Basic Computer Programming and Networking

Loops

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Repetitions: Loops

- A loop is a sequence of instruction s that is continually repeated until a certain condition is reached.
- The statement may be repeated
  - For a specific number of items
  - For an indeterminate number of times, depending on the truth or falsity of some condition.

Loops

- C++ provides three types of loops
  - for loops (1- n times)
    - Repeat a section of code known number of times
  - while loops (0 – more times)
    - Loop is used to repeat a specific block of code an **unknown** number of times
  - do while loops (1 – more times)
    - A do while loop is a control flow statement that executes a block of code at least once, and then repeatedly executes the block

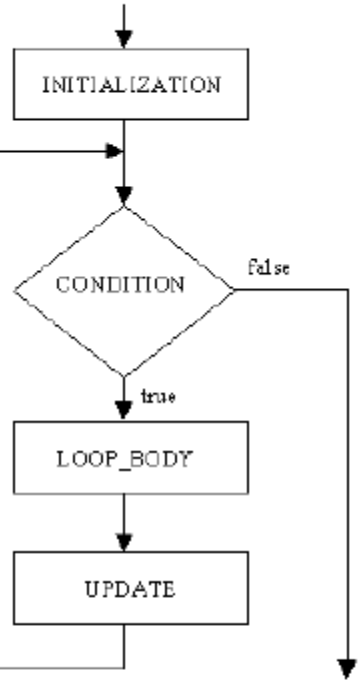
Repeat some work

- **Do some repeated work**
  - **Initialization** (Start number)
  - **Condition** (do repeat action until satisfy some condition)
  - **Update** (Next Value)
- **Example**
  - **Initialization** Start with 1
  - **Condition** Count up to 50
  - **Update** Count 1 by 1

For Loop

- **Syntax**

```
for (initialization; condition; update)
    {
      statement(s)
    }
```



- **Example**

Initialization

Condition

Update

```
for(int i = 1 ; i <11 ; i ++)
{
     cout << "Value "<< i << endl;
}
```

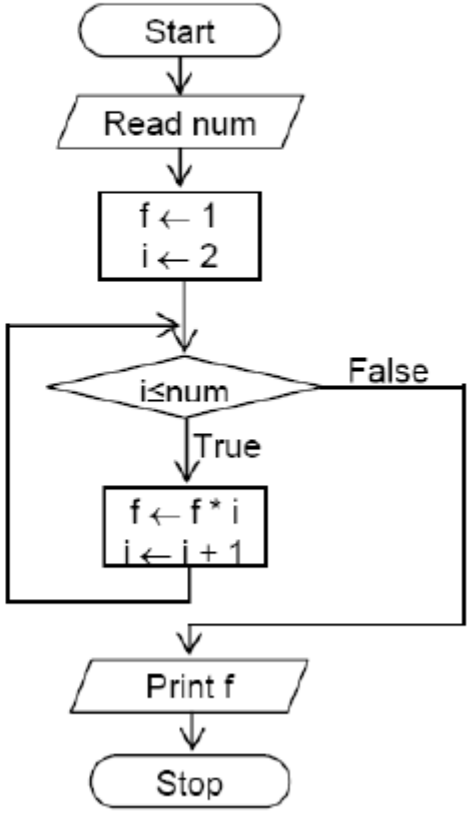
```
Value 1
Value 2
Value 3
Value 4
Value 5
Value 6
Value 7
Value 8
Value 9
Value 10
```

Exercise 6.1

Write a C++ program to find the factorial of a given number

Example:

$$5! = 5 \times 4 \times 3 \times 2 \times 1 = 120.$$



Answer

```
int number, i;
double fac;
cout << "Enter Number ";
cin >> number;

i = 1;
fac = 1;

while (i<=number)
{
    fac = fac * i;
    i++;
}
cout.setf(ios::fixed);
cout.precision(0);
cout << "Factorial Number is "<< fac;
```

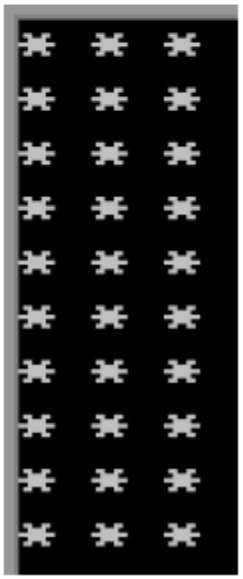
Nested for Loops

- A loop can be nested inside of another loop. C++ allows at least 256 levels of nesting.
- Syntax

```
for ( init; condition; increment )
{
   for ( init; condition; increment )
   {
      statement(s);
   }
      statement(s);
}
```

```
for(int i = 1 ; i <=10 ; i ++)
{
     for(int j = 1 ; j <=3 ; j++)
     {
          cout << "* ";
     }

     cout << endl;
}
```



Exercise 6.2

- Write a C++ program to display the following Multiplication table

Multiplication Table 1-12 Chart

	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

Exercise 6.3

1. Write a c++ program to print the following figure

a)
```
*
**
***
****
*****
```

b)
```
1
12
123
1234
12345
```

While Loop

- Allows the repetition of a statement based on the truth value of a condition
- Can run 0 to infinite times

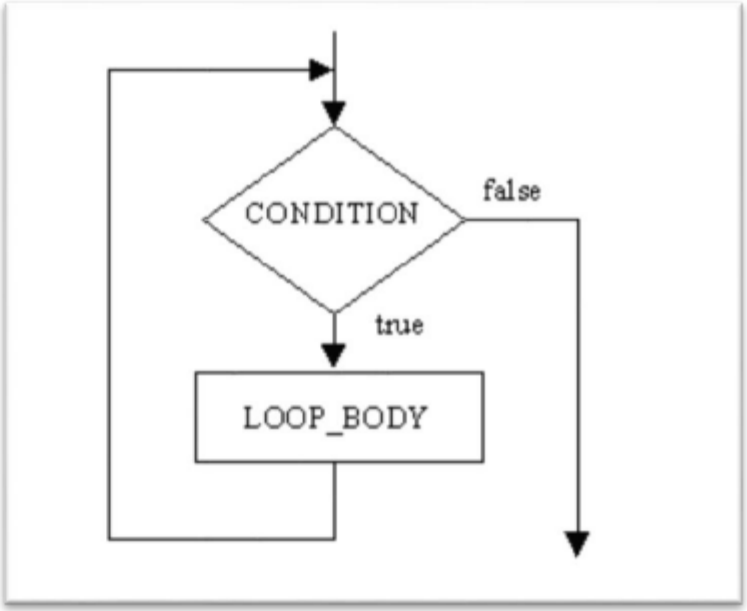
```
while (condition)
{
    statement(s)
}
```

```
while (1)
{
    statement(s)
}
```

While Loop

- Syntax

```
while (Condition)
 {
    statement(s)
 }
```



- Example

```
int num=1;

while (num <=10)
{
    cout << num<<endl;
    num++;
}
```

Initialization

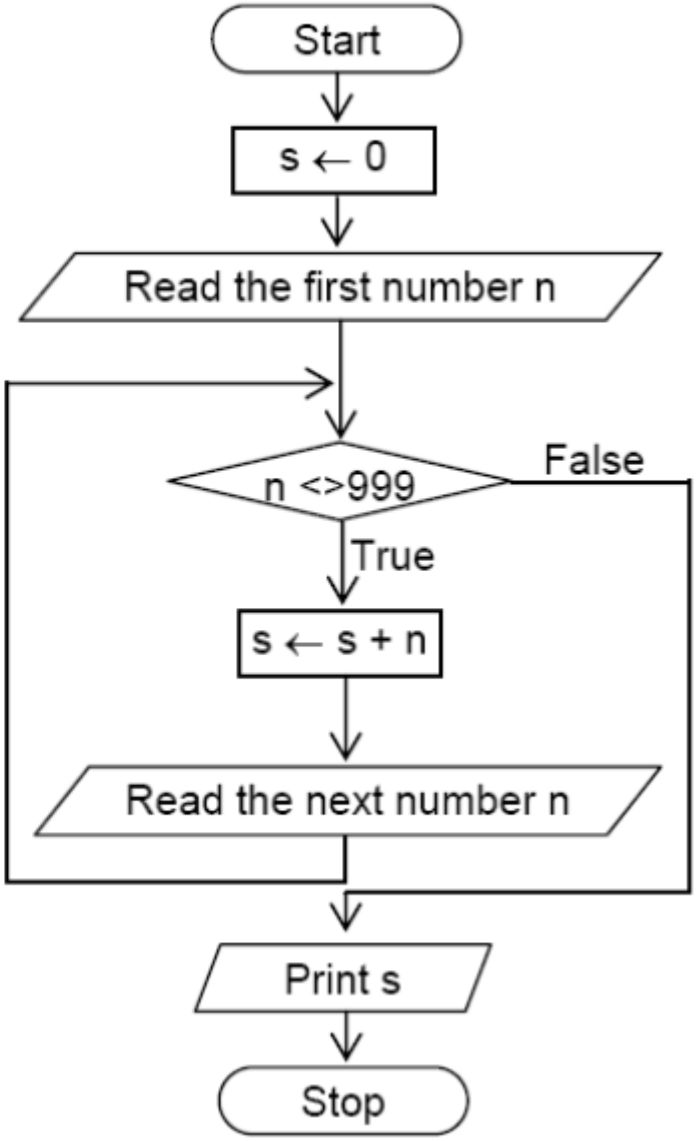
Condition

Update

```
1
2
3
4
5
6
7
8
9
10
```

Exercise 6.4

- Write a C++ program to accept numbers until the user enters a 999 and output the sum of the given numbers



Do-while Loop

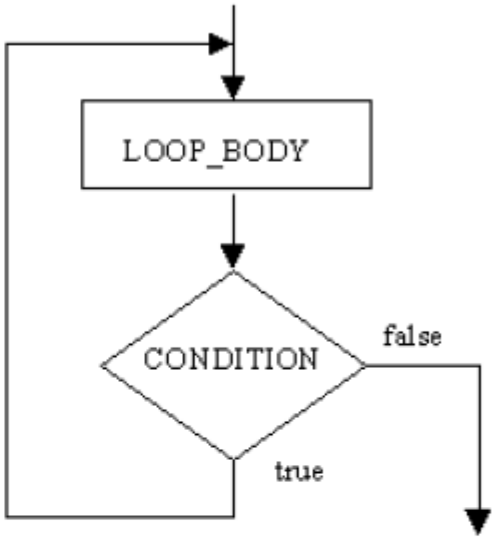
- do…while loop also depends on a condition, but unlike while loop, its condition is evaluated at the bottom of the loop, after the body has already executed.

```
do
{
    statement(s)
}
while (condition);
```

Do-while Loop

- Syntax

```
do
 {
     statement(s)
 }
 while (condition);
```



Example

```
int num = 1;
do
{
cout << "Number is: "<< num << endl;
num++;
}
while (num <= 10);
```

Initialization

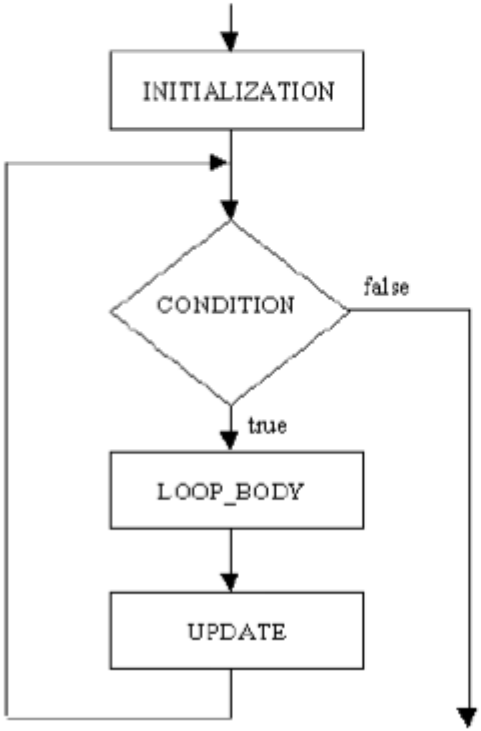
Update

Condition

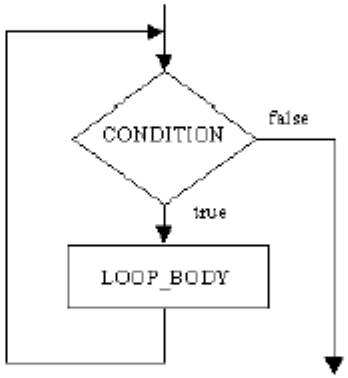
```
Number is: 1
Number is: 2
Number is: 3
Number is: 4
Number is: 5
Number is: 6
Number is: 7
Number is: 8
Number is: 9
Number is: 10
```

Loops comparison

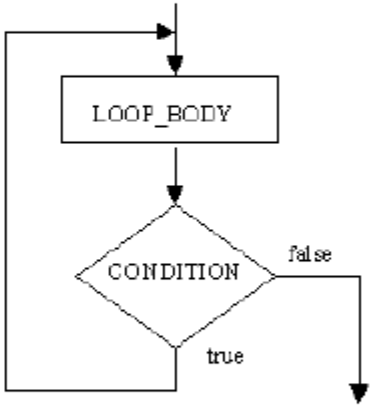
For



while



do-while



Loops comparison

```
for(int i = 1 ; i <11 ; i ++)
{
    cout << "Value "<< i << endl;
}
```

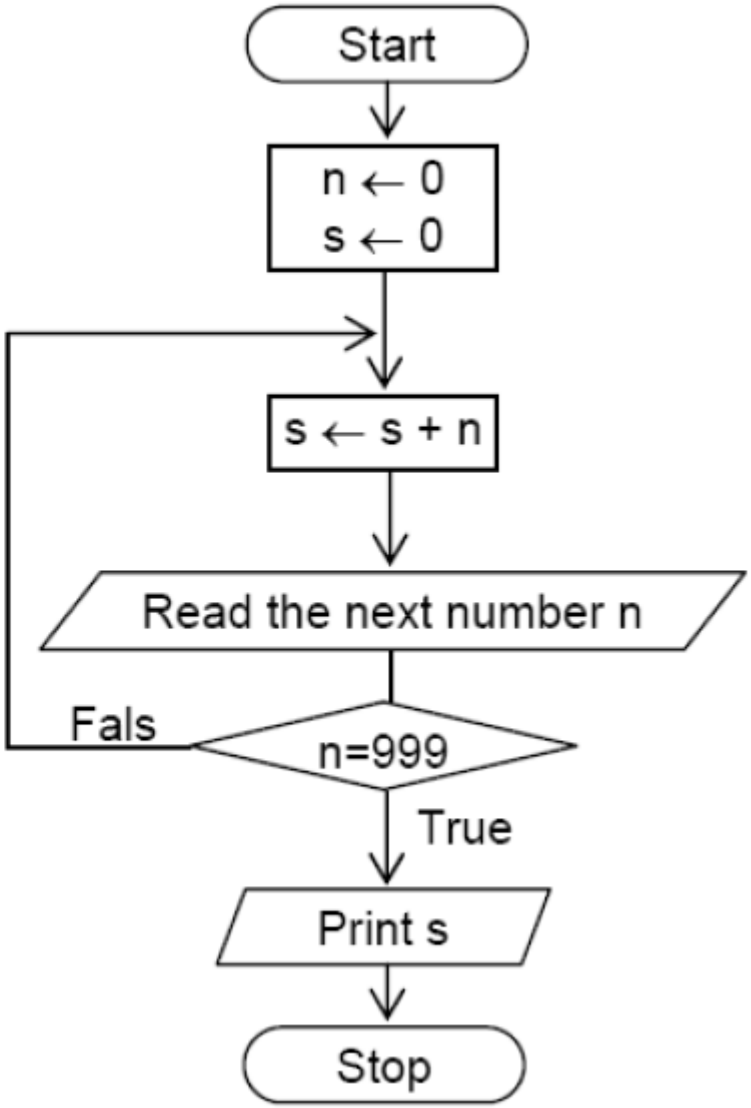
```
int num=1;

while (num <=10)
{
    cout << num<<endl;
    num++;
}
```

```
int num = 1;
do
{
cout << num << endl;
num++;
}
while (num <= 10);
```

Exercise 6.6

Accept numbers until the user enters a 999 and output the average of the given numbers



Exercise 6.8

Write a C++ program to read **N** number of integers and find the total and average.

- **N** is an input 1, 2, 3….. **N**
- Use for, while and do-while loops
- Draw 3 flow chart for the above 3 programs

Exercise 6.9

Write a C++ program to compute the gross pay for an employee. An employee is paid at hourly rate for the first 40 hours worked in a week. Any hours worked in excess of 40 hours are paid at the overtime rate of one and half times that. Your program should print the pay sheets of all the employees.

Thank You