**Module 4 Critical Thinking Option #1: List Based Stack**

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Stacks and queues are fundamental data structures that can be implemented in Python using lists or linked lists.

Stacks follow the Last-In-First-Out (LIFO) principle, meaning the last element added is the first one removed. Imagine a stack of plates: the plate you put on last is the one you take off first.

Queues follow the First-In-First-Out (FIFO) principle, meaning the first element added is the first one removed. Think of a line at a store: the person who joins the line first is the first one to be served.

Python lists are good for implementing stacks because they are efficient at adding and removing elements from the end. However, they are not ideal for queues because adding or removing elements from the beginning is slow, as all the other elements need to be shifted.

Python's collections.deque is a double-ended queue implemented with a doubly-linked list. This means it allows for efficient addition and removal of elements from both ends, making it suitable for both stacks and queues.

This script first compares the time it takes to push and pop a million elements for both list-based and deque-based stacks. Then it does the same for queues. The time.time() function is used to record the time before and after each operation, and the difference is printed.

From the results, you should see that deque-based stacks and queues perform similarly to list-based stacks for pushing and popping elements at the end. However, deque-based queues are significantly faster than list-based queues for dequeuing elements, which involves removing elements from the beginning of the queue. This is because dequeues are implemented with linked lists, which allow efficient removal of elements from the beginning, while lists are implemented with dynamic arrays, which do not allow that.

**References:**

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