

# Modules, Packages, and File I/O

## 1. Modules and Packages

Definition:

A module in Python is simply a file containing Python code (functions, classes, variables). A package is a collection of modules organized in directories with an `__init__.py` file.

Syntax:

```
import module_name  
from module_name import function_name  
from package_name import module_name
```

Example:

```
# math module example  
import math  
print(math.sqrt(16)) # Output: 4.0
```

```
# custom module example (mymodule.py)  
def greet(name):  
    return f'Hello {name}'
```

```
from mymodule import greet  
print(greet('Athar'))
```

Assignment:

1. Create a module named calculator with functions add, subtract, multiply, divide.
2. Import this module into another file and perform operations.

## 2. File I/O Operations

Definition:

File I/O (Input/Output) refers to reading from and writing to files in Python.

Syntax:

```
f = open('filename.txt', 'mode')  
f.read() / f.readline() / f.readlines()  
f.write('text')  
f.close()
```

Modes: 'r' - read, 'w' - write, 'a' - append, 'rb' - read binary, 'wb' - write binary

Example:

```
# Writing to a file
with open('sample.txt', 'w') as f:
    f.write('Hello World')
```

```
# Reading from a file
```

```
with open('sample.txt', 'r') as f:
    content = f.read()
    print(content)
```

Assignment:

1. Write a program to create a file and store 5 student names.
2. Read the file and display the names.

### 3. Modular Programming in Python

Definition:

Modular Programming is the practice of breaking large programs into smaller, independent, and reusable modules.

Best Practices:

- Keep functions small and focused.
- Use meaningful names for modules, functions, and variables.
- Group related functions into modules.
- Use packages to organize modules in large projects.
- Write reusable and maintainable code.

Example:

```
# file: math_operations.py
def add(a, b):
    return a + b

def subtract(a, b):
    return a - b

# main.py
import math_operations
print(math_operations.add(10, 5))
print(math_operations.subtract(10, 5))
```

Assignment:

1. Create a package named 'school' with modules student.py and teacher.py.
  - student.py should have functions add\_student, list\_students.
  - teacher.py should have functions add\_teacher, list\_teachers.
2. Import and use these modules in a main program.