



## 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

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#### **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 {} current 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  $V=120\angle 0^\circ V = 120\angle 0^\circ V=120\angle 0^\circ$  V (so in Python  $V = \text{complex}(120, 0)$ ).
  - 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.