

Loops in Python

Welcome! This notebook will teach you about the loops in the Python Programming Language. By the end of this lab, you'll know how to use the loop statements in Python, including for loop, and while loop.

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Estimated time needed: 20 min


Loops

Range

Sometimes, you might want to repeat a given operation many times. Repeated executions like this are performed by **loops**. We will look at two types of loops, `for` loops and `while` loops.

Before we discuss loops lets discuss the `range` object. It is helpful to think of the range object as an ordered list. For now, let's look at the simplest case. If we would like to generate a sequence that contains three elements ordered from 0 to 2 we simply use the following command:

range(3)



[0,1,2]

What is `for` loop?

There are two types of loops—those that repeat an action a pre-defined number of times and those that perform until the program determines that it needs to stop (indefinite iteration). The `for` loop enables you to execute a code block multiple times. For example, you would use this if you would like to print out every element in a list.

range(stop)

range(start, stop)

range(start,stop,step)

```
In [ ]: list(range(4))

In [7]: for count in range(4):
        print(count,end = " ")

0 1 2 3

In [8]: for count in [0,1,2,3]:
        print(count,end = " ")

0 1 2 3

In [9]: for count in range(1,10):
        print(count,end = " ")

1 2 3 4 5 6 7 8 9

In [10]: for count in range(1,10,2):
        print(count,end = " ")

1 3 5 7 9

In [11]: for count in range(10,0,-1):
        print(count,end = " ")

10 9 8 7 6 5 4 3 2 1

In [ ]: #Program to find x^y (pow(x,y))
x = int(input("Enter the value of x: "))
y = int(input("Enter the value of y: "))
product = 1
for count in range(y):
    product = product * x
    print(product, end = " ")
print("\n")
print("product = ", product )

In [ ]: #program to find factorial of a number
number = int(input("Enter the number :"))
fact = 1
for count in range(number):
    fact = fact * (count + 1)
    print(fact)
print("Factorial of {0} is {1}".format(number,fact))

In [ ]: list(range(5))

In [12]: for ascii in range(128):
        print(ascii, chr(ascii), end = " ")

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 !
34 " # $ % & ' ( ) * + , - . / : ; < = > ? [ \ ] ^ _ ` { | } ~ 127 
74 J 75 K 76 L 77 M 78 N 79 O 80 P 81 Q 82 R 83 S 84 T 85 U 86 V 87 W 88 X 89 Y 90 Z 91 [ 92 \ 93 ]
94 ^ 95 _ 96 ` 97 a 98 b 99 c 100 d 101 e 102 f 103 g 104 h 105 i 106 j 107 k 108 l 109 m 110 n 111
o 112 p 113 q 114 r 115 s 116 t 117 u 118 v 119 w 120 x 121 y 122 z 123 { 124 | 125 } 126 ~ 127 

In [13]: testString = "Computer"
for ch in testString:
    print(ch, ord(ch))

C 67
o 111
m 109
p 112
u 117
t 116
e 101
r 114

In [14]: #Program to find the sum of the sine series x - x^3/3! + x^5/5! - ....
import math
n = int(input('Enter the value of n :'))
x = float(input('Enter the degree'))
x = math.radians(x)
s = x
t = x
i = 1
for i in range(1,n):
    t = ((-t * x * x)/(2*i*(2 * i + 1)))
    s = s + t
print ('sum = %0.2f' % s)

Enter the value of n :90
Enter the degree90
sum = 1.00

In [ ]: #Program to find the sum of the cosine series 1 - x^2/2! + x^4/4! - ...
import math
n = int(input('Enter the value of n :'))
x = float(input('Enter the degree :'))
d = x
x = math.radians(x)
s = 1
t = 1
i = 1
for i in range(1,n):
    t = ((-t * x * x)/(2*i*(2 * i - 1)))
    s = s + t
print ('cos ('+str(d)+') = %0.2f' % s)

In [15]: for count in range(10,0,-1):
        print(count,end = " ")

10 9 8 7 6 5 4 3 2 1

In [16]: for count in range(6,1,-1):
        print(count,end = " ")

6 5 4 3 2

In [17]: for count in range(1,0,-1):
        print(count,end = " ")

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Nested for loop

In [18]: #Pyramid
n = 10
for i in range(1,n+1):
    for j in range(1, i+1):
        print(j,end=" ")
    print()

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

In [19]: #pyramid-2
n = 10
for i in range(1,n+1):
    for j in range(1, i+1):
        print(chr(64+j),end=" ")
    print()

A
A B
A B C
A B C D
A B C D E
A B C D E F
A B C D E F G
A B C D E F G H
A B C D E F G H I
A B C D E F G H I J

In [20]: #pyramid-3
n = 10
for i in range(1,n+1):
    for j in range(1, n-i+1):
        print(" ",end = "")
    for k in range(1,i+1):
        print(k,end = "")
    print()

1
12
123
1234
12345
123456
1234567
12345678
123456789
12345678910

In [21]: #pyramid-4
n = 10
for i in range(1,n+1):
    for j in range(1, n-i+1):
        print(" ",end = "")
    for k in range(1,i+1):
        print(k,end = "")
    for m in range(i-1,0,-1):
        print(m,end = "")
    print()

1
121
12321
1234321
123454321
12345654321
1234567654321
123456787654321
1234567897654321
12345678910987654321

In [ ]: #Multiplication table
for i in range(1,11):
    for j in range(1,11):
        print(i , 'X' ,j, ' = ', i * j)
    print()

formatted output

In [ ]: print("%4s%18s%10s%16s" % ("Year","Starting balance",\
"Interest","Ending balance"))

In [ ]: year = 2022
startBalance = 10000.259
interest = 7.565
endBalance = 17000.7896
print("%-8d%-18.2f%-10.2f%-16.2f" % \
(year,startBalance,interest,endBalance))

In [ ]: amount = 24.326
print("Salary = %0.2f" %amount)
print("Salary = %0.1f" %amount)
print("Salary = %-7.1f" %amount)

While Loop

while : While loop is entry controlled loop since its condition is checked first

In [ ]: for count in range(100):
        print(count, end = " ")

In [ ]: count = 0
while (count < 100):
    print(count,end= " ")
    count = count + 1

In [ ]: """
Computes the sum and average of a series of input numbers.
"""

sum = 0
count = 0
while True:
    number = input("Enter a number or press Enter to quit: ")
    if number == "":
        break
    sum += float(number)
    count += 1

print("The sum is", sum)
if count > 0:
    print("The average is", sum / count)

In [ ]: #Program to find GCD of two numbers
print('Enter two numbers ')
a = int(input('Enter the value of a :'))
b = int(input('Enter the value of b: '))
while (b > 0):
    r = a % b
    a = b
    b = r
print('GCD = ', a)

In [ ]: #Generation of first n Fibanaaci numbers
n = int(input('Enter the number :'))
f1 = 0
f2 = 1
print (f1,f2, end=" ")
i = 1
while (i <= n - 2):
    f3 = f1 + f2
    print (f3,end = ' ')
    f1 = f2
    f2 = f3
    i = i + 1

In [ ]: #To check the number is prime or not
n = int(input('Enter the number :'))
prime = True
i = 2
while (i <= n/2):
    if (n % i == 0):
        prime = False
        break
    i = i + 1
if (prime):
    print("The number {} is prime".format(n))
else:
    print("The number {} is not prime".format(n))

In [ ]: #Generation of prime numbers within a certain range
print ('Enter the range :')
a = int(input('Enter the lower range :'))
b = int(input('Enter the upper range :'))
for i in range(a,b+1):
    prime = True
    j = 2
    while (j <= i/2):
        if (i % j == 0):
            prime = False
            break
        j = j + 1
    if (prime):
        print (i, end = ' ')

In [ ]: #Pythagorean Triplets
m = 2
limit = 100
while (m <= 10):
    a = 2*m
    b = m*m - 1
    c = m*m + 1
    if c > limit :
        break
    print(a,b,c)
    m = m + 1

In [ ]: """
The factorial of an integer N is the product of all of the integers between 1
and N, inclusive. Write a while loop that computes the factorial of a
given integer N.
"""
#Write ur code here

In [ ]: """
The log 2 of a given number N is given by M in the equation N = 2^M .
The value of M is approximately equal to the number of times N can be
evenly divided by 2 until it becomes 0. Write a loop that computes this
approximation of the log 2 of a given number N.
"""
#Write your code here

In [ ]: 
```