

CS 251

Intermediate Programming

Java Collections Framework

Brooke Chenoweth

University of New Mexico

Fall 2025

What is a collection?

A *collection* is an object that groups multiple objects into a single unit.

Collections are used to store, retrieve, manipulate, and communicate aggregate data.

Collections Framework

A *collections framework* is a unified architecture for representing and manipulating collections.

Interfaces: The abstract data types that represent collections. Allow collections to be manipulated independently of the representation details.

Implementations: The concrete implementations of the collection interfaces. Reusable data structures.

Algorithms: Methods that perform useful computations (searching, sorting, etc.) on objects that implement collection interfaces. Polymorphic. Algorithms are reusable functionality.

Benefits of Java Collections

- Reduces programming effort
- Increases program speed and quality
- Allows interoperability among unrelated APIs
- Reduces effort to learn and use new APIs
- Reduces effort to design new APIs
- Encourages software reuse

Core Collection Interfaces

- Collection – root of the collection hierarchy
- Set – no duplicates
- List – ordered collection, sequence
- Queue – holds elements for processing
- Deque – double ended queue
- Map – maps keys to values

Polymorphic algorithms

The `Collections` class provides algorithms for:

- Sorting
- Shuffling
- Routine data manipulation – reverse, fill, copy, swap, addAll
- Searching
- Finding extreme values – min, max