**E-Commerce Search Optimization**

**1. Understanding Asymptotic Notation:**

Big O notation is used to describe the time complexity of algorithms. It provides a high-level understanding of the algorithm's efficiency by expressing the relationship between the input size and the number of operations performed. It helps developers analyze and compare different algorithms based on performance.

Search operations can have different performance in best, average, and worst cases:  
- Best Case: The desired element is found at the first position.  
- Average Case: The desired element is located somewhere in the middle.  
- Worst Case: The desired element is at the end or not found at all.

**4. Analysis:**

Linear Search:  
- Time Complexity: O(n)  
- Description: Scans each element one-by-one. Suitable for small datasets or unsorted data.

Binary Search:  
- Time Complexity: O(log n)  
- Description: Works on sorted arrays. Repeatedly divides the search range in half.  
- Much faster than linear search for large datasets.

Conclusion:  
Binary search is more suitable for e-commerce platforms with large datasets and sorted product listings. It provides faster search results, improving the user experience. Linear search may still be used for small, unsorted collections.