



# ENGINEERING MATHEMATICS-I MATLAB

---

Department of Science and Humanities

## Data Types

---

- Data types are those which define the type of data that we are using.
- Some common data types are:
  - ❖ Integers
  - ❖ Floating point numbers
  - ❖ Scalar
  - ❖ Character
  - ❖ Strings
  - ❖ Arrays



## Integers

---



- An integer is a whole number (not a fraction) that can be positive, negative, or zero.
- Integers are a commonly used data type in computer programming.
- For example, the numbers 10, 0, and -25 are integers.
- When two integers are added, subtracted, or multiplied, the result is also an integer.

## Integers, Continued...

---



For Example:

```
>> 2+3
```

```
ans =
```

```
5
```

```
>> 4-5
```

```
ans =
```

```
-1
```

## Integers, Continued...

---

```
>> 2*8
```

```
ans =
```

```
16
```

Note that when one integer is divided by another integer, the result may be an integer or a fraction.

For example:

```
>> 6/4
```

```
ans =
```

```
3/2
```



## Integers, Continued...

---

```
>> 6/3
```

```
ans =
```

```
2
```



## Floating Point Numbers

---

- As the name indicates, floating point numbers are numbers that contain floating decimal points.
- For example, the numbers 5.5, 0.001, and -2,345.6789 are floating point numbers.
- When a calculation includes a floating point number, it is called a "floating point calculation."



## Scalar

---

- Any number which is used to represent a quantity.
- This includes integers, complex numbers , floating point numbers.
- Examples of scalar data types are: 3,  $4+6i$ , -20.45.





## Character

---

- Single alphanumeric symbol enclosed in a single quote is a character constant.
- Example, 'B' and '6'.
- 6 and '6' are different. Here, 6 is a character constant and '6' is a character constant.



## Strings

---

- Any two or more alphanumeric symbols enclosed in a single quote.
- Example, 'INDIA'=['I', 'N', 'D', 'I', 'A']



## Arrays

---

- List of similar data in a single row or a column.
- Elements can be numerical or character or strings.
- Examples, [1 2 3 4]; [a b c d].



## Special Types of Arrays

---

➤ The four types of arrays are:

- ❖ zeros() function
- ❖ eye() function
- ❖ ones() function
- ❖ rand() function



## Special Types of Arrays, Continued...

---

➤ **Zeros() Function** : It creates an array of all zeros.

➤ For example: `>> zeros(5)`

➤ MATLAB will execute the above statement and return the result:

ans =

0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

## Special Types of Arrays, Continued...

---



- **eye()** function: It creates an identity matrix.
- For example: `>> eye(4)`
- MATLAB will execute the above statement and return the result:

ans =

```
1  0  0  0
0  1  0  0
0  0  1  0
0  0  0  1
```

## Special Types of Arrays, Continued...

---

- **ones()** function: It creates an array of all ones.
- For example: `>> ones(4,3)`
- MATLAB will execute the above statement and return the result:

ans =

```
1  1  1
1  1  1
1  1  1
1  1  1
```



## Special Types of Arrays, Continued...

---



- **rand() function:** It creates an array of uniformly distributed random numbers on (0,1).
- For example: `>> rand(3, 5)`
- MATLAB will execute the above statement and return the result

ans =

0.8147	0.9134	0.2785	0.9649	0.9572
0.9058	0.6324	0.5469	0.1576	0.4854
0.1270	0.0975	0.9575	0.9706	0.8003



## Relational Operators:

---



- Relational operators compare the elements in two arrays and return logical true or false values to indicate where the relation holds.

==	Determine the equality
>=	Determine greater than or equal to
>	Determine greater than
<=	Determine less than or equal to
<	Determine less than
?=	Determine inequality

## Relational Operators continu...

---

➤ For example:

`a=10; b=10; a==b`   &   `a=10; b=12; a==b`

`ans =`

Logical

1

`ans =`

Logical

0



## Relational Operators continu...

---

➤ For example:

`a=15; b=20; a<=b`   &   `a=12; b=115; a>=b`

`ans =`

Logical

1

`ans =`

Logical

0



## Relational Operators continu...

---

➤ For example:

`a=15; b=20; a~=b`   &   `a=115; b=115; a~=b`

`ans =`

Logical

1

`ans =`

Logical

0



## Logical Operators:

---

- The logical data type represents true or false states using the numbers 1 and 0, respectively.
- The three logical operators are **&**, **|**, and **~**
- The meaning of **&** operator is **AND**
- The meaning of **|** operator is **OR**
- The meaning of **~** operator is **NOT**



## Logical Operator & truth table:

---

operand	operand	AND operand
1	1	1
1	0	0
0	1	0
0	0	0



## Logical Operator &, Continued...

---



For example, >> a=[1 1 1 0 0 0];

>> b=[0 0 0 1 1 1];

>> a&b

ans =

1×6 logical array

0 0 0 0 0 0

## Logical Operator &, Continued...

---

Consider,

```
>> a=1; b=1;
```

```
>> a&b
```

```
ans =
```

```
· logical
```

```
1
```





## Logical Operator &, Continued...

---

Consider,      >> a=0; b=1;  
                 >> a&b  
                 ans =  
                 logical  
                 0



## Logical Operator |, truth table:

---

- If the two operands evaluate to true (1) or false (0), then the operator OR has the following effect.

operand	operand	operand OR operand
1	1	1
1	0	1
0	1	1
0	0	0



## Logical Operator |, Continued...

---

Consider, `>>a=[1 1 1 0 0 0]; b=[0 0 0 1 1 1];`

`>> a|b`

`ans =`

`1×6 logical array`

`1 1 1 1 1 1`



## Logical Operator $\sim$ truth table:

---

operand	NOT operand
1	0
0	1



## Logical Operator ~, Continued...

---



➤ For example, `>>a=10;`

`>> ~a`

`ans =`

`logical`

`0`

Consider, `>> a=0;`

`>> ~a`

`ans =`

`logical`

`1`



**THANK YOU**

---