RELATIONAL OPERATORS

Relational operator	Meaning
<	Less than.
<=	Less than or equal to.
>	Greater than.
>=	Greater then or equal to.
==	Equal to.
~=	Not equal to.

- Relational operators compare two numbers in a comparison statement.
- If the statement is true, it is assigned a value of 1.
- If the statement is false, it is assigned a value of 0.

RELATIONAL OPERATORS, EXAMPLES

```
>> 5>8

ans =

     0

>> a=5<10

a =

     1

>> y=(6<10) + (7>8) + (5*3= =60/4)

y =

     2
```

=1 =0 =1

Since 5 is not larger than 8 the answer is 0.

Checks if 5 is smaller than 10, and assigns the answer to **a**.

Since 5 is smaller than 10 the number 1 is assigned to **a**.

LOGICAL OPERATORS

- Logical operators have numbers as operands.
- A nonzero number is true.
- A zero number is false.

Logical Operator	Name	Meaning
& Example: *A* & *B*	AND	True if both operands (*A* and *B*) are true.
| Example: *A* | *B*	OR	True if either or both operands (*A* and *B*) are true.
~ Example: ~ *A*	NOT	True if the operand (*A*) is false. False if the operand (*A*) is true.

LOGICAL OPERATORS, EXAMPLES

```
>> 3&7
ans =
     1
>> a=5|0
a =
     1
>> x=-2; y=5;
>> -5<x<-1
ans =
     0
>> -5<x & x<-1
ans =
     1
```

3 AND 7.

3 and 7 are both true (nonzero), so the outcome is 1.

5 OR 0 (assign to variable **a**).

1 is assigned to **a** since at least one number is true (nonzero).

Define variables **x** and **y**.

Mathematically correct. The answer is false since MATLAB executes from left to right. -5<x is true (=1) and then 1<-1 is false (0).

The mathematically correct statement is obtained by using the logical operator &. The inequalities are executed first. Since both are true (1), the answer is 1.

EXAMPLE OF USING THE `if-end` STATEMENT

```
% A script file that demonstrates the use of the if-end statement.
% The user is asked to enter three grades.
% The program calculates the average of the grades.
% If the average is less than 60, a massage:
% The student did not pass the course.  is printed.

score = input('Enter (as a vector) the scores of the three tests   ');
ave_grade = (score(1) + score(2) + score(3))/3;
disp('The average grade is:')
disp(ave_grade)
if ave_grade < 60
    disp('The student did not pass the course.')
end
```

EXAMPLE OF USING THE `if-end` STATEMENT

Executing the script file of the previous slide in the Command Window:

```
>> Lecture8Example1
Enter (as a vector) the scores of the three tests   [78 61 85]
The average grade is:
   74.6667

>> Lecture8Example1
Enter (as a vector) the scores of the three tests   [60 38 55]
The average grade is:
    51
The student did not pass the course.
```

EXAMPLE OF USING THE `if-else-end` STATEMENT

```
% A script file that demonstrates the use of the if-else-end statement.
% The user is asked to enter three grades.  The program calculates
% the average of the grades.  If the average is less than 60, a
% massage:  The student did not pass the course.  is printed.
% Otherwise, a massage: The student passed the course. is printed.

score = input('Enter (as a vector) the scores of the three tests   ');
ave_grade = (score(1) + score(2) + score(3))/3;
disp('The average grade is:')
disp(ave_grade)
if ave_grade < 60
    disp('The student did not pass the course.')
else
    disp('The student passed the course.')
end
```

EXAMPLE OF USING THE `if-else-end` STATEMENT

Executing the script file of the previous slide in the Command Window:

```
>> Lecture8Example2
Enter (as a vector) the scores of the three tests   [65 80 83]
The average grade is:
    76
The student passed the course.
>> Lecture8Example2
Enter (as a vector) the scores of the three tests   [60 40 55]
The average grade is:
   51.6667
The student did not pass the course.
```

EXAMPLE OF USING THE `if-elseif-else-end` STATEMENT

```
% A script file that demonstrates the use of the if-elseif-else-end
% statement.
% The program calculates the tip in a restaurant according to the
% amount of the bill.
% If the bill is less than 10$ the tip is $1.80.
% Between $10 and $60 the tip is 18% of the bill.
% Above $60 the tip is 20% of the bill.

format bank
clear tip
```

(The file continues on the next slide)

(Continuation from the previous slide)

```
bill = input('Enter the amount of the bill (in dollars):  ');
if  bill <= 10)
    tip = 1.8;
elseif (bill > 10) & (bill <= 60)
    tip = bill*0.18;
else
     tip = bill*0.2;
end
disp('The tip is (in dollars):')
disp(tip)
```

EXECUTING THE SCRIPT FILE OF THE RESTAURAT TIP CALCULATION

```
>> Lecture8Example3
Enter the amount of the bill (in dollars):  15
The tip is (in dollars):
        2.70
```

```
>> Lecture8Example3
Enter the amount of the bill (in dollars):  6
The tip is (in dollars):
        1.80
```

```
>> Lecture8Example3
Enter the amount of the bill (in dollars):  100
The tip is (in dollars):
       20.00
```

COMMENTS ABOUT `if-end` STATEMENTS

- For every **if** command a computer program must have an **end** command.
- A program can have many **if ….. end** statements following each other.
- A computer program can perform the same task using different combinations of **if - end**, **if – else – end**, and **if – elseif – else – end** statements.