

Variables in Python

Lab Objective:

By the end of this lab, students will:

1. Understand how to declare and initialize variables in Python.
2. Learn about different data types such as integers, floats, strings, and booleans.
3. Perform operations on variables and understand variable scope.
4. Convert variables from one type to another (type casting).

Part 1: Introduction to Variables

Objective:

- Understand what variables are and how they store data in memory.

Concept:

- A **variable** is a container for storing data values. It acts as a label for a value you assign to it.

Tasks:

1. **Variable Declaration and Initialization:**
 - Declare a variable and assign it a value.

Code Example:

```
# Declare variables
age = 25 # Integer
height = 5.9 # Float
name = "Alice" # String
is_student = True # Boolean

# Print the values
print("Age:", age)
print("Height:", height)
print("Name:", name)
print("Is student:", is_student)
```

2. Check Variable Type:

- Use the `type()` function to determine the type of a variable.

Code Example:

```
# Check the data types of the variables
print(type(age)) # Output: <class 'int'>
print(type(height)) # Output: <class 'float'>
print(type(name)) # Output: <class 'str'>
print(type(is_student)) # Output: <class 'bool'>
```

Exercise 1:

- Declare variables for your **name**, **age**, and whether you are a student (**True** or **False**). Print these values along with their types.

Part 2: Variable Operations

Objective:

- Learn how to perform arithmetic and string operations on variables.

Tasks:

1. Perform Arithmetic Operations:

- Use basic arithmetic operations on numeric variables.

Code Example:

```
# Arithmetic operations

num1 = 10
num2 = 5
sum_result = num1 + num2
diff_result = num1 - num2
prod_result = num1 * num2
div_result = num1 / num2 # Division returns a float

print("Sum:", sum_result)
print("Difference:", diff_result)
print("Product:", prod_result)
print("Division:", div_result)
```

2. String Concatenation:

- Combine multiple strings using the + operator.

Code Example:

```
first_name = "John"
last_name = "Doe"
full_name = first_name + " " + last_name # Concatenating strings
print("Full Name:", full_name)
```

Exercise 2:

- Declare two variables for your **first name** and **last name**. Concatenate them to create a full name and print it.

Part 3: Type Casting

Objective:

- Learn how to convert variables from one data type to another (e.g., from integer to string, float to integer).

Tasks:

1. Convert Integer to String:

- Convert an integer variable to a string and print it.

Code Example:

```
age = 25
age_str = str(age) # Convert integer to string
print("Age as string:", age_str)
print("Type of age_str:", type(age_str))
```

2. Convert String to Integer:

- Convert a string containing digits into an integer.

Code Example:

```
height_str = "5.9"
height_float = float(height_str) # Convert string to float
print("Height as float:", height_float)
print("Type of height_float:", type(height_float))
```

Exercise 3:

- Declare an integer variable for your age. Convert it into a string and print its type before and after conversion.

Part 4: Variable Scope

Objective:

- Understand the concept of variable scope, i.e., where a variable can be accessed within a program.

Tasks:

1. **Local vs Global Variables:**
 - Explore the difference between global and local variables.

Code Example:

```
# Global variable
greeting = "Hello"

def greet():
    # Local variable
    greeting = "Hi"
    print("Inside function:", greeting)

greet()
print("Outside function:", greeting)
```

Exercise 4:

- Create a function that declares a local variable and prints its value. Then, print the value of a global variable with the same name outside the function.

Part 5: Constants in Python

Objective:

- Understand how to declare and use constants in Python.

Concept:

- In Python, constants are usually declared by naming variables in **all uppercase letters**. Although Python does not have built-in constant types, this convention signals that the value should not be changed.

Code Example:

```
PI = 3.14159
GRAVITY = 9.8
print("Pi:", PI)
print("Gravity:", GRAVITY)
```

Exercise 5:

- Declare a constant for **Earth's gravity** and another for the **speed of light**. Print both values.

Assignment:

1. Problem 1:

- Write a Python program that declares three variables: an **integer**, a **float**, and a **string**. Perform operations on them, including addition, multiplication, and string concatenation. Print the results along with the types of the variables.

2. Problem 2:

- Write a Python program that asks the user to input their **name** and **age**. Convert the age into a string and print a message that says: "Hello [Name], you are [Age] years old."

Hint: Use the `input()` function to take user input.

3. Problem 3:

- Create a Python program that declares a **global variable** and a **local variable** inside a function. Print both variables to demonstrate the concept of scope.

4. Problem 4:

- Create a program that defines a constant value for the **radius of a circle** and calculates its **area** using the formula $\text{Area} = \text{PI} * \text{radius}^2$. Print the area of the circle.

5. Problem 5:

- Write a Python script that declares two string variables, one for your **first name** and one for your **last name**. Convert both to uppercase and print them together as a full name.