

MA2252 Introduction to Computing

Lecture 3: Variables and Arrays

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Learning outcomes

- Creating variables and assigning values
- Basic understanding of arrays and their types
- Creating some basic arrays

Variables

- Variables in MATLAB are used to store data e.g. a number or a word.
- Variable names examples: x, y, z, t_1, t_2, omega, etc.
- Variable names can contain letters, numbers or underscore.

Note: Variable name must start with a letter.

It's a good idea to name variables as they appear in your problems

Variable assignment

- The assignment operator '=' is used to store a value to a variable.

- **Examples:**

`x=5`

`omega=1.2`

`name='Sharad'`

- The assigned variables are stored in workspace.

Demo

Variable assignment (contd.)

Useful tips:

- semicolon suppresses the variable assignment output in command window.
- 'clear all' deletes all variables in workspace.
- 'clc' clears text in command window.

Demo

Variable assignment (contd.)

The assignment operator '=' in MATLAB is different from equality sign '=' in Mathematics.

Try this!

```
x=2;
```

```
y=5;
```

```
y=x+1;
```

$x=2$
 $y=5$
 $y \neq x+1$
 $5 \neq 3$

Arrays

$$B = [1 \ 0 \ 2 \ 3 \ 5] \rightarrow \text{row vector}$$
$$A = \begin{bmatrix} 1 & 2 \\ 5 & 7 \end{bmatrix}_{2 \times 2} \rightarrow 2 \times 2 \text{ array}$$

- 'Matrices' in Mathematics are 'Arrays' in MATLAB.

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

$A(1,1)$ points to element a

$A(2,1)$ points to element c

$$C = \begin{bmatrix} 1 \\ 5 \\ 7 \end{bmatrix} \rightarrow \text{column vector}$$

- Arrays are used to store and organise data.

- Arrays in MATLAB can be multi-dimensional.

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out of scope
for this lecture

Some array types

- **Double array:** stores numbers
- **Char array:** stores alphanumeric characters

↓
letters,
& numbers

Double array

Double array is a very useful array for mathematicians and engineers.

Examples:

- $x = [2 \ 4 \ 5]$

- $y = \begin{bmatrix} 3 \\ 5 \\ 12 \end{bmatrix}$

- $z = \begin{bmatrix} 1 & 2 & 8 \\ 5 & 10 & 11 \\ 3 & 4 & 9 \end{bmatrix}$ 3×3

Array creation

Basic method to create an array

Put elements of array inside square brackets with a comma or space between elements. Separate rows by semicolons.

Example:

```
x=[1 2 3;4 5 6;7 8 9]
```

creates the matrix

1	2	3
4	5	6
7	8	9

$x = [1, 2, 3; 4, 5, 6; 7, 8, 9]$

Demo

Array creation (contd.)

Linearly-spaced 1D array (row vector) can be created by using

- colon operator (:) $B = [3 \ 9 \ 15 \ 21 \ 27]$

- linspace function $A = [1 \ 2 \ 3 \ 4 \ 5]$

Arithmetic (A.P.) progression

Array creation (contd.)

Using colon operator:

The command initial value : increment : final value

- creates an array with elements starting from initial value with **specified increment** until or equal to final value.

- Example:

3:2:14 creates the array

[3 5 7 9 11 13]

Demo

Array creation (contd.)

Using linspace function:

`linspace(a,b,n)`

Handwritten notes for `linspace(a,b,n)`:

- $b - a = \frac{10 - 1}{5 - 1} = 2.25$
- $a = 1; \quad b = 10; \quad n = 5$
- Diagram showing an array starting at $a=1$ and ending at $b=10$ with 5 elements: $1, 3.25, 5.5, 7.75, 10$.

- creates an array with equally-spaced **specified number of elements** n starting at initial value a and ending at final value b .

- Example:**

`linspace(1,2,11)` creates the array

`[1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2]` containing 11 elements.

Handwritten notes for the example:

- 0.1 (under 1.1)
- 0.1 (under 1.2)

Handwritten calculation:

$$\frac{2 - 1}{(11 - 1)} = \frac{1}{10} = 0.1$$

Demo

Array creation (contd.)

To check your understanding of colon operator and linspace, let's do a mentimeter poll.

Please go to the link <https://www.menti.com/alnd6z1jfk4g> provided in chat

or

visit <https://www.menti.com> and enter the code **67866952**

$$\begin{array}{c} 0:2:11 \\ \downarrow \\ \text{increment} \end{array} \quad [0 \quad 2 \quad 4 \quad 6 \quad 8 \quad 10]$$

Diagram illustrating the increment operation for the array creation. The expression $0:2:11$ is shown, with a downward arrow pointing to the word "increment". To the right, the resulting array $[0 \quad 2 \quad 4 \quad 6 \quad 8 \quad 10]$ is displayed, with each element having a $+2$ written below it, indicating the step size.

End of Lecture 3

Please provide your feedback [▶ here](#)