Python Tasks: Scope, LEGB, and Basic OOP

1. Local vs Global Variable

Create a program that demonstrates the difference between a local variable and a global variable. The program should clearly show both values.

2. Function Using a Global Variable

Write a function that reads the value of a global variable without changing it. Show in the output that the global value remains the same after the function call.

3. Function That Modifies a Global Variable

Write a program where a function changes the value of a global variable using the global keyword. Display the value before and after the function call.

4. Local Variable Shadowing a Global Variable

Create an example where a global variable and a local variable have the same name. The program should demonstrate which value is used inside the function and which is used outside.

5. Inner Function and the LEGB Rule

Write a function that contains an inner function. Use print statements to show which version of a name is being used (local, enclosing, or global).

6. Using nonlocal

Create an example where an inner function modifies a variable in the enclosing function using the nonlocal keyword. Show the change before and after.

7. Creating Your Own Class

Write a class with at least two instance attributes and a method that prints or returns information based on those attributes. Create at least two objects and demonstrate that they can have different values.

8. Class Attribute vs Instance Attribute

Create a program demonstrating a class attribute shared across multiple objects. Then change the attribute for only one object and show that the other objects still use the original class attribute.

9. Class With a Calculation Method

Write a class with one attribute and a method that calculates something based on that attribute (for example area, price, or length). Show how changing the attribute affects the calculation.

10. Method for Updating an Attribute

Write a class where an attribute can be updated through a custom method. Demonstrate how the updated attribute changes the behavior of another method in the class.

Challenge Tasks

Challenge 1 – Tracking Variable Changes Across Scopes

Create a program that uses three nested functions. Each function should have a variable with the same name but different values. Use print statements to show exactly which value is used at each level, and experiment with both nonlocal and global to change the outcome.

Challenge 2 – Class With Both Class-Level and Instance-Level Behavior

Write a class that uses:

- at least one class attribute

- at least one instance attribute

- at least one method that uses the class attribute

- at least one method that uses only the instance attributes

Then add a way to change the class attribute and show how this affects all existing objects. Also show how changing an instance attribute affects only one object.

Challenge 3 – Object Interaction

Create two different classes where objects from one class interact with objects from the other. Demonstrate how these interactions work and how changing attributes in one object affects the result in the other.