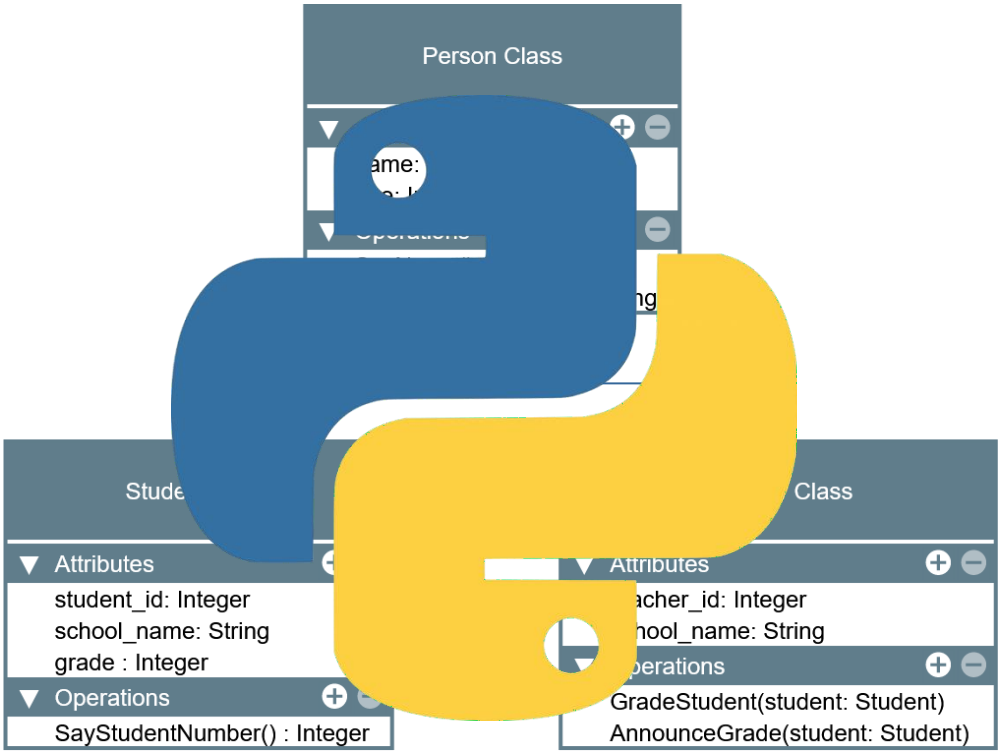
UNIVERSITY OF CALOOCAN CITY
Caloocan, 1400 Metro Manila, Philippines

COLLEGE OF ENGINEERING
Computer Engineering
2nd Semester, School Year 2024-2025



LABORATORY MANUAL

Object-Oriented Programming (CPE 103)

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Laboratory Activity No. 2.1	
Literals, Operators, and Variables	
Course Code: CPE103	**Program:** BSCPE
Course Title: Object-Oriented Programming	**Date Performed:** January 25, 2025
Section: 1A	**Date Submitted:** January 31, 2025
Name: Directo, Hannah Thea	**Instructor:** Engr. Maria Rizette Sayo

1. Objective(s):

This activity aims to familiarize students in the various data types of Python, assign values to variables, and perform operations in a Python program.

2. Intended Learning Outcomes (ILOs):

The students should be able to:
2.1 Assign different values to variables in Python
2.2 Perform different operations available with variables in Python

3. Discussion:

The **Python** programming language is an interpreted language meaning the lines are evaluated line-by-line at runtime because there is no compile time at Python. This means that Python can dynamically allocate memory to variables as needed depending on the line of code that it interprets that is why Python is also referred to as a Dynamically typed language.

Like other programming languages such as C/C++ and Java, Python can also assign values to specific blocks of memory through variables as well as perform operations such as but not limited to Addition, Subtraction, Multiplication, Division, and Modulo(remainder). This activity will focus on assigning values and performing operations in Python.

Recall that a **variable** is a name that points to a specific location in memory where the data is stored. A variable can be allocated memory based on the data type it is assigned with which in Python can be: **Integer**, **Float**, **Complex Number**, **Boolean**, and **String**. In Python, **lists**, **tuples**, and **dictionaries** are also referred to as data types specifically sequences. More information can be found here (https://docs.python.org/3.8/reference/datamodel.html?highlight=data%20type#objects -values-and-types). These will be discussed further in lab activities.

Variables in Python are assigned in the following manner:

variable_name = value

Literals refers to the raw data given in a variable or constant. Literals can be some of the following: Numeric, Complex, String, Boolean, Special. Other literals are list, tuple, dict, set, and Unicode literals.

4. Materials and Equipment:

Desktop Computer with Anaconda Python /Python Colab
Windows Operating System

5. Procedure:

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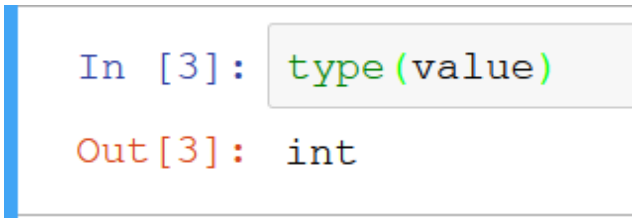
Perform the activity using the Jupyter Notebook
This activity can be done either locally on Anaconda's Jupyter Notebook or online through Google Collaboratory which offers a free Jupyter Notebook environment for Google Users. IPython Notebook files (.ipynb) that are saved in the Google Drive can be opened on Google Collaboratory. Additional guides are available on the IPython Notebook template file that is provided wit h this activity. If the template is not present, these are the valuable links for reference:

https://jupyter-notebook.readthedocs.io/en/stable/examples/Notebook/Notebook%20Basics.html
https://colab.research.google.com/notebooks/welcome.ipynb
https://colab.research.google.com/notebooks/markdown_guide.ipynb

Assigning variables of different data types in Python

1. In an empty cell, declare a variable **value** and assign it the value of 5 then display its value using print().
2. Create a new cell and type the command: type(value) then run the cell. The output should be like the image below.



3. In a new cell, use the same variable **value** and assign it the value of 5.0 then print the value.
4. Repeat step 2.
   Note: You may choose to decide how you execute the code in the cells for the next tasks in the procedure.
5. Repeat these steps for the following values:
   a. 2+3j
   b. 'Hello World'
   c. "Hello World"
   d. True
   e. False
   f. [1,2,3,4,5]
   g. (1,2,3,4,5)
   h. { 'name': 'Your_name' }
   i. None
6. Re-assign the **value** variable to be equal to 5.
7. Declare a new variable named **value2** to be equal to -6.

Performing Operations with Python

1. Using **value** and **value2**. Type the command: print(**value**+**value2**)
2. Repeat step 1 for the following values of **value** and **value2**:
   Hint: You may try using this assignment ***value, value2 = 5, -6*** in the Notebook for the following steps:
   a. value, value2 = 5.0, 6
   b. value, value2 = -5, 6.1
   c. value, value2 = "Hello", 'world'

Note: Modify the code so that hello and world would be separated.

d. value, value2 = [1,2,3], [4,5,6]
e. value, value2 = (1,2,3), (4,5,6)
f. value, value2 = {"name":"Royce"}, {"age":2}
Note: Observe the outputs carefully and try repeating them using subtraction.

3. Using value, value2 = 30, 4. Type the commands:
   a. print(value*value2)
   b. print(value2**2)
   c. print(value2**3)
   d. print(value*value2+value2**2+1)
   e. print(value/value2)
   f. print(value%value2)

Receiving Input Data using Python

Data can be received through keyboard input in Python by using the input() function. The input function has the following syntax:

input("Message Name")

The "Message Name" is an optional String parameter that can be customized to prompt the user for a message instead of having to print a message prompt separately. The default return value of the input() function is a String containing the value received from the keyboard. This value can be assigned to a variable shown in the example below:

name = input("Enter your name: ")

Assigning Input Data to a Variable

Finding a person's BMI (metric)

1. Declare a new variable named **name** and assign it the value **input("Enter your name")**
2. Create another variable named **weight** and assign it the value **input("Enter your weight(kg): ")**
3. Create another variable named **height** and assign it the value **input("Enter your meters(m): ")**
4. Declare another variable called **bmi** and assign it the formula $bmi = \frac{weight}{height^2}$
5. Address the errors displayed step#4. You can accomplish this by converting the String input to another data type. An example would be:

   weight = input("Enter your weight(kg)")
   weight = float(weight)

   Or simply **weight** = float(input("Enter your weight(kg): "))

   There are many functions available that can convert one data type to another. Some of which are the following:
   int(), float(), str()

Other functions which maybe used in the later lab activities are: complex(real, imaginary), list(), tuple(), set(), dict(), ord(), bin(), hex(), oct().

6. Print the persons's name, weight, height, and bmi
   Name: John Ray
   Weight: 60
   Height: 1.6764
   BMI = 21.3499

   Guide: 5.5 feet ~ 1.6764 m

Hint: You can combine two values by converting the output value to String and Concatenating (Addition) the operator on two strings.

print("Value: "+str(12))

You may explore many other methods to format values onto the print() function in Python. Another example is the following:

print("Value: ", 12)

6. Supplementary Activity:

Tasks

1. **Write the Python equivalent code of the following C code:**

```
int main(){
    float base = 0, height = 0, area = 0;
    printf("Enter the base of the triangle: ");
    scanf("%f", &base);
    printf("Enter the height of the triangle: ");
    scanf("%f", &height);
    area = (1/2)*base*height;
    print("The area of the triangle is %f", area);
}
```

2. **Write a program that would convert Celsius to Fahrenheit given the formula: F = (C × 9/5) + 32**
   Example of conversion:

   0°C = 32 °F
   -20°C = -4 °F

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3. **Write a program that can determine the distance between two points given the coordinates using the formula:**

$$d = \sqrt{(x_{2\ ji} - x_1)^2 + (y_2 - y_1)^2}$$

Hint/Rule: No library or package is needed to implement this equation.

Example: x2, y2 = -3, 3 and x1, y1 = 2, 2 d = 5.099019514

Laboratory Activity No. 2.1 (Literals, Operators, and Variables) - Colab

Questions:

1. **Give one major difference in syntax that Python has with other languages such as C?**

The difference between Python and languages like C is how code blocks are defined. In python, indention is used to indicate the start and end of blocks, making it mandatory for the code to be properly intended. On the other hand. In contrast, C uses curly braces {} to define code blocks, making indention optional for structure. This gives Python a more readable, visually structured style but requires careful attention to Indentation.

2. **How does variable assignment differ in Python compared with other languages such as C?**

Python's dynamic typing makes variable assignment easier and more flexible than in C. Python allows you to reassign variables to other types and does not require you to declare them type because it is deduced from the assigned value. Variables in C, on the other hand, can only contain values of the designated type and explicit type declarations are necessary.

3. **Try assigning variable names that start with numbers, and special characters. Is the assigning of variables that start with numbers accepted by Python? For Special Characters? Is there an exception for variables special characters?**

In Python, variable names cannot start with numbers. They must begin with a letter (a-z, A-Z)

or an underscore (_). If the variable name begins with a number or other special characters the result would be SyntaxError. The only exception is the underscore (_), which is permissible and often used in variable names, such as my_variable. However, special characters other than the underscore are not accepted in variable names.

4. Do the assignment operators (+, -, *, /, %, **) work for all data types? Why or Why not?

No, assignment operators do not work for all data types in Python because different types have specific rules for operations and have different behaviors. Example, for non-numeric data types, only certain operators work. Strings allow + for joining ("Hello" + " World" → "Hello World") and * for repetition ("Hello" * 3 → "HelloHelloHello"), but other arithmetic operations like -, /, or % cause errors. Lists and tuples support + for combining ([1, 2, 3] + [4, 5, 6] → [1, 2, 3, 4, 5, 6]) and * for repetition but do not allow subtraction or division. just like in the previous activity wherein we need to try the given data and repeat them using subtraction. Only the first 3 data run and the others shows error.

5. How does the * operator differ from the ** operator?

The * operator is used for multiplication with numbers (5 * 3 → 15) and repetition with sequences ("Hello" * 3 → "HelloHelloHello", [1, 2] * 2 → [1, 2, 1, 2]). In contrast, the ** operator is used for exponentiation (2 ** 3 → 8). The * operator is commonly used for multiplication in arithmetic operations, as well as for repeating elements in sequences like lists and strings. On the other hand, the ** operator is primarily used for exponentiation in mathematical calculations, raising a number to a specified power.

7. Conclusion:

In this lab activity, we learned about Python's approach to variable assignment, data types, arithmetic operations, and user input handling. Unlike C, Python uses indentation for code structure and allows dynamic typing, making it more flexible for variable assignments. Through these exercises, we observed how different data types behave when assigned to variables and how operators function across various types. By performing operations using arithmetic and assignment operators, we learned that while some operators (+, *) can be used with multiple data types (such as concatenating strings or repeating lists), others (-, /, %) are strictly for numerical operations and shows error with other data types. In this laboratory activity provided a foundational understanding of Python's variable management and operations.

8. Assessment Rubric: