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For Loop in Python

Loops in Python

Loop: A loop is a control structure used to repeat a block of code multiple times until a certain condition is met.

Why Use Loops?

- To avoid writing repetitive code
- To process data in sequences (like lists, strings, etc.)
- To perform tasks repeatedly based on conditions

For Loop in Python

A for loop in Python is used to iterate over a sequence like a list, tuple, string, or range. It's commonly used when you want to repeat a block of code a specific number of times or loop through items in a collection.

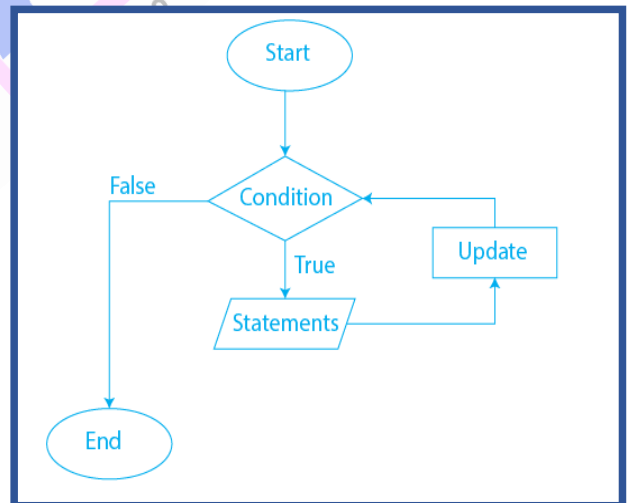
Why do we use For Loop?

- To iterate over a sequence (list, tuple, string, etc.)
- To repeat a block of code multiple times
- To process each item in a collection
- To automate repetitive tasks
- To write cleaner and more efficient code
- To avoid manual repetition
- To work with functions like range() and enumerate()
- To loop through dictionaries using .items()
- To handle data processing tasks (e.g., reading files)

Syntax of For Loop

for variable in iterable:
 # code block to execute

- variable → takes one value at a time from the sequence.
- sequence → can be a list, tuple, string, or range.
- The code inside the loop runs once for each item.



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Rules of For Loop

Rule No.	Rule	Description
1	“for” keyword	Must start the loop.
2	A variable (loop variable)	Represents each item in the sequence.
3	“in” keyword	Used to specify the iterable to loop through.
4	An iterable (e.g., list, tuple, range, string)	The object that the loop iterates over.
5	Colon (:) at the end of the for line	Required to start the indented code block.
6	Indentation	The body of the loop must be indented (usually 4 spaces).
7	Loop body executes once for each item in the iterable	The indented code runs for every item in the sequence.
8	Can use break, continue, and else	To control loop behavior.

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Methods of For Loop

No.	Technique / Method	Description	Example
1	range()	Used to generate a sequence of numbers	for i in range(5):
2	Looping through list/tuple/set	Iterate over items in a collection	for item in [1, 2, 3]:
3	Looping through a string	Iterate over characters in a string	for ch in "Python":
4	enumerate()	Get index and value from iterable	for i, val in enumerate(list):
5	break	Exit the loop early	if i == 3: break
6	continue	Skip current iteration and move to the next	if i == 3: continue
7	else with for loop	Executes when the loop finishes normally (no break)	for i in range(3): ... else: ...
8	Looping through dictionary	Use .items(), .keys(), or .values()	for key, val in dict.items():
9	Nested loops	Loop inside another loop	for i in range(3): for j in range(2):
10	List comprehension (advanced)	Shorter syntax using for inside brackets	[x**2 for x in range(5)]

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For Loop in Python

Solved Example 1: Print Numbers from 1 to 5

```
for i in range(1, 6):  
    print(i)
```

Output:

1
2
3
4
5

Explanation:

- range(1,6) generates numbers from 1 up to (but not including) 6.
- The loop runs 5 times, printing each number.

Solved Example 2: Print Each Letter in a Word

```
for letter in "PYTHON":  
    print(letter)
```

Output:

P
Y
T
H
O
N

Explanation:

The loop runs once for each character in the string "PYTHON".

Solved Example 3: Loop Through a List

```
fruits = ["apple", "banana", "cherry"]
```

```
for fruit in fruits:  
    print("I like", fruit)
```

Output:

I like apple
I like banana
I like cherry

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For Loop in Python

Explanation:

Each time, the variable fruit takes one element from the list.

Solved Example 4: Using range() in For Loop

```
for num in range(5):  
    print("Number:", num)
```

Output:

Number: 0
Number: 1
Number: 2
Number: 3
Number: 4

Explanation:

range(5) starts from 0 and goes up to 4 by default.

Solved Example 5: Sum of First 10 Numbers

```
sum = 0  
for i in range(1, 11):  
    sum = sum + i  
  
print("The sum is:", sum)
```

Output:

The sum is: 55

Explanation:

The loop keeps adding each number from 1 to 10 to the variable sum.

Solved Example 6: Looping with if Inside

```
for i in range(1, 11):  
    if i % 2 == 0:  
        print(i, "is even")  
    else:  
        print(i, "is odd")
```

Output:

1 is odd
2 is even
3 is odd
4 is even

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For Loop in Python

Explanation:

You can combine loops with conditions to check or perform specific actions.

Solved Example 7: Nested for Loop

```
for i in range(1, 4):  
    for j in range(1, 4):  
        print(i, "*", j, "=", i*j)
```

Output:

```
1 * 1 = 1  
1 * 2 = 2  
1 * 3 = 3  
2 * 1 = 2  
2 * 2 = 4  
2 * 3 = 6  
3 * 1 = 3  
3 * 2 = 6  
3 * 3 = 9
```

Explanation:

Each loop runs inside another – used for tables, grids, or patterns.

Assignment

1. Write a Python program to print all numbers from 10 to 1 in reverse order.
2. Print all multiples of 3 between 1 and 30.
3. Find the factorial of a number using a for loop.
4. Print the sum of even numbers between 1 and 50.

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For Loop in Python

Solved Example 1: Generate a Sequence of Numbers

```
for i in range(5):
    print(i)
```

0
1
2
3
4

=== Code Execution Successful ===

Looping through List/Tuple/Set

```
for item in [1, 2, 3]:
    print(item)
```

1
2
3

=== Code Execution Successful ===

Looping through a String

```
for ch in "Python":
    print(ch)
```

P
y
t
h
o
n

=== Code Execution Successful ===

enumerate() - Get Index and Value

```
fruits = ['apple', 'banana', 'cherry']
for i, val in enumerate(fruits):
    print(i, val)
```

0 apple
1 banana
2 cherry

=== Code Execution Successful ===

break - Exit the loop early

```
for i in range(5):
    if i == 3:
        break
    print(i)
```

Output: 0 1 2

=== Code Execution Successful ===

Continue: Skip current iteration and move to the next.

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For Loop in Python

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```
for i in range(5):
    if i == 3:
        continue
    print(i)
```

0
1
2
4

=== Code Execution Successful ===

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Else with for loop: Executes when the loop finishes normally (no break)

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```
for i in range(3):
    print(i)
else:
    print("Loop finished without break.")
```

0
1
2
Loop finished without break.

=== Code Execution Successful ===

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Looping through dictionary using .items(), .keys(), .values()

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```
my_dict = {'a': 1, 'b': 2, 'c': 3}

# Using .items()
for key, value in my_dict.items():
    print(f"{key}: {value}")

# Using .keys()
for key in my_dict.keys():
    print(f"Key: {key}")

# Using .values()
for value in my_dict.values():
    print(f"Value: {value}")
```

a: 1
b: 2
c: 3
Key: a
Key: b
Key: c
Value: 1
Value: 2
Value: 3

=== Code Execution Successful ===

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Nested for loops: Loop inside another loop

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```
for i in range(3):
    for j in range(2):
        print(f"i={i}, j={j}")
```

i=0, j=0
i=0, j=1
i=1, j=0
i=1, j=1
i=2, j=0
i=2, j=1

Code Execution Successful

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For Loop in Python

List comprehension (advanced): Shorter syntax using for inside brackets

```
squares = [x**2 for x in range(5)]  
print(squares)
```

```
[0, 1, 4, 9, 16]
```

```
=== Code Execution Successful ===
```



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