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**WEEK 1**

**Data Structures and Algorithms**  
**Exercise 2: E-commerce Platform Search Function**

**Understanding Asymptotic Notation**

**Big O Notation**Big O describes the upper bound of an algorithm's running time in terms of input size. It helps analyze how efficiently an algorithm performs as the dataset grows.

**Time Complexities of Search Algorithms**

|  |  |  |  |
| --- | --- | --- | --- |
| **Algorithm** | **Best Case** | **Average Case** | **Worst Case** |
| Linear Search | O(1) (first match) | O(n/2) ≈ O(n) | O(n) |
| Binary Search | O(1) (middle match) | O(log n) | O(log n) |

**Time Complexity Comparison**

|  |  |  |
| --- | --- | --- |
| **Algorithm** | **Time Complexity** | **Space Complexity** |
| Linear Search | O(n) | O(1) |
| Binary Search | O(log n) | O(1) |

**Which is Better?**

**Linear Search**

* No sorting required
* Works on unsorted data
* Slower for large datasets

**Binary Search**

* Requires sorted data
* Much faster on large datasets

**Conclusion**

For an e-commerce platform with a large number of products, **binary search is more efficient**, assuming the product list is sorted (e.g., by product name or ID). Sorting can be done once and maintained with minimal overhead.