**Modules and Submodules in Python**

In Python, **modules** and **submodules** help in organizing code into reusable and manageable components. They are used to logically structure a program by grouping related functions, classes, and variables.

**1. What is a Module?**

A **module** is a single Python file (.py) that contains Python code, such as functions, classes, and variables. Modules help in code reuse and organization.

**Example of a Module**

Let's create a module named math\_operations.py:

# math\_operations.py

def add(x, y):

return x + y

def subtract(x, y):

return x - y

**Using the Module**

You can import and use the module in another script:

import math\_operations

print(math\_operations.add(5, 3)) # Output: 8

print(math\_operations.subtract(10, 4)) # Output: 6

Alternatively, you can import specific functions:

from math\_operations import add

print(add(7, 2)) # Output: 9

**2. What is a Submodule?**

A **submodule** is a module inside a package. A package is a collection of modules organized in directories, with each package containing an \_\_init\_\_.py file (in Python 3.3+, this file is optional).

**Example of a Package with Submodules**

Consider a package mypackage with the following structure:

mypackage/

│── \_\_init\_\_.py # Marks 'mypackage' as a package

│── operations.py # A module inside the package

│── subpackage/

│ │── \_\_init\_\_.py # Marks 'subpackage' as a subpackage

│ │── advanced\_math.py # A submodule

**Contents of operations.py**

# operations.py

def multiply(x, y):

return x \* y

def divide(x, y):

if y != 0:

return x / y

else:

return "Cannot divide by zero"

**Contents of subpackage/advanced\_math.py**

# advanced\_math.py

import math

def square\_root(x):

return math.sqrt(x)

**Importing from Modules and Submodules**

You can import and use the package and its submodules like this:

import mypackage.operations

from mypackage.subpackage import advanced\_math

print(mypackage.operations.multiply(3, 4)) # Output: 12

print(advanced\_math.square\_root(16)) # Output: 4.0

**3. Summary**

| **Feature** | **Module** | **Submodule** |
| --- | --- | --- |
| Definition | A single Python file (.py) containing code | A module within a package, typically inside a subdirectory |
| Structure | Standalone Python file | Exists inside a package or subpackage |
| Example | math\_operations.py | mypackage.subpackage.advanced\_math |
| Import | import module\_name | from package.subpackage import submodule |