



UNIVERSITY OF ENGINEERING AND TECHNOLOGY PESHAWAR, JALOZAI CAMPUS

Lab 2: Basic Python Data Types

Lab Title: EE-271, “OOP & Data Structures Lab”

Note: Using the internet is encouraging for finding relevant code and modifying it for the problem at hand.

Time: 10 min/ Task

Lab Report Tasks:

Find Total Impedance

- i. Add the three impedances.
- ii. Print **real part** (resistive) and **imaginary part** (reactive).
- iii. Print **magnitude** and **phase angle** (use `abs()` and `cmath.phase()`).

Lab work tasks:

1. String formatting

Imagine you are writing a Python program to generate lab reports for an experiment automatically.

Each report must show the resistor value, current through it, and the calculated voltage using different formatting styles.

Run the Code and Observe the Output

Task 1: Set up Variables

```
resistance = 10
current = 2.5324
voltage = resistance * current
```

Task 2: Old-Style Formatting (%)

```
print("The resistor value is %d Ω" % resistance)
print("The current is %.2f A" % current)
print("The voltage across the resistor is %.2f V" % voltage)
```

Task 3: .format() Method

```
print("Resistor: {} Ω, Current: {} A, Voltage: {} V".format(resistance, current, voltage))
print("Voltage across {} Ω resistor with {} A current is {} V".format(resistance, current, voltage))
```

Note: More flexible allows ordering and naming.

Task 4: f-Strings

```
print(f"Resistor: {resistance} Ω, Current: {current:.2f} A, Voltage: {voltage:.2f} V")
```

Note: Modern, fastest, and easiest to read. Preferred in new Python code.

2. File Handling: Integer number and string

Please read the attached CSV file (you can easily create it using the CSV module). Once you have read the rows, add 2 to each row and print the result.

File name: numbers.csv

In addition, use the code in multiple scenarios and play with different data types.

3. Task:

You are given a CSV file named `integers.csv` that contains one number per row (some are integers, and some are decimal numbers).

Write a Python program that:

- i. Reads all numbers from the CSV file.
- ii. Converts them into floating-point numbers.
- iii. Counts how many of them are whole numbers (integers).
- iv. Prints the total count of integers.

Note: You must not use any if statements in your program. Instead, use expressions like `.is_integer()` and built-in functions like `sum()`.

4. Task: Bit Parity Checker

Digital systems often use **parity bits** to detect errors in data transmission.

- **Even Parity** → If the number of 1s in a binary signal is even.
- **Odd Parity** → If the number of 1s in a binary signal is odd.

Task Description

Write a Python program that:

- i. Takes a binary signal stored as an integer (e.g., 0b11010110).
- ii. Counts the number of 1s in the signal using the `.bit_count()` method.
- iii. Determines whether the signal has **even parity** or **odd parity**.

iv. Prints the result clearly.

5. Task

Represent Impedance Using Complex Numbers

- Define R , L , C , and f .
- Compute $\omega=2\pi f$
- Represent Z_R , Z_L , and Z_C using Python's `complex` type.
- Print them.

Note:

```
import cmath

import math

# Circuit parameters

R = 50          # ohms

L = 0.1         # H

C = 100e-6      # F

f = 60          # Hz

w = 2 * math.pi * f

# Impedances

Z_R = complex(R, 0)

Z_L = complex(0, w * L)

Z_C = complex(0, -1 / (w * C))

print("Resistor Impedance:", Z_R)

print("Inductor Impedance:", Z_L)

print("Capacitor Impedance:", Z_C)
```

6. Task

Find Total Impedance

- iv. Add the three impedances.
- v. Print **real part** (resistive) and **imaginary part** (reactive).
- vi. Print **magnitude** and **phase angle** (use `abs()` and `cmath.phase()`).

7. Task

Compute Circuit Current

- i. Assume AC voltage source $V=120\angle 0^\circ \text{V} = 120\angle 0^\circ \text{V} = 120\angle 0^\circ \text{V}$ (so in Python `V = complex(120, 0)`).
- ii. Compute current:
- iii. Print current magnitude and phase.

8. Task: Run and understand

a. Ohm's Law

```
V = 230      # volts

I = 5        # amps

R = V / I    # ohms


# Using f-string

print(f"The voltage is {V} V, the current is {I} A, so the resistance
is {R:.2f} Ω.")


# Using .format()

print("The voltage is {} V, the current is {} A, so the resistance is
 {:.2f} Ω.".format(V, I, R))
```

b. AC Power

```
P = 2000     # watts

V = 220      # volts

I = P / V    # amps
```

```
print(f"The real power is {P} W at {V} V supply, drawing {I:.2f} A  
current.")

print("The real power is {0} W at {1} V supply, drawing {2:.2f} A  
current.".format(P, V, I))
```

c. RLC Circuit Impedance

```
R = 50

X_L = 30

X_C = 20

Z = complex(R, X_L - X_C)

print(f"Impedance of the circuit is {Z.real} + j{Z.imag} Ω.")

print("Impedance of the circuit is {0} + j{1} Ω.".format(Z.real,  
Z.imag))
```

d. Efficiency Calculation

```
P_out = 950    # watts

P_in = 1000    # watts

eff = (P_out / P_in) * 100

print(f"The machine efficiency is {eff:.1f}% when output is {P_out} W  
and input is {P_in} W.")

print("The machine efficiency is {:.1f}% when output is {} W and input  
is {} W.".format(eff, P_out, P_in))
```

9. Task

Write a Python program that:

- i. Reads a given directory path.
- ii. Checks all files in that directory.
- iii. Counts how many files are PDF files (ending with .pdf).
- iv. Prints the total number of PDF files.