Loops in Python - For, While and Nested Loops

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Loops in Python are used to repeat actions efficiently. The main types are For loops (counting through items) and While loops (based on conditions).

For Loop

For loops is used to iterate over a sequence such as a list, tuple, string or range. It allow to execute a block of code repeatedly, once for each item in the sequence.

```
n = 4
for i in range(0, n):
    print(i)
```

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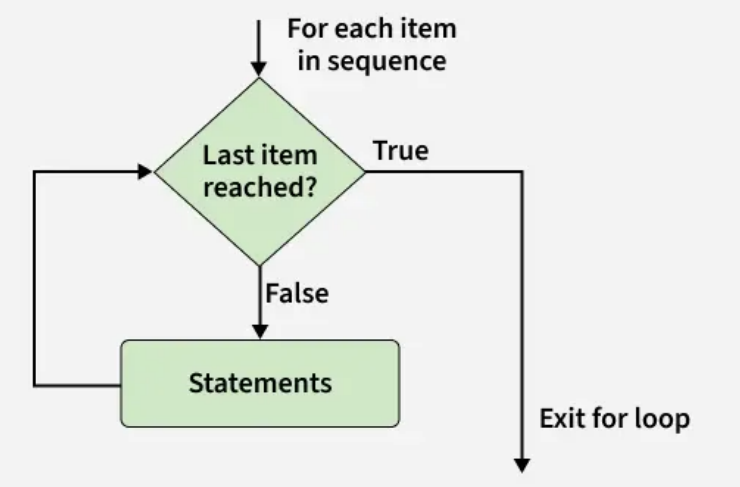
Output

```
0
1
2
3
```

Explanation: This code prints the numbers from 0 to 3 (inclusive) using a for loop that iterates over a range from 0 to n-1 (where n = 4).



For Loop

Example: Iterating Over List, Tuple, String and Dictionary Using for Loops in Python

```
li = ["geeks", "for", "geeks"]
for x in li:
    print(x)

tup = ("geeks", "for", "geeks")
for x in tup:
    print(x)

s = "abc"
for x in s:
    print(x)

d = dict({'x':123, 'y':354})
for x in d:
    print("%s  %d" % (x, d[x]))

set1 = {10, 30, 20}
for x in set1:
    print(x),
```

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Output

```
geeks
for
geeks
geeks
for
geeks
a
b
c
x  123
y  354
10
20
30
```

Iterating by Index of Sequences

We can also use the index of elements in the sequence to iterate. The key idea is to first calculate the length of the list and then iterate over the sequence within the range of this length.

```
li = ["geeks", "for", "geeks"]
for index in range(len(li)):
    print(li[index])
```

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Output

```
geeks
for
geeks
```

Explanation: This code iterates through each element of the list using its index and prints each element one by one. The **range(len(list))** generates indices from 0 to the length of the list minus 1.

While Loop

In Python, a while loop is used to execute a block of statements repeatedly until a given condition is satisfied. When the condition becomes false, the line immediately after the loop in the program is executed.

In below code, loop runs as long as the condition cnt < 3 is true. It increments the counter by 1 on each iteration and prints "Hello Geek" three times.

```
cnt = 0
while (cnt < 3):
    cnt = cnt + 1
    print("Hello Geek")
```

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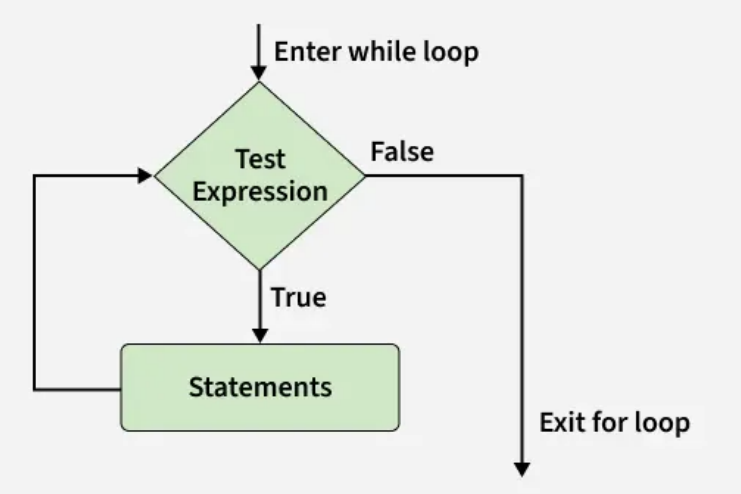
Output

```
Hello Geek
Hello Geek
Hello Geek
```



While Loop

Infinite While Loop

If we want a block of code to execute infinite number of times then we can use the while loop in Python to do so.

Code given below uses a 'while' loop with the condition "**True**", which means that the loop will run infinitely until we break out of it using "**break**" keyword or some other logic.

```
while (True):
    print("Hello Geek")
```

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> ***Note:*** *It is suggested not to use this type of loop as it is a never-ending infinite loop where the condition is always true and we have to forcefully terminate the compiler.*

Nested Loops

Python programming language allows to use one loop inside another loop which is called nested loop. Following example illustrates the concept.

```
from __future__ import print_function
for i in range(1, 5):
```

```
    for j in range(i):
        print(i, end=' ')
    print()
```

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Output

```
1
2 2
3 3 3
4 4 4 4
```

Explanation: In the above code we use nested loops to print the value of i multiple times in each row, where the number of times it prints i increases with each iteration of the outer loop. The print() function prints the value of i and moves to the next line after each row.

A final note on loop nesting is that we can put any type of loop inside of any other type of loops in Python. For example, a for loop can be inside a while loop or vice versa.

Loop Control Statements

Loop control statements change execution from their normal sequence. When execution leaves a scope, all automatic objects that were created in that scope are destroyed. Python supports the following control statements.

Continue Statement

The continue statement in Python returns the control to the beginning of the loop.

```
for letter in 'geeksforgeeks':
    if letter == 'e' or letter == 's':
        continue
    print('Current Letter :', letter)
```

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Output

```
Current Letter : g
Current Letter : k
Current Letter : f
Current Letter : o
Current Letter : r
Current Letter : g
Current Letter : k
```

Explanation: The continue statement is used to skip the current iteration of a loop and move to the next iteration. It is useful when we want to bypass certain conditions without terminating the loop.

Break Statement

The break statement in Python brings control out of the loop.

```
for letter in 'geeksforgeeks':
    if letter == 'e' or letter == 's':
        break

print('Current Letter :', letter)
```

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Output

```
Current Letter : e
```

Explanation: break statement is used to exit the loop prematurely when a specified condition is met. In this example, the loop breaks when the letter is either 'e' or 's', stopping further iteration.

Pass Statement

We use pass statement in Python to write empty loops. Pass is also used for empty control statements, functions and classes.

```
for letter in 'geeksforgeeks':
    pass
print('Last Letter :', letter)
```

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Output

```
Last Letter : s
```

Explanation: In this example, the loop iterates over each letter in 'geeksforgeeks' but doesn't perform any operation, and after the loop finishes, the last letter ('s') is printed.

Related Links:

- Python Loops Quiz
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- Use for Loop That Loops Over a Sequence
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12 Questions

What is the value of x? Python x = 0 while x < 100: x += 2 print(x)

(A) 101

(B) 99

(C) 98

(D) 100