Python Modules and Libraries: Student Handout

Introduction to Modules and Libraries

Modules and libraries in Python allow you to use pre-written code to solve problems efficiently. Instead of writing everything from scratch, you can leverage existing solutions.

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1. What is a Python Module?

A **module** is a file containing Python code, including functions, classes, and variables. You can import a module into your program to use its code.

How to Use a Module?

To use a module, you need to import it using the `import` statement.

Example 1: Using the `math` Module

```python
import math

# Calculate the square root of 16
result = math.sqrt(16)
print(result)  # Output: 4.0
```

Example 2: Using the `random` Module

```python
import random

# Generate a random number between 1 and 10
random_number = random.randint(1, 10)
print(random_number)
```

Example 3: Using the `statistics` Module

```
import statistics

# Calculate the mean of a list of numbers
data = [1, 2, 3, 4, 5]
mean_value = statistics.mean(data)
print(mean_value)  # Output: 3
```

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2. What is a Python Library?

A **library** is a collection of modules that are related to each other. Libraries help you perform specific tasks without writing all the code yourself.

Popular Python Libraries

Example 1: NumPy

NumPy is used for numerical computations and provides support for arrays and matrices.

```
import numpy as np

# Create a NumPy array
array = np.array([1, 2, 3, 4, 5])
print(array)
```

Example 2: Pandas

Pandas is used for data manipulation and analysis, providing data structures like DataFrames.

```
import pandas as pd

# Create a DataFrame
data = {'Name': ['Alice', 'Bob'], 'Age': [25, 30]}
df = pd.DataFrame(data)
print(df)
```

Example 3: Matplotlib

Matplotlib is used for creating visualizations like graphs and charts.

```python
import matplotlib.pyplot as plt

# Plot a simple line graph
plt.plot([1, 2, 3], [4, 5, 6])
plt.show()
```

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3. Importing and Using Built-in Modules

Python has several built-in modules that you can use without installing anything.

Built-in Modules

Example 1: The `datetime` Module

```python
import datetime

# Get the current date and time
current_time = datetime.datetime.now()
print(current_time)
```

Example 2: The `os` Module

```python
import os

# Get the current working directory
current_directory = os.getcwd()
print(current_directory)
```

Example 3: The `sys` Module

```python
import sys

# Get the list of command-line arguments
```

```
arguments = sys.argv
print(arguments)
```

4. Installing External Libraries

For external libraries, you need to install them using a package manager like `pip`.

Installing a Library

Example: Installing NumPy

```
pip install numpy
```

Conclusion

- A **module** is a file containing Python code.
- A **library** is a collection of related modules.
- Use built-in modules like `math`, `datetime`, `os`, and `sys` without installation.
- Install external libraries using `pip`.

By using modules and libraries, you can save time and effort in your programming tasks. Happy coding!