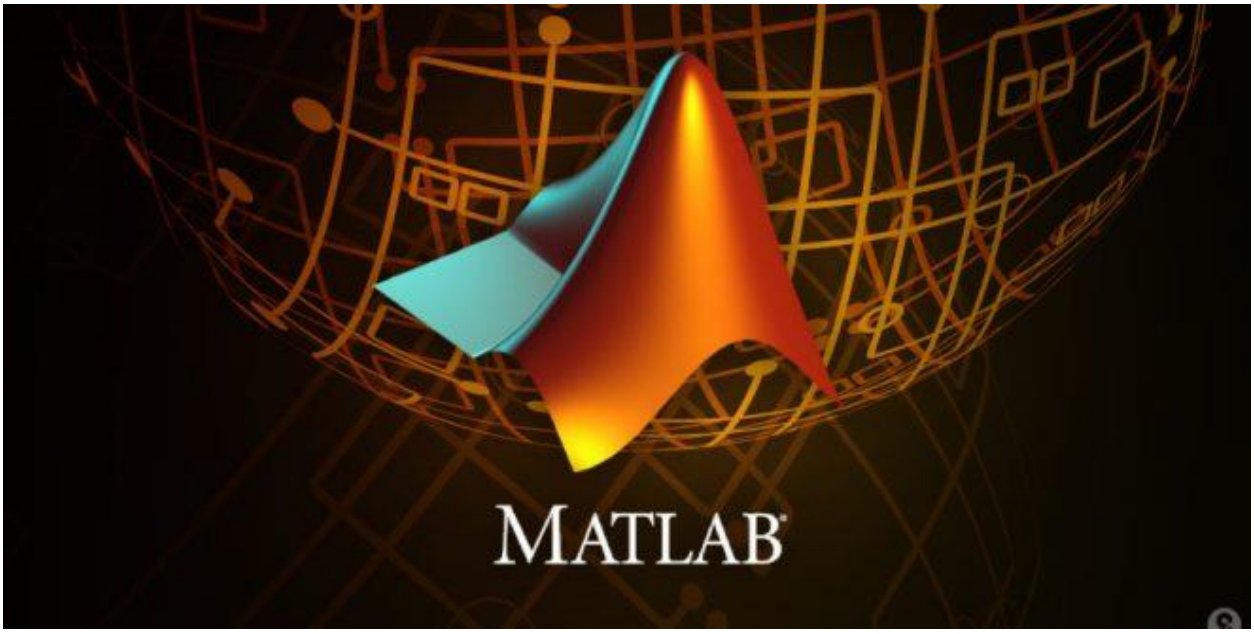
Mohamed Khider University of Biskra, Algeria
Faculty of Sciences and Technology
Department of Civil Engineering and Hydraulics
2nd Year Civil Engineering / Hydraulics / Public Works

# Course N°2

# Vectors in

# MATLAB




Dr. Salah Djerouni

## 1. Definition a vector

By default, a vector is a **one-dimensional** array of numbers. In other words, it is a single row with several columns or a single column with several rows.

## 2. Different methods to identify a vector

Before we identify a vector in **MATLAB**, we must know if the vector:

### 2.1. Random vector

MATLAB allows you to create an *arbitrary vector or called (irregular, random) vector in three ways, containing different numbers.

•Each element in the vector with the order

•All the elements inside a square bracket and between each element and the other space

•All the elements inside a **square bracket** and between each element and the other **comma** ”,”

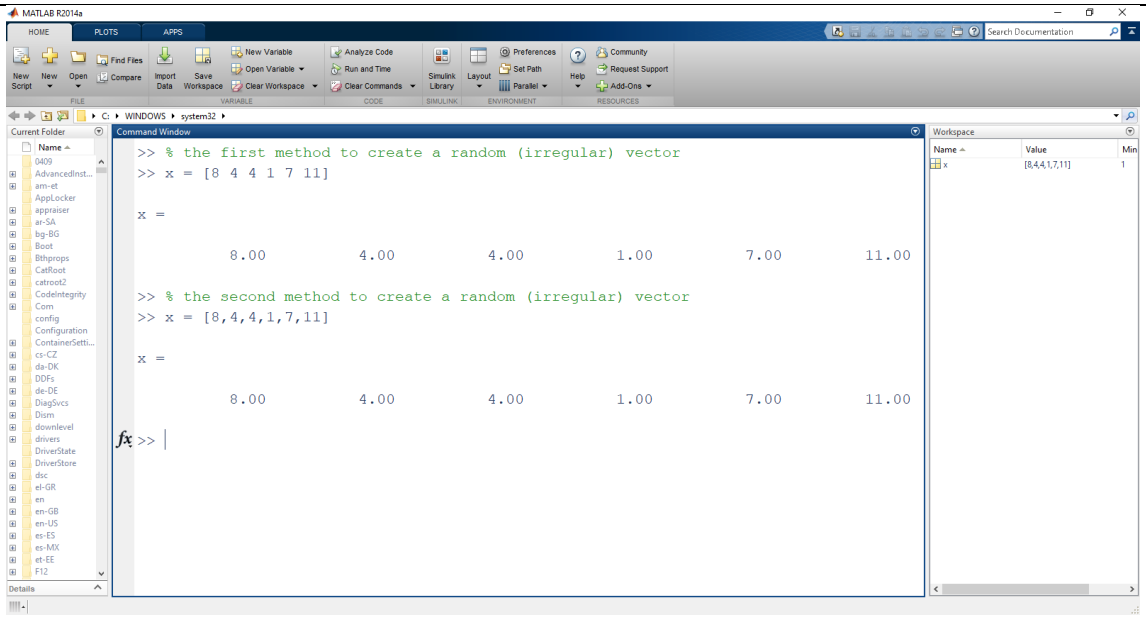



Fig 1. Different methods to create an irregular (random) vector

### 2.2. Regular vector

MATLAB allows you to create a uniformly spaced vector called a **proper (regular)** vector in **two ways**.

- Using the function/command **linspace(Xi , Xf , N)**; which generates **N** points between **Xi** and **Xf**.

- Using the function/command **v = Xi : P : Xf**; which generates v vector, with the **first** element **Xi**, **last** element **Xf**, and the difference between elements is any real number **P**.

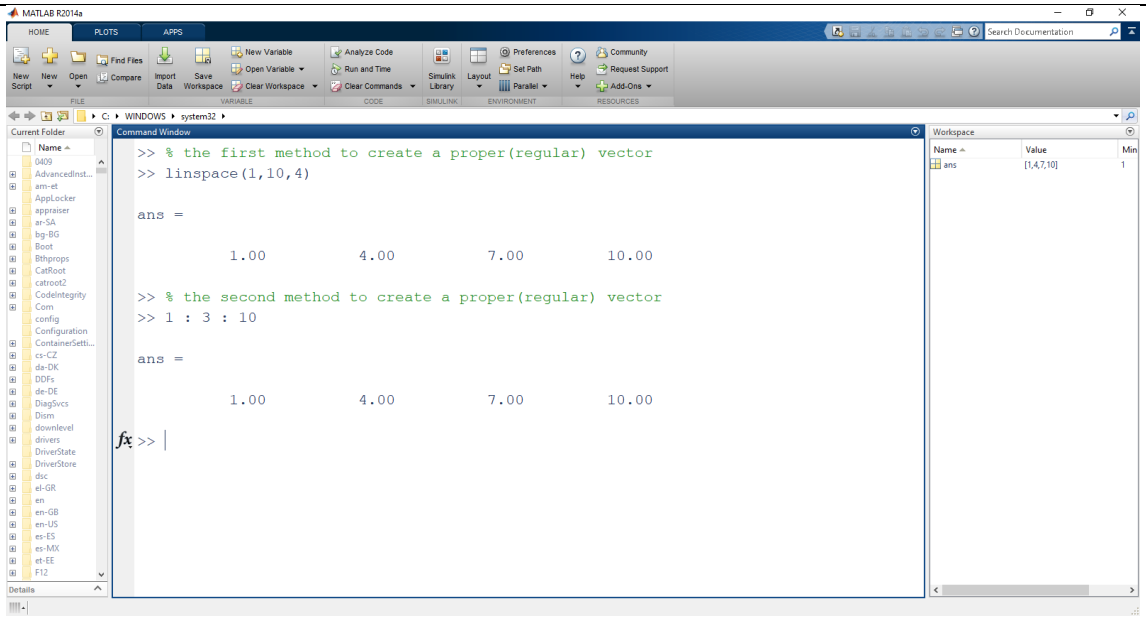



Fig 2. Two methods to create a regular vector

## 3. Types of the vectors

MATLAB allows you to create **two types** of **vectors** which can be stored either:

A row vectors and

A column vectors.

### 3.1. Row vectors

Are **created** and/or **declared** by **enclosing** the set of elements in **square brackets**, using **space** or **comma** "**,**" to **delimit** the **elements**, which can have any number of elements. For example, there are **two ways** to **create** a **row vector** with **six elements**.

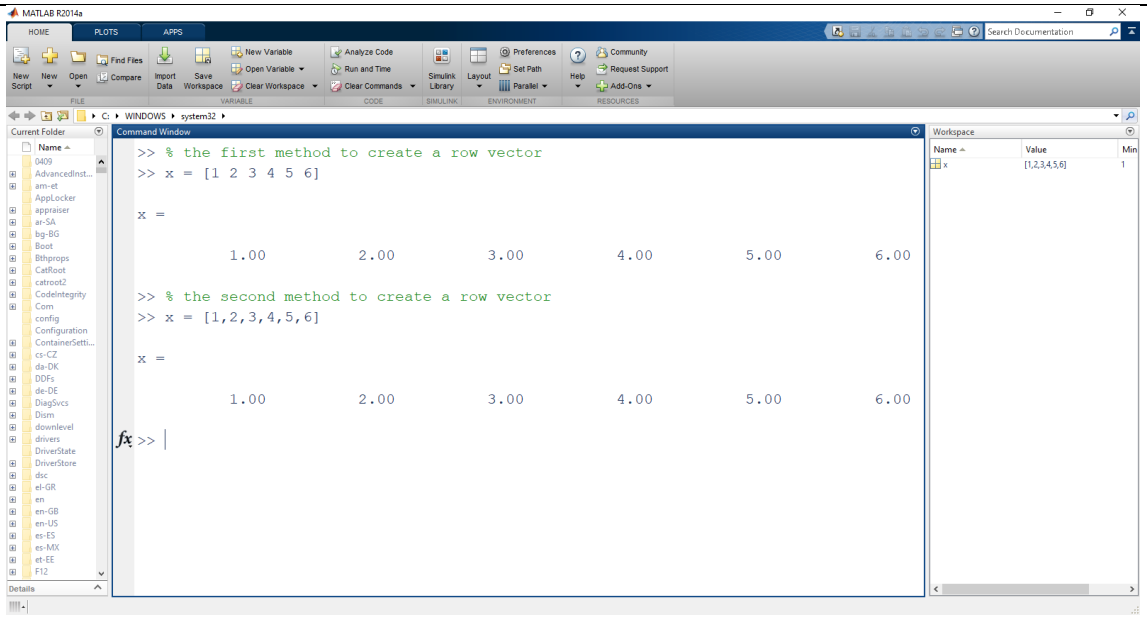



Fig 3. Two ways to create a row vectors

## 3.2. Column vectors

Are **created** and/or **declared** by **enclosing** the set of elements in **square brackets**, using a **semicolon** "**;**" to **delimit** the **elements**. For example, there is **one way** to create a **column vector** with **five elements**.

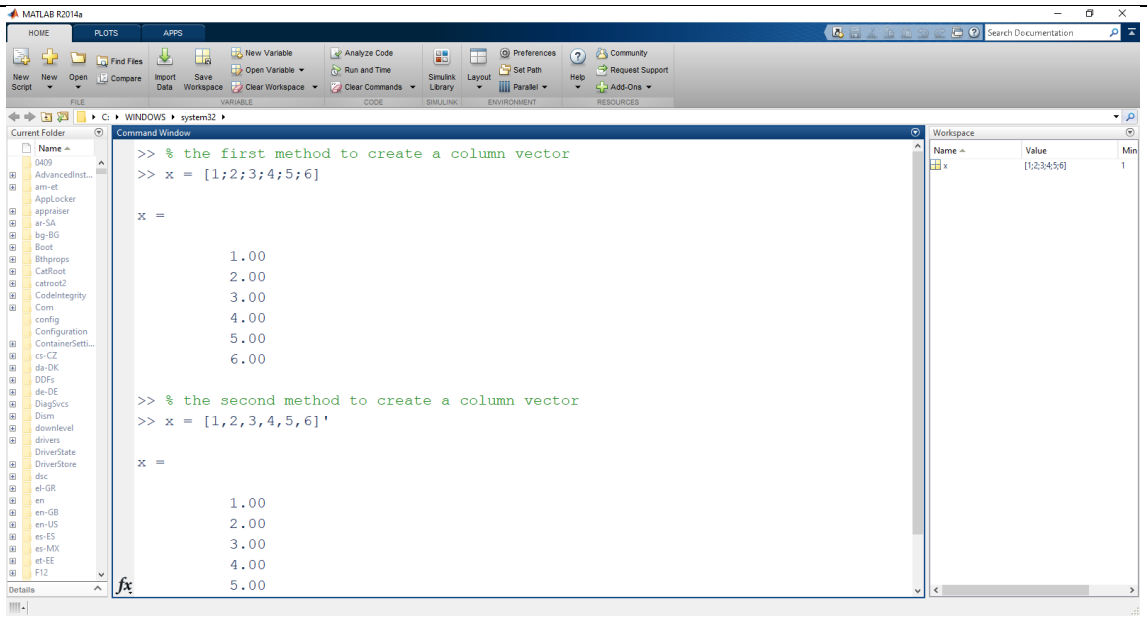



Fig 4. Two ways to create a column vectors

## 4. Vector operations

In this section, let us discuss the following **vector operations**

Addition and subtraction of vectors

Multiplication of vector

Division of vector

Power of vector, and

Transpose of vector

Besides the standard **vector operations**, **MATLAB** performs an element-by-element array operations (**addition**, **subtraction**, **multiplication**, **division**, and **power**) among vectors of the **same dimensions**. To illustrate this **special feature**, consider **two vectors**, **A** and **B**, of **n=3** elements.

### 4.1. Addition of vectors

You can **add two vectors**. Both the **operand vectors** must be the **same type** and have the **same number** of elements.

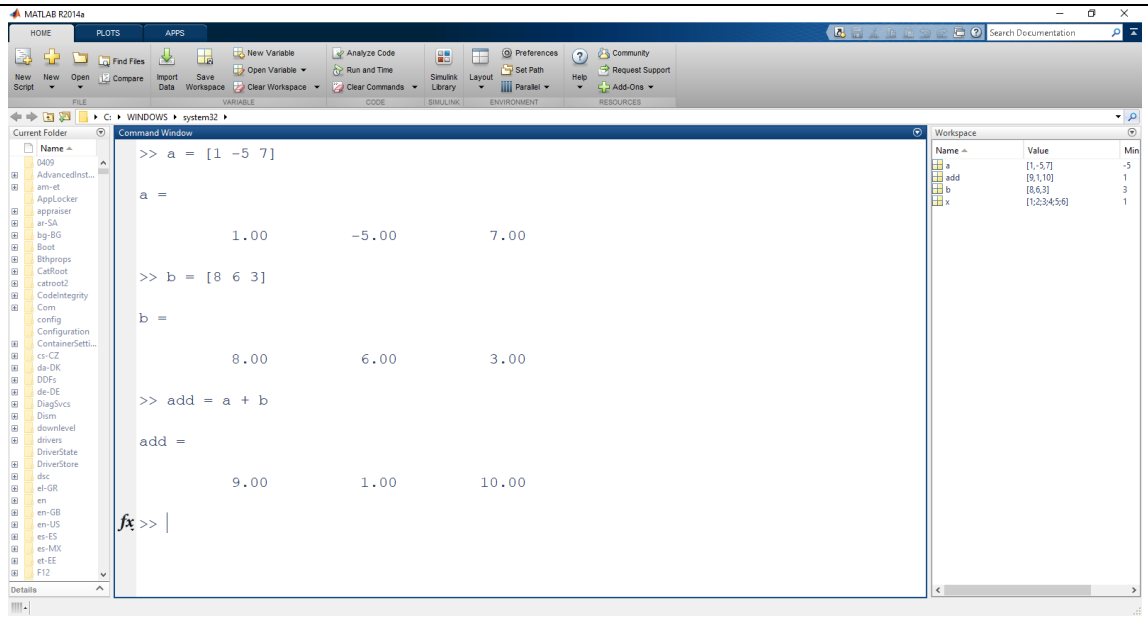



Fig 5. The sum of to vectors a and b

### 4.2. Subtraction of vectors

Is the **difference between two given vectors**, whose defined in **MATLAB** by the following way

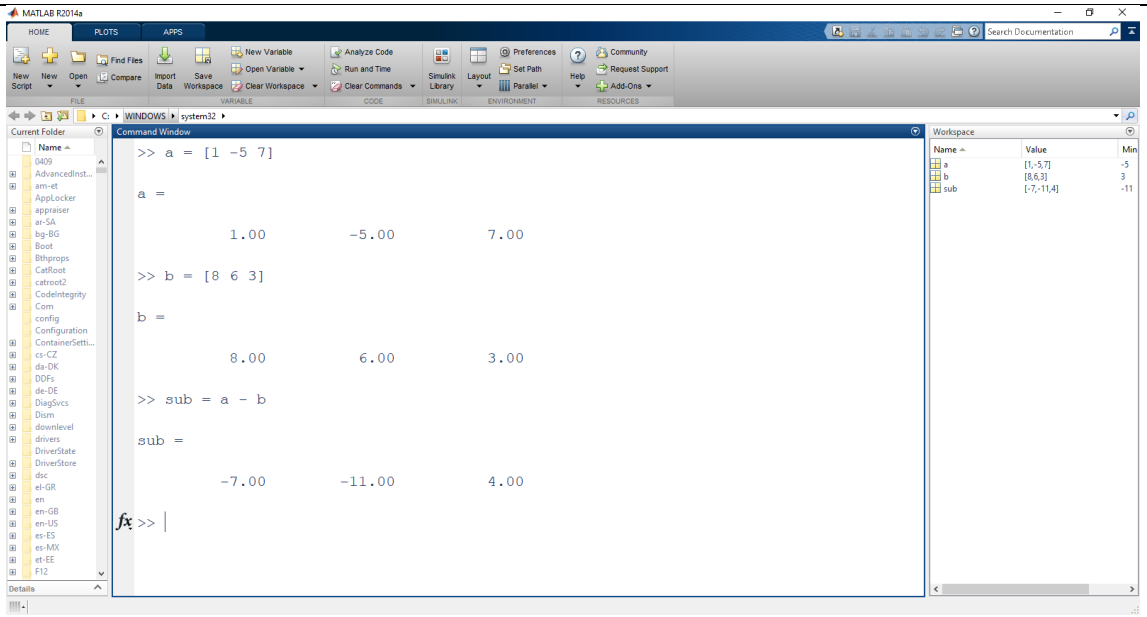



Fig 6. The difference between two vectors a and b

## 4.3. Multiplication of vectors

Is the **multiplying** of **two given vectors element-by-element**, whose defined in **MATLAB** by the following way.

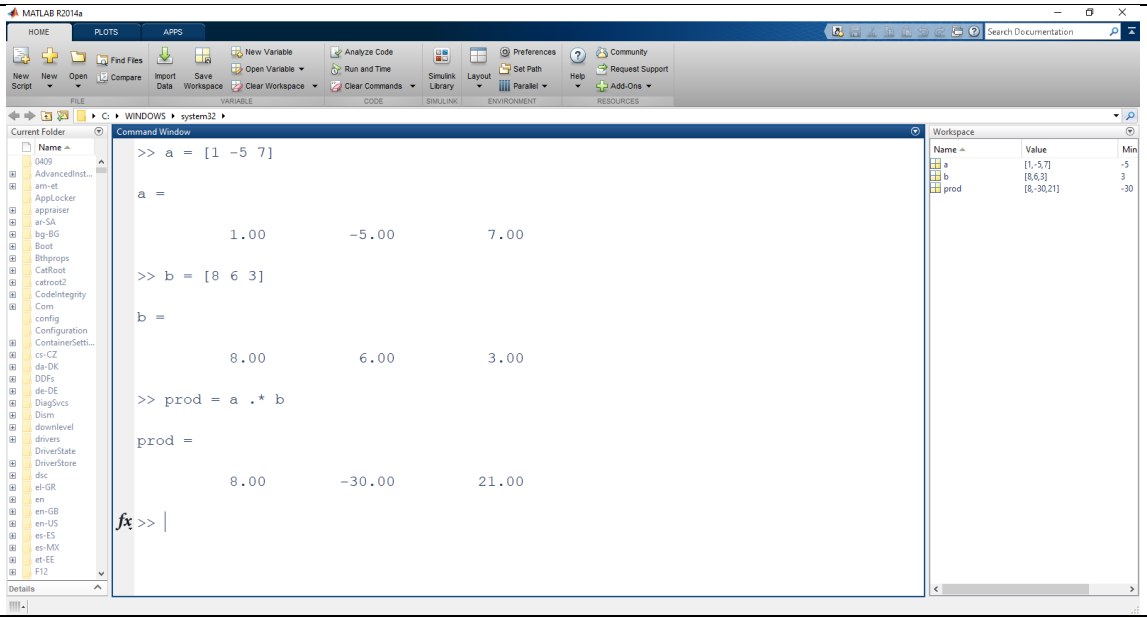



Fig 7. The multiplication of two vectors a and b (element by element)

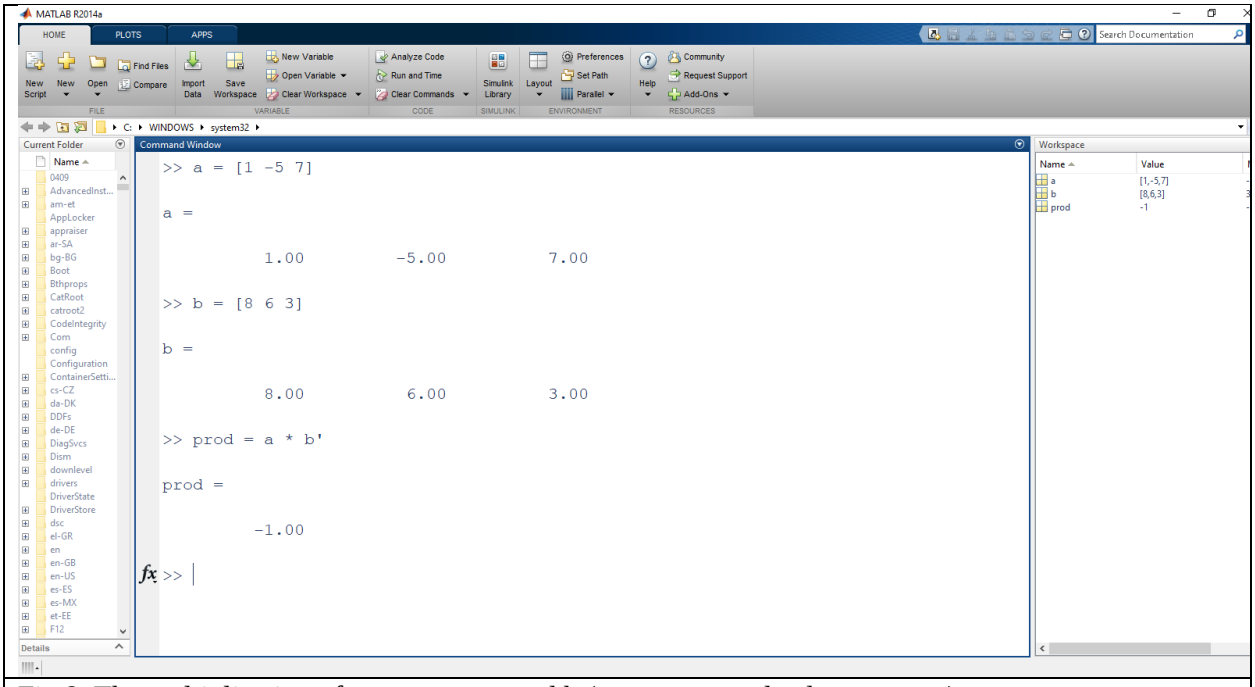



Fig 8. The multiplication of two vectors a and b (row vector and column vector)

## 4.4. Division of vectors

Is the **division** of **two given vectors element-by-element**, whose defined in **MATLAB** by the following way

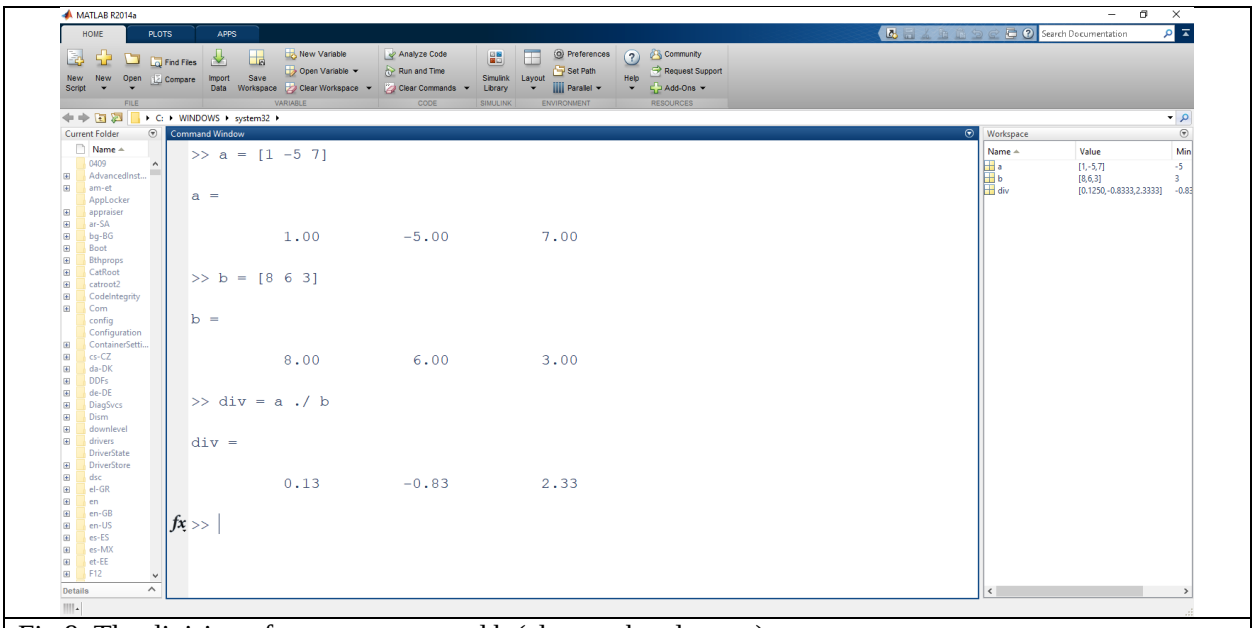



Fig 9. The division of two vectors a and b (element by element)

## 5. Other useful MATLAB functions

For vectors, to find the **maximum** and **minimum** values of the vector **x**, we use the command/function **max(.)** and **min(.)**

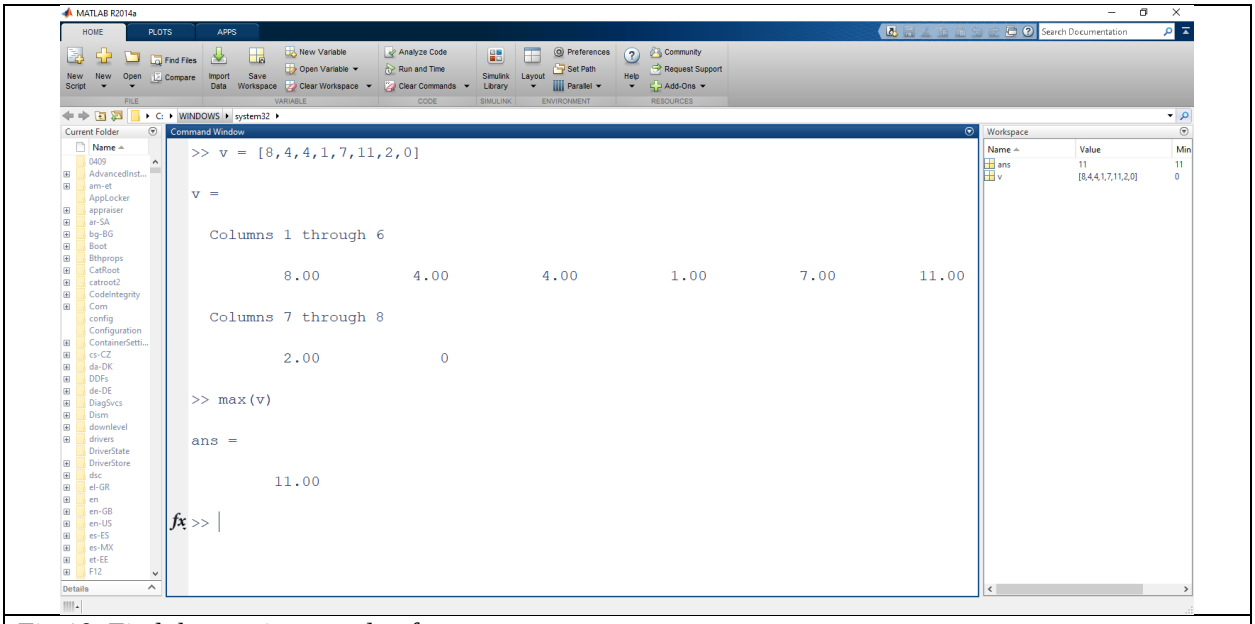



Fig 10. Find the maximum value from a vector v

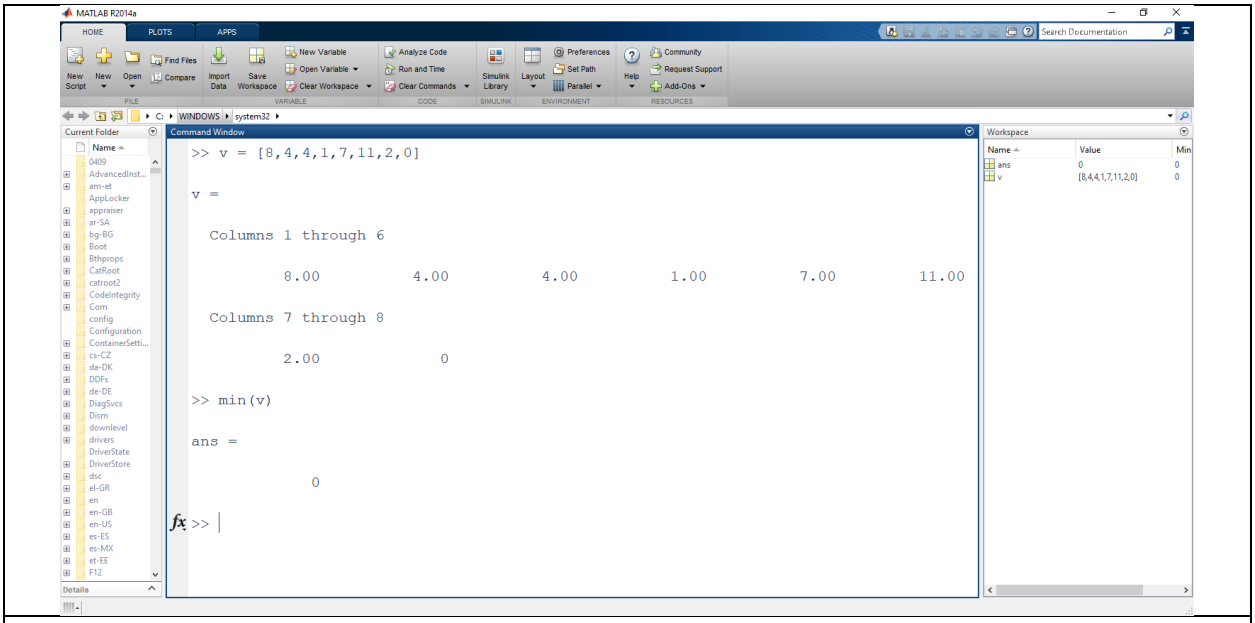



Fig 11. Find the minimum value from a vector v

To **find** the **summation** and the **production** values of the vector **x**, we use the command/function **sum(.)** and **prod(.)**

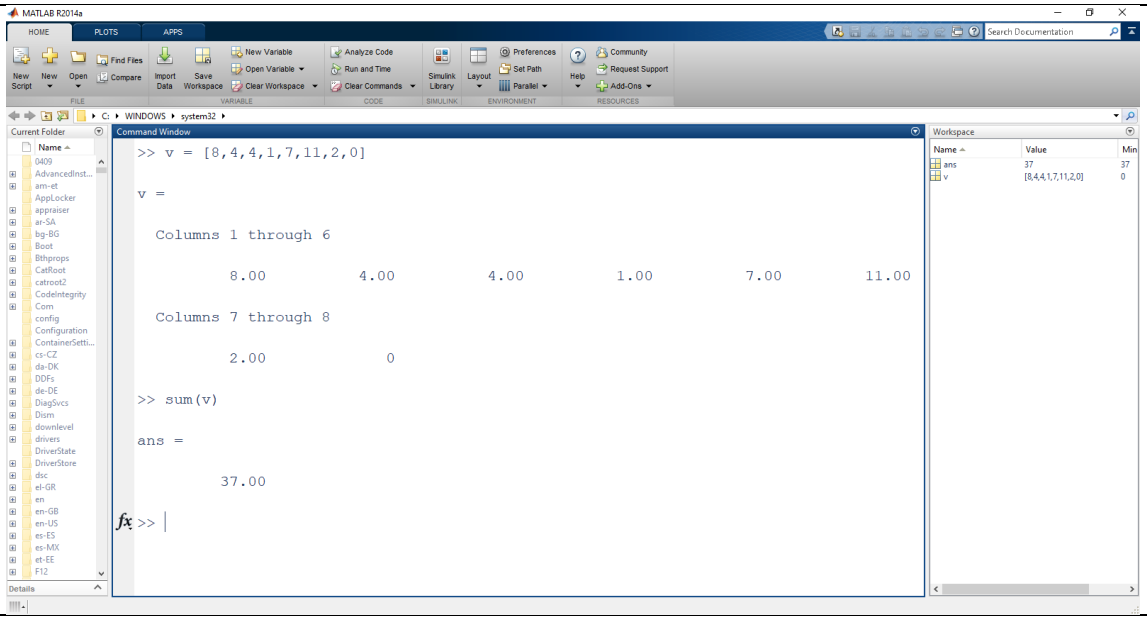



Fig 12. The summation of all element in a vector v

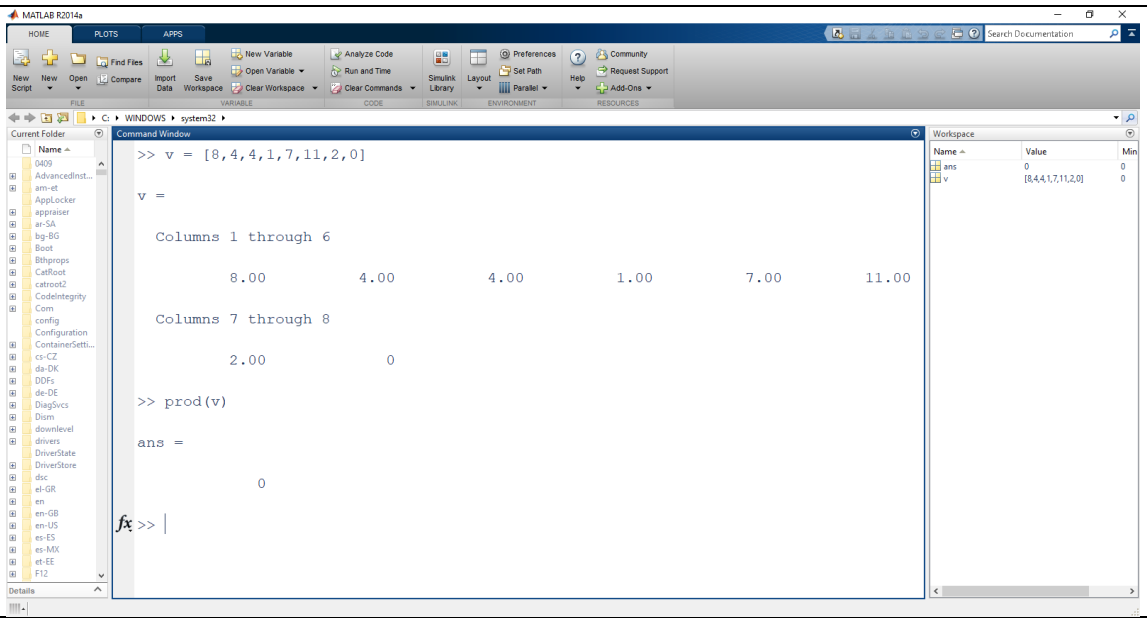



Fig 13. The production of all element in a vector v

For vectors, to **sorts** the **elements** of a given vector **x** in **ascending order arrange**, we use the command/function **sort(.)**

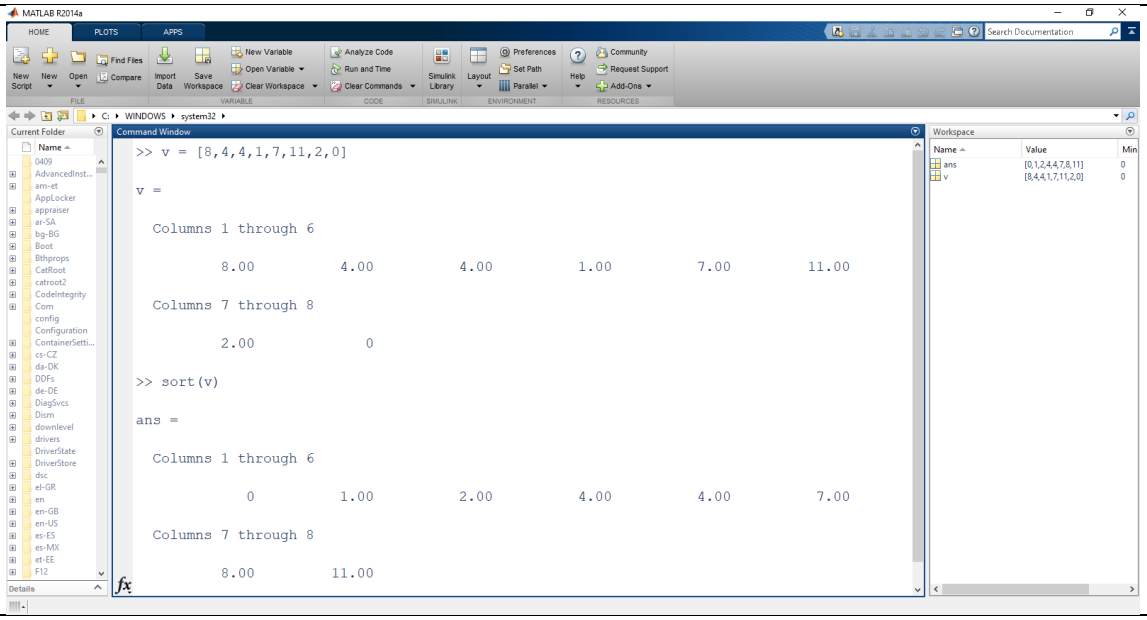



Fig 14. Arranging the vector's value from smallest to largest

Again, to **sorts** the **elements** of a given vector **x** in **descending order**, we use the command/function **sort (.,'descend')**

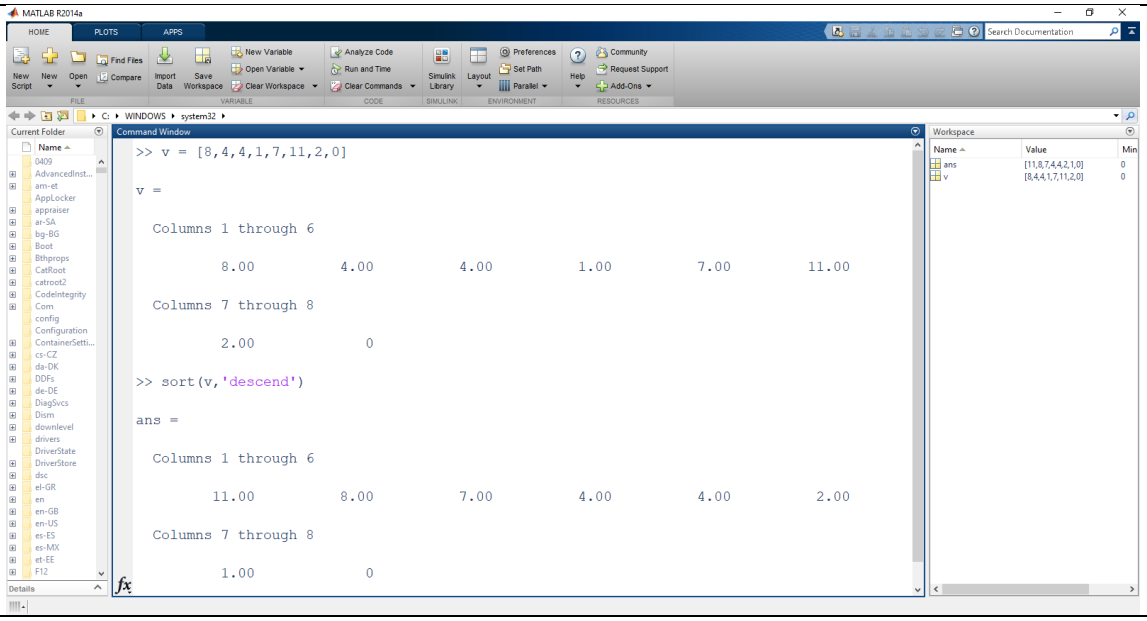



Fig 15. Arranging the vector's value from largest to smallest

The **mean** of a vector, also **known** as the **average equals** the **sum** of the **vector elements divided** by the **number** of **elements** in the **vector**, we use the command/function **mean(.)**

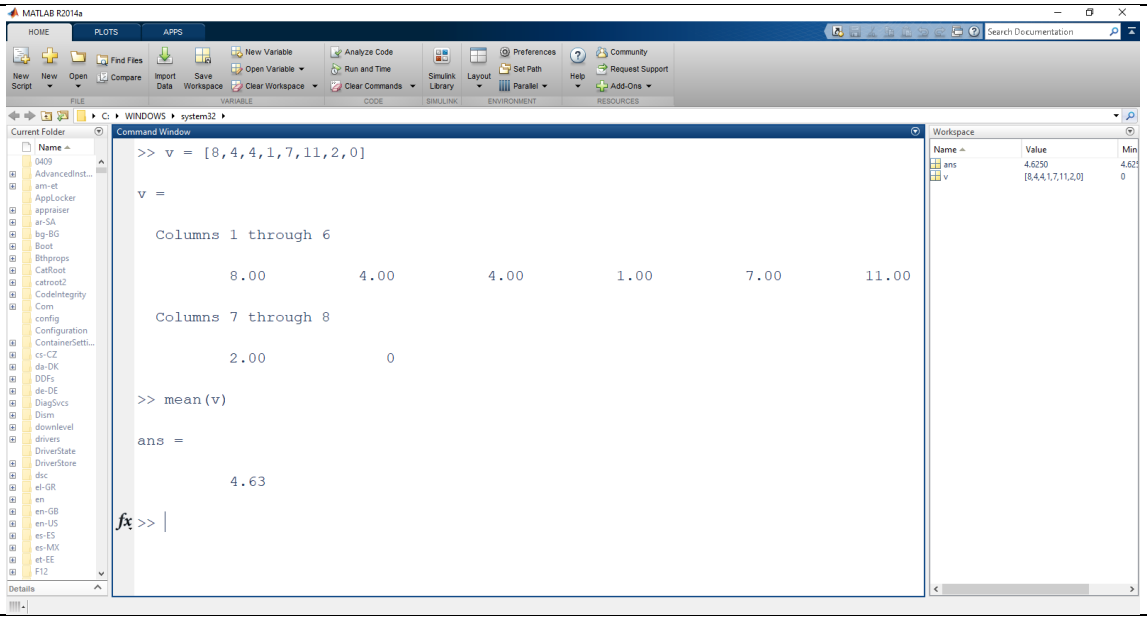



Fig 16. Evaluate the mean of the element in a vector v

To create a vector contain only number "1" or "0", we use the command/function **ones(r,c)** and **zeros(r,c)** ; where **r** and **c** are represent the **row** and **column** respectively.

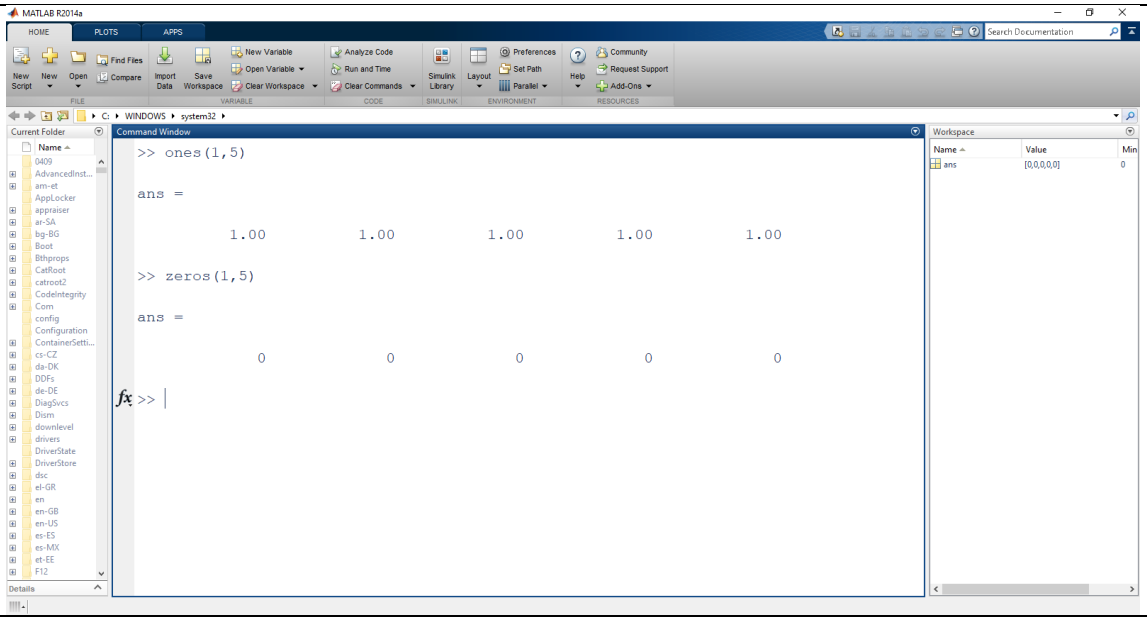



Fig 17. Create a vector contain number "1" or "0" in all the column or row

To show or peak or extract only one value from vector already written by MATLAB, we need to know the position or the order of that element in the vector

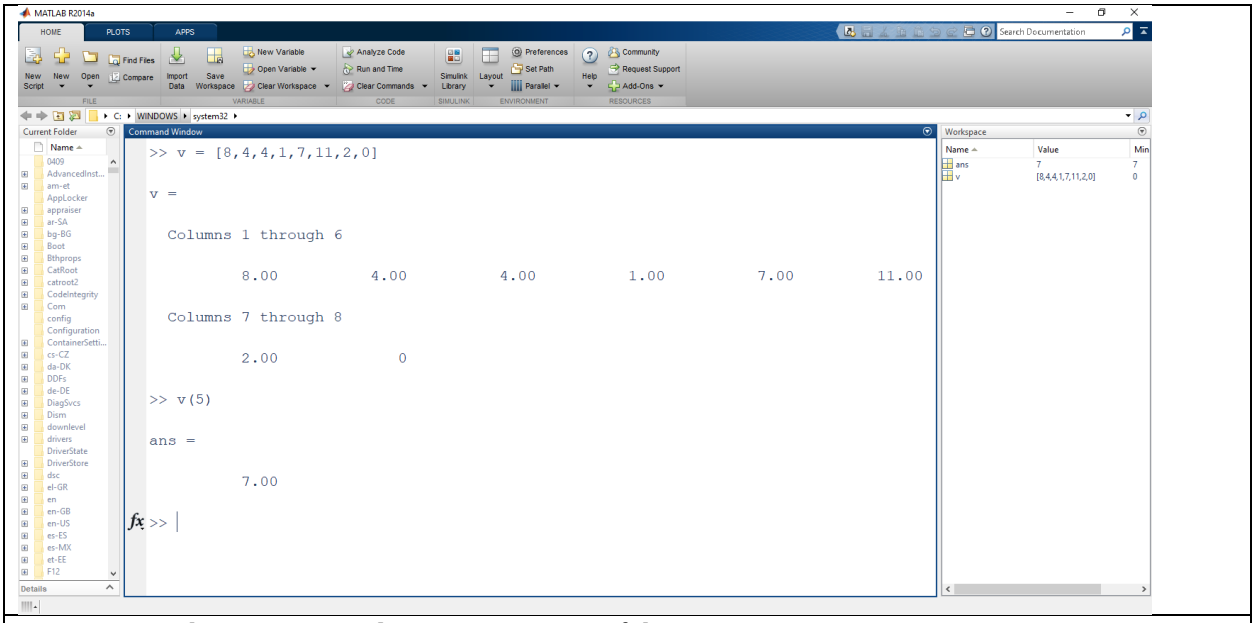



Fig 18. To peak or extract a value in any position of the vector v

In case we want to replace the recent value, we peak from the vector with another value

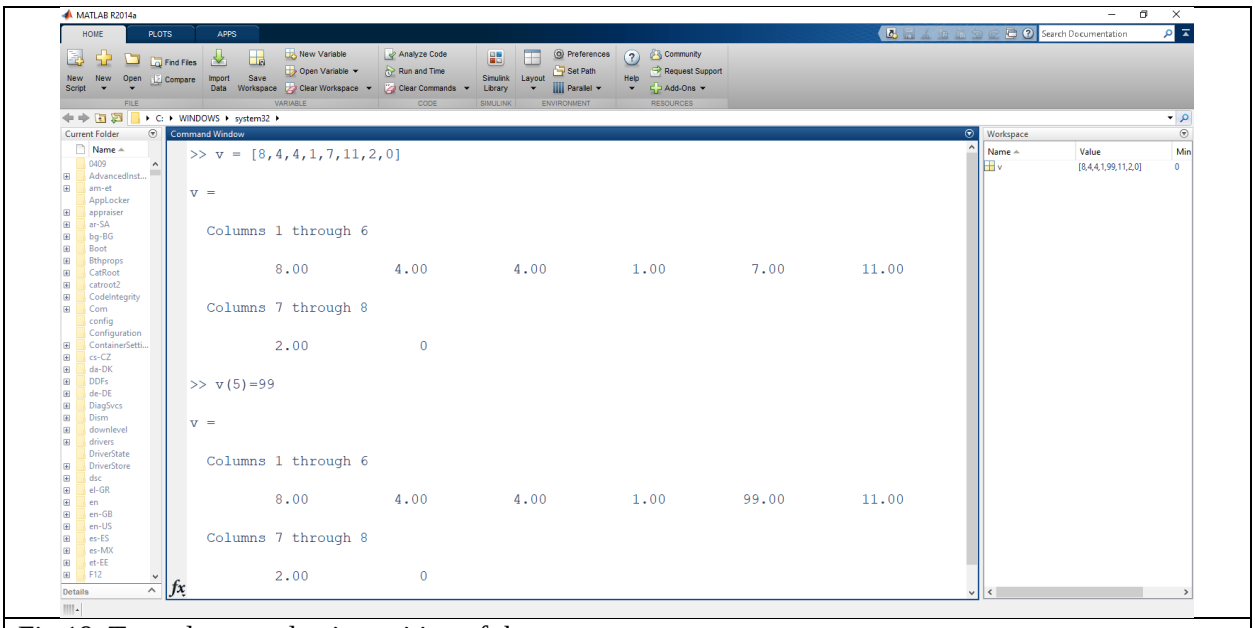



Fig 19. To replace a value in position of the vector v

To show or peak or extract more than one value from that vector already given, we need to use brackets [. .] inside the parenthesis ()

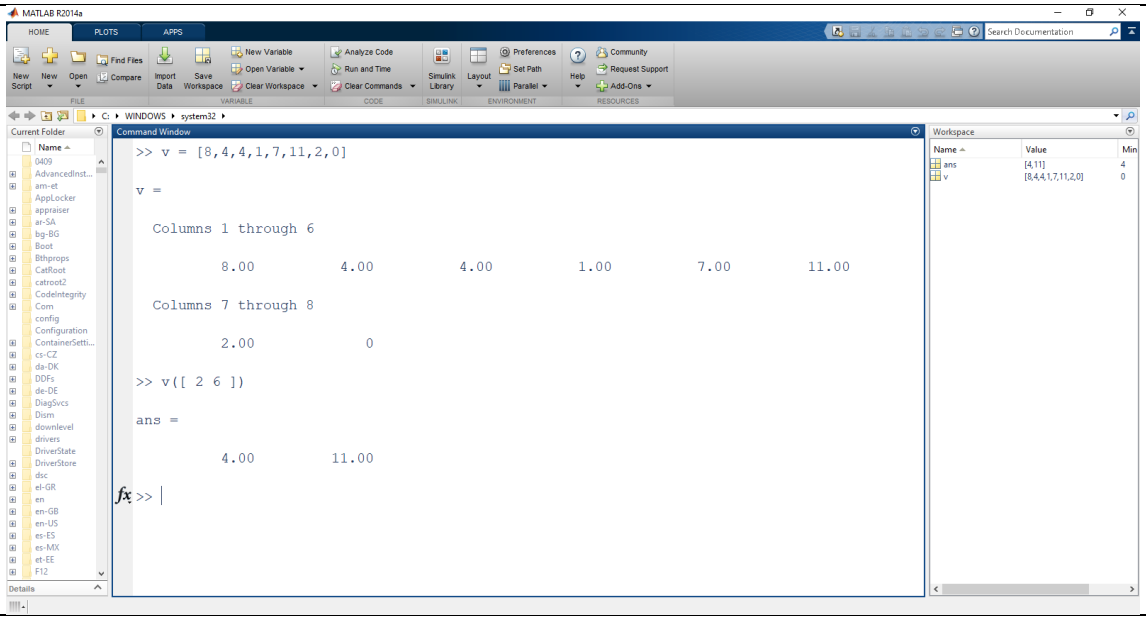



Fig 20. To peak or extract more than one value in any position of the vector v

In case we want to replace in two position different same value

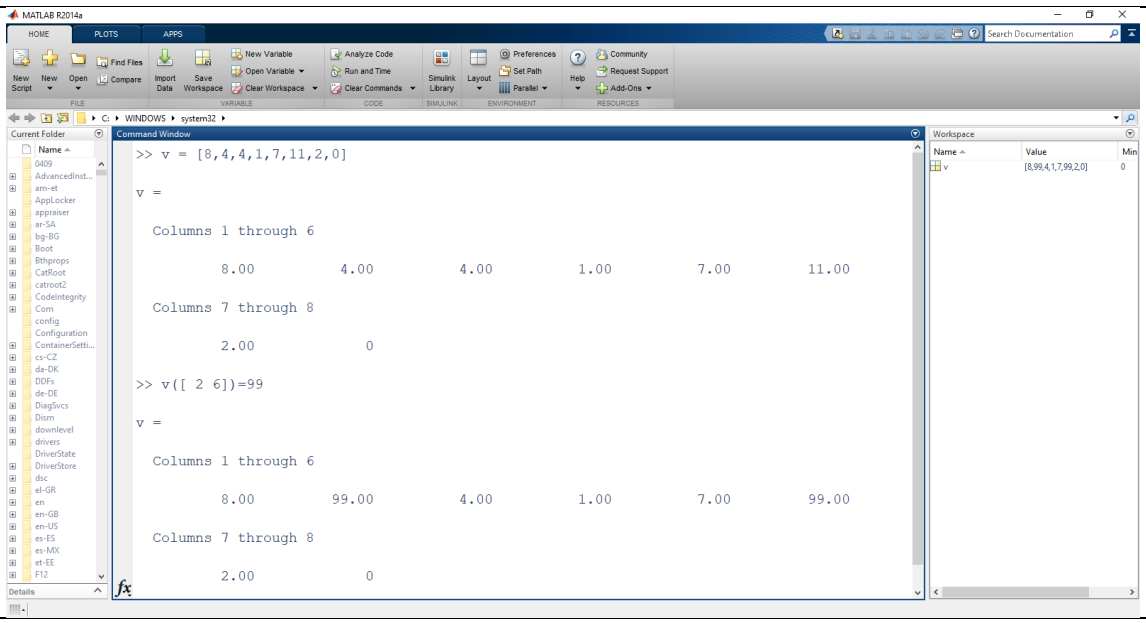



Fig 21. To replace one or same value in more than one position of the vector v

To this end, in case we want to replace in two position different two values different of a given vector written by MATLAB

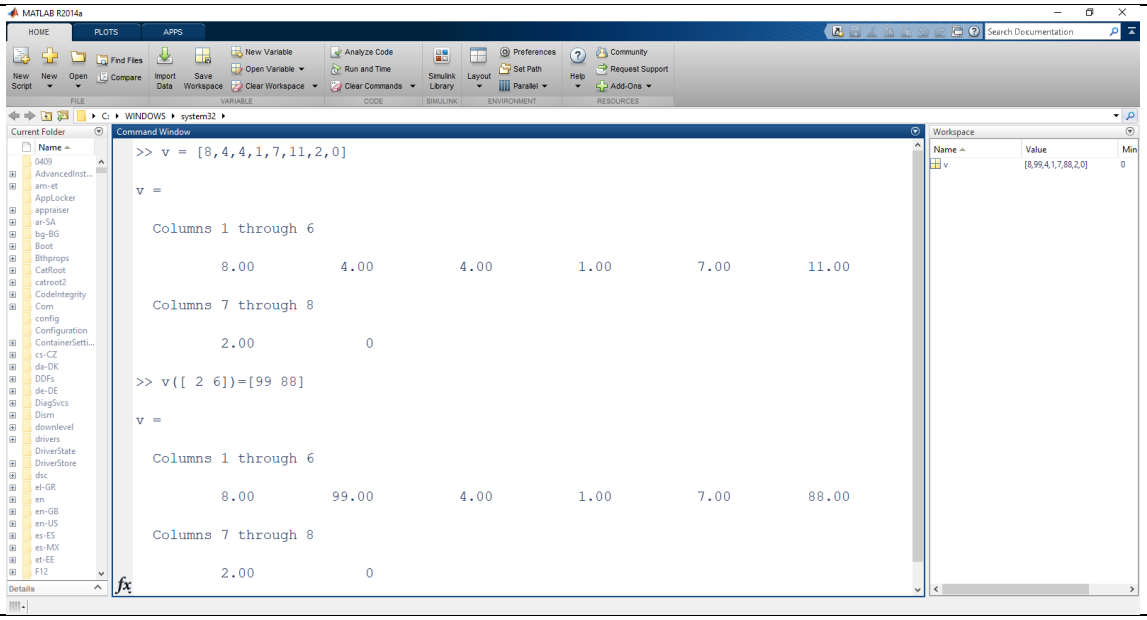


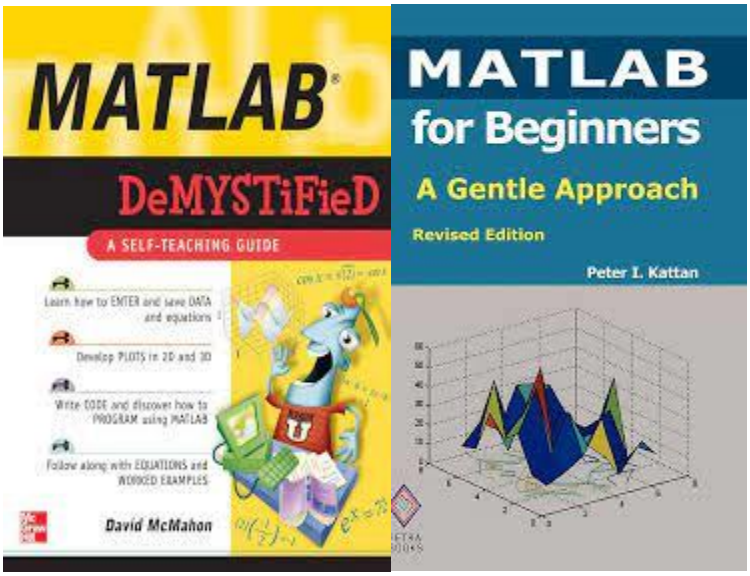

Fig 22. To replace more than one value in more different position of the vector v

## List of References

MATLAB A Practical Introduction to Programming and Problem Solving

MATLAB A Self-Teaching Guide

MATLAB for Beginners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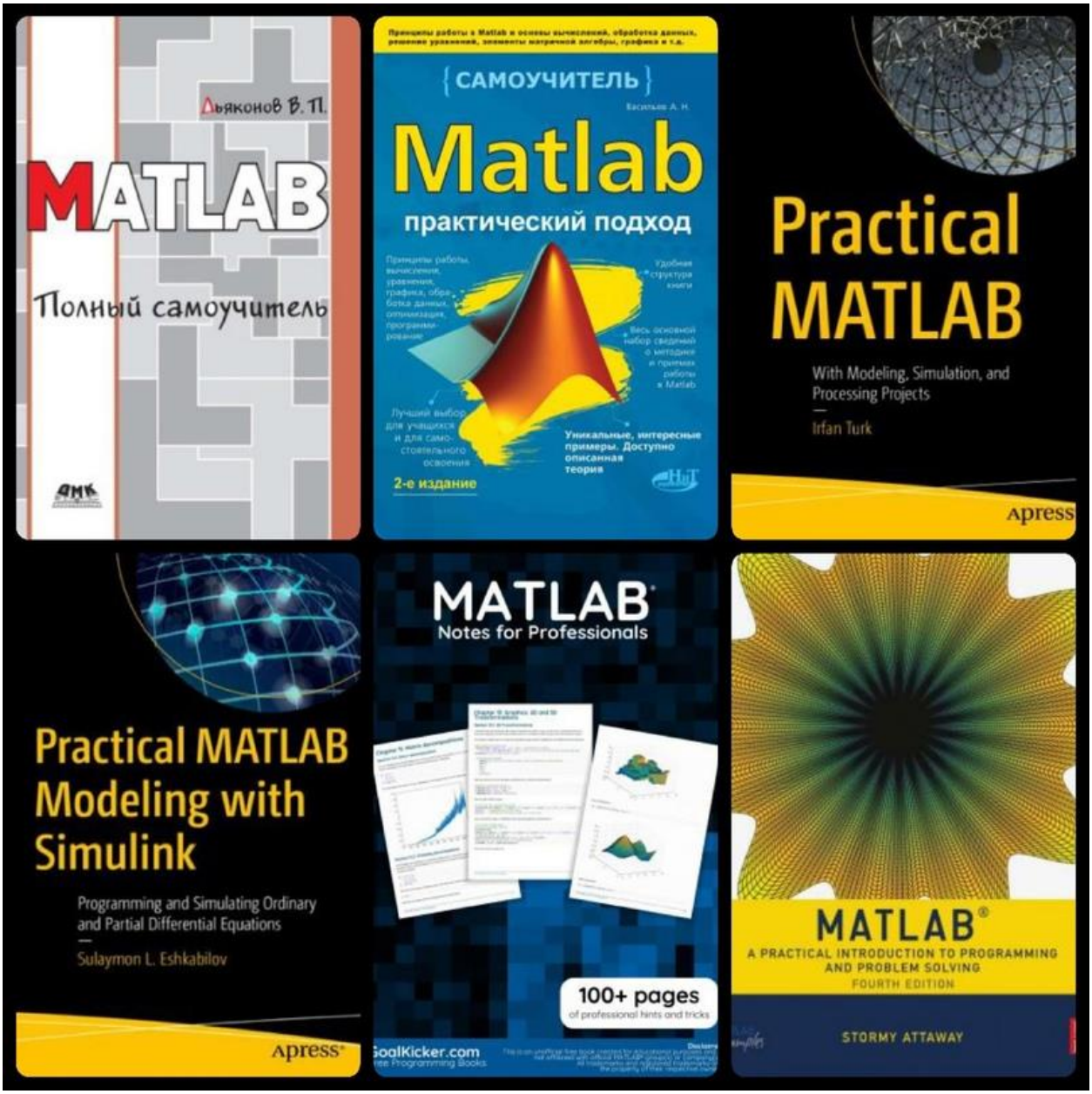
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