PYTHON DEVELOPER

TASK - 2

9. **Prime Number**
   Objective: Determine if a number is prime.
   Input: A single integer nnn.
   Output: `True` if prime, otherwise `False`.
   Hint: A prime number has no divisors other than 1 and itself; check divisors up to n\sqrt{n}n.

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10. **Sum of Digits**
    Objective: Find the sum of the digits in a number.
    Input: An integer nnn.
    Output: Single integer, the sum of digits.
    Hint: Convert the number to a string, iterate through characters, and sum up the digits.

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11. **LCM and GCD**
    Objective: Calculate the Least Common Multiple (LCM) and Greatest Common Divisor (GCD) of two integers.
    Input: Two integers aaa and bbb.
    Output: Two integers: LCM and GCD of aaa and bbb.
    Hint: Use the relationship LCM(a,b)=∣a⋅b∣GCD(a,b)\text{LCM}(a, b) = \frac{|a \cdot b|}{\text{GCD}(a, b)}LCM(a,b)=GCD(a,b)∣a⋅b∣. Python's `math.gcd()` function can simplify this.

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12. **List Reversal**
    Objective: Reverse a given list without using built-in functions.
    Input: A list of integers.
    Output: Reversed list.
    Hint: Use a loop to swap elements from start to end or slice the list (`[::-1]`).

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13. **Sort a List**
    Objective: Sort a list of numbers in ascending order.
    Input: A list of integers.

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Output: A sorted list.
Hint: Use sorting algorithms like bubble sort, selection sort, or simply `sorted()`.

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14. **Remove Duplicates**
    Objective: Remove duplicate elements from a list.
    Input: A list of integers.
    Output: A list with unique elements.
    Hint: Use a `set` to eliminate duplicates or iterate and add unique elements to a new list.

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15. **String Length**
    Objective: Find the length of a string without using the `len()` function.
    Input: A string.
    Output: Integer representing the length.
    Hint: Use a loop to count characters in the string.

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16. **Count Vowels and Consonants**
    Objective: Count the number of vowels and consonants in a string.
    Input: A string.
    Output: Two integers: count of vowels and count of consonants.
    Hint: Define a set of vowels (`'a', 'e', 'i', 'o', 'u'`), and use string methods to identify letters.

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2. Maze Generator and Solver

- **Description**: Build a program that generates random mazes and solves them using techniques like Depth-First Search (DFS) or Breadth-First Search (BFS).
- **Challenges**:
    - Represent the maze as a grid using nested lists.
    - Implement logic to ensure generated mazes are solvable.
    - Visualize the maze in the terminal with clear paths and walls.
- **Skills**: Recursive algorithms, graph theory, and problem-solving.

2. Maze Generator and Solver

- **Restriction**: **No use of external libraries for visualization or graphical rendering** (like `matplotlib`, `pygame`).
- **Reason**: This restriction ensures that students **focus on core algorithmic logic** rather than visualizing the maze. The main objective is to implement algorithms like **Depth-First Search (DFS)** or **Breadth-First Search (BFS)** to generate and solve mazes programmatically. The visualization of the maze is secondary and can be achieved in a simple text-based format (like using `1` for walls and `0` for paths).
- **Learning Outcome**: Students will learn about **graph traversal algorithms**, **backtracking**, and **recursive thinking**, which are fundamental concepts in computer science.

Deadline Compliance

- **Restriction**: **Submit the project within 7 days** from the start date.
- **Reason**: Meeting deadlines is crucial in the real-world software development environment. This restriction helps students practice **time management** and **task prioritization**. In professional settings, tight deadlines are often the norm, and learning to meet them without compromising quality is an essential skill.
- **Learning Outcome**: Students will learn to manage their time effectively, complete projects under pressure, and **deliver results on time**, which are all important skills in the workplace.