# Python Modules and Math Module Methods

## Part 1: What are Modules in Python?

A module in Python is a file containing Python code (functions, classes, or variables) that can be imported and reused in other programs.  
Modules help organize code, promote reuse, and keep programs manageable.

* Types of Modules:
* 1. Built-in Modules – already provided by Python (e.g., math, random, os)
* 2. User-defined Modules – created by the programmer
* Importing a Module:
* import math
* from math import sqrt

## Part 2: math Module Methods

The math module provides built-in mathematical functions and constants. It needs to be imported before use:  
import math

### math.sqrt(x)

* 👉 Purpose: Returns the square root of x (x must be non-negative).
* 🔍 Examples:
* • math.sqrt(25) → 5.0
* • math.sqrt(2) → 1.41...
* • math.sqrt(0) → 0.0

### math.pow(x, y)

* 👉 Purpose: Returns x raised to the power y. Always returns a float.
* 🔍 Examples:
* • math.pow(2, 3) → 8.0
* • math.pow(9, 0.5) → 3.0
* • math.pow(5, 0) → 1.0

### math.floor(x)

* 👉 Purpose: Returns the largest integer less than or equal to x.
* 🔍 Examples:
* • math.floor(5.9) → 5
* • math.floor(2.1) → 2
* • math.floor(-1.1) → -2

### math.ceil(x)

* 👉 Purpose: Returns the smallest integer greater than or equal to x.
* 🔍 Examples:
* • math.ceil(5.1) → 6
* • math.ceil(3.0) → 3
* • math.ceil(-2.8) → -2

### math.fabs(x)

* 👉 Purpose: Returns the absolute value of x as a float.
* 🔍 Examples:
* • math.fabs(-10) → 10.0
* • math.fabs(5.5) → 5.5
* • math.fabs(0) → 0.0

### math.factorial(x)

* 👉 Purpose: Returns the factorial of x (x must be a non-negative integer).
* 🔍 Examples:
* • math.factorial(5) → 120
* • math.factorial(0) → 1
* • math.factorial(3) → 6

### math.gcd(x, y)

* 👉 Purpose: Returns the greatest common divisor of x and y.
* 🔍 Examples:
* • math.gcd(12, 18) → 6
* • math.gcd(7, 5) → 1
* • math.gcd(15, 0) → 15

### math.log(x, base)

* 👉 Purpose: Returns the logarithm of x to the given base. If no base is given, returns natural log.
* 🔍 Examples:
* • math.log(10) → 2.30...
* • math.log(100, 10) → 2.0
* • math.log(8, 2) → 3.0

### math.log10(x)

* 👉 Purpose: Returns the base-10 logarithm of x.
* 🔍 Examples:
* • math.log10(100) → 2.0
* • math.log10(1000) → 3.0
* • math.log10(1) → 0.0

### math.sin(x)

* 👉 Purpose: Returns the sine of x (x in radians).
* 🔍 Examples:
* • math.sin(0) → 0.0
* • math.sin(math.pi/2) → 1.0
* • math.sin(math.pi) → ~0.0

### math.cos(x)

* 👉 Purpose: Returns the cosine of x (x in radians).
* 🔍 Examples:
* • math.cos(0) → 1.0
* • math.cos(math.pi/2) → ~0.0
* • math.cos(math.pi) → -1.0

### math.tan(x)

* 👉 Purpose: Returns the tangent of x (x in radians).
* 🔍 Examples:
* • math.tan(0) → 0.0
* • math.tan(math.pi/4) → 1.0
* • math.tan(math.pi) → ~0.0

### math.degrees(x)

* 👉 Purpose: Converts x from radians to degrees.
* 🔍 Examples:
* • math.degrees(math.pi) → 180.0
* • math.degrees(math.pi/2) → 90.0
* • math.degrees(1) → ~57.29

### math.radians(x)

* 👉 Purpose: Converts x from degrees to radians.
* 🔍 Examples:
* • math.radians(180) → π
* • math.radians(90) → π/2
* • math.radians(45) → π/4

### math.pi

* 👉 Purpose: Mathematical constant π (pi).
* 🔍 Examples:
* • math.pi → 3.14159...
* • round(math.pi, 2) → 3.14
* • math.pi \* 2 → 6.2831...

### math.e

* 👉 Purpose: Mathematical constant Euler's number (e).
* 🔍 Examples:
* • math.e → 2.718...
* • math.e\*\*1 → 2.718...
* • math.log(math.e) → 1.0