



INTRODUCTION TO PYTHON MODULES



- A module is a file containing Python definitions and statements.
- It allows code reusability, better organization and makes our program easy to maintain.
- Python comes with many built-in modules in the standard library.

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① IMPORTING MODULES

(A) Using `import <module>` statement

- Imports the entire module.
- To access members, use: `module_name.member_name`

Example:

```
import math
print(math.pi)      # 3.141592653589793
print(math.sqrt(16)) # 4.0
print(math.e)       # 2.718281828459045
```

(B) Using `from <module> import <name1, name2, ...>` statement

- Imports specific members from a module.
- Members can be used directly without module name.

Example:

```
from math import pi, sqrt
print(pi)      # 3.141592653589793
print(sqrt(25)) # 5.0
```

Note

- Use `import <module>` when you need many functions from a module.
- Use `from ... import ...` when you need only few functions.



② MATH MODULE

Provides mathematical functions and constants.

import math

Member	Description	Example	Output
<code>math.pi</code>	Value of pi (π)	<code>print(math.pi)</code>	3.141592653589793
<code>math.e</code>	Value of e (Euler's number)	<code>print(math.e)</code>	2.718281828459045
<code>math.sqrt(x)</code>	Square root of x	<code>print(math.sqrt(25))</code>	5.0
<code>math.ceil(x)</code>	Smallest integer greater than or equal to x	<code>print(math.ceil(4.2))</code>	5
<code>math.floor(x)</code>	Greatest integer less than or equal to x	<code>print(math.floor(4.8))</code>	4
<code>math.pow(x, y)</code>	x raised to the power y	<code>print(math.pow(2, 3))</code>	8.0
<code>math.fabs(x)</code>	Absolute value of x (always positive)	<code>print(math.fabs(-8))</code>	8.0
<code>math.sin(x)</code>	Sine of x (x in radians)	<code>print(round(math.sin(math.pi/2), 5))</code>	1.0
<code>math.cos(x)</code>	Cosine of x (x in radians)	<code>print(round(math.cos(0), 5))</code>	1.0
<code>math.tan(x)</code>	Tangent of x (x in radians)	<code>print(round(math.tan(math.pi/4), 5))</code>	1.0

Example Program

Find area of a circle using math module.

```
import math
r = float(input("Enter radius: "))
area = math.pi * math.pow(r, 2)
print("Area =", round(area, 2))
```

Sample Run:

Enter radius: 7
Area = 153.94

③ RANDOM MODULE

Generates pseudo-random numbers.

import random

Function	Description	Example	Output (may vary)
<code>random.random()</code>	Returns a random float in the range [0.0, 1.0)	<code>print(random.random())</code>	0.374829
<code>random.randint(a, b)</code>	Returns a random integer N such that $a \leq N \leq b$	<code>print(random.randint(1, 10))</code>	7
<code>random.randrange(start, stop, step)</code>	Returns a randomly selected element from range	<code>print(random.randrange(1, 100, 10))</code>	41

Example Program

Generate a random number between 1 and 50.

```
import random
n = random.randint(1, 50)
print("Random number:", n)
```

Sample Run:

Random number: 23



④ STATISTICS MODULE

Provides functions for statistical calculations.

import statistics

Function	Description	Example	Output
<code>statistics.mean(data)</code>	Returns arithmetic mean	<code>print(statistics.mean([10, 20, 30, 40]))</code>	25
<code>statistics.median(data)</code>	Returns median value	<code>print(statistics.median([10, 20, 30, 40]))</code>	25.0
<code>statistics.mode(data)</code>	Returns mode (most common value)	<code>print(statistics.mode([1, 2, 2, 3, 2, 4]))</code>	2

Example Program

Find mean, median and mode of a list of numbers.

```
import statistics
data = [12, 15, 12, 18, 20, 15, 12]
print("Mean : ", statistics.mean(data))
print("Median : ", statistics.median(data))
print("Mode : ", statistics.mode(data))
```

Sample Run:

Mean : 14.857142857142858
Median : 15
Mode : 12



Key Points

- ✓ Modules make programs modular and reusable.
- ✓ Import the module using `import` or `from`.
- ✓ math for advanced math operations.
- ✓ random for generating random numbers.
- ✓ statistics for basic statistical calculations.

When to use which module?

- Use math for calculations in science, engineering and games.
- Use random in games, simulations, lotteries.
- Use statistics in data analysis and reporting.

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