# Python Basic Libraries: math, datetime, and random

This notebook will teach you about three important Python libraries:

- math → Mathematical operations
- datetime → Working with dates and times
- (random) → Generating random numbers

We'll learn with examples, explanations, and practice code.

### 1. math Library

The (math) module provides mathematical functions like trigonometry, logarithms, power, square root, and constants.

```
import math
```

#### Commonly Used Functions

```
# Square root and power
print("Square root of 16:", math.sqrt(16))
print("2 raised to power 5:", math.pow(2, 5))

Square root of 16: 4.0
2 raised to power 5: 32.0
```

```
# Constants
print("Pi:", math.pi)
print("Euler's number:", math.e)

Pi: 3.141592653589793
Euler's number: 2.718281828459045
```

```
# Logarithmic functions
print("Natural log of e:", math.log(math.e))
print("Log base 10 of 100:", math.log10(100))

Natural log of e: 1.0
Log base 10 of 100: 2.0
```

```
# Rounding functions
print("Ceil of 4.2:", math.ceil(4.2))
print("Floor of 4.8:", math.floor(4.8))
print("Factorial of 5:", math.factorial(5))

Ceil of 4.2: 5
Floor of 4.8: 4
Factorial of 5: 120
```

# 🗸 🔷 2. datetime Library

The datetime module is used to work with dates and times.

import datetime

```
# Current date and time
now = datetime.datetime.now()
print("Current Date & Time:", now)
print("Only Date:", now.date())
print("Only Time:", now.time())
Current Date & Time: 2025-09-24 17:55:03.563703
Only Date: 2025-09-24
Only Time: 17:55:03.563703
# Creating a specific date
d = datetime.date(2025, 9, 24)
print("Specific Date:", d)
Specific Date: 2025-09-24
# Formatting dates
print("Formatted:", now.strftime("%d-%m-%Y %H:%M:%S"))
Formatted: 24-09-2025 17:55:03
# Difference between dates
date1 = datetime.date(2025, 1, 1)
date2 = datetime.date(2025, 9, 24)
diff = date2 - date1
print("Days Difference:", diff.days)
Days Difference: 266
# Adding/Subtracting time
from datetime import timedelta
print("10 days later:", now + timedelta(days=10))
print("5 hours earlier:", now - timedelta(hours=5))
10 days later: 2025-10-04 17:55:03.563703
5 hours earlier: 2025-09-24 12:55:03.563703
```

# 3. random Library

random.shuffle(nums)

The (random) module generates pseudo-random numbers. Useful for simulations, games, and testing.

```
import random

# Random float between 0 and 1
print("Random float between 0 and 1:", random.random())

Random float between 0 and 1: 0.8224970506493373

# Random integer
print("Random int between 1 and 10:", random.randint(1, 10))

Random int between 1 and 10: 1

# Random choice from a list
colors = ["Red", "Blue", "Green", "Yellow"]
print("Random Choice:", random.choice(colors))

Random Choice: Yellow

# Shuffle a list
nums = [1, 2, 3, 4, 5]
```

```
print("Shuffled List:", nums)
Shuffled List: [3, 5, 2, 1, 4]
```

```
# Random sample
print("Random Sample of 3 numbers:", random.sample(range(1, 20), 3))
Random Sample of 3 numbers: [11, 16, 3]
```

#### **Summary Table**

Library	Key Features
math	Trigonometry, logarithms, factorial, constants (pi, e), rounding
datetime	Current date/time, formatting, difference, adding/subtracting days
random	Random numbers, shuffle, choice, sampling

### 🗸 🎮 Mini Project: Random Math Quiz Game

We will build a quiz game that:

- 1. Randomly selects math questions.
- 2. Uses math library for calculations.
- 3. Uses datetime to track how long the user takes.
- 4. Uses (random) to shuffle and pick questions.

```
import math
import random
import datetime
# List of questions (using math functions)
questions = [
    ("What is the square root of 81?", math.sqrt(81)),
    ("What is 2 raised to power 6?", math.pow(2, 6)),
    ("What is factorial of 5?", math.factorial(5)),
    ("What is sin(90^\circ)?", round(math.sin(math.radians(90)), 2)),
    ("What is log base 10 of 1000?", math.log10(1000))
# Shuffle questions randomly
random.shuffle(questions)
print("@ Welcome to the Math Quiz Game!")
print("You have 5 questions. Let's begin...\n")
score = 0
start_time = datetime.datetime.now() # Start timer
for i, (q, ans) in enumerate(questions, 1):
    print(f"Q{i}: {q}")
    user_answer = input("Your answer: ")
        if abs(float(user_answer) - float(ans)) < 0.01: # Tolerance for float comparison
           print("▼ Correct!\n")
           score += 1
        else:
           print(f"X Wrong! Correct Answer = {ans}\n")
    except:
        print(f" Invalid input! Correct Answer = {ans}\n")
end_time = datetime.datetime.now() # End timer
time_taken = end_time - start_time
print(" Quiz Over!")
print(f"Your Score: {score} / {len(questions)}")
print(f"Time Taken: {time_taken.seconds} seconds")
You have 5 questions. Let's begin...
Q1: What is factorial of 5?
Your answer: 120

✓ Correct!
```

```
Q2: What is sin(90°)?
Your answer: 1
    Correct!

Q3: What is 2 raised to power 6?
Your answer: 32
    Wrong! Correct Answer = 64.0

Q4: What is log base 10 of 1000?
Your answer: 1000
    Wrong! Correct Answer = 3.0

Q5: What is the square root of 81?
Your answer: 9
    Correct!

## Quiz Over!
Your Score: 3 / 5
Time Taken: 80 seconds
```