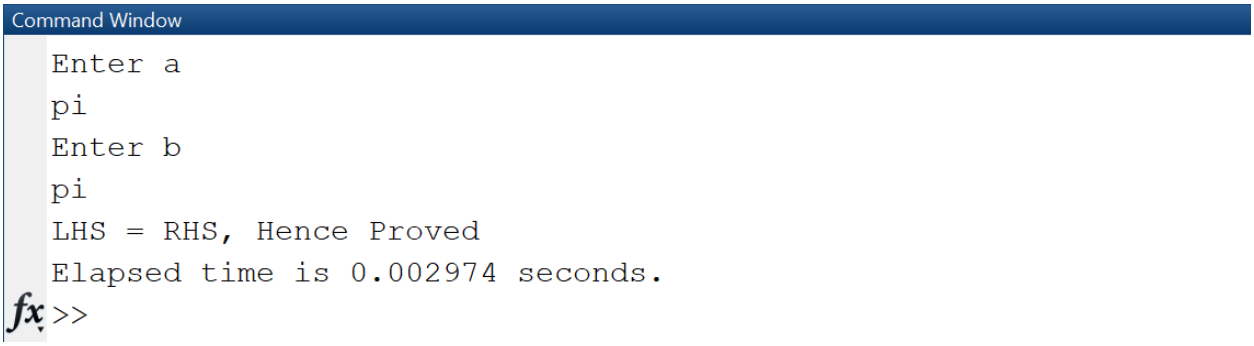
Equation 4:



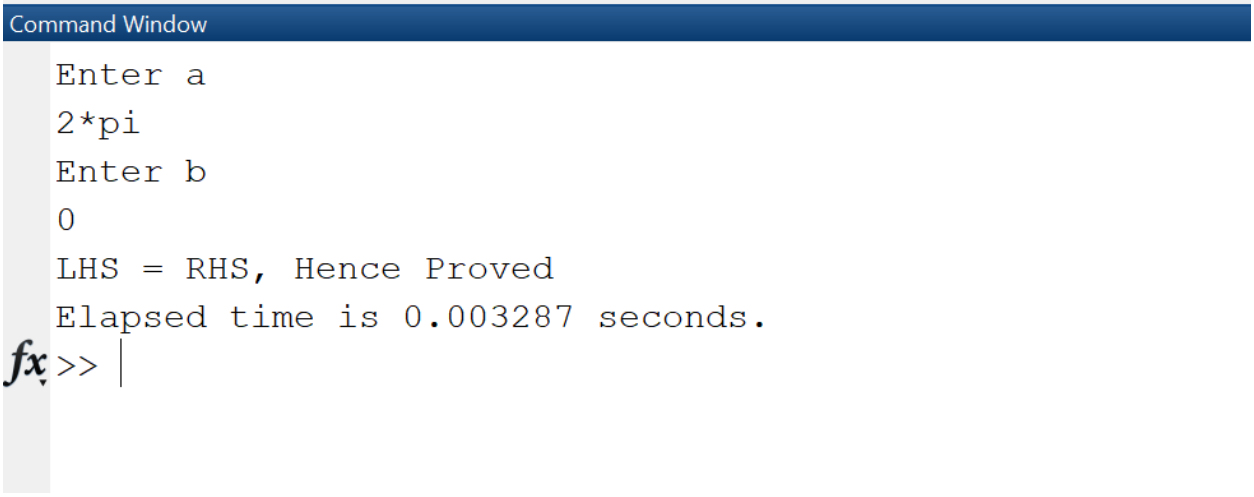
Equation 5:

Output:

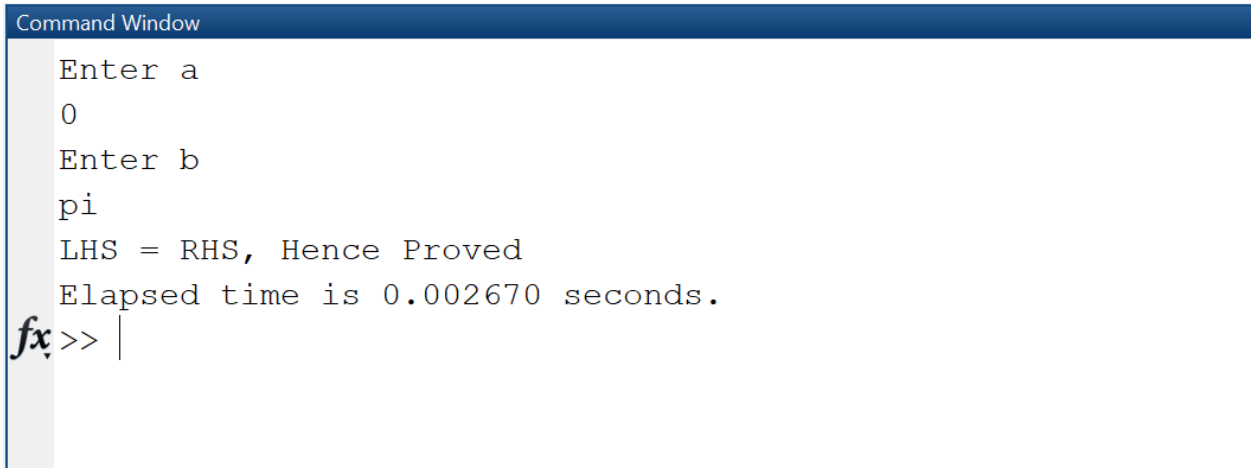
Equation 1:



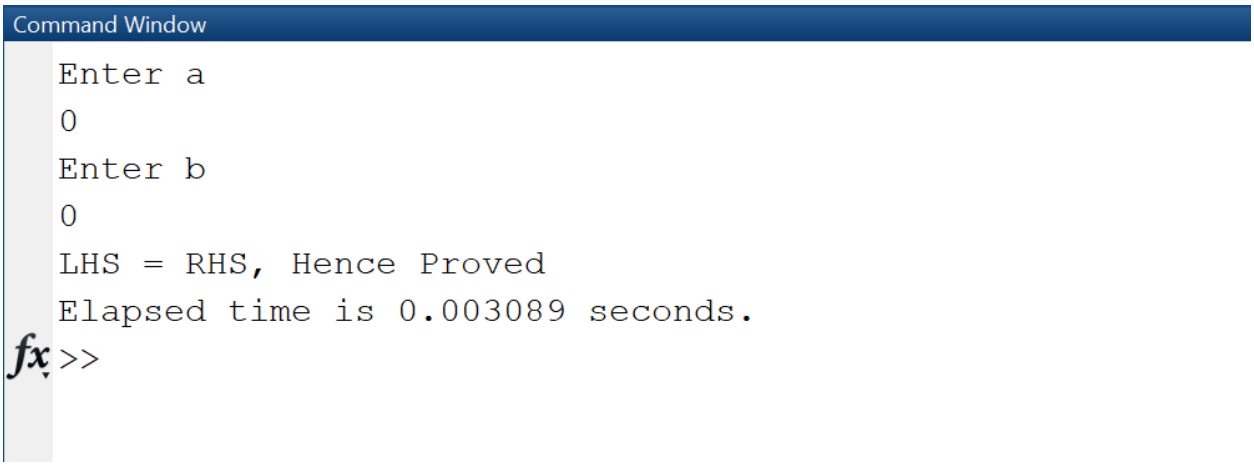
Equation 2:



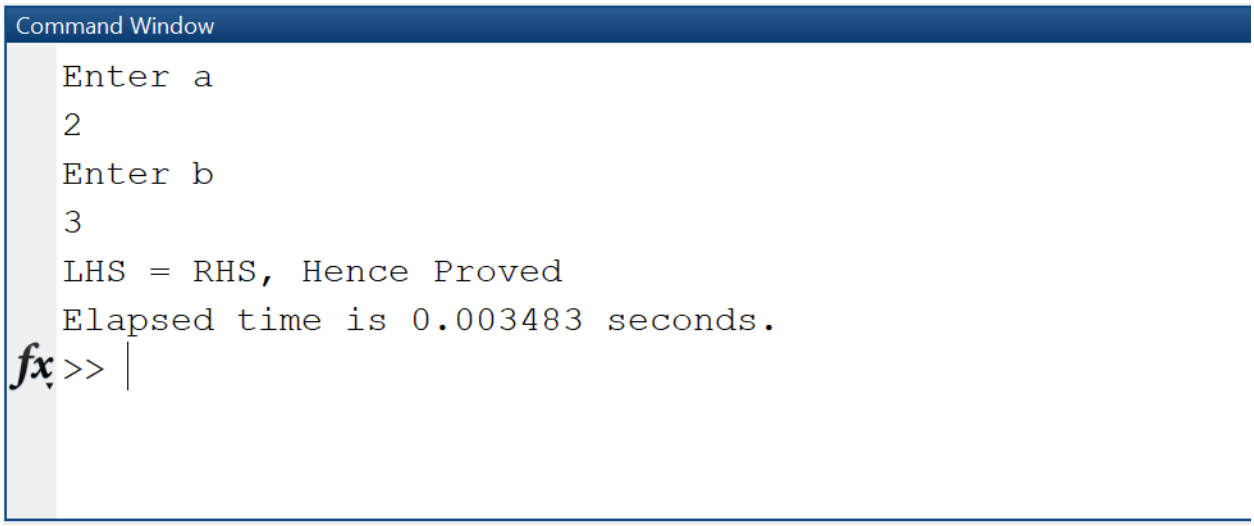
Equation 3:



Equation 4:



Equation 5:



Task # 03:

Write a CGPA Calculator program using M-File: Design a transcript for your second semester result i.e. take grade points and credit hours of each subject as input from user and store in variables. Take product of each subject grade points with its credit hours and divide by total credit hours in order to evaluate CGPA. Show the results in the form of well designed transcript using disp and input commands. Use the following table to display equivalent grades for each grade point:

Grade	Grade Point
A	4.00
A-	3.67
B+	3.33
B	3.00
B-	2.67
C+	2.33
C	2.00
C-	1.67
D+	1.33
D	1.00
F	0

Code:

Output:

Command Window

```
Enter CP Credit Hours
3
Enter CP Grade Points
4
Enter CS Credit Hours
3
Enter CS Grade Points
4
Enter DE Credit Hours
3
Enter DE Grade Points
4
Enter CPS Credit Hours
2
Enter CPS Grade Points
3.67
Enter EDG Credit Hours
2
```

Command Window

```
Enter EDG Grade Points
3.67
Enter PS Credit Hours
2
Enter PS Grade Points
3.33
Enter CP Lab Credit Hours
1
Enter CP Lab Grade Points
4
Enter CS Lab Credit Hours
1
Enter CS Lab Grade Points
4
Enter EDG Lab Credit Hours
1
Enter EDG Lab Grade Points
4
```

Command Window

```
Enter EDG Lab Grade Points
4
    3.8406

------------------------------
|        TRANSCRIPT          |
------------------------------
| Course           |  Credits |  Grade |
|------------------|----------|--------|
| CP               |      3   |   4    |
| CS               |      3   |   4    |
| DE               |      3   |   4    |
| CPS              |      2   |   3.67    |
| EDG              |      2   |   3.67    |
| PS               |      2   |   3.33    |
| CP Lab           |      1   |   4    |
| CS Lab           |      1   |   4    |
| EDG Lab          |      1   |   4    |
------------------------------
```

Command Window

```
    3.8406


------------------------------
|        TRANSCRIPT          |
------------------------------
| Course           |  Credits |  Grade |
|------------------|----------|--------|
| CP               |      3   |   4    |
| CS               |      3   |   4    |
| DE               |      3   |   4    |
| CPS              |      2   |   3.67   |
| EDG              |      2   |   3.67   |
| PS               |      2   |   3.33   |
| CP Lab           |      1   |   4    |
| CS Lab           |      1   |   4    |
| EDG Lab          |      1   |   4    |
------------------------------
| Semester GPA     |          |  3.8522
fx >>
```

Task # 04:

Write a simple code to swap the values of two variables of double type using M-file. Create the logic in such a way that no third variable is used. Show the etime for this code.

Code:

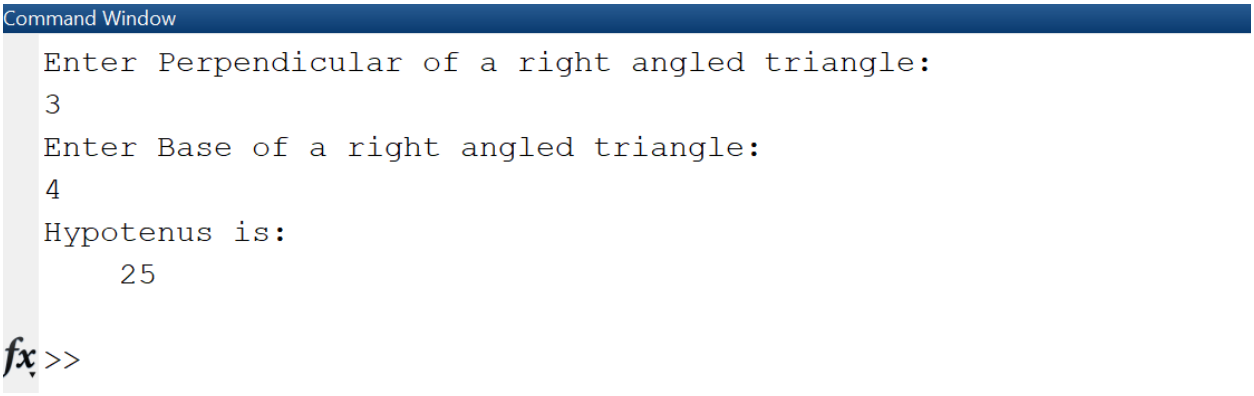
Output:

Task # 05:

Implement the Pythagoras theorem in MatLab that takes input from the user.

Code:

Output:

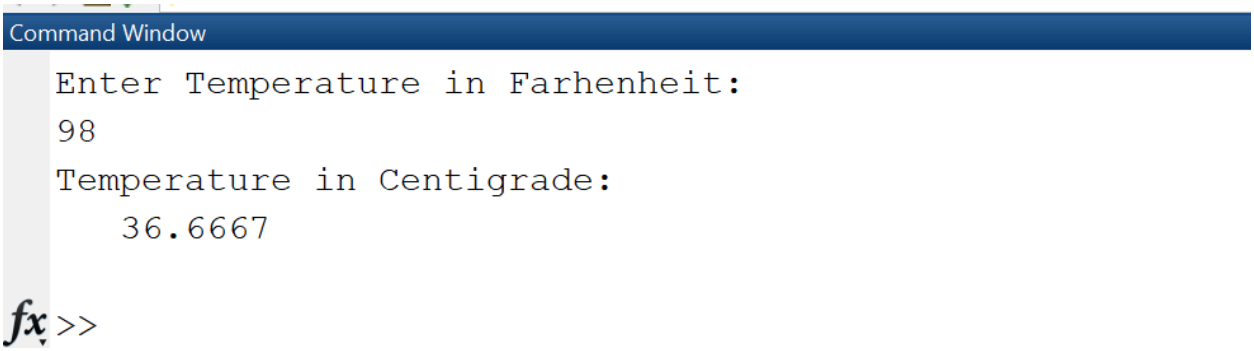


Task # 06:

Implement a temperature conversion scenario in MatLab that takes the temperature from the user in Fahrenheit and displays the output in Centigrade.

Code:

Output:



Task # 07:

Devise an algorithm in MatLab that takes ten inputs from the user and normalizes them between [0-1]. Hints: Find the pair-wise max (maxi) and min (mini) of ten numbers using the max and min built-in command. Find the normalized value for each input using formula **(input-mini)/(maxi-mini).** Note: Do not use loops or if else structures.

Code:

Output:

```
Command Window
  Input any 10 numbers
  [2 3 4 5 6 7 8 7 9 10]
    Columns 1 through 9

            0    0.1250    0.2500    0.3750    0.5000    0.6250    0.7500    0.6250    0.8750

    Column 10

      1.0000

fx >>
```