Name: _____ **Date:** _____

Answer Key: Do You Have the Logic to Architect This Grade 12 Advanced Code?

Evaluate high-level algorithmic patterns and memory management through code synthesis exercises designed for future software engineers.

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1. Which programming paradigm focuses on the use of 'Pure Functions' to ensure that the output is determined solely by input values without observable side effects?

Answer: B) Functional Programming

Functional programming emphasizes immutability and pure functions, minimizing side effects and state changes to enhance predictability in complex systems.

2. In the context of Big O notation and algorithm efficiency, a nested loop structure where the inner loop depends on the outer loop's size typically results in a time complexity of _____.

Answer: C) O(n^2)

Quadratic time complexity, represented as O(n^2), occurs when an operation is performed n times for each of the n elements in a data set.

3. Recursion is always more space-efficient than iterative loops because it leverages the call stack to manage local variables.

Answer: B) False

Recursion can actually be less space-efficient due to stack overflow risks and the overhead of maintaining multiple stack frames, whereas iteration usually uses a constant amount of memory.

4. Consider a scenario where you must pass a large object to a function. Which method prevents the creation of a local copy, thereby optimizing memory usage in languages like C++?

Answer: B) Pass-by-reference

Passing by reference allows the function to access the original data at its memory address, avoiding the performance hit of copying large structures.

5. Which conditional logic structure is best suited for scenarios with a high number of discrete, mutually exclusive constant values to improve readability and potentially performance via jump tables?

Name: _____ **Date:** _____

Answer: C) Switch/Case statement

Switch statements are optimized for multi-way branching and are often cleaner than long sequences of if-else statements when checking a single variable against many constants.

6. The concept of 'Scope' refers to the visibility of variables. A variable defined inside a function that cannot be accessed outside of it is known as a _____ variable.

Answer: D) Local

Local variables are confined to the block or function in which they are declared, preventing naming conflicts and accidental modification by other parts of the program.

7. In short-circuit evaluation of a logical AND (&&) operation, if the first condition is false, the second condition is never evaluated.

Answer: A) True

Since an AND operation requires both sides to be true, if the first is false, the entire expression is guaranteed false, so the compiler skips the second check for efficiency.

8. In object-oriented design, what is the process of hiding the internal details of a function's implementation while only showing the necessary interface to the user?

Answer: C) Abstraction

Abstraction reduces complexity by masking low-level logic, allowing developers to interact with higher-level concepts without needing to understand the underlying code.

9. A loop that fails to reach its termination condition and continues to execute indefinitely is referred to as an _____ loop.

Answer: B) Infinite

Infinite loops occur when the loop's condition never evaluates to false, often due to logical errors or improper incrementing/decrementing of loop control variables.

10. A 'Function' can only return a single primitive data value, and never an object or a pointer to a memory address.

Answer: B) False

Name: _____ **Date:** _____

Functions in most modern languages can return complex data types, including objects, arrays, pointers, or even other functions (first-class functions).