Computer 2
(MATLAB)

حاسوب 2 (ماتلاب)
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Week 2

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MATLAB®

Learning Objectives

- Get familiar with basic MATLAB operations and expressions.
- Learn how to create and manipulate matrices.
- Understand variable assignments and simple matrix generation.

First Steps with MATLAB (1)

- To get MATLAB to work out basic operations, simply type at the command prompt:

  1 + 1

- MATLAB responds with: ans = 2

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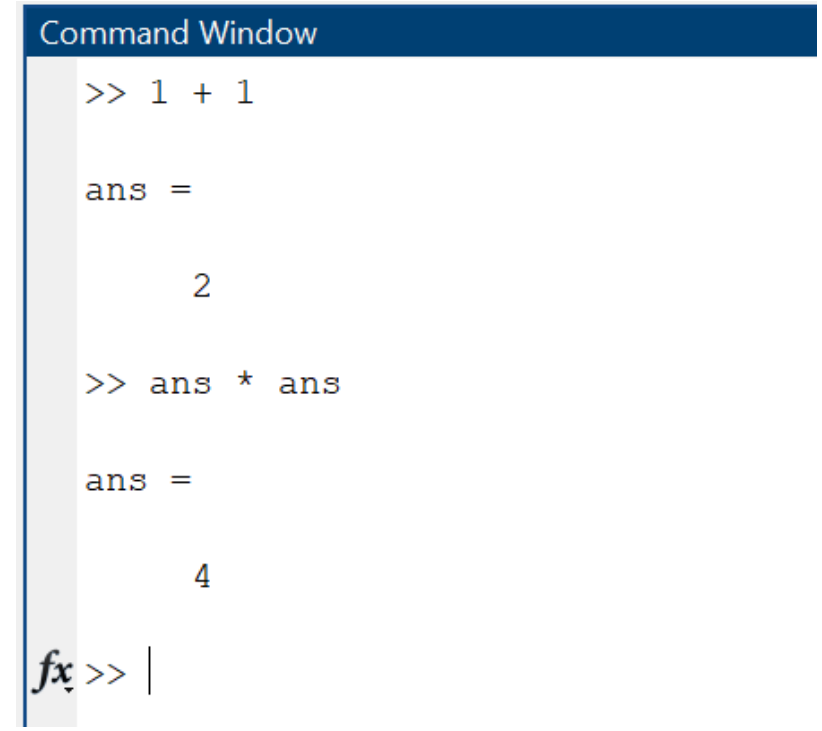
First Steps with MATLAB (2)

- MATLAB stores the result in the variable ans, which you can reuse.
- Ex: ans * ans
- MATLAB responds with: ans = 4



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Spacing in MATLAB Expression

- The spacing of operators doesn't affect the result.

```
1 + 3 * 2 - 1 / 2 * 4
```

- Gives the same answer as:

```
1+3*2-1/2*4
```

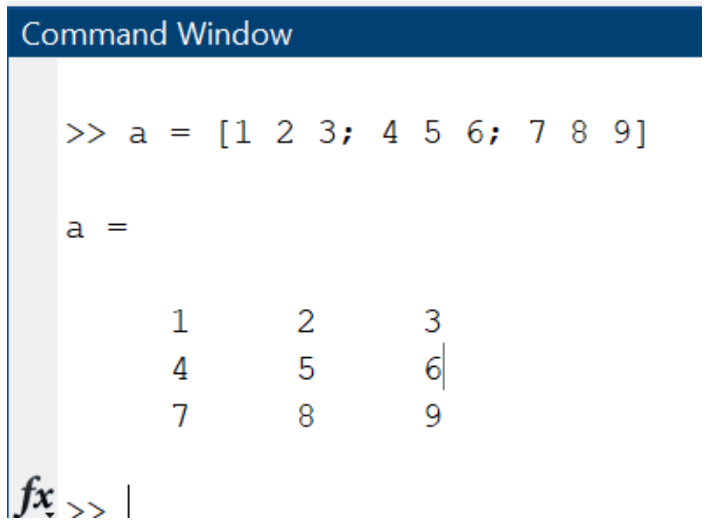
- Clearer formatting improves **readability**. Use parentheses for clarity:

```
1 + 3*2 - (1/2)*4
```

Entering Matrices in MATLAB

- Steps to type a matrix into MATLAB:
  - Begin with a square bracket **[**.
  - Separate elements in a row with **spaces** or **commas**.
  - Use a semicolon **;** to separate rows.
  - End with a square bracket **]**.

- Example: a = [1 2 3; 4 5 6; 7 8 9]



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Variables and Assignment in MATLAB

- Variables are memory locations used to store data.
- Variable names can include letters and digits but must start with a letter.
- MATLAB does not require variable declarations, but this can sometimes lead to errors.
- Assignment Example:

```
a = 6;
name = 'Mark';
```

Variables in MATLAB

- Definition: A variable is a named location in memory that stores data.
- Rules for Variable Names:
  - Must start with a letter.
  - Can include letters, numbers, and underscores (_).
  - MATLAB is case-sensitive (e.g., myVar and myvar are **different**).

Variables in MATLAB

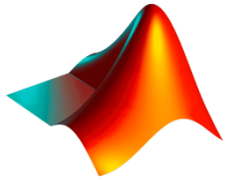
- Examples of valid variables:

```
x = 5;
speed_of_light = 3e8;
temperature1 = 298;
```

- Invalid variables:
  - Numbers or special characters at the start (e.g., 1stVar or @value).

Variable Assignment

- Assignment Statement Format:
  variable_name = expression;
- Examples:
  a = 10;
  b = 25 + 7;
  c = sqrt(a)
- Reassigning Values:
- You can update the value of a variable at any time:
  a = 10;
  a = a + 5;



Displaying Variables

- Use the disp function to display variable contents.
- Example:

```
disp(a);
disp(name);
```

Generating Matrices with MATLAB

- MATLAB offers functions for generating specific types of matrices:
  - zeros(m, n): Generates a matrix filled with zeros.
  - ones(m, n): Generates a matrix filled with ones.
  - randi(max_val, [m, n]): Generates a matrix with random integers.
  - eye(n): Generates an identity matrix.

Generating Matrices with MATLAB

- Examples:

  u = randi(10, [2 2])

  u = 7 2
       9 4

Command Window

```
>> u = randi(10, [3 3])

u =

     9     8     7
    10     8     2
     7     4     8
```

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Try on your machine

- Z = zeros(3, 3);
- O = ones(2, 4);
- U = randi(5, [3, 3]);
- I = eye(4);

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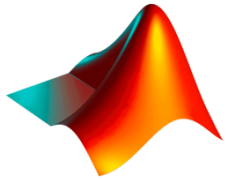
Practice Exercise 1

- Task: Create matrices using zeros, ones, and randi functions.
- Example:
  - Create a 5x5 matrix of random integers between 1 and 10.
  - Create a 3x3 identity matrix and a 4x4 matrix filled with ones.



Practice Exercise 2

- Task: Define variables and perform arithmetic operations.
- Example:
  - Assign values to two variables and compute their sum, product, and difference.
  - Display the result using disp.

Review of Key Concepts

- Recap:
  - How to enter expressions and work with the ans variable.
  - Properly spacing operations for readability.
  - Creating matrices manually and using matrix generators (zeros, ones, randi, eye).
  - Variable assignment and displaying results using disp

Let’s try MATLAB

Install MATLAB and familiarise yourself with its interface.