

Unit 4: Control flow (II)

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Interactive Systems Group

Example

Example: Display on the screen the numbers between 1 and 10 sorted in increasing order.

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

Example: Display on the screen the numbers between 1 and 10 sorted in increasing order.

```
fprintf( '\n Number: %d', 1 );  
fprintf( '\n Number: %d', 2 );  
fprintf( '\n Number: %d', 3 );  
fprintf( '\n Number: %d', 4 );  
fprintf( '\n Number: %d', 5 );  
fprintf( '\n Number: %d', 6 );  
fprintf( '\n Number: %d', 7 );  
fprintf( '\n Number: %d', 8 );
```

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

Example: Display on the screen the numbers between 1 and 10 sorted in increasing order.

```
fprintf( '\n Number: %d', 1 );  
fprintf( '\n Number: %d', 2 );  
fprintf( '\n Number: %d', 3 );  
fprintf( '\n Number: %d', 4 );  
fprintf( '\n Number: %d', 5 );  
fprintf( '\n Number: %d', 6 );  
fprintf( '\n Number: %d', 7 );  
fprintf( '\n Number: %d', 8 );
```

We are repeating the same command 10 times...
In this case it's not too bad, but what if we have to print the numbers between 1 and 1000? We don't want to write the same instruction 1000 times!!

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Iterative Statements

- Allow us to repeat the execution of the same block of statements.
- There are 2 types of loops in MATLAB:
 - **for-loops**: repeat a sequence of instructions a **fixed number of times** by stepping an index through a set of values.
 - **while-loops**: repeat a sequence of instructions **until a boolean test is true**.
- The structure in both cases is similar:
 - Variables initialization.
 - A expression to test the end condition of the loop.

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

For loop

- `for variable = expression`
 `statement1;`
 `statement2;`
 `...`
`end`

The for-loop in MATLAB works like this

- MATLAB evaluates the *<expression>* **obtaining a vector of values as a result.**
- The *<variable>* is set to the first value in the vector and the sequence of statements is executed with this value of the *<variable>*
- Then the *<variable>* is set to the second value in the vector and the sequence of statements is executed with this value of the *<variable>*

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

```
for i=[7 1 3 4]
    fprintf('\n Number: %d', i);
end
```

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

1st iteration

```
for i=[7 1 3 4]
    fprintf('\n Number: %d', i);
end
```

i=7

Program output

Number: 7

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

2nd iteration

```
for i=[7 1 3 4]
    fprintf('\n Number: %d', i);
end
```

i=1

Program output

Number: 7

Number: 1

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

3rd iteration

```
for i=[7 1 3 4]
    fprintf('\n Number: %d', i);
end
```

i=3

Program output

Number: 7

Number: 1

Number: 3

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

4th iteration

```
for i=[7 1 3 4]
    fprintf('\n Number: %d', i);
end
```

i=4 ↓
[] end
↓

Program output

Number: 7

Number: 1

Number: 3

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

You can also use vectors of characters

```
for i=['C' 'a' 't']  
    fprintf('\n%c',i);  
end
```

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

1st iteration

```
for i=['C' 'a' 't']  
    fprintf('\n%c',i);  
end
```

i = 'C'

Program output

C

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

2nd iteration

```
for i=['C' 'a' 't']  
    fprintf('\n%c',i);  
end
```

i = 'a'

Program output

C
a

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

3rd iteration

```
for i=['C' 'a' 't']  
    ↓  
i='t'  ↓  fprintf('\n%c',i);  
-----  
end  
    ↓
```

Program output

C
a
t

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

Most of the times you'll write the for loops like this:

```
for i= init_number:last_number  
    . . .  
end
```



MATLAB will replace this by a vector containing the numbers between *init_number* and *last_number*. Then the variable *i* will be assigned to those values one by one at each iteration

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

Example: Display on the screen the numbers between 1 and 10 sorted in increasing order.

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

Example: Display on the screen the numbers between 1 and 10 sorted in increasing order.

```
for i=1:10
    fprintf('\n Number: %d', i);
end
```

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

Example: Display on the screen the numbers between 1 and 10 sorted in increasing order.

```
for i=1:10
    fprintf('\n Number: %d ', i);
end
```

The statement `fprintf('\n Number: %d ', i)` will be executed ten times. Each time the variable `i`

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Cartagena99

Example

Example: Display on the screen the numbers between 1 and 10 sorted in increasing order.

```
for i=1:10
    fprintf('\n Number: %d ', i);
end
```

Output

Number: 1

The statement `fprintf('\n Number: %d ', i)` will be executed ten times. Each time the variable `i`

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Cartagena99

Example

Example: Display on the screen the numbers between 1 and 10 sorted in increasing order.

```
for i=1:10
    fprintf('\n Number: %d ', i);
end
```

Output

Number: 1
Number: 2

The statement `fprintf('\n Number: %d ', i)` will be executed ten times. Each time the variable `i`

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Cartagena99

Example

Example: Display on the screen the numbers between 1 and 10 sorted in increasing order.

```
for i=1:10
    fprintf('\n Number: %d ', i);
end
```

Output

Number: 1
Number: 2
Number: 3

The statement `fprintf('\n Number: %d ', i)` will be executed ten times. Each time the variable `i`

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Cartagena99

Example

Example: Display on the screen the numbers between 1 and 10 sorted in increasing order.

```
for i=1:10
    fprintf('\n Number: %d ', i);
end
```

Output

Number: 1
Number: 2
Number: 3
Number: 4

The statement `fprintf('\n Number: %d ', i)` will be executed ten times. Each time the variable `i`

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Cartagena99

Example

Example: Display on the screen the numbers between 1 and 10 sorted in increasing order.

```
for i=1:10
    fprintf('\n Number: %d ', i);
end
```

Output

Number: 1
Number: 2
Number: 3
Number: 4
Number: 5

The statement `fprintf('\n Number: %d ', i)` will be executed ten times. Each time the variable `i`

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Cartagena99

Example

Example: Display on the screen the numbers between 1 and 10 sorted in increasing order.

```
for i=1:10
    fprintf('\n Number: %d ', i);
end
```

Output

Number: 1
Number: 2
Number: 3
Number: 4
Number: 5
Number: 6

The statement `fprintf('\n Number: %d ', i)` will be executed ten times. Each time the variable `i`

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Cartagena99

Example

Example: Display on the screen the numbers between 1 and 10 sorted in increasing order.

```
for i=1:10
    fprintf('\n Number: %d ', i);
end
```

Output

Number: 1
Number: 2
Number: 3
Number: 4
Number: 5
Number: 6
Number: 7

The statement `fprintf('\n Number: %d ', i)` will be executed ten times. Each time the variable `i`

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Cartagena99

Example

Example: Display on the screen the numbers between 1 and 10 sorted in increasing order.

```
for i=1:10
    fprintf('\n Number: %d ', i);
end
```

Output

Number: 1
Number: 2
Number: 3
Number: 4
Number: 5
Number: 6
Number: 7
Number: 8

The statement `fprintf('\n Number: %d ', i)` will be executed ten times. Each time the variable `i`

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Cartagena99

Example

Example: Display on the screen the numbers between 1 and 10 sorted in increasing order.

```
for i=1:10
    fprintf('\n Number: %d ', i);
end
```

Output

Number: 1
Number: 2
Number: 3
Number: 4
Number: 5
Number: 6
Number: 7
Number: 8
Number: 9

The statement `fprintf('\n Number: %d ', i)` will be executed ten times. Each time the variable `i`

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Cartagena99

Example

Example: Display on the screen the numbers between 1 and 10 sorted in increasing order.

```
for i=1:10
    fprintf('\n Number: %d ', i);
end
```

Output

Number: 1
Number: 2
Number: 3
Number: 4
Number: 5
Number: 6
Number: 7
Number: 8
Number: 9

The statement `fprintf('\n Number: %d ', i)` will be executed ten times. Each time the variable `i`

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Cartagena99

Example

It is also possible to write loops like this:

```
for i= init_number:step:last_number
    . . .
end
```



MATLAB will replace this expression by a vector which contains numbers between `init_number` and `last_number` obtained adding/subtracting the step to the previous number in the vector

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

It is also possible to write loops like this:

```
for i= init_number:step:last_number
    . . .
end
```

For example:

```
for i= 1:2:10
    . . .
end
```

The logo for Cartagena99, featuring the text "Cartagena99" in a stylized font with a blue and orange gradient background.

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

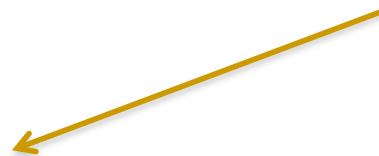
It is also possible to write loops like this:

```
for i= init_number:step:last_number  
    . . .  
end
```

This will be replaced by
[1 3 5 7 9]

For example:

```
for i= 1:2:10  
    . . .  
end
```



Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

It is also possible to write loops like this:

```
for i= init_number:step:last_number  
    . . .  
end
```

For example:

```
for i= 0:5:20  
    . . .  
end
```

The logo for Cartagena99, featuring the text "Cartagena99" in a stylized font with a blue and orange gradient background.

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

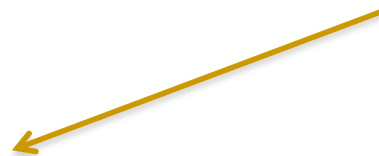
It is also possible to write loops like this:

```
for i= init_number:step:last_number  
    . . .  
end
```

This will be replaced by
[0 5 10 15 20]

For example:

```
for i= 0:5:20  
    . . .  
end
```



Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

It is also possible to write loops like this:

```
for i= init_number:step:last_number
    . . .
end
```

For example:

```
for i= 100:-25:10
    . . .
end
```

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

It is also possible to write loops like this:

```
for i= init_number:step:last_number  
    . . .  
end
```

This will be replaced by
[100 75 50 25]

For example:

```
for i= 100:-25:10  
    . . .  
end
```



Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

Example: Display on the screen the numbers between 1 and 10 sorted in decreasing order.

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Example

Example: Display on the screen the numbers between 1 and 10 sorted in decreasing order.

```
for i=10:-1:1
    fprintf('\n Number: %d', i);
end
```

Output

Number: 10
Number: 9
Number: 8
Number: 7
Number: 6
Number: 5
Number: 4
Number: 3
Number: 2

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Exercise

Exercise: Display on the screen the numbers between 1 and 10 (included) squared.

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Exercise

Exercise: Display on the screen the numbers between 1 and 10 (included) squared.

```
for i=1:10
    square = i * i;
    fprintf('\n The square of %d is %d ', i, square);
end
```

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Modifying variables inside a loop

What will be the value of the variable 'var' at the end of the program execution?

```
var = 0;
for i=1:5
    var = var + 1;
end
fprintf('\n The value is %d ', var);
```

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Modifying variables inside a loop

What will be the value of the variable 'var' at the end of the program execution?

```
var = 0;
for i=1:5
    var = var + 1;
end
fprintf('\n The value is %d ', var);
```

1st iteration

i = 1
var = 0 + 1 = 1

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Modifying variables inside a loop

What will be the value of the variable 'var' at the end of the program execution?

```
var = 0;
for i=1:5
    var = var + 1;
end
fprintf('\n The value is %d ', var);
```

1st iteration

i = 1

var = 0 + 1 = 1

2nd iteration

i = 2

var = 1 + 1 = 2

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Modifying variables inside a loop

What will be the value of the variable 'var' at the end of the program execution?

```
var = 0;
for i=1:5
    var = var + 1;
end
fprintf('\n The value is %d ', var);
```

1st iteration

i = 1

var = 0 + 1 = 1

2nd iteration

i = 2

var = 1 + 1 = 2

3rd iteration

i = 3

var = 2 + 1 = 3

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Modifying variables inside a loop

What will be the value of the variable 'var' at the end of the program execution?

```
var = 0;
for i=1:5
    var = var + 1;
end
fprintf('\n The value is %d ', var);
```

1st iteration

i = 1
var = 0 + 1 = 1

2nd iteration

i = 2
var = 1 + 1 = 2

3rd iteration

i = 3
var = 2 + 1 = 3

4rd iteration

i = 4
var = 3 + 1 = 4

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Modifying variables inside a loop

What will be the value of the variable 'var' at the end of the program execution?

```
var = 0;
for i=1:5
    var = var + 1;
end
fprintf('\n The value is %d ', var);
```

1st iteration

i = 1
var = 0 + 1 = 1

2nd iteration

i = 2
var = 1 + 1 = 2

3rd iteration

i = 3
var = 2 + 1 = 3

4rd iteration

i = 4
var = 3 + 1 = 4

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Modifying variables inside a loop

What will be the value of the variable 'var' at the end of the program execution?

```
var = 0;
for i=1:5
    var = var + 1;
end
fprintf('\n The value is %d ', var);
```

At the end of the program the value of var is 5

CLASES PARTICULARES, TUTORIAS TECNICAS ONLINE
LLAMA O ENVIA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Cartagena99

Modifying variables inside a loop

And in this case?

```
var = 0;
for i=1:5
    var = var + i;
end
fprintf('\n The value is %d ', var);
```

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Modifying variables inside a loop

And in this case?

```
var = 0;
for i=1:5
    var = var + i;
end
fprintf('\n The value is %d ', var);
```

1st iteration

i = 1

var = 0 + 1 = 1

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Modifying variables inside a loop

And in this case?

```
var = 0;
for i=1:5
    var = var + i;
end
fprintf('\n The value is %d ', var);
```

1st iteration

$i = 1$

$var = 0 + 1 = 1$

2nd iteration

$i = 2$

$var = 1 + 2 = 3$

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Modifying variables inside a loop

And in this case?

```
var = 0;  
for i=1:5  
    var = var + i;  
end  
fprintf('\n The value is %d ', var);
```

1st iteration

$i = 1$

$var = 0 + 1 = 1$

2nd iteration

$i = 2$

$var = 1 + 2 = 3$

3rd iteration

$i = 3$

$var = 3 + 3 = 6$

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Modifying variables inside a loop

And in this case?

```
var = 0;
for i=1:5
    var = var + i;
end
fprintf('\n The value is %d ', var);
```

1st iteration

$i = 1$

$var = 0 + 1 = 1$

2nd iteration

$i = 2$

$var = 1 + 2 = 3$

3rd iteration

$i = 3$

$var = 3 + 3 = 6$

4rd iteration

$i = 4$

$var = 6 + 4 = 10$

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Modifying variables inside a loop

And in this case?

```
var = 0;  
for i=1:5  
    var = var + i;  
end  
fprintf('\n The value is %d ', var);
```

1st iteration

$i = 1$

$var = 0 + 1 = 1$

2nd iteration

$i = 2$

$var = 1 + 2 = 3$

3rd iteration

$i = 3$

$var = 3 + 3 = 6$

4rd iteration

$i = 4$

$var = 6 + 4 = 10$

5th iteration

$i = 5$

$var = 10 + 5 = 15$

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Modifying variables inside a loop

And in this case?

```
var = 0;
for i=1:5
    var = var + i;
end
fprintf('\n The value is %d ', var);
```

At the end of the program the value of var is 15

CLASES PARTICULARES, TUTORIAS TECNICAS ONLINE
LLAMA O ENVIA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Cartagena99

Exercise

Write a program that asks the user to introduce two numbers and prints on screen all the numbers between them

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Exercise

Write a program that asks the user to introduce two numbers and prints on screen all the numbers between them

```
varMin = input('Introduce a number');  
varMax = input('Introduce another number');  
for i=varMin:varMax  
    fprintf('\n Number: %d',i);  
end
```

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

- For loops are specially useful when working with vectors. We can use them to:
 - ❑ Modify the values of the elements of the vector
 - ❑ Retrieve their values
 - ❑ Count how many of them satisfy certain condition
 - ❑ Find the maximum, minimum...
 - ❑ ... in general to loop through the elements in the vector and work with them

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

Exercise: Write a program that asks the user to introduce 20 numbers and stores them in a vector

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

Exercise: Write a program that asks the user to introduce 20 numbers and stores them in a vector

```
vect = zeros(1,20);  
for i=1:20  
    vect(i) = input('Introduce a number: ');  
end
```

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

Exercise: Write a program that asks the user to introduce 20 numbers and stores them in a vector

```
vect = zeros(1,20);  
for i=1:20  
    vect(i) = input('Introduce  
end
```

It is a good practice to initialize the vector before using it. We do it because the variable vect could have been used in a previous program and it might contain data from previous executions. When working with numbers we normally initialize filling it with zeros,

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Cartagena99

Working with vectors

Exercise: Modify the previous program so that, once the user finishes introducing the values, it counts how many numbers in the vector are even

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

Exercise: Modify the previous program so that, once the user finishes introducing the values, it counts how many numbers in the vector are even

```
vect = zeros(1,20);  
for i=1:20  
    vect(i) = input('Introduce a number: ');  
end  
count = 0;  
for i=1:20  
    if (rem(vect(i),2) ==0)  
        count = count + 1;  
    end  
end
```

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

Exercise: Modify the previous program so that, once the user finishes introducing the values, it counts how many numbers in the vector are even

```
vect = zeros(1,20);  
for i=1:20  
    vect(i) = input('Introduce a number: ');  
end  
count = 0;  
for i=1:20  
    if (rem(vect(i),2) ==0)  
        count = count + 1;  
    end  
end
```

You can put ifs, switches...
any commands inside the
for... even another for.

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

Exercise: Modify the previous program so that, once the user finishes introducing the values, it says how many numbers in the vector are even

```
vect = zeros(1,20);  
for i=1:20  
    vect(i) = input('Introduce a number: ');  
end  
count = 0;  
for number=vect  
    if (rem(number,2) ==0)  
        count = count + 1;  
    end  
end
```

ANOTHER SOLUTION. IN THIS CASE WE USE vect DIRECTLY AS THE VECTOR TO ITERATE IN THE for

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Cartagena99

Working with vectors

Exercise: Modify the previous program so that, once the user finishes introducing the values, it says how many numbers in the vector are even

```
vect = zeros(1,20);  
count = 0;  
for i=1:20  
    vect(i) = input('Introduce a number: ');  
    if (rem(vect(i),2) ==0)  
        count = count + 1;  
    end  
end
```

You could even improve the solution by checking if the number is even when the user introduce it

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

Exercise: Write a program that asks the user to introduce 5 characters one by one, and prints on screen the number of vowels introduced

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

Exercise: Write a program that asks the user to introduce 5 characters one by one, and prints on screen the number of vowels introduced

```
vectCh = [];  
for i=1:5  
    vectCh(i) = input('Introduce a character: ','s');  
end  
countvow = 0;  
for i = 1:5  
    switch vectCh(i)  
        case {'a','e','i','o','u'}  
            countvow = countvow + 1;  
        end  
    end  
end
```

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

Exercise: Write a program that asks the user to introduce 5 characters one by one, and prints on screen the number of vowels introduced

```
vectCh = []; ←  
for i=1:5  
    vectCh(i) = input('Introduce a charac  
end  
countvow = 0;  
for i = 1:5  
    switch vectCh(i)  
        case {'a','e','i','o','u'}  
            countvow = countvow +
```

We initialize the vector with an “empty vector”. We cannot use zeros, as we are going to store characters, and the elements in the vector should all be of the same types (you can't have numbers and characters in the same vector)

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Cartagena99

Working with vectors

Exercise: Write a program that asks the user to introduce 5 characters one by one, and prints on screen the number of vowels introduced

```
vectCh = [];  
for i=1:5  
    vectCh(i) = input('Introduce a character: ','s');  
end  
countvow = 0;  
for letter = vectCh  
    switch letter  
        case {'a','e','i','o','u'}  
            countvow = countvow + 1;  
        end  
    end  
end
```

Another possible solution

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

Exercise: Write a program that asks the user to introduce 5 characters one by one, and prints on screen the number of vowels introduced

```
countvow = 0;
for i=1:5
    ch = input('Introduce a character: ','s');
    switch ch
        case {'a','e','i','o','u'}
            countvow = countvow + 1;
        end
    end
end
fprintf('\n There are %d vowels', countvow);
```

Another possible solution. This time the problem didn't say anything about vectors, so we could solve the problem like this.

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

Exercise: Write a program that asks the user to introduce 5 numbers and prints on screen the highest number introduced. Solve it using ***for*** (do not use the function *max*)

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

```
vect = zeros(1,5);  
for i=1:5  
    vect(i) = input ('Introduce a number: ');  
end  
maxNum = vect (1);  
for var = vect  
    if (var > maxNum)  
        maxNum = var;  
    end  
end  
fprintf('\The maximun is %d', maxNum);
```

Before we start we consider as maximum the first number in the vector

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

```
vect = zeros(1,5);  
for i=1:5  
    vect(i) = input ('Introduce a number: ');  
end  
maxNum = vect (1);  
for var = vect  
    if (var > maxNum)  
        maxNum = var;  
    end  
end  
fprintf ('\nThe maximum is %d', maxNum).
```

At each iteration we compare the “maximum so far”, which is stored in the variable maxNum, with a new element taken from the vector (var).

If this number is greater than the maximum so far, then it will be our new maximum

Cartagena99

CLASES PARTICULARES, TUTORIAS TECNICAS ONLINE
LLAMA O ENVIA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

An example of an execution of the program

```
vect = zeros(1,5);  
for i=1:5  
    vect(i) = input ('Introduce a number: ');  
end  
maxNum = vect (1);  
for var = vect  
    if (var > maxNum)  
        maxNum = var;  
    end  
end  
end
```

Let's say the user has introduced the values 2 1 4 3 1, so the content of vect is [2 1 4 3 1]

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70


Working with vectors

An example of an execution of the program

```
vect = zeros(1,5);  
for i=1:5  
    vect(i) = input ('Introduce a number: ');  
end  
maxNum = vect (1);  
for var = vect  
    if (var > maxNum)  
        maxNum = var;  
    end  
end
```

vect = [2 1 4 3 1]

maxNum = 2



Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

An example of an execution of the program

```
vect = zeros(1,5);  
for i=1:5  
    vect(i) = input ('Introduce a number: ');  
end  
maxNum = vect (1);  
for var = vect  
    if (var > maxNum)  
        maxNum = var;  
    end  
end
```

vect = [2 1 4 3 1]

1st Iteration

var = 2

It is our maximum

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

An example of an execution of the program

```
vect = zeros(1,5);  
for i=1:5  
    vect(i) = input ('Introduce a number: ');  
end  
maxNum = vect (1);  
for var = vect  
    if (var > maxNum)  
        maxNum = var;  
    end  
end  
end
```

vect = [2 1 4 3 1]

2nd Iteration

var = 1

1 is smaller than 2,
nothing changes

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

An example of an execution of the program

```
vect = zeros(1,5);  
for i=1:5  
    vect(i) = input ('Introduce a number: ');  
end  
maxNum = vect (1);  
for var = vect  
    if (var > maxNum)  
        maxNum = var;  
    end  
end  
end
```

vect = [2 1 4 3 1]

3rd Iteration

var = 4

4 is greater than 2,

maxNum = 4

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

An example of an execution of the program

```
vect = zeros(1,5);  
for i=1:5  
    vect(i) = input ('Introduce a number: ');  
end  
maxNum = vect (1);  
for var = vect  
    if (var > maxNum)  
        maxNum = var;  
    end  
end  
end
```

vect = [2 1 4 3 1]

4th Iteration

var = 3

3 is smaller than 4,
nothing changes

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

An example of an execution of the program

```
vect = zeros(1,5);
```

```
for i=1:5
```

```
    vect(i) = input ('Introduce a number: ');
```

```
end
```

```
maxNum = vect (1);
```

```
for var = vect
```

```
    if (var > maxNum)
```

```
        maxNum = var;
```

```
    end
```

```
end
```

vect = [2 1 4 3 1]

5th Iteration

var = 1

1 is smaller than 4,
nothing changes

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

An example of an execution of the program

```
vect = zeros(1,5);  
for i=1:5  
    vect(i) = input ('Introduce a number: ');  
end  
maxNum = vect (1);  
for var = vect  
    if (var > maxNum)  
        maxNum = var;  
    end  
end
```

vect = [2 1 4 3 1]

The value of

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Cartagena99

Working with vectors

Another way of solving the exercise

```
vect = zeros(1,5);
for i=1:5
    vect(i) = input ('Introduce a number: ');
end
maxNum = vect (1);
for i = 2:length(vect)
    if (vect (i) > maxNum)
        maxNum = vect(i);
    end
end
```

The function length returns the length of the vector. In this case the variable i is going to take values between 2 and the length of the vector. Then we compare the number of the vector in the

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70

Working with vectors

Another different way of solving the exercise.
This time we are not using vectors

```
num = input ('Introduce a number: ');
maxNum = num;
for i = 1:4
    num = input ('Introduce a number: ');
    if (num > maxNum)
        maxNum = num;
    end
end
fprintf('\nThe maximun is %d', maxNum);
```

We ask for a number which, initially, it will be our “maximun so far”

Now we ask 4 numbers more, comparing each of them with the “maximun so far” and updating the value of this latter if they are higher

Cartagena99

CLASES PARTICULARES, TUTORÍAS TÉCNICAS ONLINE
LLAMA O ENVÍA WHATSAPP: 689 45 44 70

ONLINE PRIVATE LESSONS FOR SCIENCE STUDENTS
CALL OR WHATSAPP:689 45 44 70