Name: _____ **Date:** _____

Big O and Heuristics: 11th Grade Algorithmic Synthesis Quiz

Logic-driven students analyze 10 complex scenarios involving Dijkstra's algorithm, O(log n) optimization, and memoization to solve computational bottlenecks.

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1. A logistics company needs to find the shortest path for deliveries in a weighted graph where some edges represent tolls. Which algorithmic approach is most appropriate for a single-source shortest path problem without negative weight edges?

A. Kruskal's Algorithm
B. Dijkstra's Algorithm
C. Breadth-First Search (BFS)
D. Depth-First Search (DFS)

2. A programmer is using Dynamic Programming to solve the Fibonacci sequence efficiently. By storing the results of expensive function calls, they are utilizing a technique called _____.

A. Recursion
B. Backtracking
C. Memoization
D. Abstraction

3. An algorithm with a time complexity of O(2^n) is considered more efficient for large datasets than an algorithm with O(n^2) complexity.

A. True
B. False

4. When designing a search feature for a massive, pre-sorted global database of Social Security numbers, which algorithm provides the best worst-case time complexity?

A. Linear Search
B. Jump Search
C. Binary Search
D. Selection Search

5. The 'Divide and Conquer' paradigm involves breaking a problem into independent subproblems, solving them, and then combining their solutions.

A. True
B. False

6. To solve the 'Traveling Salesperson Problem' for 500 cities timely, a developer must use a _____ algorithm, which provides a 'good enough' solution rather than the absolute optimum.

A. Recursive
B. Brute-force

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C. Heuristic
D. Deterministic

7. You are auditing a program that uses nested loops to compare every element in an array of size 'n' with every other element. What is the Big O complexity of this operation?

A. O(1)
B. O(n)
C. O(log n)
D. O(n^2)

8. In the context of problem decomposition, creating a high-level overview of an algorithm using a mix of natural language and code structures is known as _____.

A. Syntax
B. Pseudocode
C. Compilation
D. Scripting

9. Space complexity refers solely to the amount of permanent hard drive storage an algorithm requires to run.

A. True
B. False

10. A developer is implementing a 'Undo' feature in a text editor. Which data structure is most efficient for managing the history of changes to allow for the 'last-in, first-out' (LIFO) retrieval of states?

A. Queue
B. Stack
C. Binary Tree
D. Linked List