



Repetition statements

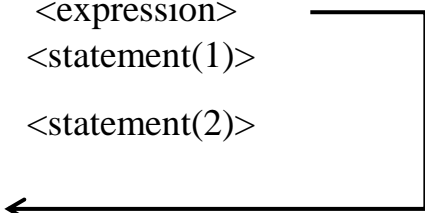
1. Concept of while loops

Recall from a previous lecture, loops are MATLAB constructs that allow a sequence of MATLAB commands to be executed more than once.

A while loop repeat a block of commands as long as an expression controlling it is true (1).

The while loop repeatedly executes statements while condition is true. The syntax of a while loop in MATLAB is:

```
while <expression>  
    <statement(1)>  
    <statement(2)>  
    ...  
end
```



code block is repeated
while expression is true (1)

The while loop repeatedly executes program statement(s) as long as the expression remains true as in Figure 1. The variables modified within the loop should include the variables in the expression, or the value of the expression will never change. If the expression is always true (or is a value that is nonzero), the loop becomes an infinite loop.

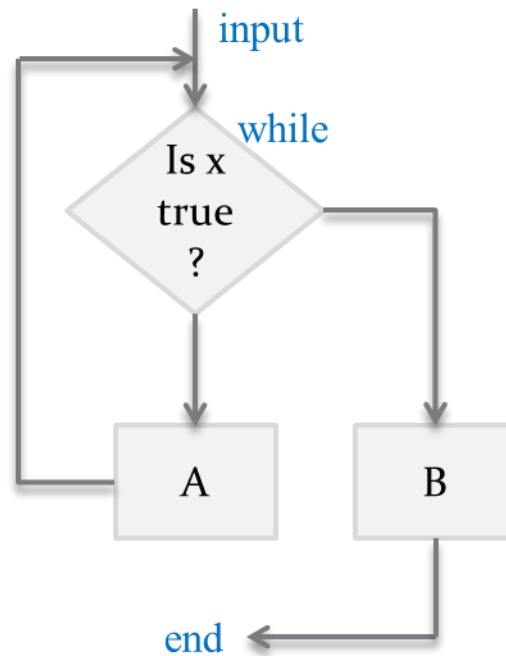


Figure 1 While loop statement

while Loop – Example 1

Repeatedly increment x by 7 as long as x is less than or equal to 30

```
x=12; % input number
```

```
while x<=30
```

```
    x=x+7
```

```
end
```

- x values displayed: 19, 26, 33
- x gets incremented beyond 30



All loop code is executed as long as the condition was true at the start of the loop as in Figure 2,

The previous example could be simplified by modifying the while condition

```
x=12; % input number
```

```
while (x+7)<=30
```

```
    x=x+7
```

```
end
```

- x values displayed: 19, 26

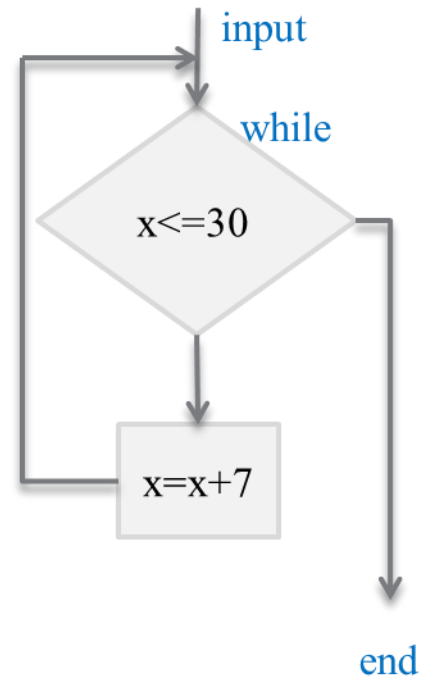


Figure 2 Example 1

2. for loop statement

A **for loop** is a repetition control structure that allows you to efficiently write a loop that needs to execute a specific number of times.

A for loop repeats a group of commands a fixed, predetermined number of times.

A for loop has the following structure:

```
for index = initval : step : endval
```

```
    <statement(s)>
```

```
...
```

```
end
```



Increments **index** by the value **step** on each iteration, or decrements when **step** is *negative*, **step** is *omitted* when increment is **1**. Figure 3 illustrated for loop,

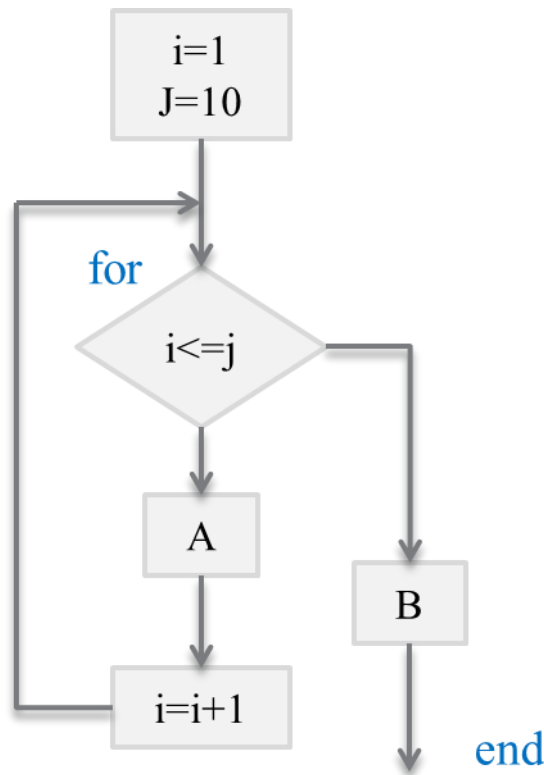


Figure 3 for loop

The commands between the for and end statements are executed once for every column in the expression, beginning with the first column and stepping through to the last column. At each step, known as an iteration, the appropriate column of the expression is assigned to the variable. Thus, on step *i*, column *i* of the expression is assigned to the variable, which then can be operated on by one of the commands in the loop.



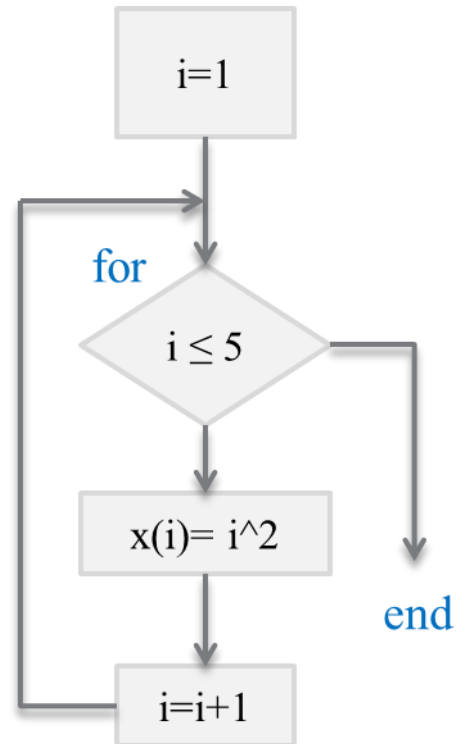
for Loop – Example 2

- Here, x is defined as a vector
- Loop still iterates 5 times
- Successive values appended to the end of x
- x grows with each iteration

```
for i= 1 : 5    % input number of iteration  
    x(i) = i^2  
end
```

Answers: in MATLAB

x = loop 1, when i = 1
1
x = loop 2, when i = 2
1 4
x = loop 3, when i = 3
1 4 9
x = loop 4, when i = 4
1 4 9 16
x = loop 5, when i = 5
1 4 9 16 25





for Loop – Example 3

```
B=[1 2 3 4;9 7 5 3]; % input matrix  
  
n=size(B,1); % get row number  
  
m=size(B,2); % get column number  
  
for i = 1: n % external loop  
  
    for j = 1 : m % internal loop  
  
        C(i , j ) = B(i , j ) ^ 2;  
  
    end  
  
end
```

disp (C)

Answers: in MATLAB

```
C = 1   4   9  16  
    81  49  25   9
```

