• Explain the difference between Big O, Big Θ, and Big Ω notations with examples.

• What is the time complexity of this nested loop?  
  
for i in range(n):  
 for j in range(i):  
 print(i, j)

• How would you determine the space complexity of a recursive function?

• Describe your approach to solving a new programming problem on an unfamiliar topic.

• How would you break down a complex problem into smaller components? Give an example.

• Given a problem, how do you decide between recursion and iteration?

• Write code to check if a number is a twin prime.

• Implement Sieve of Eratosthenes and explain its time complexity.

• Write a function to compute the Collatz sequence for a given number.

• What is Goldbach’s conjecture? How would you attempt to test it in Python?

• Write code to calculate mean, median, and mode of a list of numbers.

• Explain the concept of standard deviation with a code example.

• How do you compute correlation and regression in Python using only built-in functions?

• Write Python code to calculate conditional probability from a dataset.

• Write a program to calculate the area of a triangle given its coordinates.

• How would you represent geometric points and compute distance between them?

• Demonstrate set operations (union, intersection, difference) using Python sets.

• Write a Python function to check if two sets are disjoint.

• Write your own implementation of a Stack using a Python list.

• Implement a Queue with enqueue, dequeue, and front operations.

• Explain the difference between a Hashtable and Dictionary in Python.

• Implement a basic Linked List with insert and delete operations.

• Write Python functions for linear search, binary search, and hash search.

• What is the time complexity of quicksort and mergesort? Show Python code for each.

• Write a function to find the Kth smallest/largest element without sorting the whole list.

• Find the maximum difference between any two elements such that the larger comes after the smaller.

• Write code to find the longest increasing subsequence in an array.

• Given a list of numbers, write a function to partition it into primes and non-primes.

• Solve the classic 'Trapping Rain Water' problem with a Python implementation.

• Write a recursive solution for generating all permutations of a list.

• What is brute-force approach to solving the subset sum problem? Write code.

• Implement N-Queens problem using backtracking in Python.

• How would you use backtracking to solve a Sudoku puzzle?