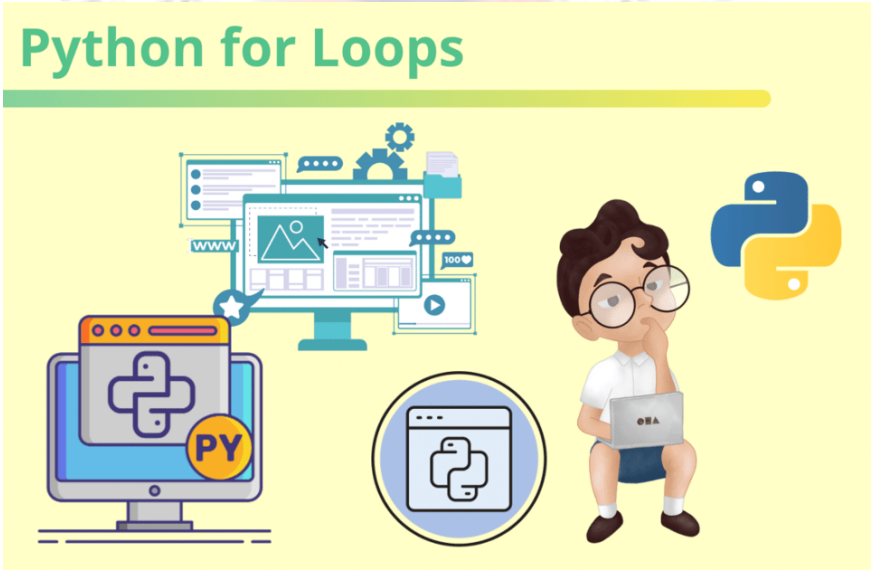
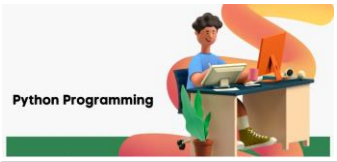
LECTURE TEN

Loops

Loops are used in programming to repeat a specific block of code. Loop allows a statement or a sequence of statements to be repeatedly executed based on some loop condition. You must ensure that the condition for the termination of the looping must be satisfied after some finite number of iterations, otherwise it ends up as an infinite loop.

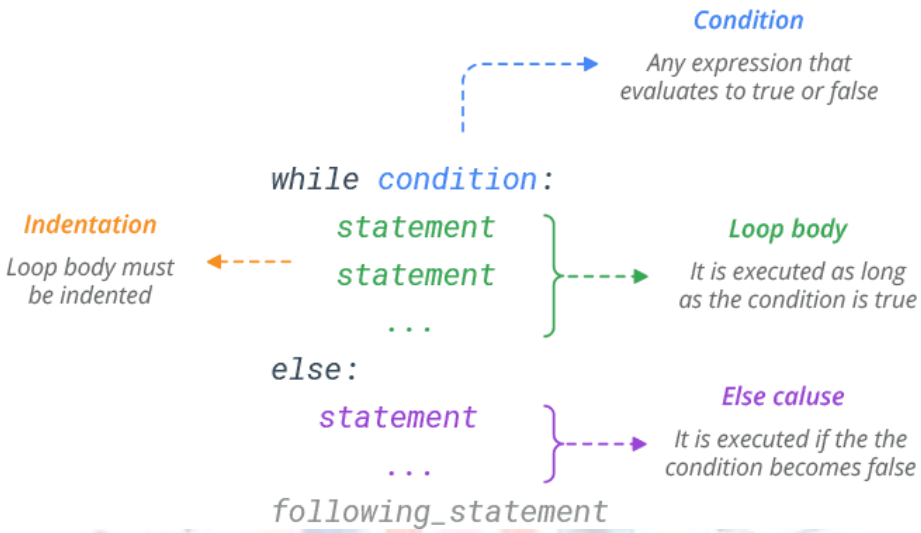




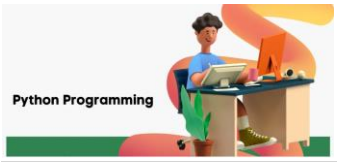
while loop in Python

The while loop in Python is used to iterate over a block of code as long as the test expression (condition) is true. We generally use this loop when we don't know the number of times to iterate beforehand.

Syntax of while Loop in Python



- The reserved word **while** begins the **while** statement.
- The condition determines whether the body will be (or will continue to be) executed. A colon (**:**) must follow the condition.
- block is a block of one or more statements to be executed as long as the condition is true. As a block, In Python, the body of the while loop (block) is determined through **indentation.**
- The **else** clause will still be executed if the condition is false at the start.



for loop in Python

The for loop in Python is used in two methods:

1. to iterate over a block of code using a **range function**

Syntax of for Loop

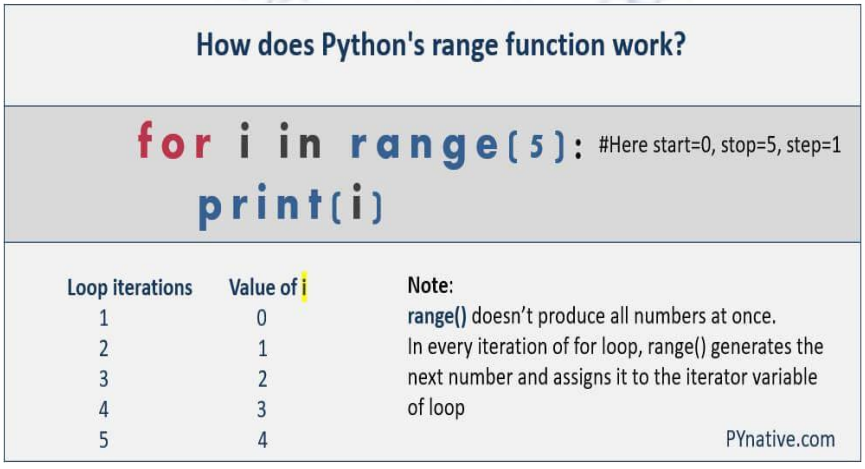
for **val** in range (**begin** , **end** , **step**):

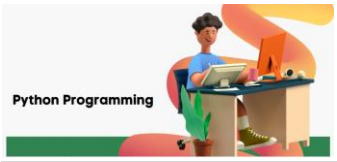
Body of for

- **val** is the variable that takes the value of the item inside the range function on each iteration.
- **begin** is the first value in the range; if **omitted**, the default value is **0**
- **end** is one past the last value in the range; the end value is **always required** and may **not** be **omitted**
- **step** is the amount to increment or decrement; if the step parameter is omitted, it **defaults to 1** (counts up by ones)

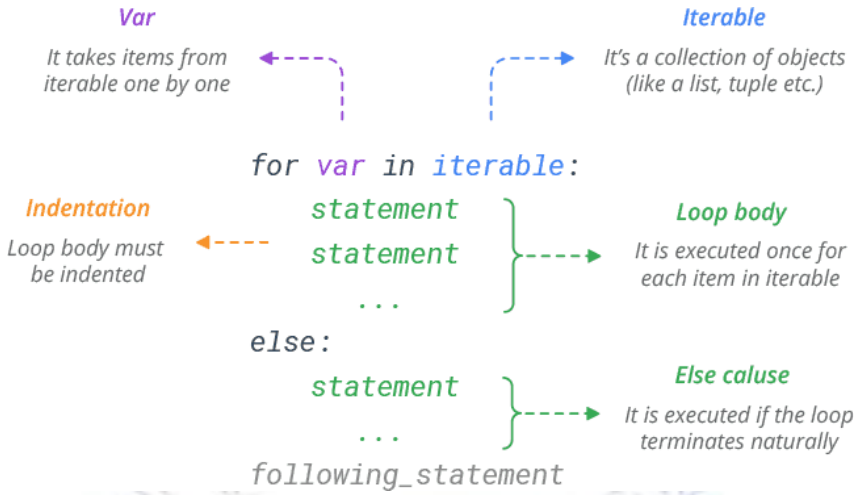
	Syntax	Output
Single Argument	Ex: `range(10)`	`0,1,2,3,4,5,6,7,8,9`
Double Argument	Ex: `range(1, 10)`	`1,2,3,4,5,6,7,8,9`
Triple Argument	Ex: `range(1, 10, 2)`	`1,3,5,7,9`

- `range(10, 0, -1)` → 10,9,8,7,6,5,4,3,2,1
- `range(10, 0, -2)` → 10,8,6,4,2
- `range(2, 11, 2)` → 2,4,6,8,10





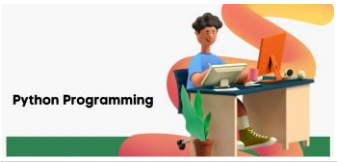
2. to iterate over a sequence (list, tuple, string, etc.). Iterating over a sequence is called traversal.



Here, **val** is the variable that takes the value of the item inside the sequence on each iteration. It will be described later in **Python Collections**.

Example (1): Write Python Program to print numbers between 0 and 99.	
while	for
i = 0 while i < 100: print(i) i = i+1	for i in range (100): print(i)

In the above a python program, in while loop, the test expression will be True as long as our counter variable i is less than or equal to 100 . We need to increase the value of the counter variable in the body of the loop **i=i+1**. Failing to do so will result in an infinite loop (never-ending loop). Finally, the result is displayed. In for loop, The expression range (100) creates a range object that allows the for loop to assign to the variable **i** the values 0, 1,2, . . . , 99.



Example (2): Write Python Program to print odd numbers between 0 and 99.

while	for

i = 1
while i <= 99:
  print(i)
  i = i+2
	for i in range (1,100,2):
	  print(i)

Example (3): Write Python Program to print even numbers between 0 and 99.

while	for

i = 0
while i <= 99:
  print(i)
  i = i+2
	for i in range (0,100,2):
	  print(i)

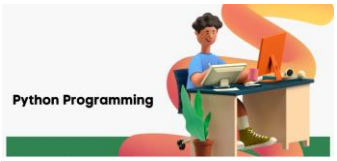
Example (4): Write Python Program to find the following series:
s=1+2+3+4+……+ n

while	for

n = int(input("Enter n: "))
s= 0
i = 1
while i <= n:
  s = s + i
  i = i+1
print("The sum is", s)
	n = int(input("Enter n: "))
	s= 0
	for i in range (1, n+1):
	  s = s + i
	print("The sum is", s)

When you run either of them (while ; for) the output will be:

```
Enter n: 10
The sum is 55
```



Example (5): Write Python Program to read n numbers and print the largest number of them.

while	for

n = int(input("Enter n: "))
x = int(input("Enter x: "))
m= x
i = 1
while i < n:
  x = int(input("Enter x: "))
  if x > m:
  m=x
  i = i+1
print("The max is", m)
	n = int(input("Enter n: "))
	x = int(input("Enter x: "))
	m= x
	for i in range (1, n):
	  x = int(input("Enter x: "))
	  if x > m:
	  m=x
	print("The max is", m)

Example (6): Write Python Program to find factorial X!
Hint: x! = x * x-1 * x-2 * x-3 * ... * 2 * 1.

while	for

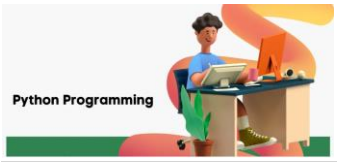
x = int(input("Enter x: "))
f= 1
i = x
while i > 1:
  f = f * i
  i = i - 1
print("The factorial is", f)
	x = int(input("Enter x: "))
	f= 1
	for i in range (x,1,-1):
	  f = f * i
	print("The factorial is", f)

Example (7): Write Python Program to find the following series:

$S = ½ + ¼ + \ldots + 1/n$

while	for

n = int(input("Enter n: "))
s= 0
i = 2
while i <= n:
  s = s + (1/i)
  i = i+2
print("The sum is", s)
	n = int(input("Enter n: "))
	s= 0
	for i in range (2, n+1,2):
	  s = s + (1/i)
	print("The sum is", s)



WORK SHEET (5)

Homework Write Python Program to print numbers from 5000 to 1 and then prints total sum of them.

Homework Write Python Program to print numbers between 10 and 10000 and then prints total multiplication of them.

Homework Write Python Program to print the square of all numbers from 1 to 10.

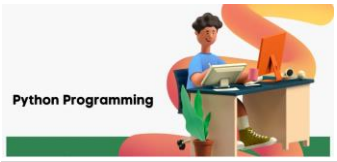
Homework Write Python Program to calculate the average from 25 exam scores s.

Homework Write Python Program to to read number. And check if it's prime or not prime.

Homework Write an algorithm to find X^Y i.e. power(X, Y).

Homework Write Python Program to read n of number and print how many even and odd number in n.

Homework Write Python Program which generates first 50 items of the Fibonacci series: 1, 1, 2, 3, 5, 8, 13, 21…?



Homework Write Python Program for finding the sum of the numbers 3, 9, 27, 81, 243 …, n

Homework Find the output of range function for following:

- `range(-5, 5)`
- `range(1, 2)`
- `range(1, 1)`
- `range(1, -1)`
- `range(1, -1, -1)`
- `range(0)`