## 7.2 (while) loops

The command (while) is used to generate a loop that repeats as long as a condition is satisfied. When the condition is violated the program exits the loop. The condition depends on a variable (n) that must be initiated before entering the loop. The loop must also contains a statement that changes the variable (n) until reaching a value that ends the loop, otherwise the loop will not stop and the program never stops by itself. In this case it should be ended by pressing the buttons (ctrl + Break). The command (while) can be replaced by using (for) loop integrated with (if) statement. The structure of the command (while) can be illustrated as follows:
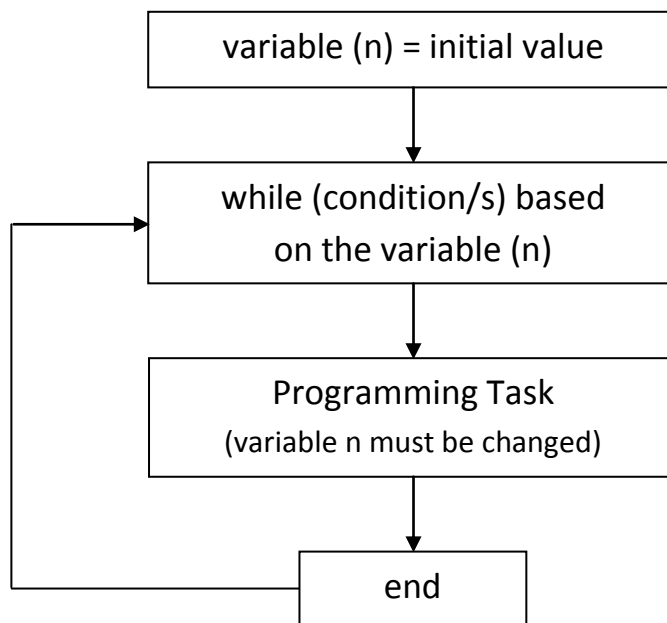


**Ex. 7.9** Write MATLAB program to evaluate the following two functions for values of x from 1 to 5 using (while) command:

$y = x^2$    $z = x^3$       $x = 1$ to $5$

**Sol.**

```
clear,clc
x=0;
while x<5
    x=x+1;
    y=x^2;
    z=x^3;
    disp([x y z])
end
```

**Run:**

```
1      1      1

2      4      8

3      9      27

4      16     64

5      25     125
```

**Ex. 7.10** Write MATLAB code to evaluate the following function for values of x starting from 1 at a step of unity. The program should stop evaluating the function (y) when its value exceeds 20. Use (while) loop:

$$y = \frac{x^3 + 1}{x + 1}$$

**Sol.**

```
clear,clc
x=0;
y=0;
while y<=20
    x=x+1;
    y=(x^3+1)/(x+1);
    disp([x,y])
end
```

**Run:**

| | |
|---|---|
| 1 | 1 |
| 2 | 3 |
| 3 | 7 |
| 4 | 13 |
| 5 | 21 |

**Ex. 7.11** Write MATLAB program to generate a matrix of five elements. Make the program display the matrix at each number added using (while) loop.

**Sol.**

```
clear,clc
n=0;
while n<=4
    n=n+1;
    a(n)=3^n;
    disp(a)
end
```

**Run:**

| 3 | | | | |
|---|---|---|---|---|
| 3 | 9 | | | |
| 3 | 9 | 27 | | |
| 3 | 9 | 27 | 81 | |
| 3 | 9 | 27 | 81 | 243 |

**Ex. 7.12** Write MATLAB program to find how many marks that are greater than or equal 90 out of 10 arbitrary marks. Use (while) command.

**Sol.**

```
scores=[74,45,98,95,80,88,92,90,85,82];
c=0;
n=0;
while n<length(scores)
    n=n+1;
    if scores(n)>=90
        c=c+1;
    end
end
fprintf(' There are ( %1.0f ) marks > = 90 \n ', c )
```

**Run:**

There are ( 4 ) marks > = 90

**Ex. 7.13** Write MATLAB program to evaluate the natural logarithm and the logarithm to base 10 for any input value of x. The program should accept only positive numbers limiting the user to three tries to enter the correct value.

**Sol.**

```
clear,clc
n=0;
while n<3
    x=input('Enter x = ');
    n=n+1;
    if x>0
        y=log(x);
        z=log10(x);
        R=[x,y,z];
        fprintf('     x       y        z \n ')
        fprintf('--------------------\n')
        fprintf('  %5.3f   %5.3f   %5.3f \n\n',R)
        break
    end
    if x<=0
        disp('Invalid! Re-try')
        disp(' ')
    end
    if n==3
        disp(' * Your tries expires! * ')
        disp(' ')
    end
end
```

**Run:**

```
Enter x = -1
Invalid! Re-try

Enter x = 0
Invalid! Re-try

Enter x = 4
    x       y        z
  --------------------
   4.000   1.386   0.602
```