# Exercise 2: E-commerce Platform Search Function

## What I Learned

In this exercise, I learned how to implement and analyze the search functionality in an e-commerce platform. I explored the concept of asymptotic notation, particularly Big O notation, which helps in understanding the efficiency of algorithms. I implemented both linear search and binary search and compared their time complexities. I also understood when to use each algorithm depending on whether the data is sorted or not.

## Concepts Covered

- Big O Notation (O(1), O(n), O(log n))

- Linear Search vs Binary Search

- Best, Average, and Worst-Case Scenarios

- Time Complexity Analysis

## Java Code

import java.util.\*;  
  
class Product {  
 int productId;  
 String productName;  
 String category;  
  
 public Product(int productId, String productName, String category) {  
 this.productId = productId;  
 this.productName = productName;  
 this.category = category;  
 }  
  
 public String toString() {  
 return productId + " - " + productName + " (" + category + ")";  
 }  
}  
  
public class ECommerceSearch {  
  
 public static Product linearSearch(Product[] products, int targetId) {  
 for (Product product : products) {  
 if (product.productId == targetId) {  
 return product;  
 }  
 }  
 return null;  
 }  
  
 public static Product binarySearch(Product[] products, int targetId) {  
 int left = 0, right = products.length - 1;  
 while (left <= right) {  
 int mid = left + (right - left) / 2;  
 if (products[mid].productId == targetId) {  
 return products[mid];  
 } else if (products[mid].productId < targetId) {  
 left = mid + 1;  
 } else {  
 right = mid - 1;  
 }  
 }  
 return null;  
 }  
  
 public static void main(String[] args) {  
 Product[] products = {  
 new Product(105, "Mouse", "Electronics"),  
 new Product(101, "Laptop", "Electronics"),  
 new Product(103, "Shoes", "Fashion"),  
 new Product(104, "Book", "Education"),  
 new Product(102, "Bag", "Accessories")  
 };  
  
 Arrays.sort(products, Comparator.comparingInt(p -> p.productId));  
  
 Product result1 = linearSearch(products, 103);  
 System.out.println("Linear Search Result: " + (result1 != null ? result1 : "Not Found"));  
  
 Product result2 = binarySearch(products, 103);  
 System.out.println("Binary Search Result: " + (result2 != null ? result2 : "Not Found"));  
 }  
}

## Conclusion

Binary Search is more efficient (O(log n)) than Linear Search (O(n)) when the array is sorted. In an e-commerce platform with thousands of products, using binary search or even more advanced structures like hash maps or search trees would provide better performance.