



WORKING WITH COLLECTIONS AND DATA STRUCTURES

OBJECT ORIENTED PROGRAMMING I

Sercan Külcü | Object Oriented Programming I | 10.01.2023

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Introduction

Collections and data structures are fundamental concepts in Java programming. They are used to store, manipulate, and retrieve data in an efficient and organized way. In this chapter, we will explore some of the most important collections and data structures for advanced Java programming.

Arrays

Arrays are a basic data structure in Java that allow you to store a fixed number of elements of the same data type in a contiguous memory location. Arrays can be one-dimensional or multi-dimensional, and they provide constant-time access to individual elements. However, arrays have a fixed size, and adding or removing elements can be time-consuming and inefficient.

Lists

Lists are dynamic data structures in Java that allow you to store a variable number of elements of the same or different data types. The most commonly used list implementation in Java is the `ArrayList` class. `ArrayList` provides constant-time access to individual elements and amortized constant-time insertion and removal of elements at the end of the list. Other list implementations include `LinkedList` and `Vector`.

Sets

Sets are data structures in Java that allow you to store a collection of unique elements. The most commonly used set implementation in Java is the `HashSet` class. `HashSet` provides constant-time insertion and retrieval of elements and is an efficient way to remove duplicates from a collection. Other set implementations include `TreeSet` and `LinkedHashSet`.

Maps

Maps are data structures in Java that allow you to store a collection of key-value pairs. The most commonly used map implementation in Java is the `HashMap` class. `HashMap` provides constant-time insertion and retrieval of key-value pairs and is a useful way to associate data with unique identifiers. Other map implementations include `TreeMap` and `LinkedHashMap`.

Queues

Queues are data structures in Java that allow you to store a collection of elements in a specific order. The most commonly used queue implementation in Java is the `LinkedList` class. `LinkedList` provides constant-time insertion and removal of elements at both ends of the queue and is a useful way to implement a First-In-First-Out (FIFO) queue. Other queue implementations include `PriorityQueue` and `ArrayDeque`.

Stacks

Stacks are data structures in Java that allow you to store a collection of elements in a specific order. The most commonly used stack implementation in Java is the Stack class. Stack provides constant-time insertion and removal of elements at the top of the stack and is a useful way to implement a Last-In-First-Out (LIFO) queue. Other stack implementations include ArrayDeque.

Collections Framework

The Collections Framework in Java provides a set of interfaces and classes that implement common data structures and algorithms. The framework includes the Collection interface, which defines the basic operations for working with collections, and the List, Set, Map, and Queue interfaces, which extend the Collection interface and define specific behaviors for their respective data structures. The framework also includes the Arrays class, which provides utility methods for working with arrays, and the Collections class, which provides utility methods for working with collections.

Conclusion

Collections and data structures are fundamental concepts in Java programming. By understanding and using these concepts effectively, you can create software applications that are efficient, organized, and flexible. Remember to consider the specific needs and requirements of your project when selecting and using collections and data structures. With practice and experience, you can become a proficient Java developer who can work with collections and data structures effectively.