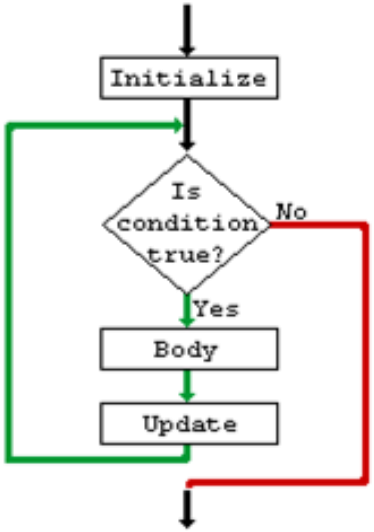
Loop Control Structures

L9-T4



Learning Objectives

- To learn and appreciate the following concepts
  - The `do-while` Statement
  - Nesting of Loops
  - Sample Programs

Learning Outcome

At the end of session the student will be able to

- The `do-while` Statement
- Nesting of loops
- Write programs

The do – while statement

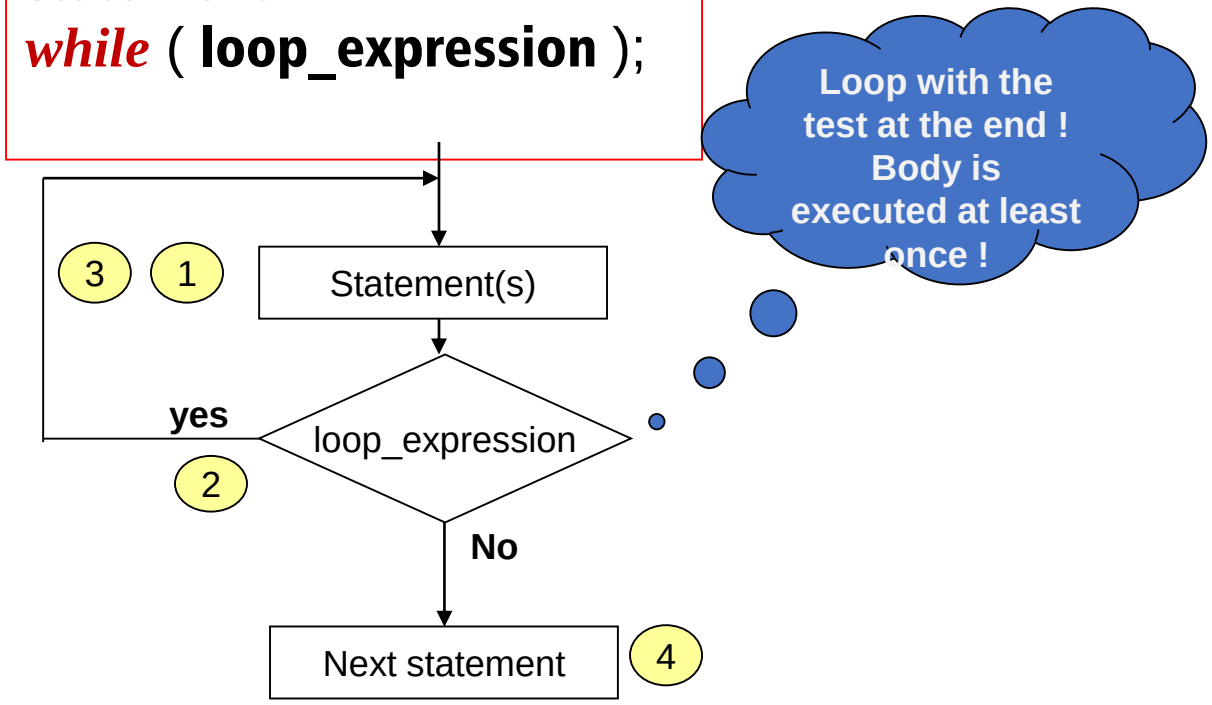
General form:

```
do
{
        body of the loop
}
while(test condition);
```

- ✓**Exit controlled loop**. At the end of the loop, the test condition is evaluated.
- ✓After do statement, program executes the body of the Loop.
- ✓Then, the condition is tested, if it is true, body of the loop is executed once again & this process continues as long as the condition is true.
- ✓**Body of the loop is executed at least once.**
- ✓**do-while loop can be nested.**

The do statement

```
do
        program
statement
while ( loop_expression );
```



Sum and Mean of first N natural numbers

Name of the algorithm: Sum and Mean of natural numbers.
Step 1: Start
Step 2: [Read the maximum value of N]
Input N
Step 3: [Set sum equal to 0]
Sum ← 0
Step 4: [Compute the sum of all first N natural numbers]

```
i=1
do
begin
Sum ← Sum + i
i++;
end
While(i<=N);
```

Sum and Mean of first N natural numbers

Step 5: [Compute mean value of N natural numbers]

Mean ← Sum / N

Step 6: [Print Sum and Mean]

Print 'Sum of N natural numbers=',Sum

Print 'Mean of N natural numbers =',Mean

Step 7: [End of algorithm]

Stop

Program to reverse the digits of a number

```
#include <stdio.h>
int main()
{
        int number, rev=0, right_digit;

        printf("Enter your number.\n");
        scanf("%d",&number);

        do
        {
                right_digit = number % 10;
                rev=rev*10 + right_digit;
                number = number / 10;
        }
        while ( number != 0 );

        printf("The reversed number is %d",rev);
        return 0;
}
```

Count the number of digits in a given number

```
scanf("%d",&num);
do
 {
   rem=num%10;
   num =num/10;
   ocnt++;
  } while(num > 0);

printf("%d digits",ocnt);
```

e.g.- num = 31467
OUTPUT
5 digits

Count the even and odd digits in a given ‘n’ digit number

```
scanf("%d",&num);
do
 {
   rem=num%10;
   num =num/10;
   if(rem%2==0)
     ecnt++;
   else
     ocnt++;
  } while(num > 0);

printf("%d even & %d odd digits",ecnt,ocnt);
```

e.g.- num = 31467
OUTPUT
2 even & 3 odd digits

Example: Convert binary to decimal

dec = bd*2^n + bd*2^{n-1} + … + bd*2^1 + bd*2^0

e.g.-given n=101 → 1*2^2 + 0*2^1 + 1*2^0 = 5

```
int  n, p=0, sum=0, k;
printf("Enter a binary number : ");
scanf("%d",&n);

do {
    k=n%10; // binary number  in n
    sum= sum + k * pow(2,p);//decimal number in sum
    p++;
    n= n/10;
    } while (n!=0);

printf("Decimal Equivalent = %d",sum);
```

Nesting of loop

Do-While Lop

```
i=0;
  do
    {      …..
           ….
             j=0;
      do     {
                 Statement S;
                 j++;
             } while(j<n);
// end of  inner 'do' statement

 i++;   } while(i<m) ;
// end of  outer 'do' statement
```

While Loop

```
i=0;
   while(i<m)
     {      …..
            ….
              j=0;
            while(j<n)
              {
                    Statement S;
                 j++;
              } // end of  inner 'while' statement
       i++;   }// end of  outer 'while' statement
```

Nesting of loop Examples: Armstrong nos for a given limit 'n'

```
scanf("%d",&lim);
n=1;
do
{
  sum = 0;
  num = n;
do
{
   dig = num%10;
   sum = sum+pow(dig,3);
   num = num/10;
  } while(num>0);
 if(sum == n)
   printf("%d\n\t",n);
n++;
} while(n<lim);
```

Armstrong Number
e.g. - 371
Σ (cubes of digits)= number
$3^3 + 7^3 + 1^3 = 371$

Nested loops

```
#include <stdio.h>
int main()
{
    int n, number, triangularNumber, counter=1;

    while (counter <= 5)
    {
        printf("What triangular number do you want? ");
        scanf("%d",&number);
        triangularNumber=0;
        n=1;
                while(n <= number)
                {
                    triangularNumber = triangularNumber + n;
                    n++;
                }printf("The %d th triangular number is %d:",n-
    1,triangularNumber);
        counter++;
    }
    return 0;
}
```

Remember indentations!

Poll Question

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