# Computational Thinking and Programming - 1

## Iterative Statements (for loop)

XI

# range() function

The range() function of Python generates a list which is a special sequence type. A sequence in Python is a succession of values bound together by a single name.

**Syntax :**        range (<lower limit>, <upper limit>, <step>)

The range () function will produce a list of values starting from **lower limit** till **upper limit - 1. By default step is 1.**

**For example :**        range(0,5)

will produce  a list of values as : [0,1,2,3,4 ]

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# range() function

**For example :**          **range(5, 0)**

will produce  an empty list

**range(12, 18)**

will produce  a list [ 12, 13, 14, 15, 16, 17 ]

**range(27, 30)**

will produce  a list [ 27, 28, 29 ]

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# range() function

To produce decreasing values, we can use step value in range() function as :

**range (<lower limit>, <upper limit>, <step value>)**

For example :        **range(5, 0, -1)**

will produce  a list of values as : [5, 4, 3, 2, 1]

**range(0, 10, 2)**

will produce  a list of values as : [0, 2, 4, 6, 8]

**range(15, 1, -4)**

will produce  a list of values as : [15, 11, 7, 3]

# for loop

The for loop in Python is a counter controlled loop designed to process the items of any sequence, such as a list or a string one by one.

Syntax:                    for <variable> in <sequence >:
                                body of the loop

For example :                              Output:
for a in range (0,5) :                     0-1-2-3-4-
    print(a , end ="-")

for ch in 'calm'  :                        c-a-l-m-
    print(ch , end ="-")

# Using operators in and not in

The membership operator "in"  returns true if value is present in the sequence and returns false if not present.

The membership operator "not in"  returns true if value is not present in the sequence and returns false if present.

```
>>> 5 in [1, 2, 3, 4, 5]

True

>>> 5 in [1, 2, 3, 4]

False
```

```
>>> 5  not in [1, 2, 3, 4, 5]

False

>>> 5 not in [1, 2, 3, 4]

True
```

# Example : Code to print first 10 natural numbers

```python
print("First 10 Natural Numbers")
for i in range(1,11):
    print(i)
```

Output:

First 10 Natural Numbers
1
2
3
.
.
.
10

# Question 1

Write a program to print all even numbers from 1 to 10 and find their sum too.

```python
s=0
print("Even Numbers are :")
for i in range(2,11,2):
    print(i)
    s=s+i
print("Sum of even numbers :",s)
```

**Output :**

Even numbers are:
2
4
6
8
10
Sum of even numbers :30

# Question 2

Program to print all multiples of 5 till n using for loop

```
n=int(input("Enter the number:"))
print("Multiples of 5 are :")
for i in range(1,n+1):
    if i%5==0:
        print(i)
```

Output:

Enter the number: 20
5
10
15
20

# Question 3

Program to find sum of series till n:  s=1+2+3+4+5+....................n

```
num1=int(input("Enter the number:"))
s=0
for i in range(1,n+1):
    s=s+i
print("Sum of series :",s)
```

**Output:**

Enter the number: 10
Sum of series :55

# Question 4

Program to find the sum of the series : $s = 1 + x + x^2 + x^3 + \ldots\ldots x^n$

```
n=int(input("Enter the value of n:"))
x=int(input("Enter the value of x:"))
s=1
for i in range(1,n+1):
    s=s+x**i
print("Sum of series :",s)
```

**Output:**

Enter the value of n: 2
Enter value of x: 5
Sum of series :31

# Programs

1. Print all the natural numbers from m to n using for loop.
2. Input a number n and then print all natural numbers from n to 1.(in reverse order) using for loop.
3. Input a number n and then print all the odd numbers from 1 to n along with their sum using for loop.
4. Input a number n and then print all its factors using for loop.
5. Program to find the sum of the series : $s = 1 + \frac{x^2}{2} + \frac{x^3}{3} + \frac{x^4}{4} + \ldots\ldots + \frac{x^n}{n}$
6. Program to find the sum of the series : $s = 1 - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \ldots\ldots + \frac{x^n}{n}$

# Question 1

Write a program to print all the natural numbers from m to n.

```
m=int(input("Enter the number m:"))
n=int(input("Enter the number n:"))
print("Natural numbers are:")
for i in range(m,n+1):
        print(i)
```

Output:

Enter the number m: 10
Enter the number n: 16
Natural numbers are:
10
11
12
13
14
15
16

# Question 2

Write a program to print all the natural numbers from n to 1.(Reverse Order)

```
n=int(input("Enter the number n:"))
print("Natural numbers are:")
for i in range(n,0,-1):
        print(i)
```

**Output:**

Enter the number m: 7
Natural numbers are:
7
6
5
4
3
2
1

# Question 3

Write a program to input a number m and then print all the odd numbers from 1 to m along with their sum.

```
m=int(input("Enter the number m:"))
print("Natural numbers are:")
sum=0
for i in range(m+1):
    print(m)
    sum=sum+m
print("Sum :",sum)
```

Output:

Enter the number m: 5
Natural numbers are:
1
3
5
Sum : 9

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# Question 4

Write a program to input a number m and then print the sum of all its factors.

```
m=int(input("Enter the number m:"))
print("Factors are:")
sum=0
for i in range(1,m+1):
    if m%i==0:
        print(i)
        sum+=i
print("The sum of the factors is :", sum)
```

Output:

Enter the number m: 15
Factors are:
1
3
5
15
The sum of the factors is 28

# Question 5

Program to find the sum of the series : $s = 1 + \dfrac{x^2}{2} + \dfrac{x^3}{3} + \dfrac{x^4}{4} + \ldots\ldots\ldots + \dfrac{x^n}{n}$

```python
n=int(input("Enter the number n:"))
x=int(input("Enter the number x:"))
s=1
for i in range(2,n+1):
    term=(x**i)/i
    s=s+term
print("Sum of series :",s)
```

**Output :**

Enter the number n:5
Enter the number x:2
Sum of series :
16.066666666666666

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# Question 6

Program to find the sum of the series : $s = 1 - \dfrac{x^2}{2} + \dfrac{x^3}{3} - \dfrac{x^4}{4} + \ldots\ldots\ldots + \dfrac{x^n}{n}$

```python
n=int(input("Enter the number n:"))
x=int(input("Enter the number x:"))
sum=1
sign=-1
for i in range(2,n+1):
    term=sign*(x**i)/i
    sum=sum+term
    sign=sign*-1
print("Sum of series :",sum)
```

**Output:**

Enter the number n: 4
Enter the number x: 2
Sum of series
:-2.3333333

# Unconditional exit from loop : break

The break statement prematurely ends execution of the current while or for loop. It brings the control to the statement immediately following the current control structure, skipping the optional "else" clause if the loop has one.
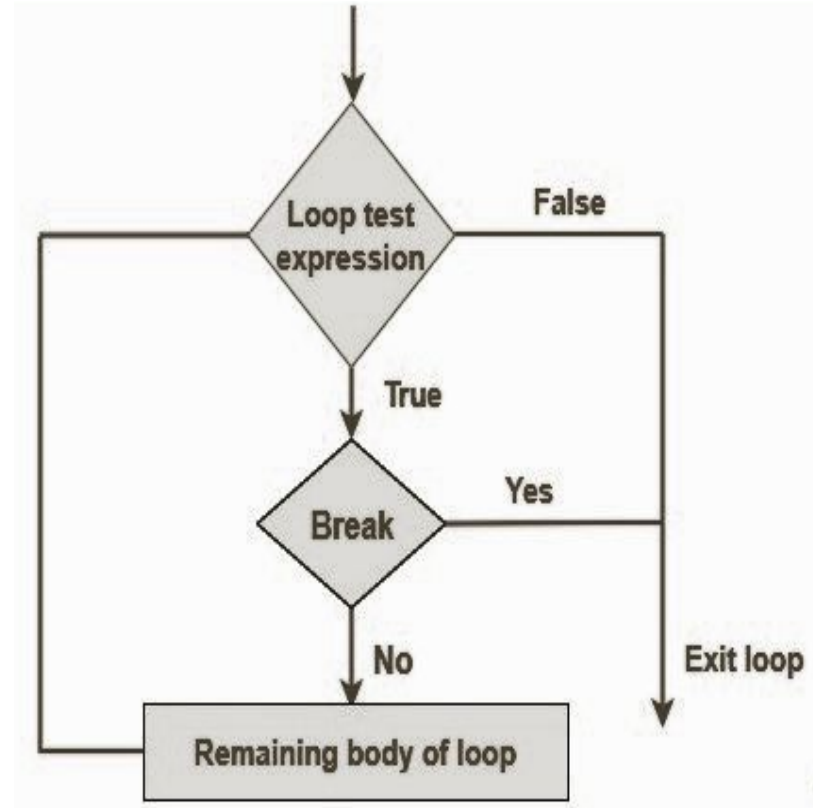
# Unconditional exit from loop : break

Example :

```
for a in range(1,30,5):
    print(a)
    if a>15:
        break
```
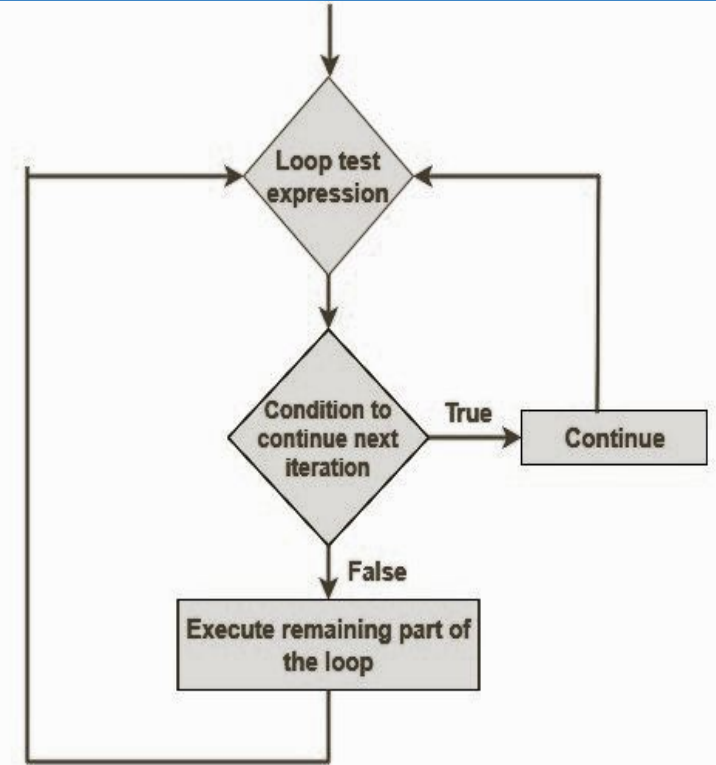
Output :  1

5

10

15

# Shift to the next iteration of the loop - continue statement

The continue statement is used to skip the execution of the current iteration of a loop, and continue with the next. continue does not terminate the loop, but continues with the next iteration of the loop.

break and continue are also called unconditional jump statements

# Shift to the next iteration of the loop - continue statement

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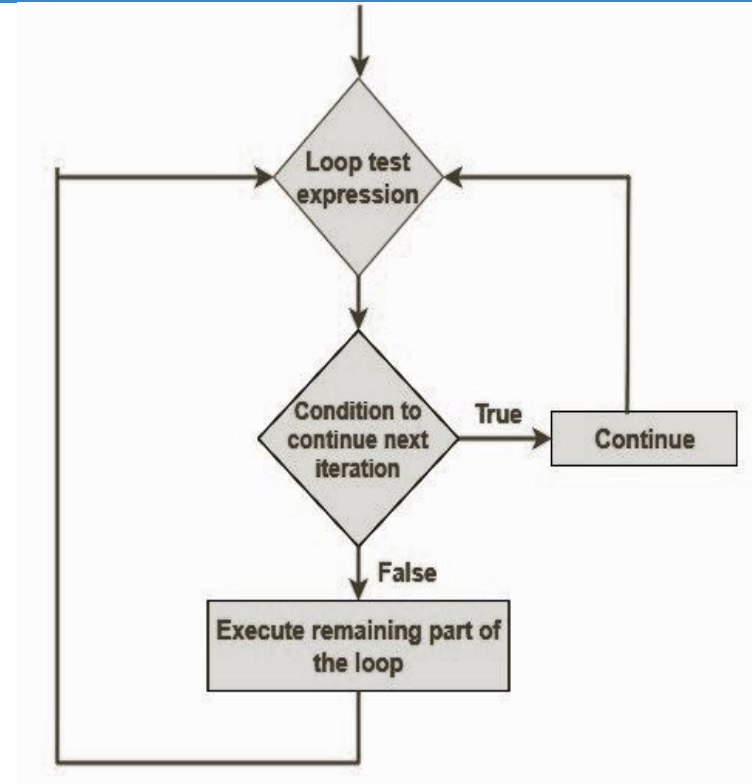
break and continue are also called unconditional jump statements

# Shift to the next iteration of the loop - continue statement

```
for i in range(lower,upper):
        Statement 1
        if <condition>:
                continue
                Statement 2
                Statement 3
        Statement 5
```

In the above loop, continue will cause skipping of statements 2 and 3 in the current situation and next iteration will start

**Example :**

```
for var in range(10,1,-1):
    if var == 5:
        continue
    print ('Current variable value :', var)
```

**Output :**
```
           Current variable value :9
           Current variable value :8
           Current variable value :7
           Current variable value :6
           Current variable value :4
           Current variable value :3
           Current variable value :2
           Current variable value :1
```

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# Find the output :

```
x=0
for j in range(2):
    for i in range(-2,-5,-1):
        x+=1
        print(x)
```

# Solution :

```
x=0
for j in range(2):
    for i in range(-2,-5,-1):
        x+=1
        print(x)
```

1
2
3
4
5
6

```
for num in range(10,14):
    for i in range(2,num):
        if num%i!=0:
            print(num,"-",i)
            break
```

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# Solution :

```
for num in range(10,14):
    for i in range(2,num):
        if num%i!=0:
            print(num,"-",i)
            break
```

```
10 - 3
11 - 2
12 - 5
13 - 2
```

# Nested for loop

Nested loop is a loop inside another loop.

Example :

```
n=int(input('Enter the no of lines:'))
for i in range(1,n+1):
    for j in range(1,i+1):
        print(j,end='')
    print( )
```

**Output :**

```
Enter the no of lines:5
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
```

# Nested for loop

Example :

```
n=int(input('Enter the no of lines:'))
for i in range(1,n+1):
    for j in range(1,i+1):
        print(chr(64+j),end='')
    print( )
```

**Output:**

Enter the no of lines:5
A
A B
A B C
A B C D
A B C D E

# Nested for loop

Example :

```
n=int(input('Enter the no of lines:'))
for i in range(1,n+1):
    for j in range(1,i+1):
        print('*',end='')
    print( )
```

**Output:**

```
Enter the number of rows: 5

*
* *
* * *
* * * *
* * * * *
```

# Question 5

Program to find the sum of the series : $s=1+\dfrac{x^2}{2!}+\dfrac{x^3}{3!}+\dfrac{x^4}{4!}+\ldots\ldots+\dfrac{x^n}{n!}$

```python
n=int(input("Enter the value of n : "))
x=int(input("Enter the value of x : "))
s=1
for i in range(2,n+1):
    fact=1
    for j in range(1, i+1):
        fact=fact*j
    term=x**i/fact
    s=s+term
print("Sum of series  : ",s)
```

**Output :**

```
Enter the value of n :4
Enter the value of x :2
Sum of series   : 5.0
```

# Question 6

Program to find the sum of the series : $s = 1 + \dfrac{x^2}{1!} + \dfrac{x^4}{2!} + \dfrac{x^6}{3!} + \ldots\ldots + \dfrac{x^{2n}}{n!}$

```
n=int(input("Enter the value of n : "))
x=int(input("Enter the value of x : "))
s=1
for i in range(2,2*n+1,2):
    fact=1
    for j in range(1, i//2+1):
        fact=fact*j
    term=x**i/fact
    s=s+term
print("Sum of series  : ",s)
```

**Output:**

```
Enter the value of n :2
Enter the value of x :3
Sum of series  : 50.5
```

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# Program to print patterns using for loop

a)
```
A
BB
CCC
DDDD
EEEEE
```

b)
```
A
BC
DEF
GHIJ
KLMNO
```

c)
```
        1
      1 2
    1 2 3
  1 2 3 4
```

d)
```
*
* *
* * *
* * * *
* * * * *
* * * *
* * *
* *
*
```

# Question 1

```
n=int(input("Enter the value of n : "))
for i in range(1,n+1):
    ch='A'
    for j in range(1,i+1):
        print(ch,end="")
        ch=chr(ch+1)
    print()
```

**Output :**

Enter the value of n : 5

A

BB

CCC

DDDD

EEEEE

# Question 2

```
n=int(input("Enter the value of n : "))
num=65
for i in range(1,n+1):
    for j in range(1,i+1):
        print(chr(num),end="")
        num=num+1
    print()
```

**Output :**

 Enter the value of n : 5

A

BC

DEF

GHIJ

KLMNO

# Question 3

```python
rows =int(input("Enter the value of n:"))
for i in range(1, rows+1):
    num = 1
    for j in range(rows, 0, -1):
        if j > i:
            print(" ", end=' ')
        else:
            print(num, end=' ')
            num += 1
    print("")
```

**Output:**
Enter the value of n: 5
```
        1
      1 2
    1 2 3
  1 2 3 4
1 2 3 4 5
```

# Question 4

```
rows =int(input("Enter the value of n:"))
for i in range(1, rows+1):
    num = 1
    for j in range(rows, 0, -1):
        if j > i:
            print(" ", end=' ')
        else:
            print(num, end='')
            num += 1
    print("")
```

**Output:**
Enter the value of n:5
```
        1
    1  2
   1 2  3
  1 2 3 4
 1 2 3 4 5
```

# Programs

Write programs based on for loops :

1. $1+x+x^2+x^3+x^4+\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots x^n$
2. $1-x+x^2-x^3+x^4+\ldots\ldots\ldots\ldots\ldots\ldots\ldots x^n$
3. $x+x^2+x^3+x^4+\ldots\ldots\ldots\ldots\ldots\ldots\ldots x^n$
4. $x+x^2-x^3+x^4-x^5\ldots\ldots\ldots\ldots\ldots\ldots\ldots x^n$
5. $1^2+2^2+3^2+4^2+\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots n^2$

# Program to input a number n and then print the factorial that number.

```python
m=int(input("Enter the value of m:"))
fact=1
for i in range(m,0,-1):
    fact=fact*i
print("Factorial :",fact)
```

**Output:**
Enter the value of m:5
 Factorial :120

# Program to input a number n and check whether number is prime or not.

```python
m=int(input("Enter the value of m:"))
flag=0
for j in range(2,m):
    if (m%j==0):
        flag=1
        break
if flag==0:
    print("Number is prime")
else:
    print("Number is not prime")
```

**Output:**
Enter the value of m:23
 Number is prime

# Question 1

Program to input a number n and then print the factorial of all numbers from 1 till n.

For example : if n =5 then program should display

1! = 1

2!=2

3!=6

4!=24

5!= 120

# Solution

```
n=int(input("Enter the value of n:"))

for i in range(1,n+1):
    fact=1
    for i in range(m,0,-1):
        fact=fact*i
    print(i,"!=",fact)
```

**Output :**

```
Enter the value of n:5
1 != 1
2 != 2
3 != 6
4 != 24
5 != 120
```

# Question 2

Program to input numbers m and n and then print the all prime numbers between m to n.

For example : if m=1 and n =10 then program should display

Prime numbers from 1 to 10 are: 2,3,5,7

# Solution

```python
m=int(input("Enter the value of m:"))
n=int(input("Enter the value of n:"))
print("Prime numbers are:")
for i in range(m,n+1):
    flag=0
    for j in range(2,i):
        if (i%j==0):
            flag=1
            break
    if flag==0:
        print(i)
```

**Output:**

```
Enter the value of n:10
Enter the value of n:20
Prime numbers are:
11
13
17
19
```

# Find the output :

```
Sum=0
for I in range(1,10,2):
    Sum+=I
    if I==9:
        print(I,end="=")
    else:
        print(I,end="+")
print(Sum)
```

# Find the output :

```
Sum=0
for I in range(1,10,2):
    Sum+=I
    if I==9:
        print(I,end="=")
    else:
        print(I,end="+")
print(Sum)
```

1+3+5+7+9=25

# Find the output :

```
m=1000
for I in range(5):

    print(I+1,m,sep="#",end=",")
     m-=100*(I+1)
```

# Find the output :

```
m=1000
for I in range(5):

    print(I+1,m,sep="#",end=",")
    m-=100*(I+1)
```

1#1000,2#900,3#700,4#400,5#0,

# Find the output :

```
for I in range(5):
    A=2*I
    B=8-2*I
    print(A,B,sep="*",end="=")
    print(A*B)
```

# Find the output :

```
for I in range(5):
    A=2*I
    B=8-2*I
    print(A,B,sep="*",end="=")
    print(A*B)
```

0*8=0
2*6=12
4*4=16
6*2=12
8*0=0

# Find the errors in the following code:

```
30=To

for k in range(0,To)

IF K%4==0:

    print(k*4)

Else:

    print(k+3)
```

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# Solution:

Wrong assignment

Wrong IF statement

Wrong Else statement

No colon at the end

```
30=To

for k in range(0,To)

IF K%4==0:

    print(k*4)

Else:

    print(k+3)
```

# Find the errors in the following code:

```python
val=int(input("Value")
Adder=0
for c in range(1,val,3):
    Adder+=c
    If c%2=0:
        Print(c*10)
    Else:
        print(c*)
print(Adder)
```

# Find the errors in the following code:

```
val=int(input("Value"))
Adder=0
for c in range(1,val,3)
        Adder+=c
        If c%2=0:
                Print(c*10)
        Else:
                print(c*)
        print(Adder)
```

Wrong input() function

No colon at the end of for statement

Wrong if statement and operator = used here

Wrong "Print()" function

Wrong else statement

One more operand required

# Happy Learning

## Thank you!!!