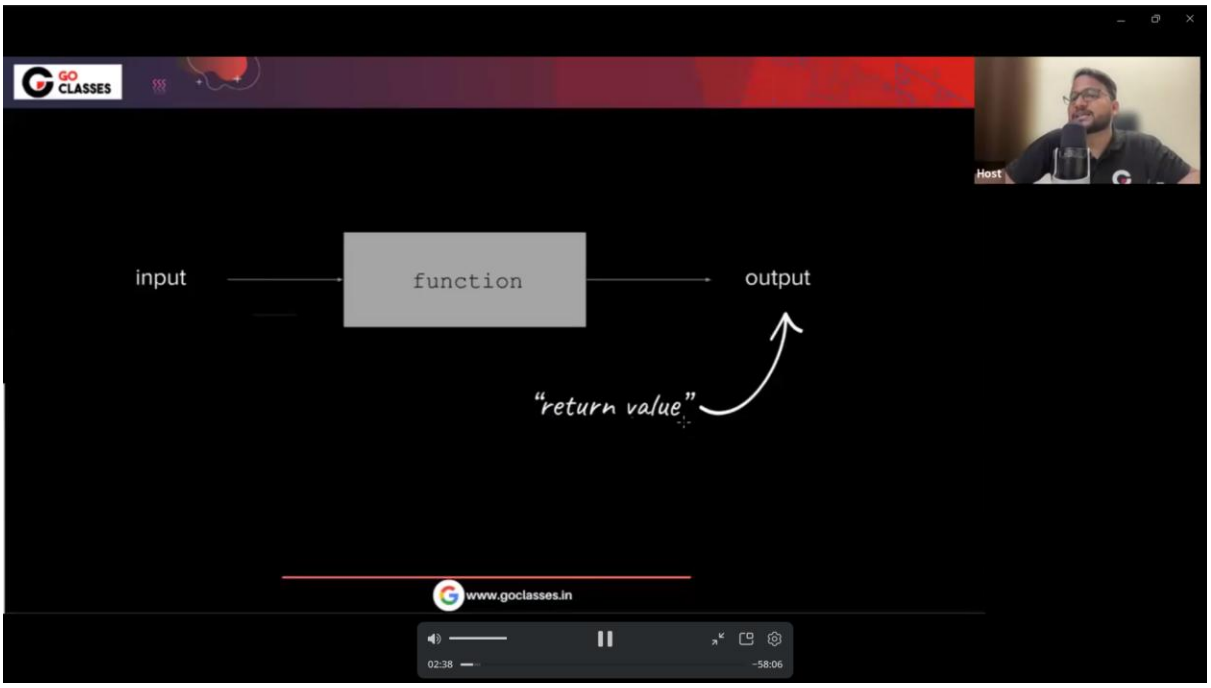
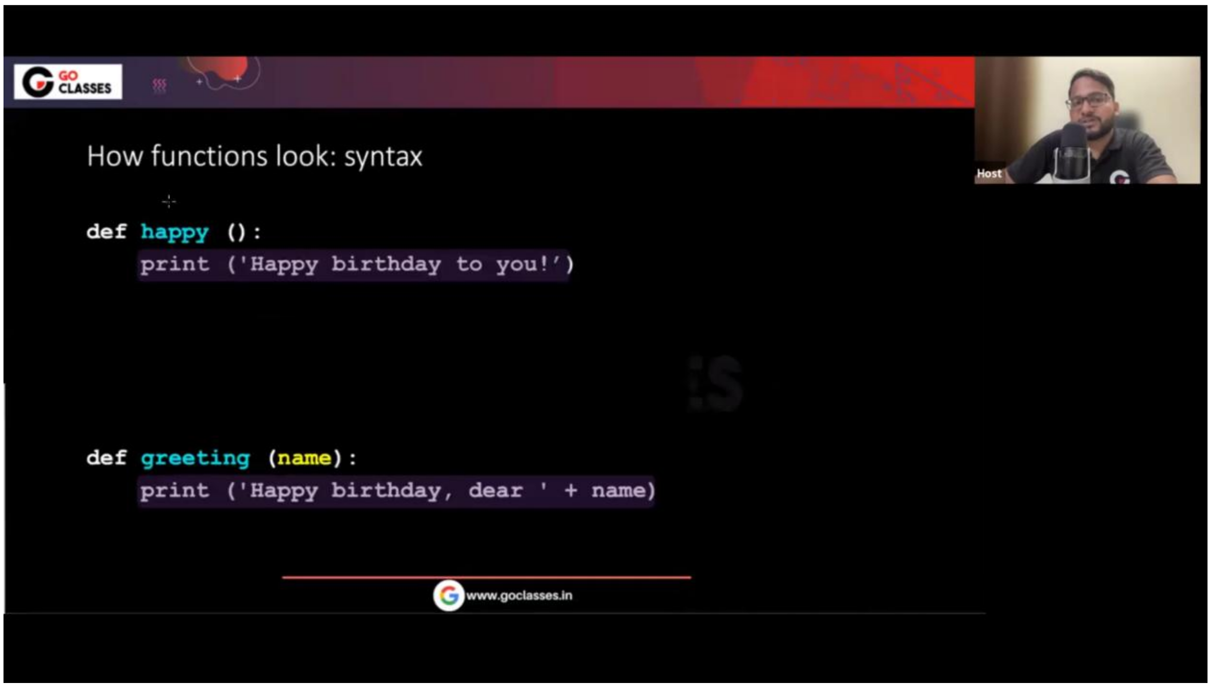
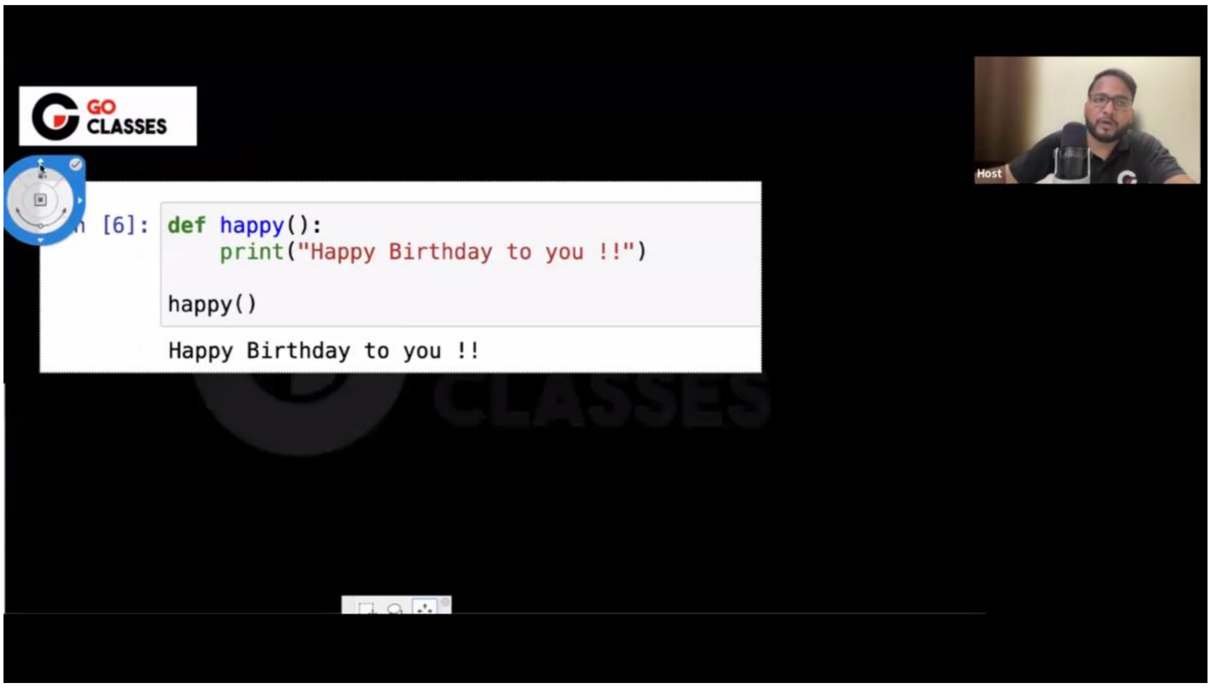




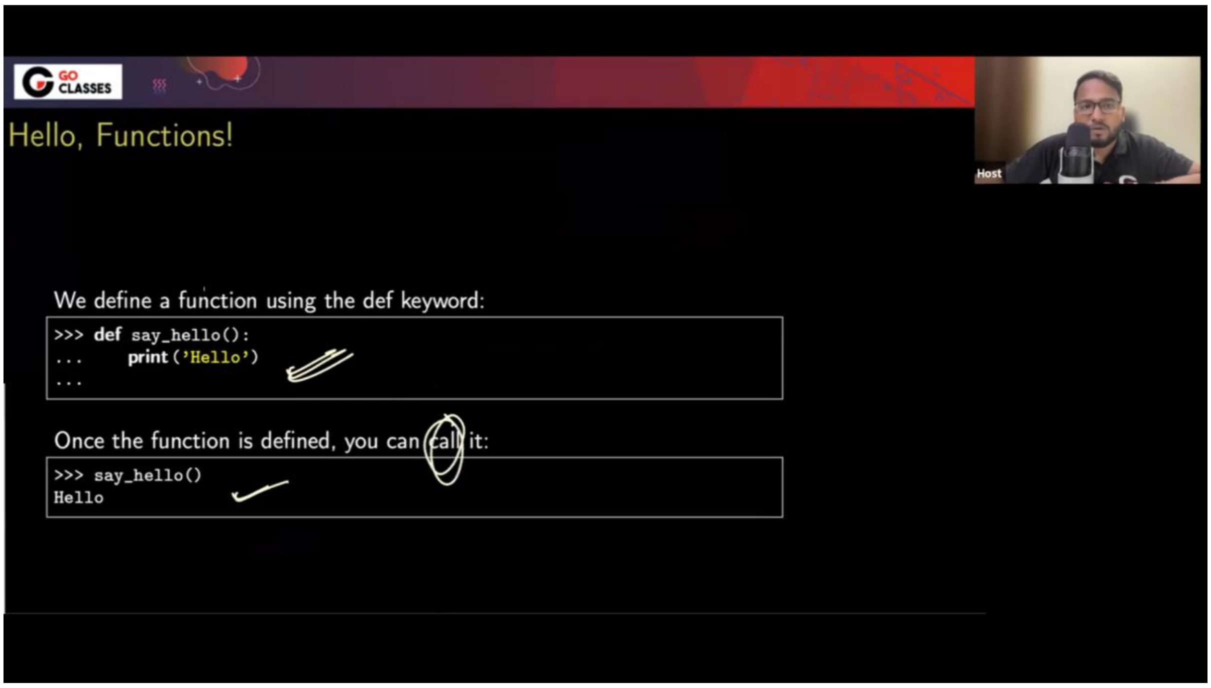
How functions look: syntax

```
def happy ():
    print ('Happy birthday to you!')
```

```
def greeting (name):
    print ('Happy birthday, dear ' + name)
```



```
In [6]: def happy():
            print("Happy Birthday to you !!")

        happy()

        Happy Birthday to you !!
```



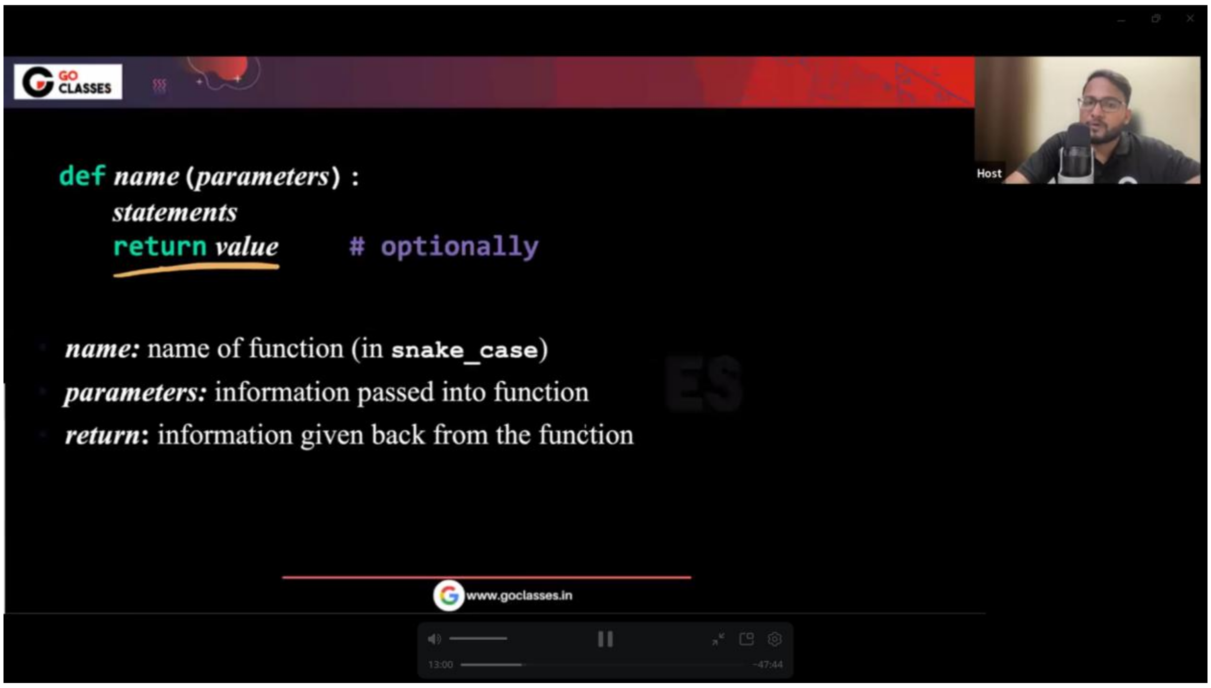
Hello, Functions!

We define a function using the def keyword:

```
>>> def say_hello():
...     print('Hello')
...
```

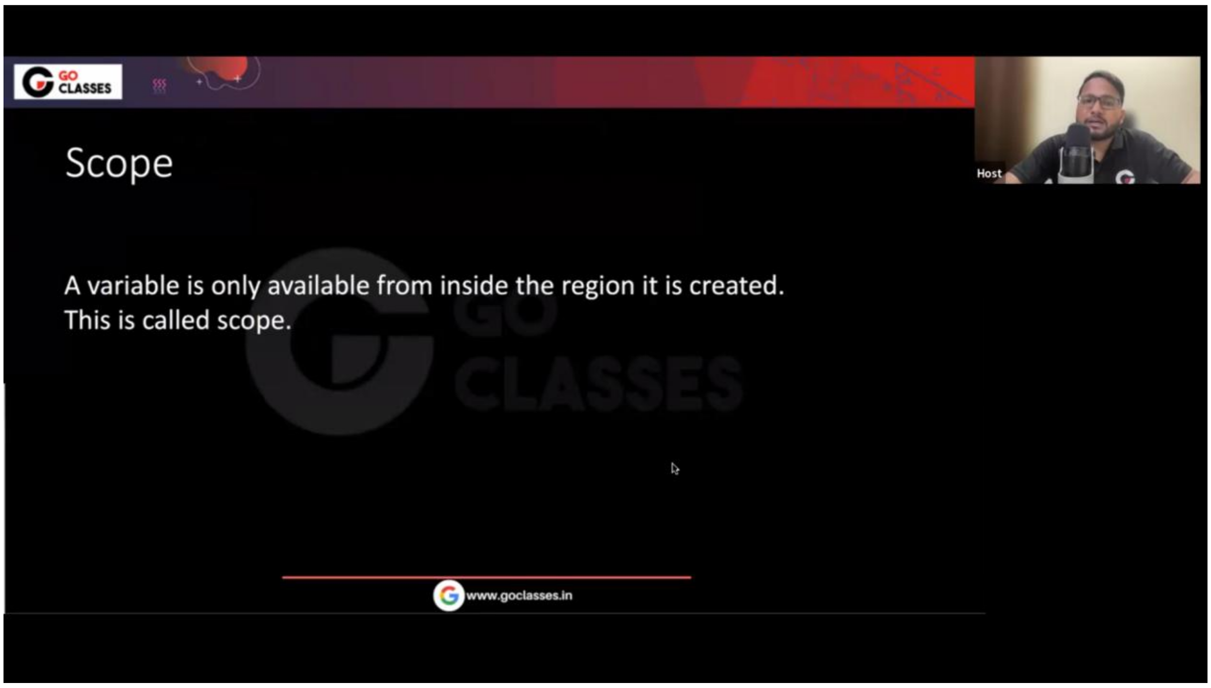
Once the function is defined, you can call it:

```
>>> say_hello()
Hello
```



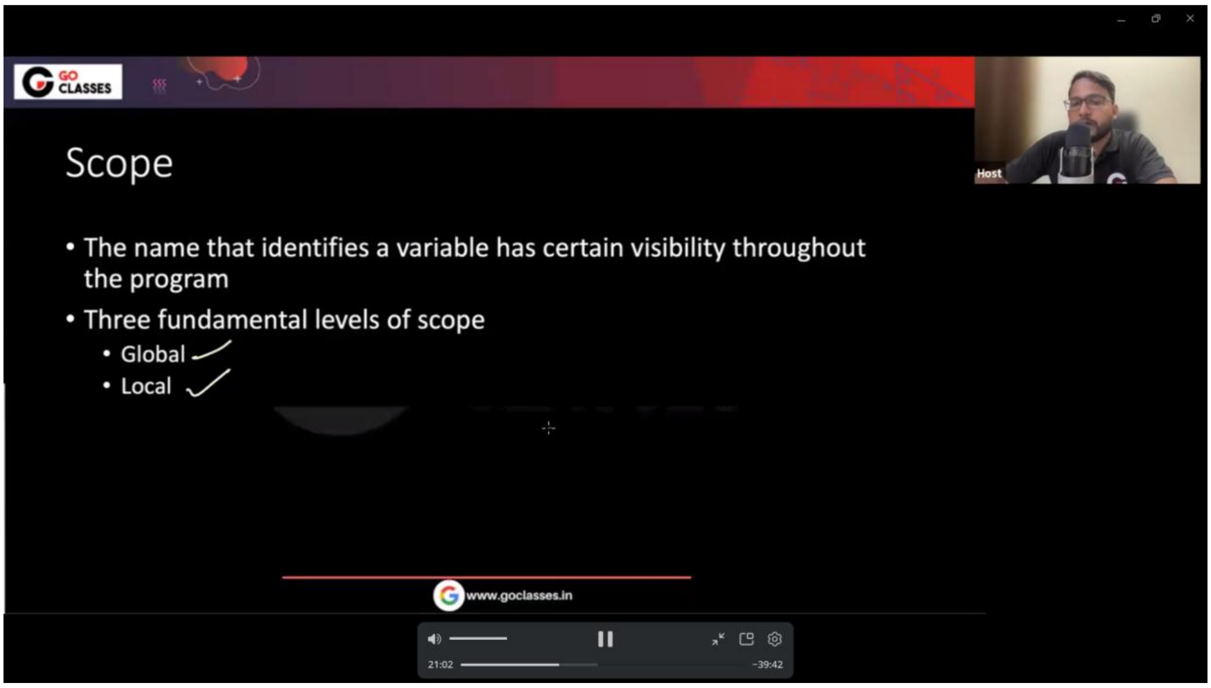
```
def name(parameters) :
    statements
    return value        # optionally
```

- ***name:*** name of function (in **snake_case**)
- ***parameters:*** information passed into function
- ***return***: information given back from the function



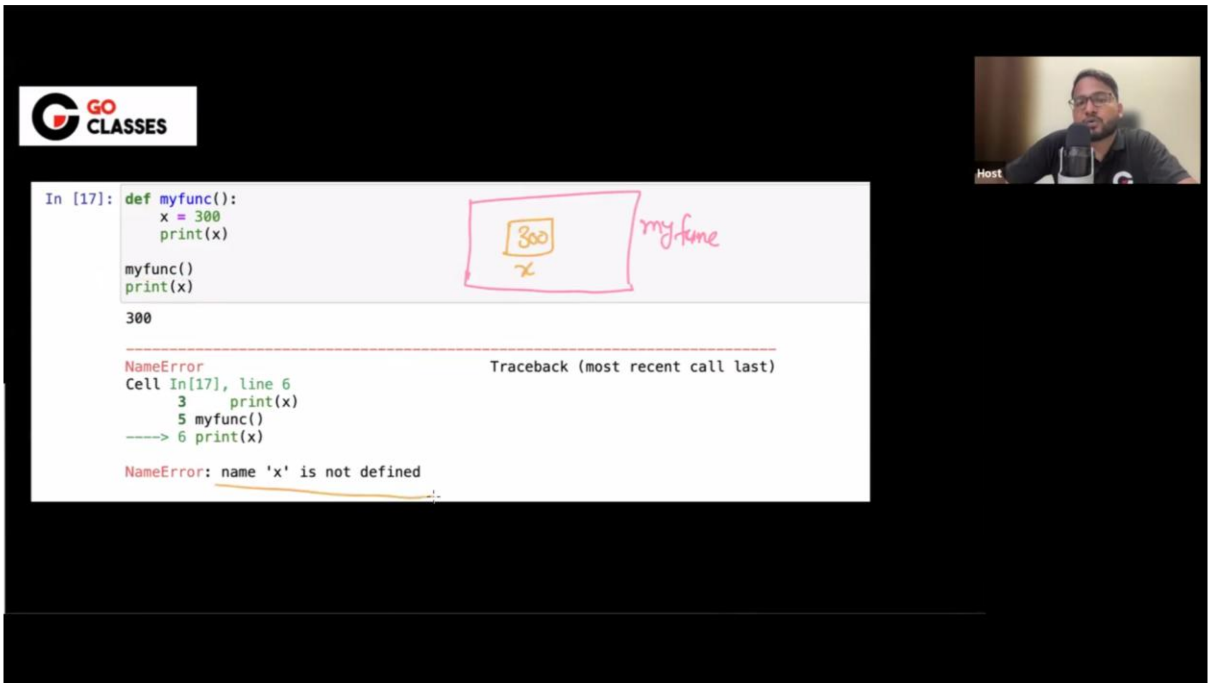
Scope

A variable is only available from inside the region it is created.
This is called scope.

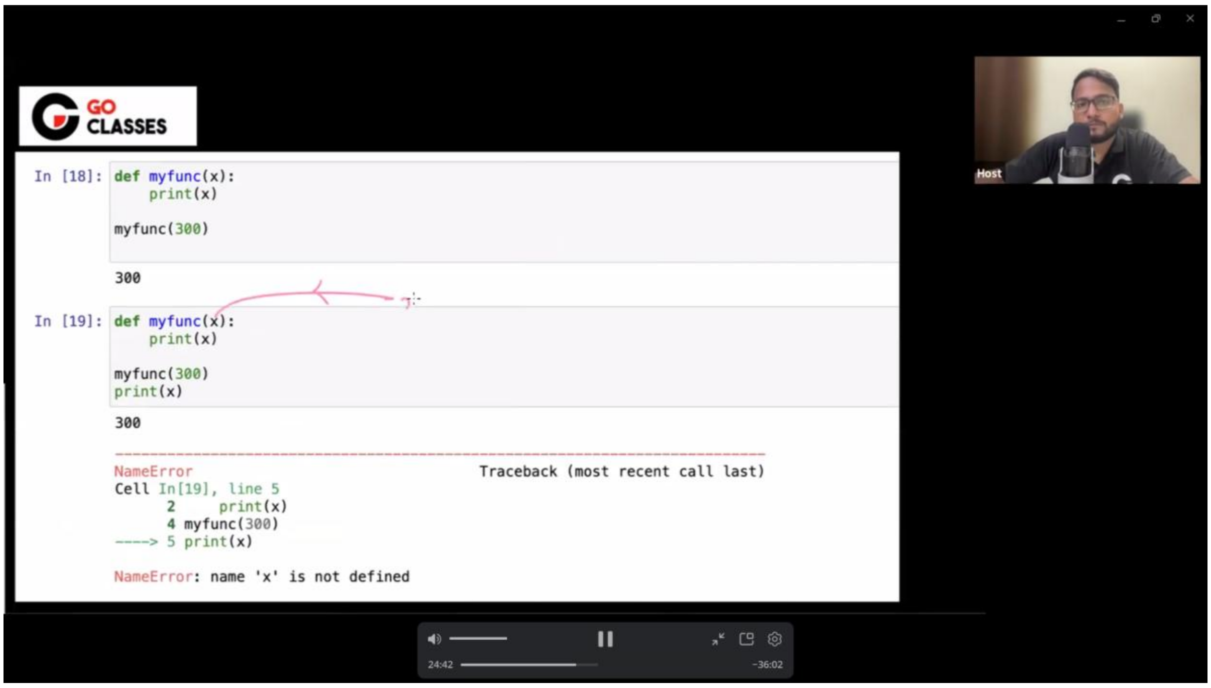


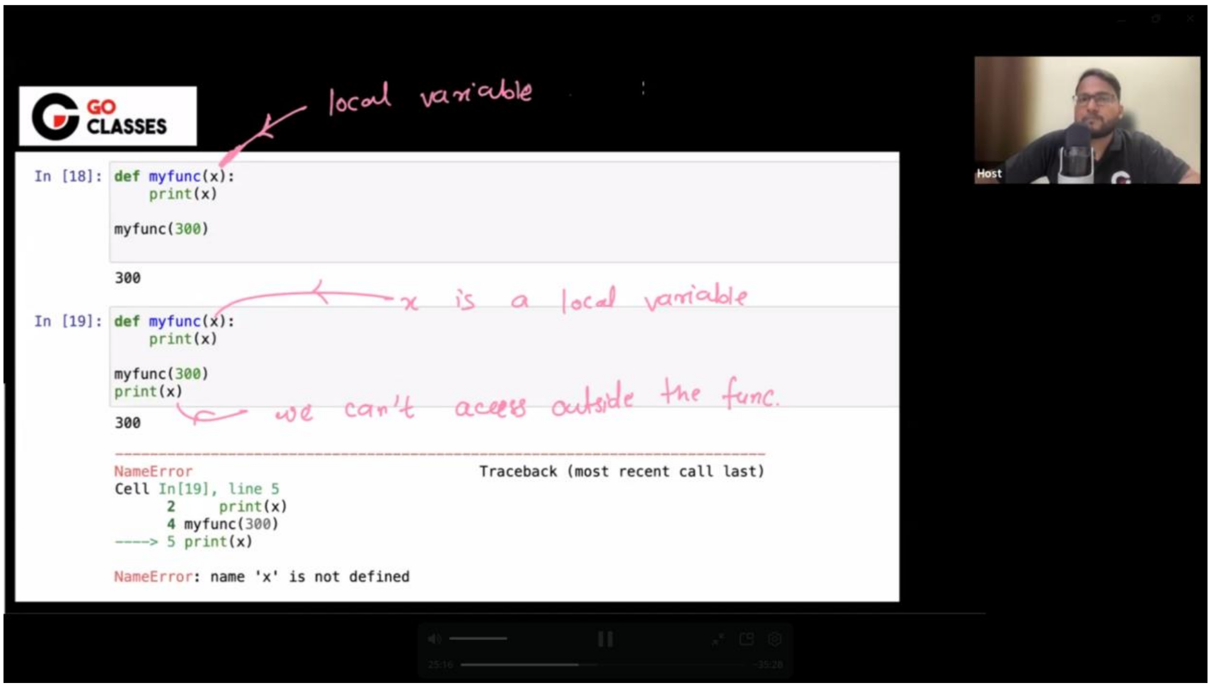
Scope

- The name that identifies a variable has certain visibility throughout the program
- Three fundamental levels of scope
  - Global ✓
  - Local ✓



```
In [17]: def myfunc():
             x = 300
             print(x)

         myfunc()
         print(x)

         300

         ---------------------------------------------------------------------------
         NameError                                 Traceback (most recent call last)
         Cell In[17], line 6
               3     print(x)
               5 myfunc()
         ----> 6 print(x)

         NameError: name 'x' is not defined
```

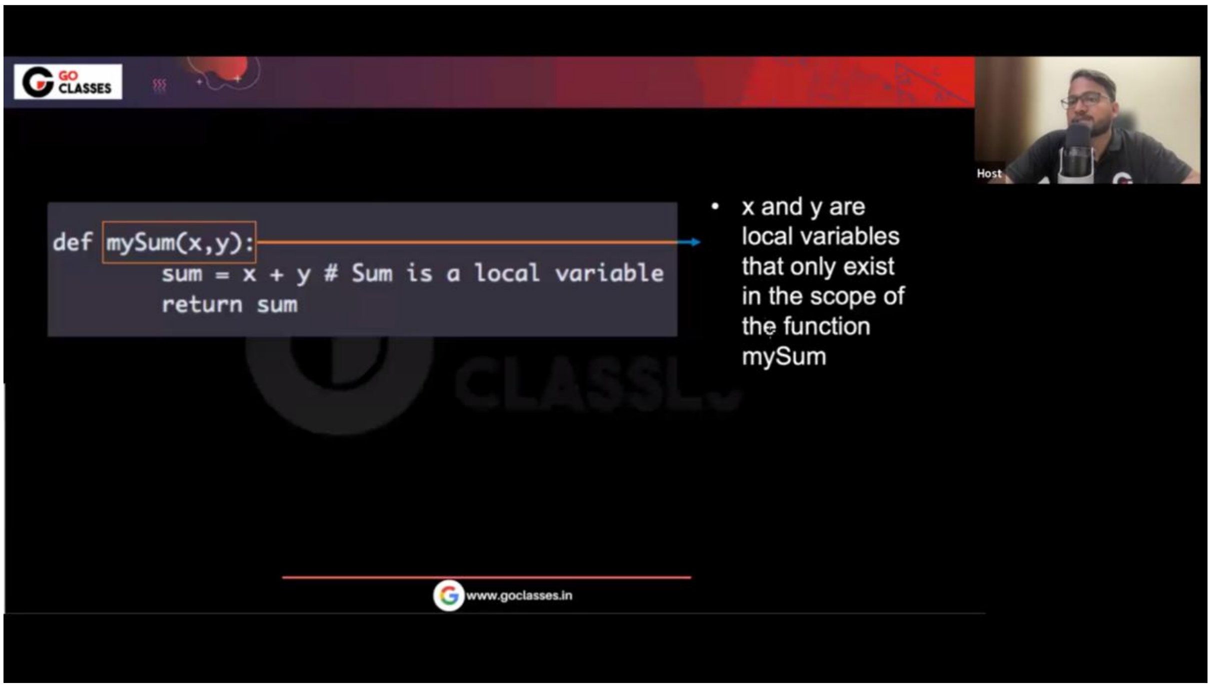

```
In [18]: def myfunc(x):
             print(x)

         myfunc(300)

         300

In [19]: def myfunc(x):
             print(x)

         myfunc(300)
         print(x)

         300

         ---------------------------------------------------------------------------
         NameError                                 Traceback (most recent call last)
         Cell In[19], line 5
               2     print(x)
               4 myfunc(300)
         ----> 5 print(x)

         NameError: name 'x' is not defined
```


```
In [18]: def myfunc(x):
             print(x)

         myfunc(300)

         300

In [19]: def myfunc(x):
             print(x)

         myfunc(300)
         print(x)

         300

         ---------------------------------------------------------------------------
         NameError                                 Traceback (most recent call last)
         Cell In[19], line 5
               2     print(x)
               4 myfunc(300)
         ----> 5 print(x)

         NameError: name 'x' is not defined
```

local variable

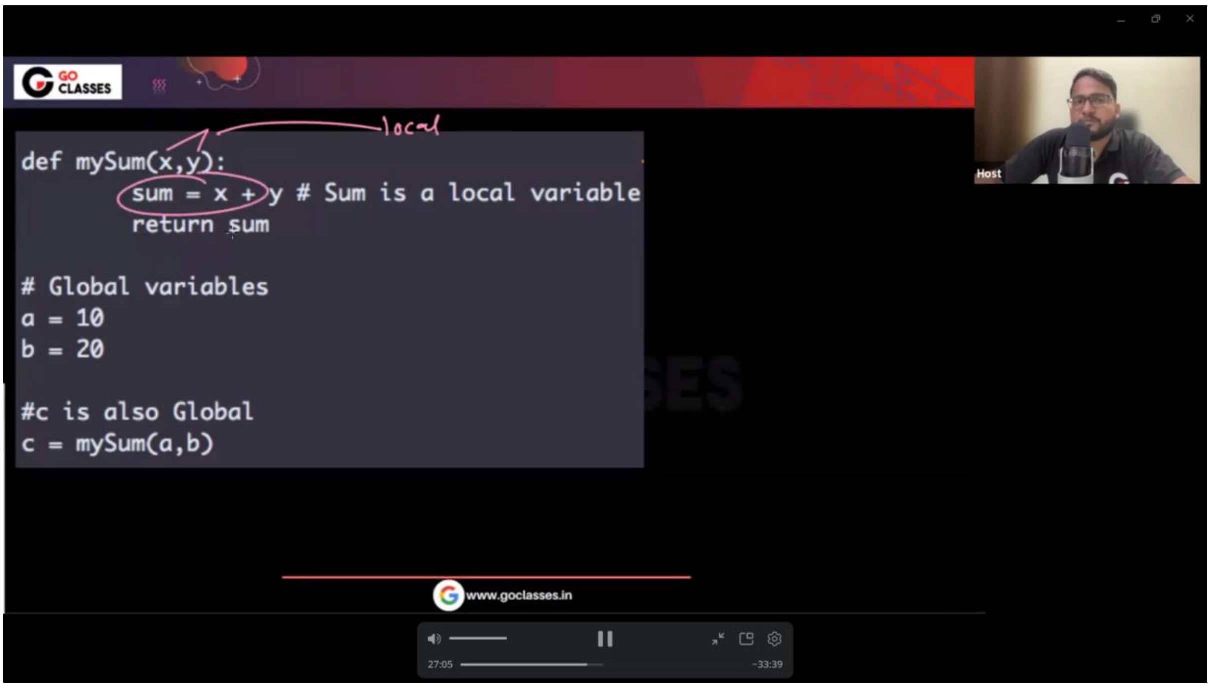
x is a local variable

we can't access outside the func.

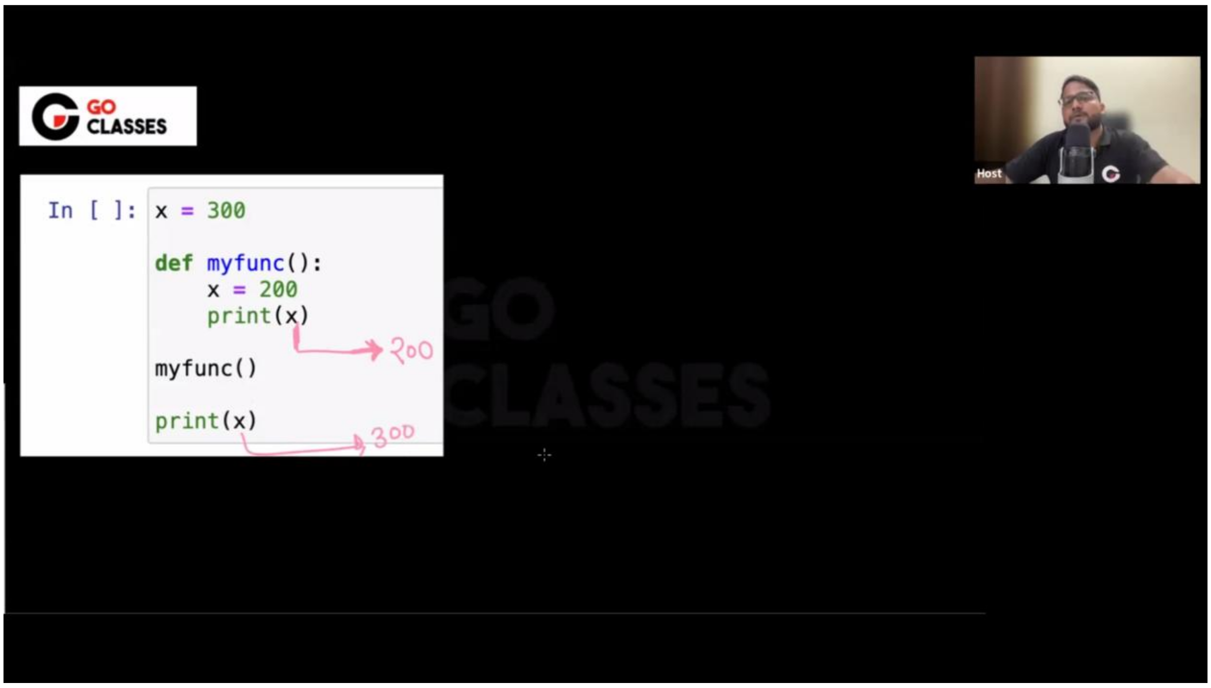


```
def mySum(x,y):
        sum = x + y # Sum is a local variable
        return sum
```

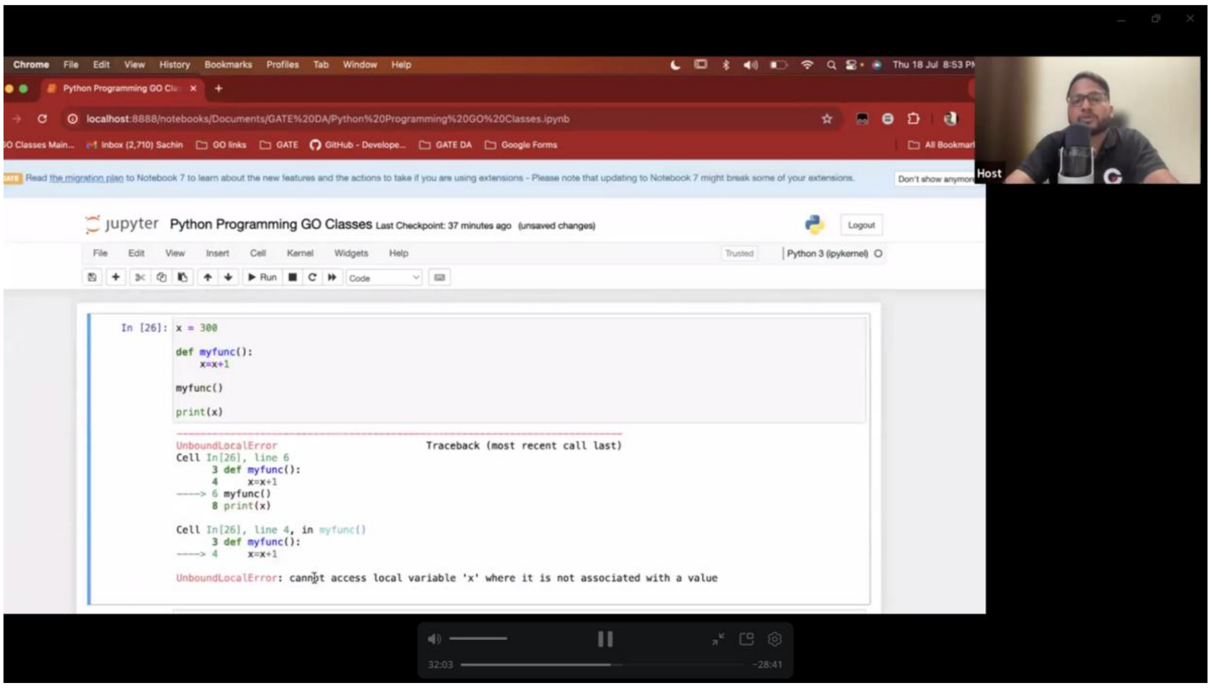
- x and y are local variables that only exist in the scope of the function mySum



```
def mySum(x,y):
        sum = x + y # Sum is a local variable
        return sum

# Global variables
a = 10
b = 20

#c is also Global
c = mySum(a,b)
```



```
In [ ]: x = 300

        def myfunc():
            x = 200
            print(x)

        myfunc()

        print(x)
```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Python Programming GO Cla
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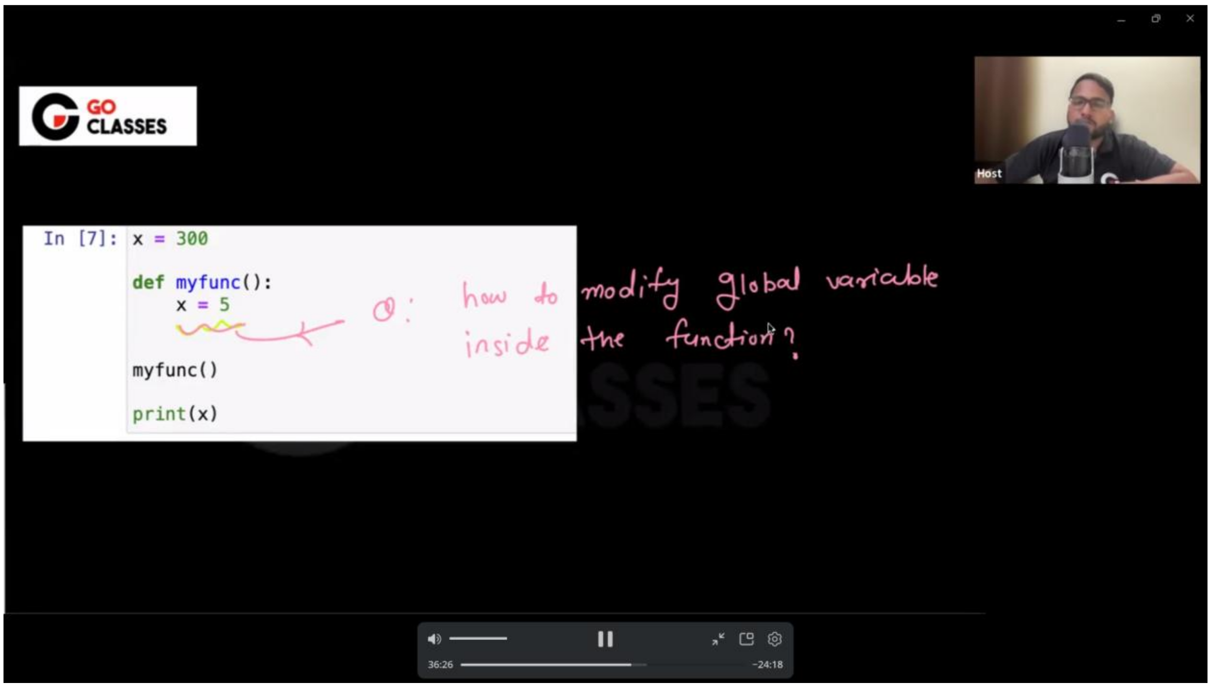
jupyter Python Programming GO Classes Last Checkpoint: 37 minutes ago (unsaved changes)
Logout
File Edit View Insert Cell Kernel Widgets Help
Trusted
Python 3 (ipykernel)
Run
Code
Host
32:03
-28:41

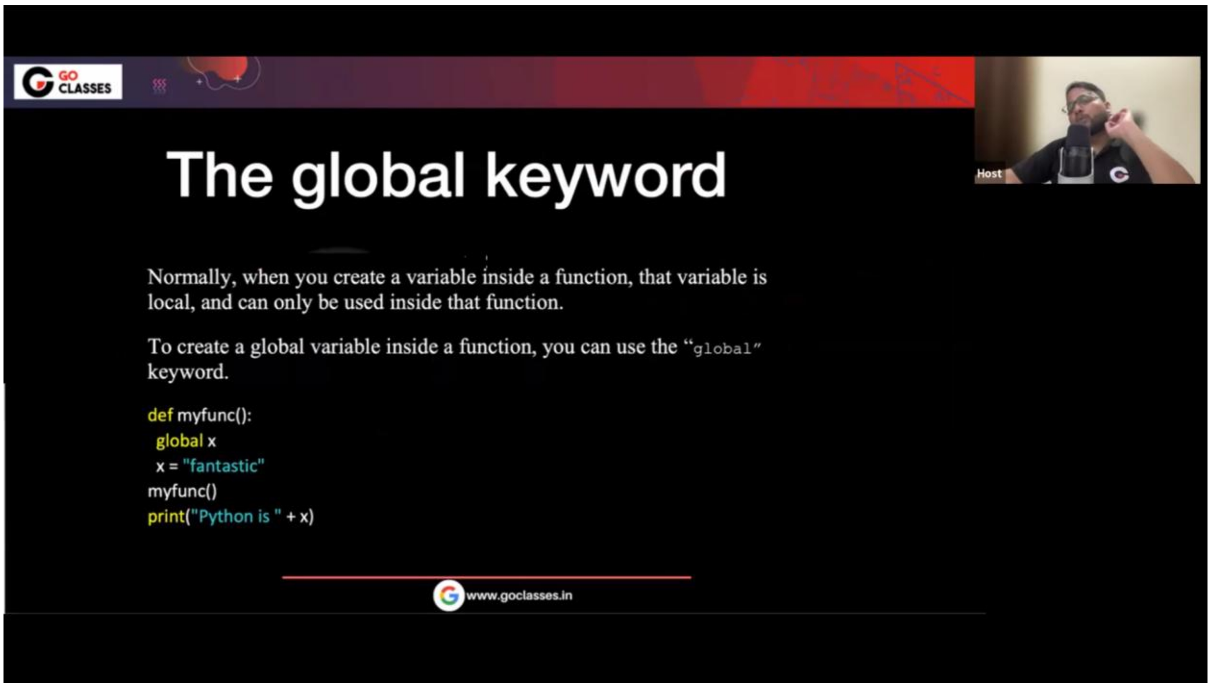
```
In [26]: x = 300

         def myfunc():
             x=x+1

         myfunc()

         print(x)
```

```
UnboundLocalError                         Traceback (most recent call last)
Cell In[26], line 6
      3 def myfunc():
      4     x=x+1
----> 6 myfunc()
      8 print(x)

Cell In[26], line 4, in myfunc()
      3 def myfunc():
----> 4     x=x+1

UnboundLocalError: cannot access local variable 'x' where it is not associated with a value
```



```
In [7]: x = 300

        def myfunc():
            x = 5

        myfunc()

        print(x)
```

Q: how to modify global variable inside the function?



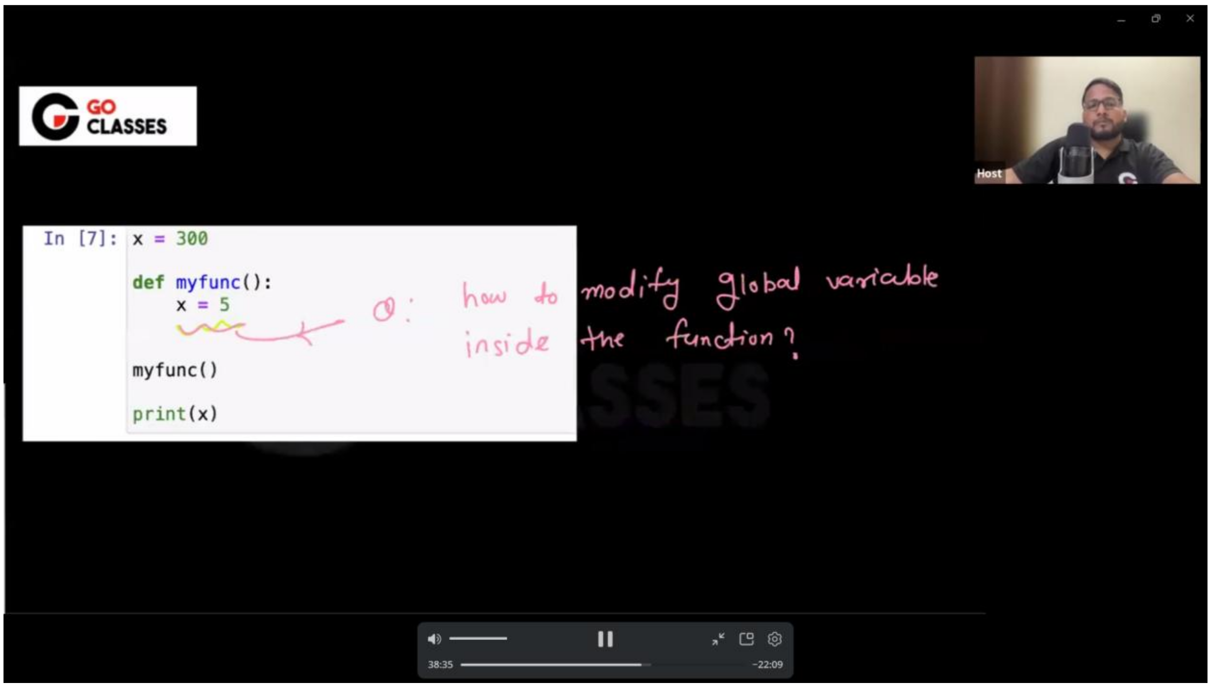
The global keyword

Normally, when you create a variable inside a function, that variable is local, and can only be used inside that function.

To create a global variable inside a function, you can use the "global" keyword.

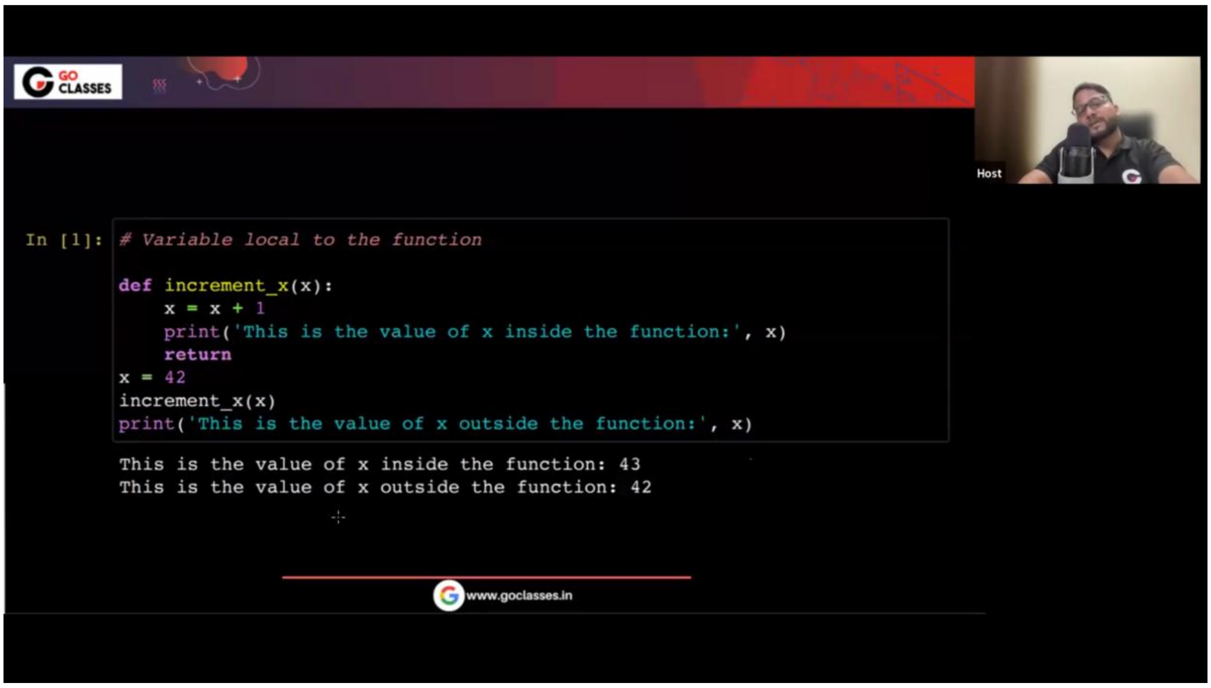
```
def myfunc():
 global x
 x = "fantastic"
myfunc()
print("Python is " + x)
```

www.goclasses.in



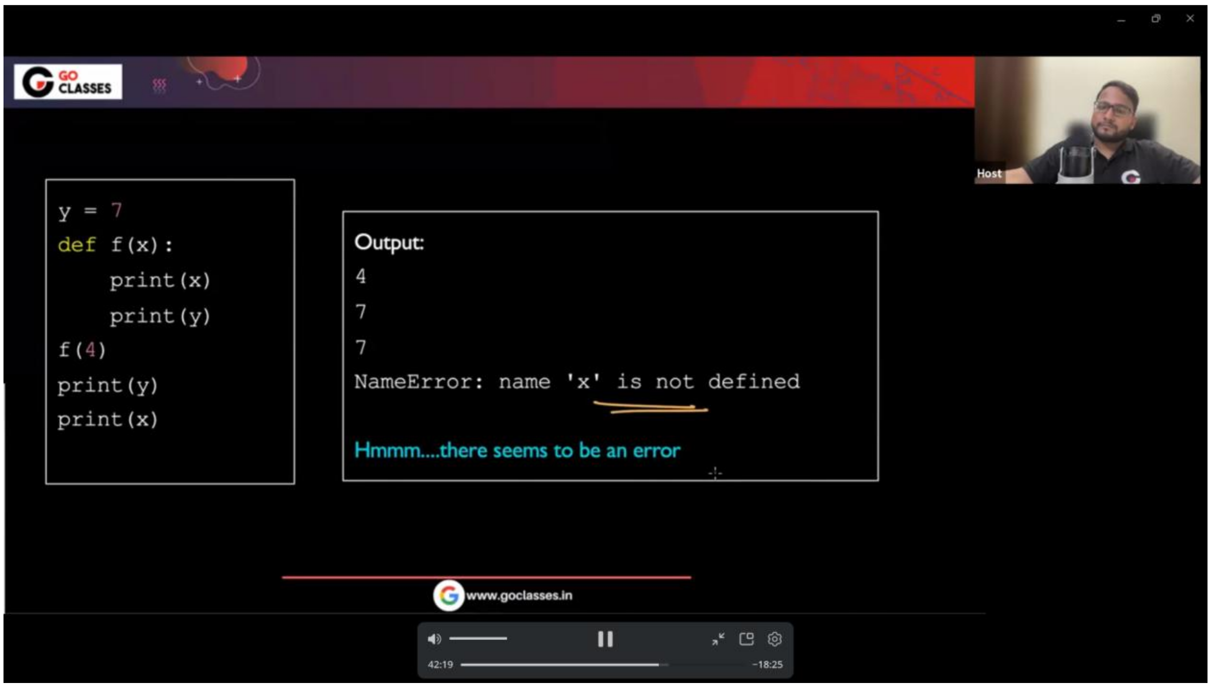
```
In [7]: x = 300

        def myfunc():
            x = 5

        myfunc()

        print(x)
```

Q: how to modify global variable inside the function?



```
In [1]: # Variable local to the function

        def increment_x(x):
            x = x + 1
            print('This is the value of x inside the function:', x)
            return
        x = 42
        increment_x(x)
        print('This is the value of x outside the function:', x)

        This is the value of x inside the function: 43
        This is the value of x outside the function: 42
```

www.goclasses.in

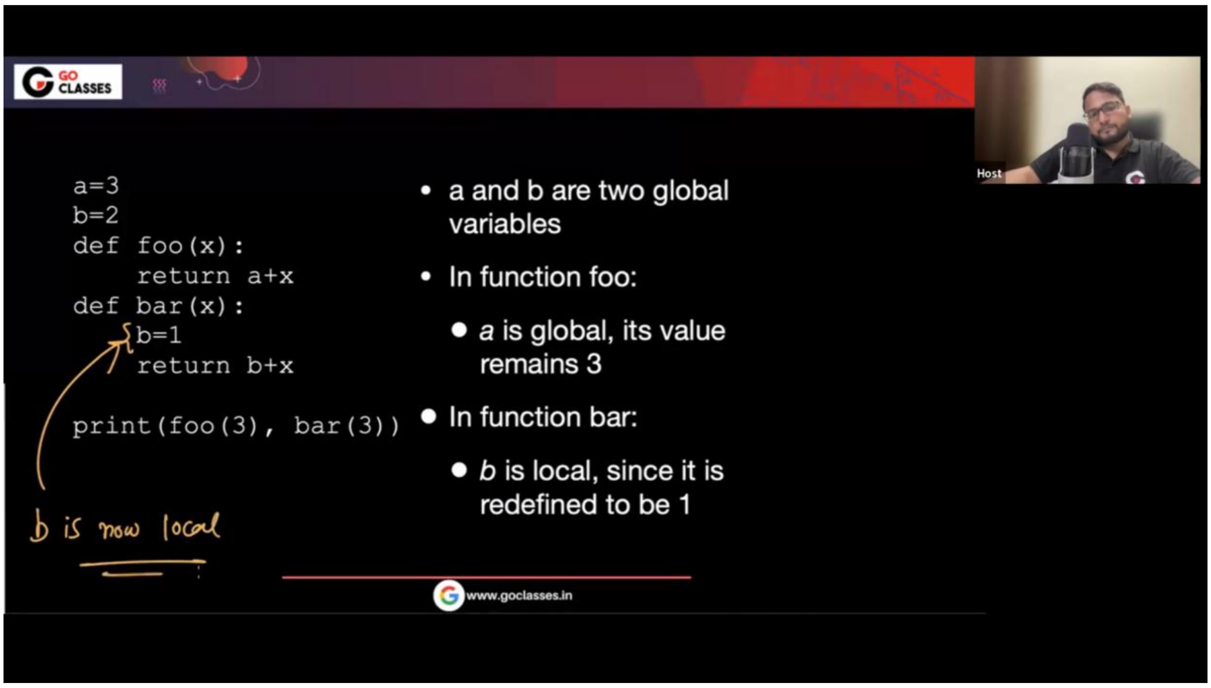


```
y = 7
def f(x):
    print(x)
    print(y)
f(4)
print(y)
print(x)
```

Output:

```
4
7
7
NameError: name 'x' is not defined
```

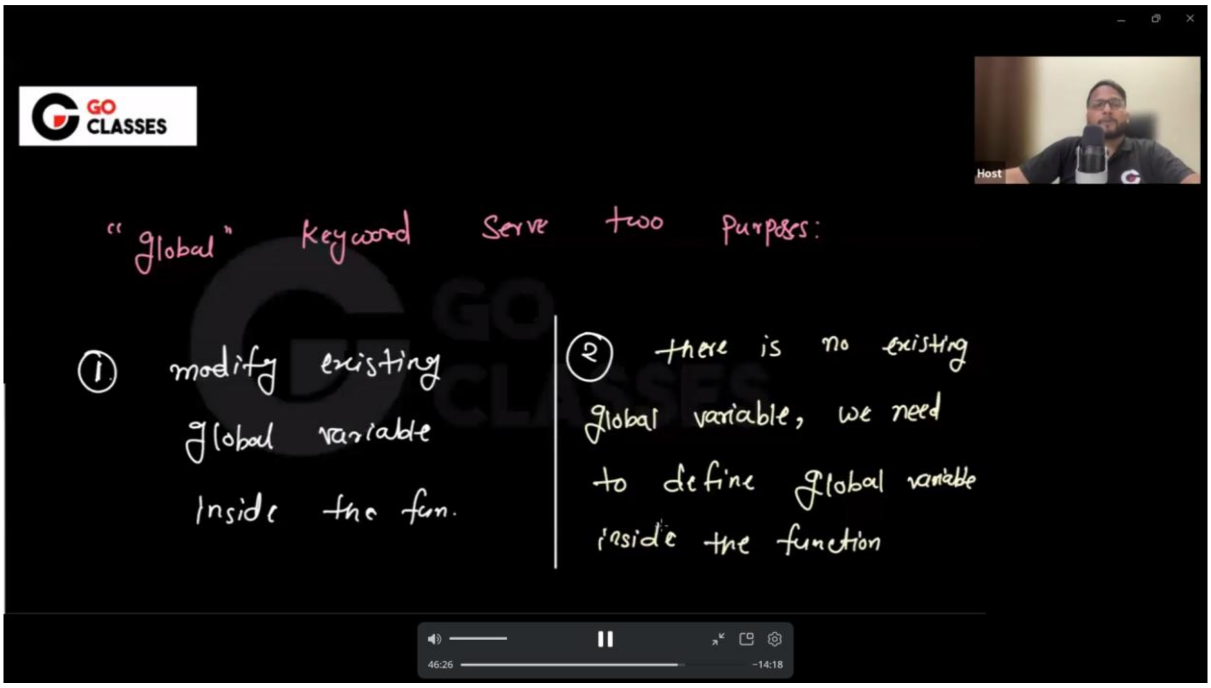
Hmmm....there seems to be an error



```
a=3
b=2
def foo(x):
    return a+x
def bar(x):
    b=1
    return b+x

print(foo(3), bar(3))
```

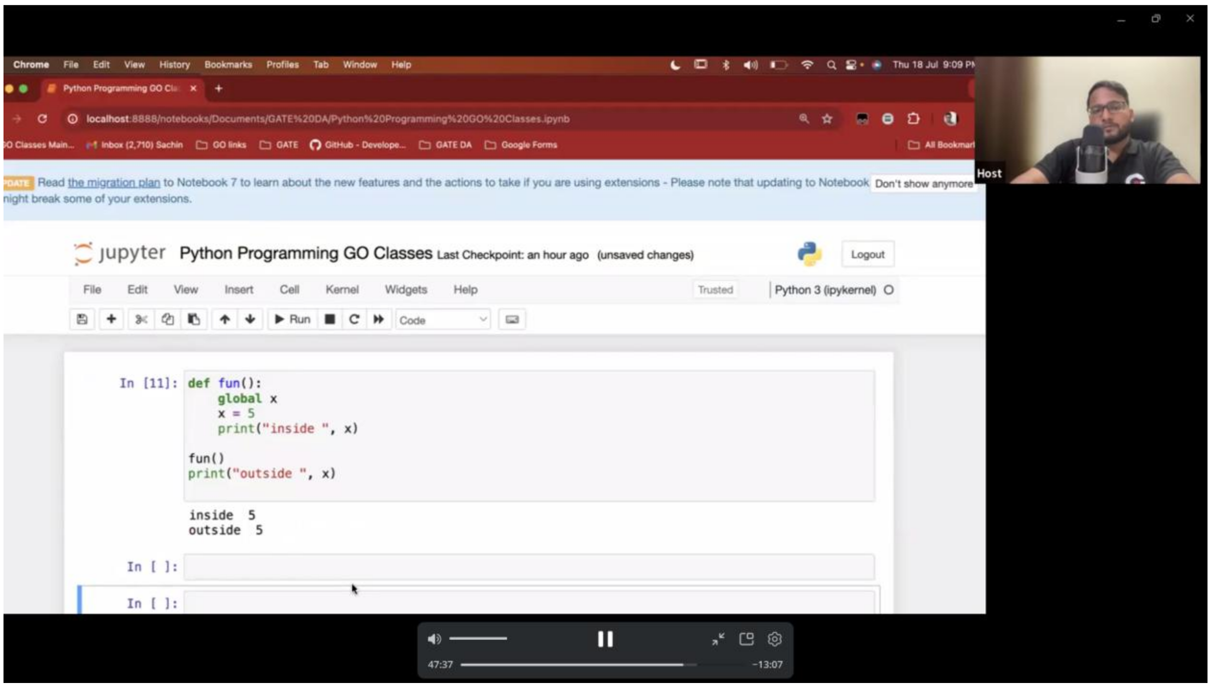
b is now local

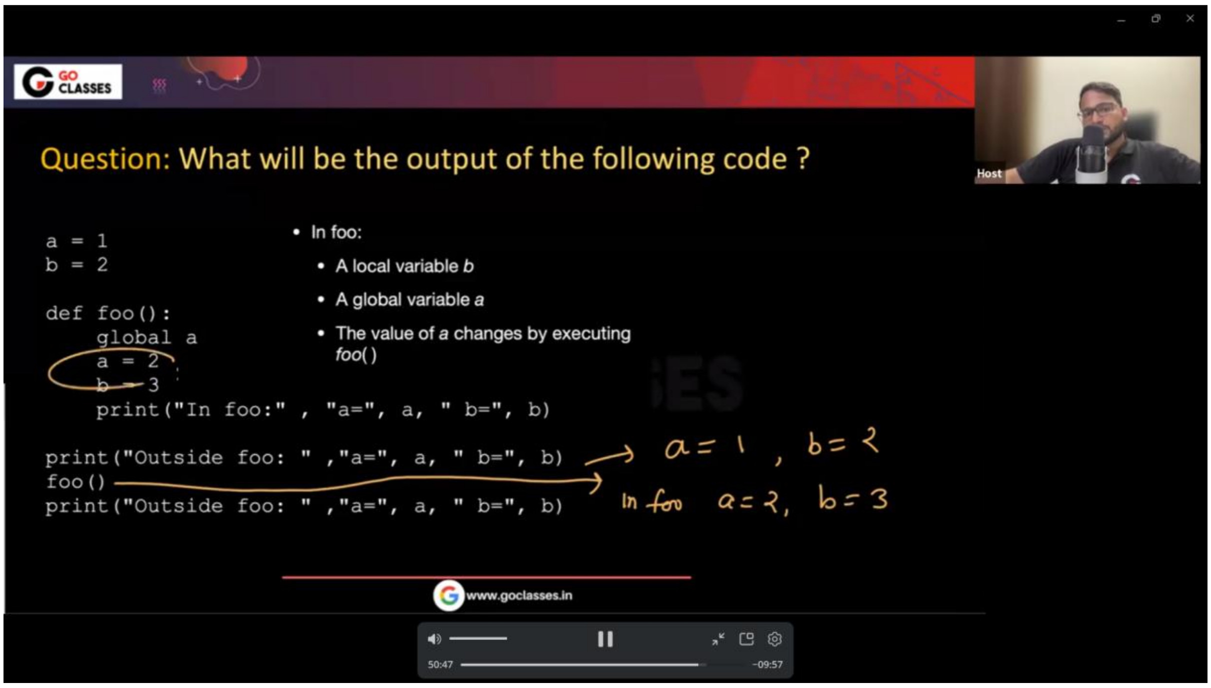
- a and b are two global variables
- In function foo:
  - *a* is global, its value remains 3
- In function bar:
  - *b* is local, since it is redefined to be 1


"global" keyword serve two purposes:

① modify existing global variable inside the fun.

② there is no existing global variable, we need to define global variable inside the function


```
In [11]: def fun():
             global x
             x = 5
             print("inside ", x)

         fun()
         print("outside ", x)

inside  5
outside  5
```



Question: What will be the output of the following code ?

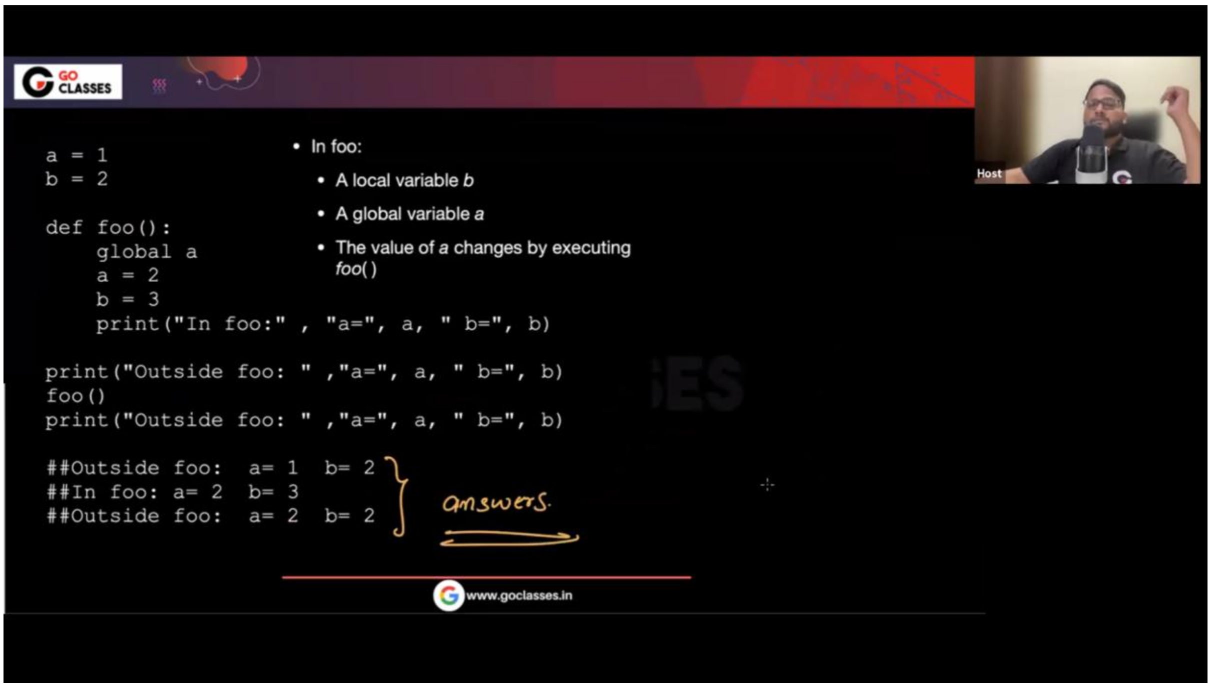
```
a = 1
b = 2

def foo():
    global a
    a = 2
    b = 3
    print("In foo:" , "a=", a, " b=", b)

print("Outside foo: " ,"a=", a, " b=", b)
foo()
print("Outside foo: " ,"a=", a, " b=", b)
```

- In foo:
  - A local variable *b*
  - A global variable *a*
  - The value of *a* changes by executing *foo*( )

$\rightarrow a = 1 \ , \ b = 2$

In foo $a = 2, \ b = 3$

www.goclasses.in



```
a = 1
b = 2

def foo():
    global a
    a = 2
    b = 3
    print("In foo:" , "a=", a, " b=", b)

print("Outside foo: " ,"a=", a, " b=", b)
foo()
print("Outside foo: " ,"a=", a, " b=", b)

##Outside foo:  a= 1  b= 2
##In foo: a= 2  b= 3
##Outside foo:  a= 2  b= 2
```

- In foo:
  - A local variable *b*
  - A global variable *a*
  - The value of *a* changes by executing *foo*( )

answers.

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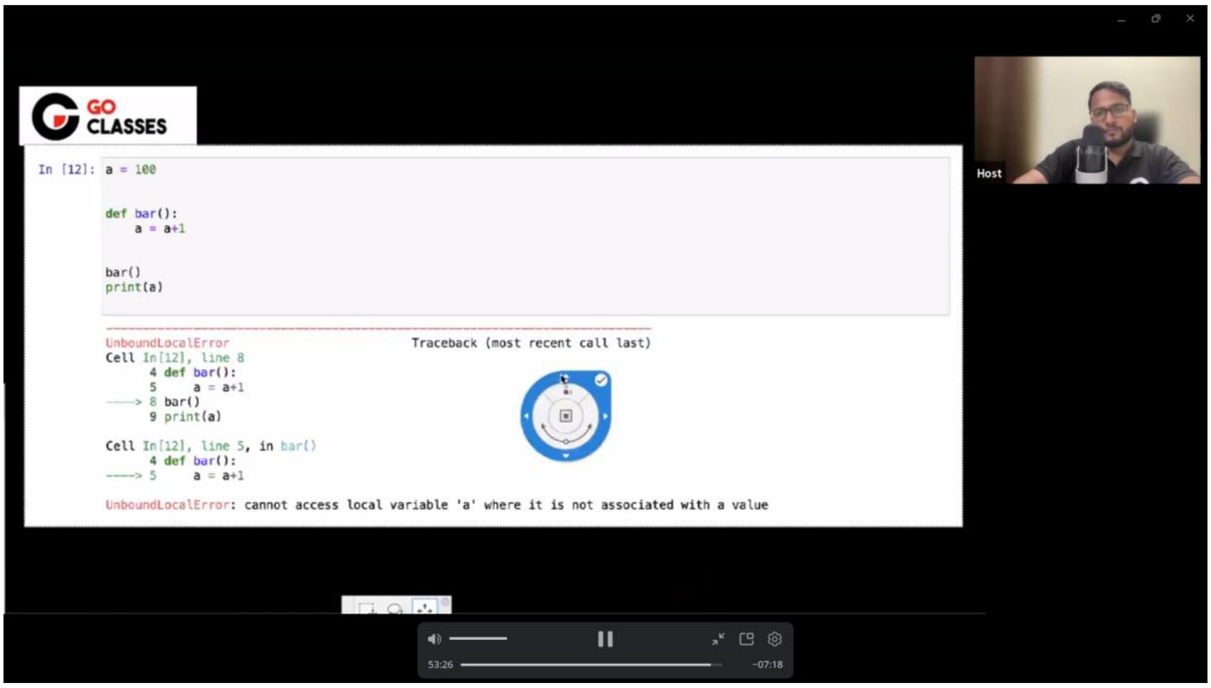
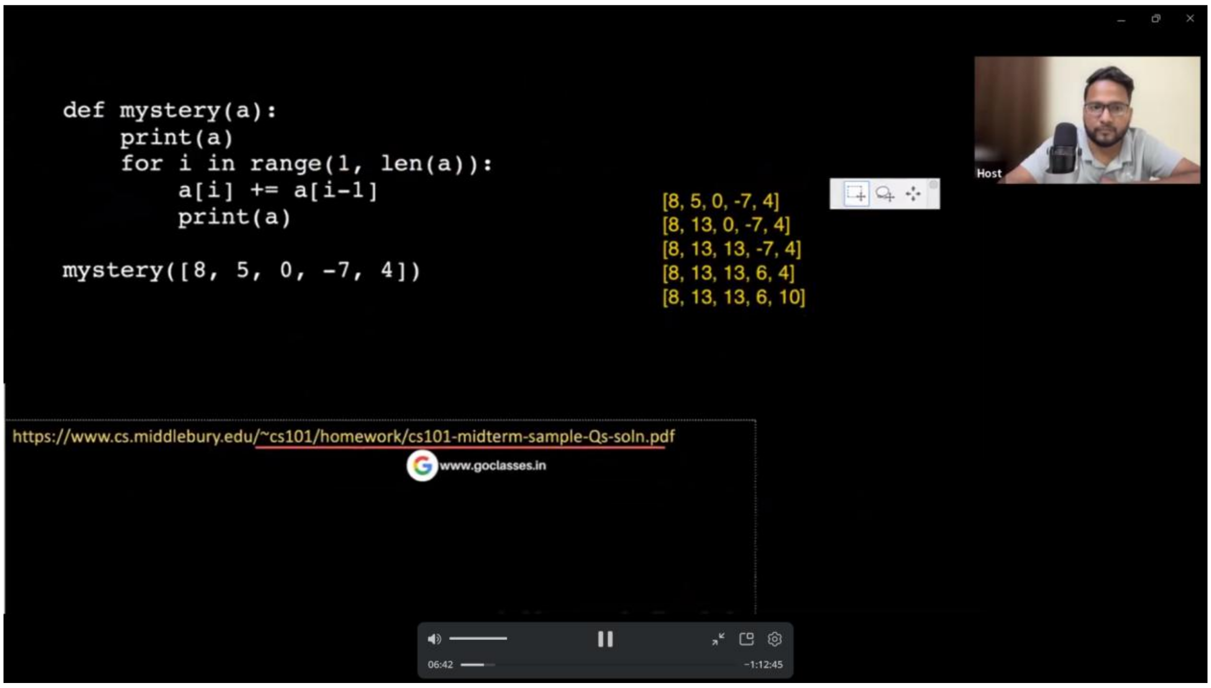


```
In [12]: a = 100

         def bar():
             a = a+1


         bar()
         print(a)
```

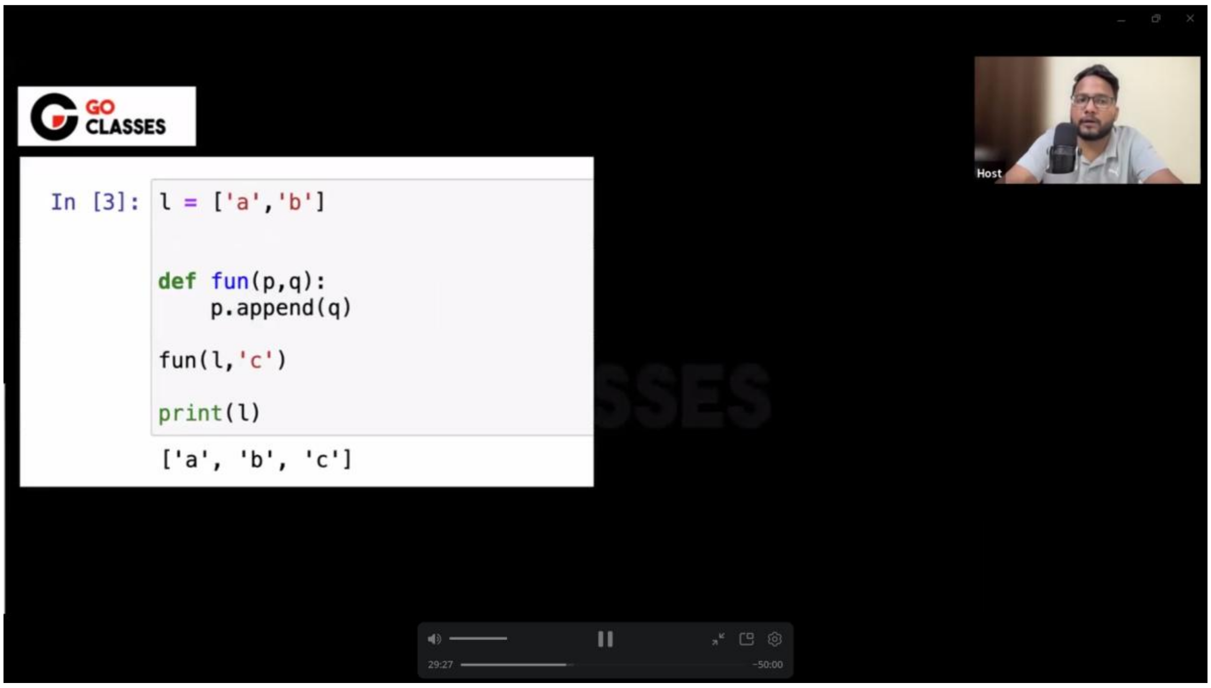
```
---------------------------------------------------------------------------
UnboundLocalError                         Traceback (most recent call last)
Cell In[12], line 8
      4 def bar():
      5     a = a+1
----> 8 bar()
      9 print(a)

Cell In[12], line 5, in bar()
      4 def bar():
----> 5     a = a+1

UnboundLocalError: cannot access local variable 'a' where it is not associated with a value
```



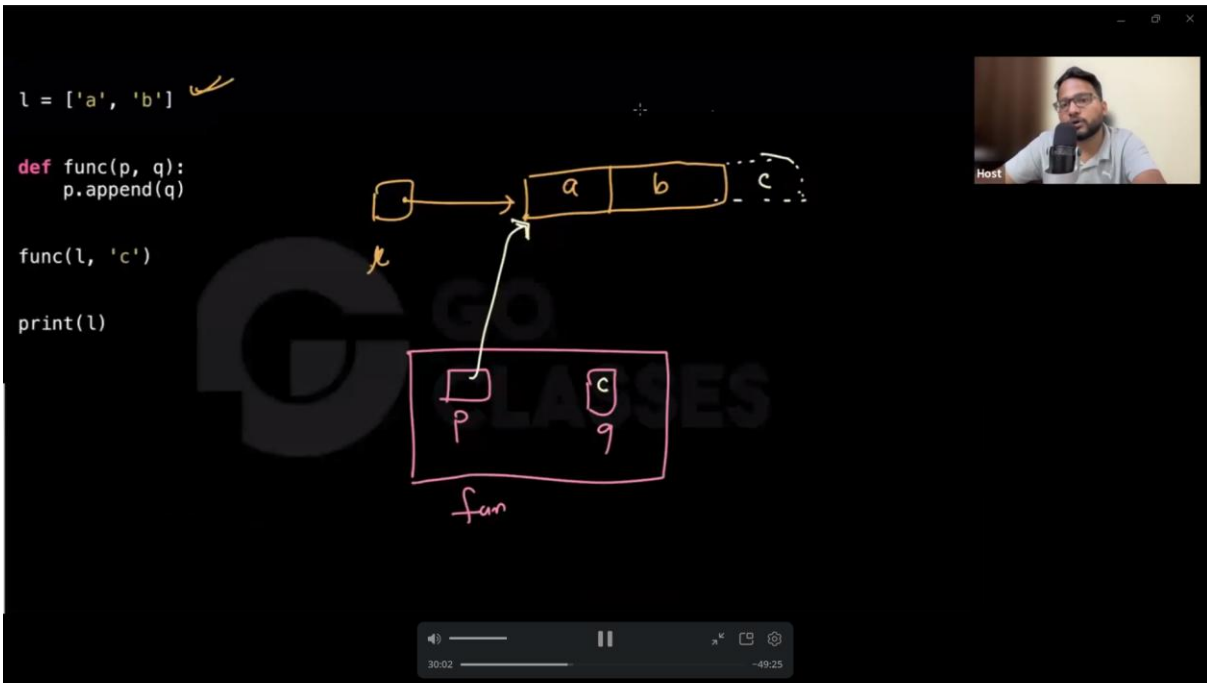
```
def mystery(a):
    print(a)
    for i in range(1, len(a)):
        a[i] += a[i-1]
        print(a)

mystery([8, 5, 0, -7, 4])
```

```
[8, 5, 0, -7, 4]
[8, 13, 0, -7, 4]
[8, 13, 13, -7, 4]
[8, 13, 13, 6, 4]
[8, 13, 13, 6, 10]
```

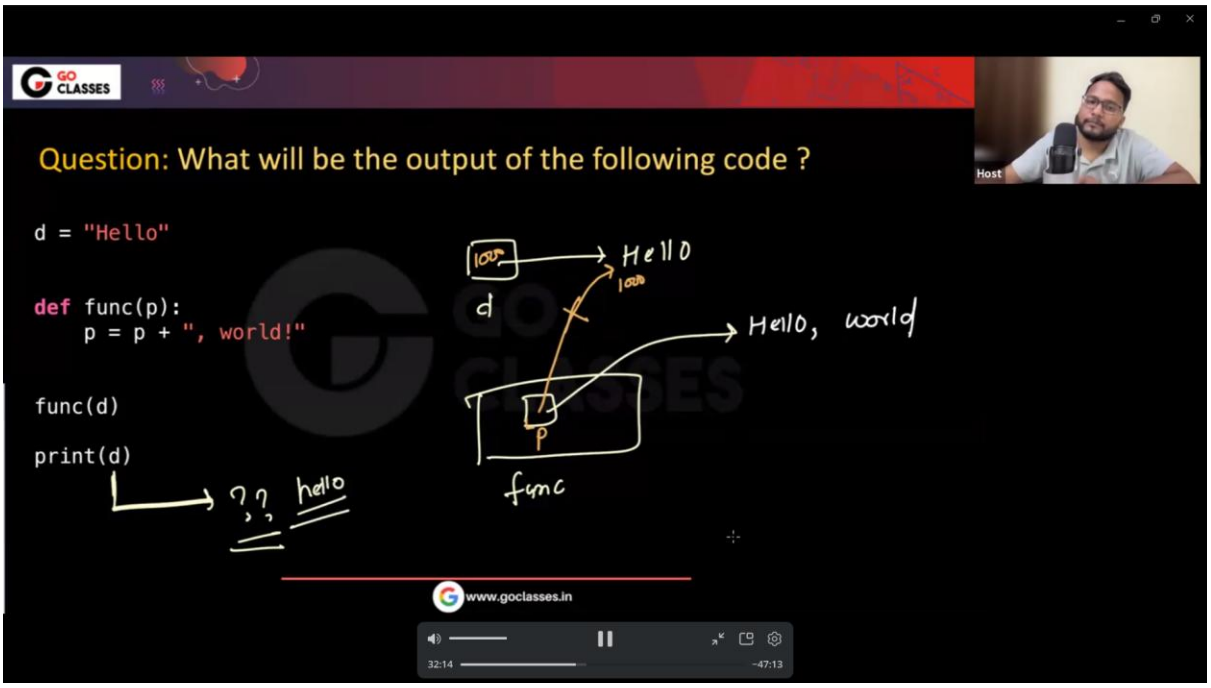
https://www.cs.middlebury.edu/~cs101/homework/cs101-midterm-sample-Qs-soln.pdf



```
In [3]: l = ['a','b']


        def fun(p,q):
            p.append(q)

        fun(l,'c')

        print(l)

['a', 'b', 'c']
```

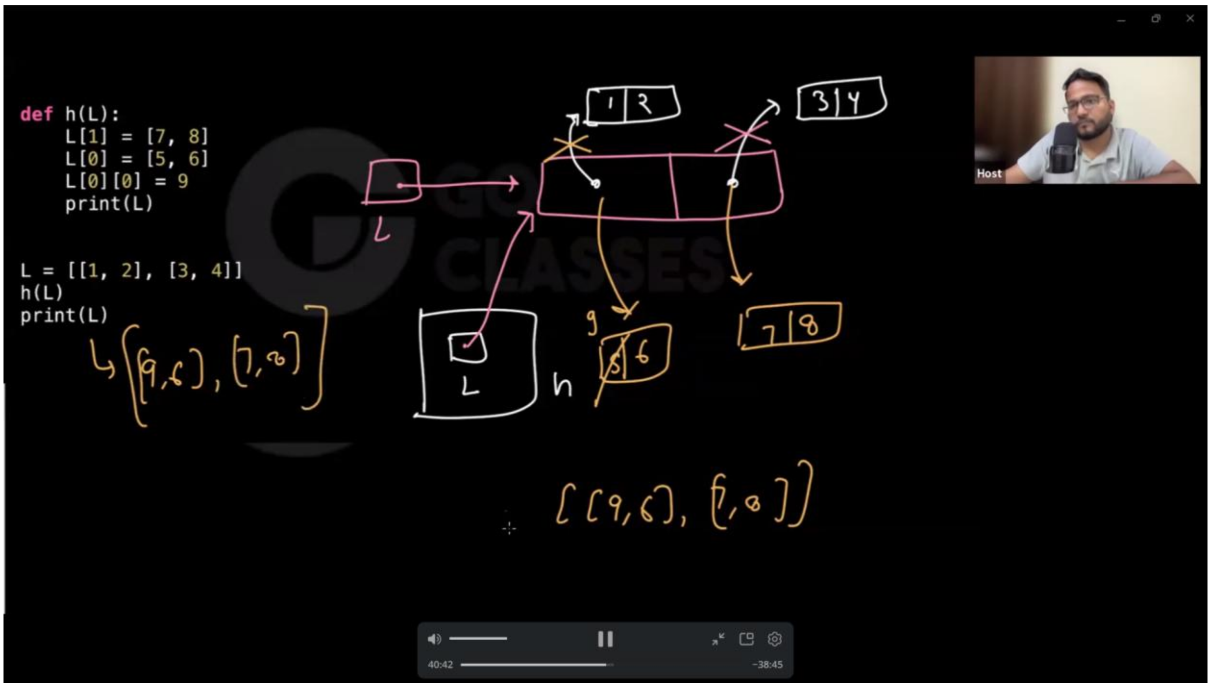


```
l = ['a', 'b']


def func(p, q):
    p.append(q)


func(l, 'c')


print(l)
```

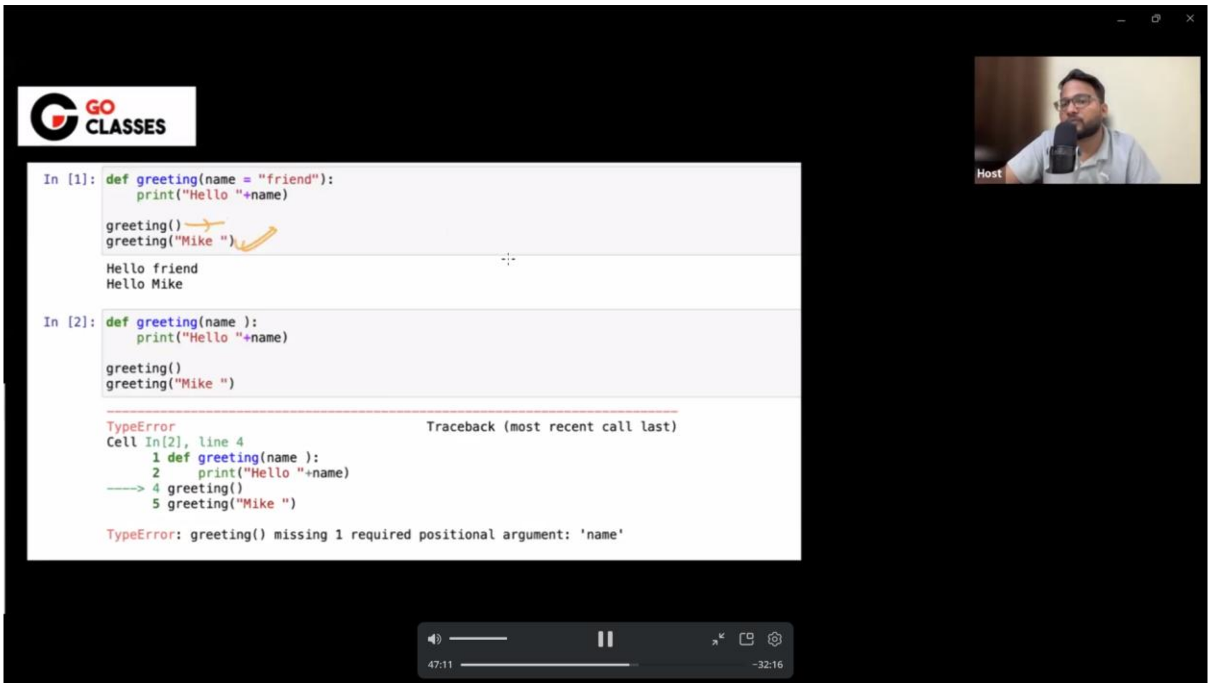


Question: What will be the output of the following code ?

```python
d = "Hello"

def func(p):
    p = p + ", world!"

func(d)

print(d)
```

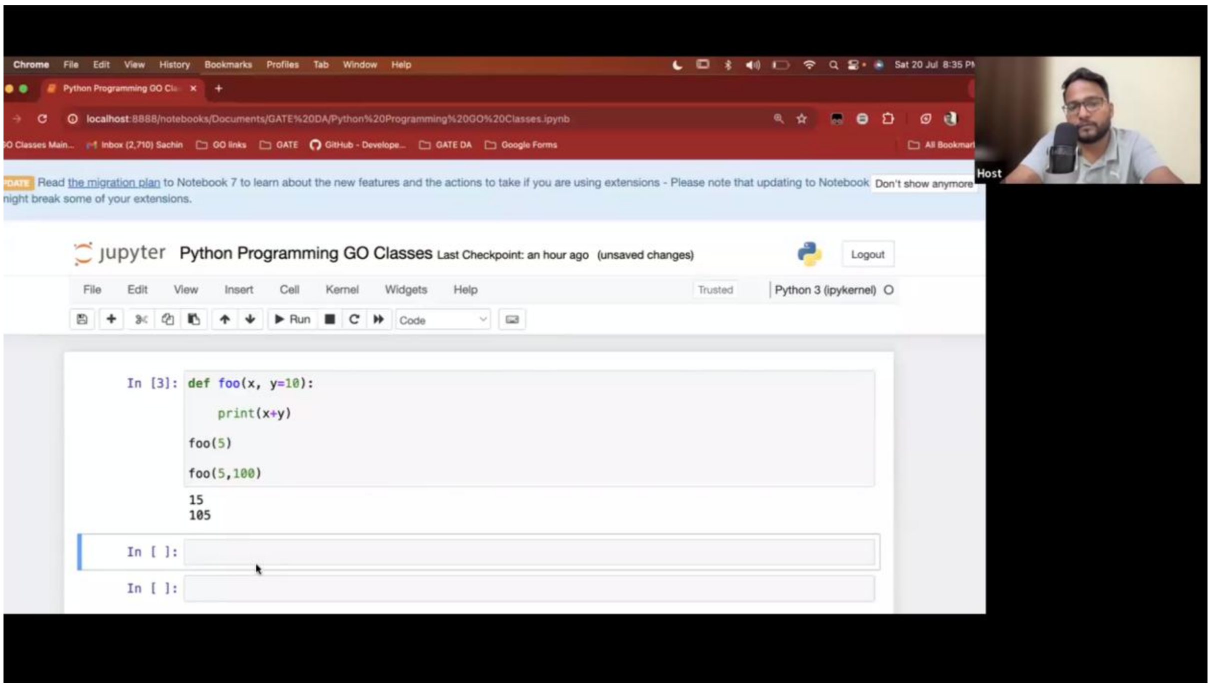


```python
def h(L):
    L[1] = [7, 8]
    L[0] = [5, 6]
    L[0][0] = 9
    print(L)

L = [[1, 2], [3, 4]]
h(L)
print(L)
```



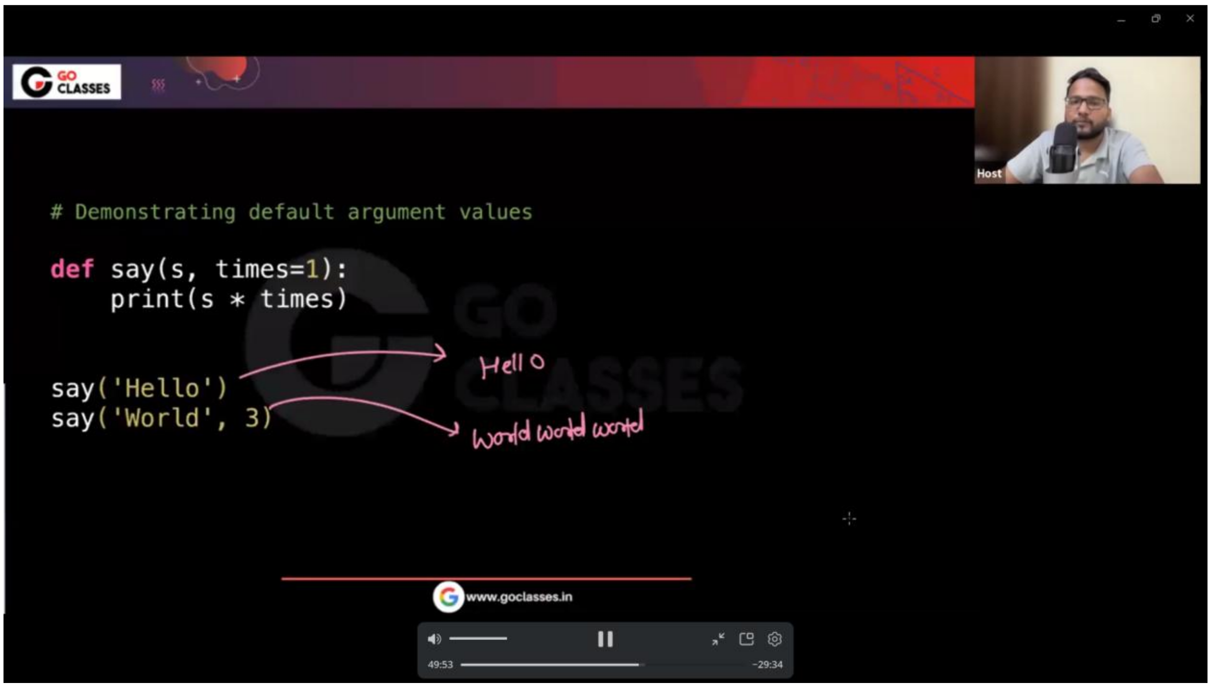
```
In [1]: def greeting(name = "friend"):
            print("Hello "+name)

        greeting()
        greeting("Mike ")

Hello friend
Hello Mike
```

```
In [2]: def greeting(name ):
            print("Hello "+name)

        greeting()
        greeting("Mike ")

---------------------------------------------------------------------------
TypeError                                 Traceback (most recent call last)
Cell In[2], line 4
      1 def greeting(name ):
      2     print("Hello "+name)
----> 4 greeting()
      5 greeting("Mike ")

TypeError: greeting() missing 1 required positional argument: 'name'
```



```
In [3]: def foo(x, y=10):

            print(x+y)

        foo(5)

        foo(5,100)

15
105
```

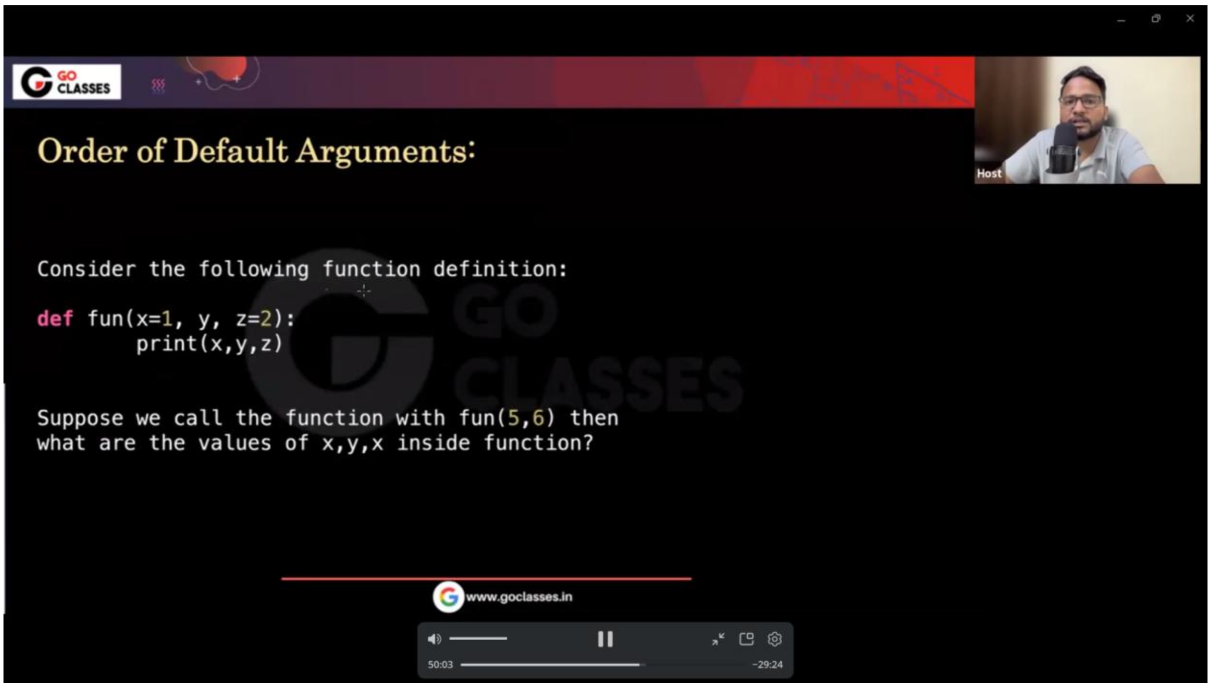
```
In [ ]:

In [ ]:
```



```python
# Demonstrating default argument values

def say(s, times=1):
    print(s * times)


say('Hello')
say('World', 3)
```

$$\xrightarrow{}$$ Hell o

$$\xrightarrow{}$$ World World World

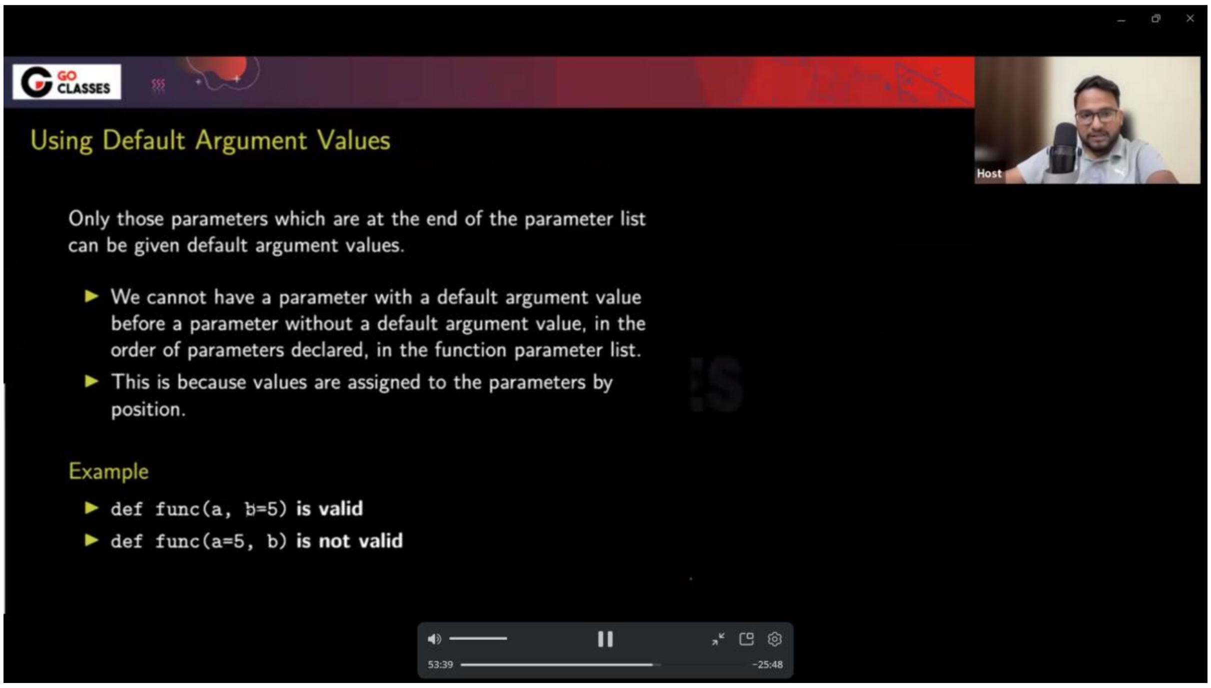


Order of Default Arguments:

Consider the following function definition:

```python
def fun(x=1, y, z=2):
        print(x,y,z)
```

Suppose we call the function with fun(5,6) then
what are the values of x,y,x inside function?



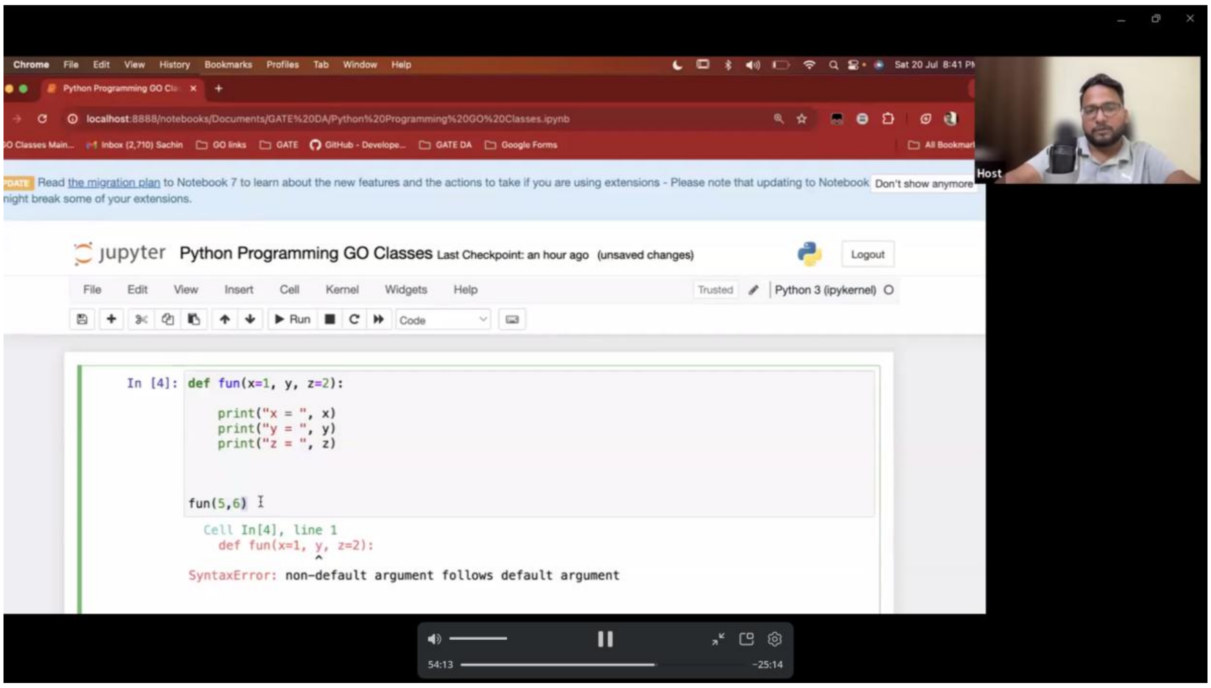
Using Default Argument Values

Only those parameters which are at the end of the parameter list can be given default argument values.

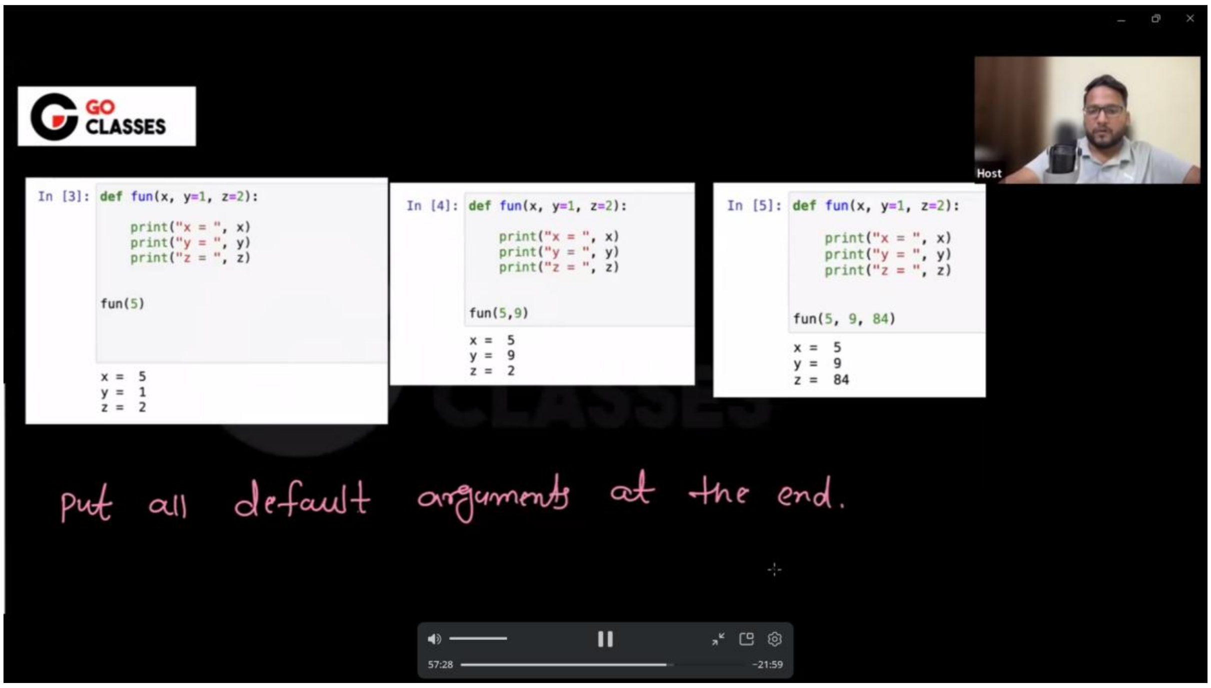
- We cannot have a parameter with a default argument value before a parameter without a default argument value, in the order of parameters declared, in the function parameter list.
- This is because values are assigned to the parameters by position.

Example

- `def func(a, b=5)` **is valid**
- `def func(a=5, b)` **is not valid**



```
In [4]: def fun(x=1, y, z=2):

            print("x = ", x)
            print("y = ", y)
            print("z = ", z)


        fun(5,6)

          Cell In[4], line 1
            def fun(x=1, y, z=2):
                         ^
        SyntaxError: non-default argument follows default argument
```

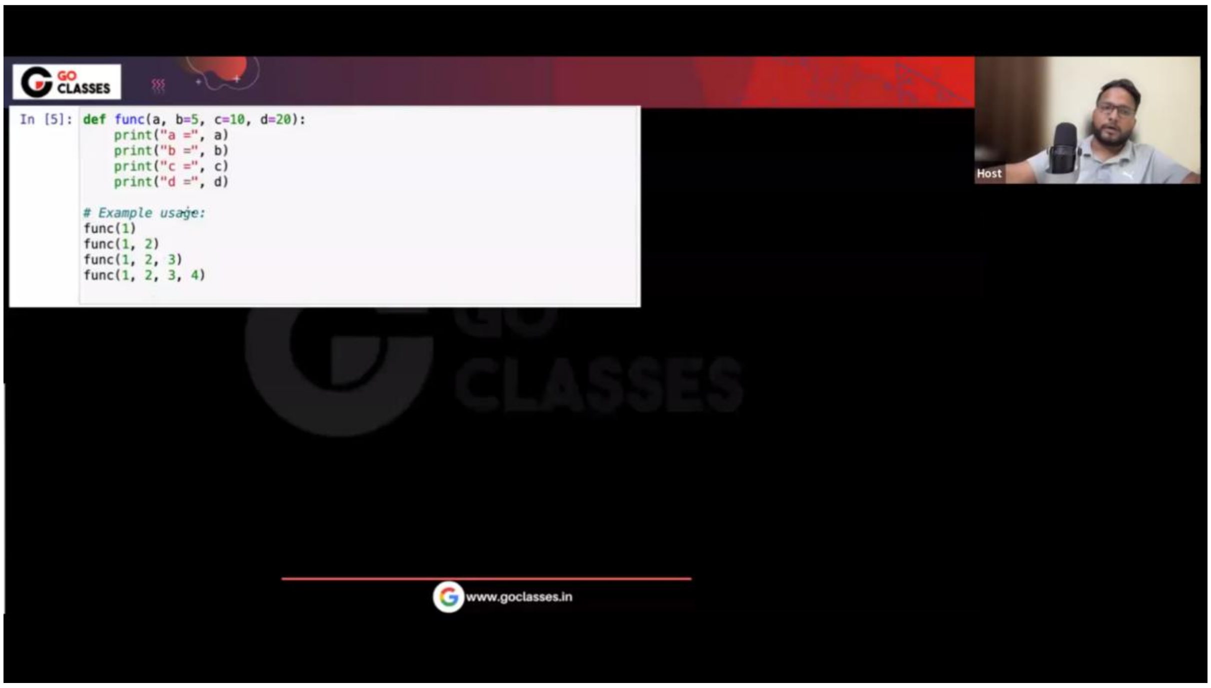


```
In [3]: def fun(x, y=1, z=2):

            print("x = ", x)
            print("y = ", y)
            print("z = ", z)


        fun(5)

        x =  5
        y =  1
        z =  2
```

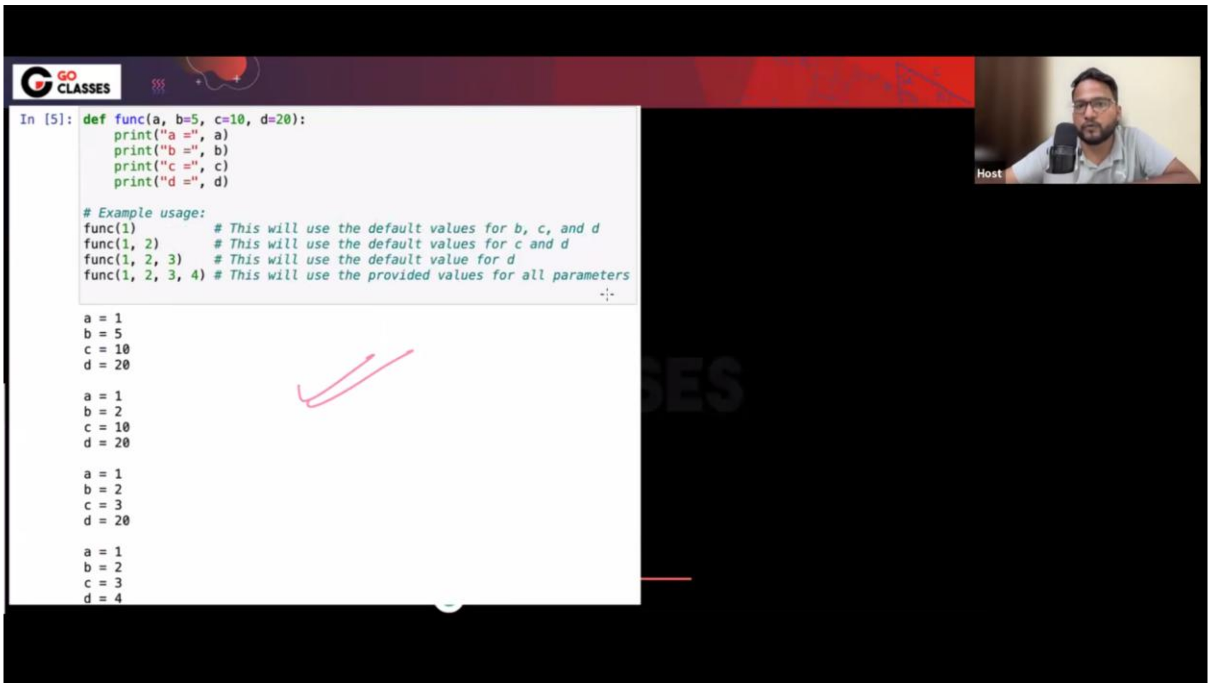
```
In [4]: def fun(x, y=1, z=2):

            print("x = ", x)
            print("y = ", y)
            print("z = ", z)


        fun(5,9)
        x =  5
        y =  9
        z =  2
```

```
In [5]: def fun(x, y=1, z=2):

            print("x = ", x)
            print("y = ", y)
            print("z = ", z)


        fun(5, 9, 84)
        x =  5
        y =  9
        z =  84
```

put all default arguments at the end.



```
In [5]: def func(a, b=5, c=10, d=20):
            print("a =", a)
            print("b =", b)
            print("c =", c)
            print("d =", d)

        # Example usage:
        func(1)
        func(1, 2)
        func(1, 2, 3)
        func(1, 2, 3, 4)
```



```
In [5]: def func(a, b=5, c=10, d=20):
            print("a =", a)
            print("b =", b)
            print("c =", c)
            print("d =", d)

        # Example usage:
        func(1)          # This will use the default values for b, c, and d
        func(1, 2)       # This will use the default values for c and d
        func(1, 2, 3)    # This will use the default value for d
        func(1, 2, 3, 4) # This will use the provided values for all parameters
```

```
a = 1
b = 5
c = 10
d = 20

a = 1
b = 2
c = 10
d = 20

a = 1
b = 2
c = 3
d = 20

a = 1
b = 2
c = 3
d = 4
```