Name: _____ **Date:** _____

Glitch in the Matrix: High School Logic and Flow Control

Evaluate complex algorithm design through recursive thinking, Boolean logic gates, and memory management scenarios in this high-level programming assessment.

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1. A developer is optimizing a search algorithm that needs to traverse a hierarchical file system. Why might they choose a recursive function over a standard iterative loop for this task?

A. Recursion inherently uses less memory on the stack than iteration.
B. Recursive structures naturally mirror the self-similar nodes of a tree.
C. Iteration cannot be used to traverse deeply nested directories.
D. Recursion prevents the possibility of infinite loops occurring.

2. In a banking application, a variable tracking a user's account balance must remain consistent across multiple threads. This concept of limiting a variable's visibility and protecting its state is known as _____.

A. Global Initialization
B. Garbage Collection
C. Encapsulation
D. Dynamic Typing

3. In short-circuit evaluation of a Boolean AND (&&) expression, if the first condition is false, the second condition is never evaluated.

A. True
B. False

4. Consider an AI pathfinding script where an NPC moves 'while (target_found == false)'. If the target is never reachable, this creates a logic error known as:

A. A syntax violation
B. A segmentation fault
C. An infinite loop
D. A stack overflow

5. When passing a large dataset to a function, a programmer chooses to pass by _____ to avoid copying the entire data structure into memory twice.

A. Value
B. Reference
C. Default
D. Literal

6. Constants are variables whose values can be modified by the program during runtime as long as the data type remains the same.

Name: _____ Date: _____

A. True
B. False

7. In a complex 'switch' or 'case' statement, what occurs if a 'break' command is omitted after a matching condition?

A. The program immediately terminates with an error.
B. The code 'falls through' and executes subsequent cases.
C. The variable being checked is automatically reset to null.
D. The compiler skips the entire switch block.

8. An array with a fixed size of 10 elements has valid indices ranging from _____ to 9.

A. 1
B. -1
C. 0
D. 10

9. Which of the following scenarios best demonstrates the need for a nested loop structure?

A. Calculating the sum of all integers in a single list.
B. Checking if a single user input matches a hardcoded password.
C. Iterating through every pixel in a 2D image to apply a filter.
D. Toggling a light switch on or off based on a timer.

10. A global variable is accessible only within the specific function where it was first declared.

A. True
B. False