CS 2050
Computer Science II

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LIVES TRANSFORMED

Agenda

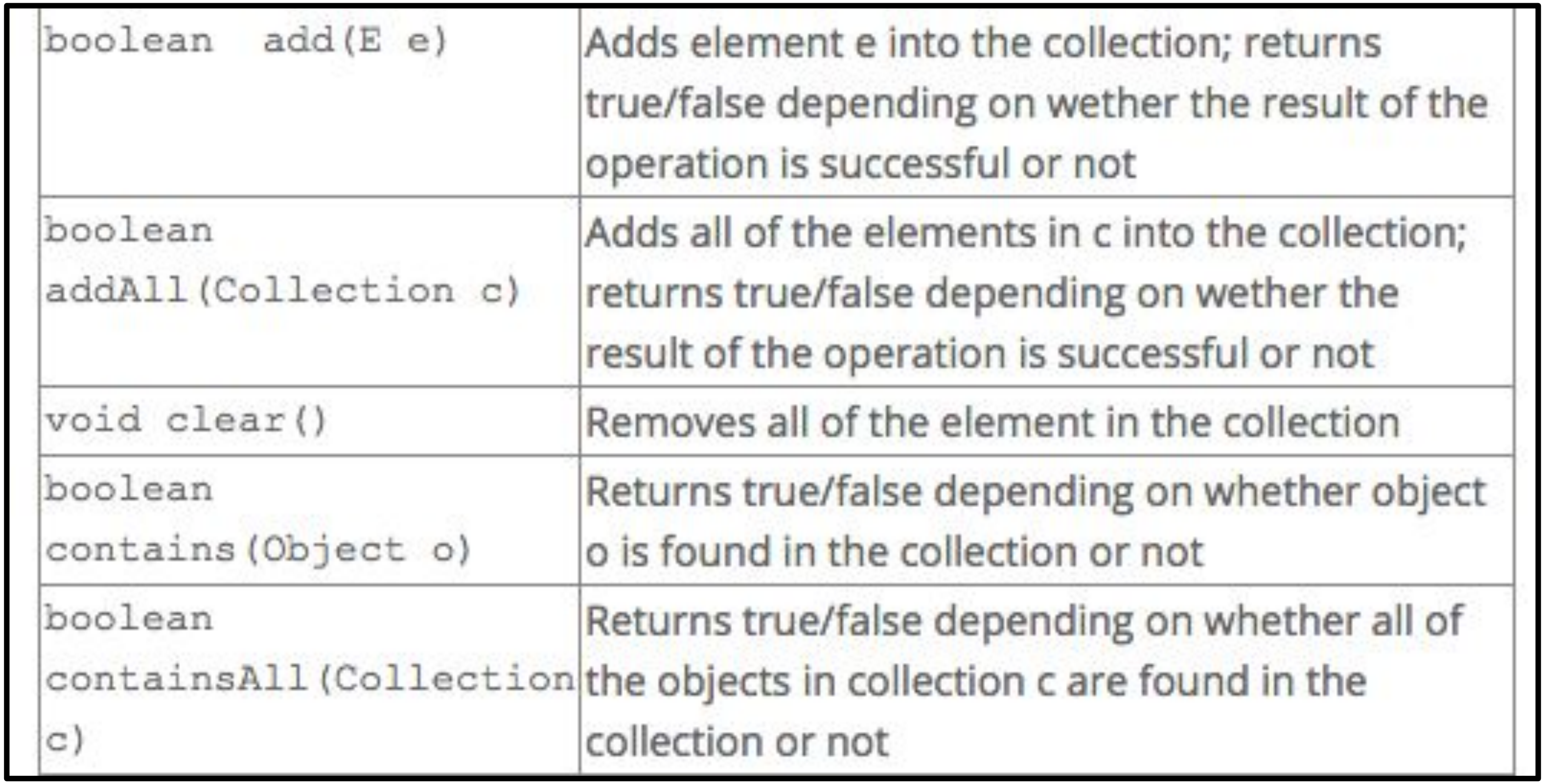
- Overview
- The `Collection` Interface
  - The `List` Interface
  - The `Set` Interface
  - The `Map` Interface
- Summary
- Practice

Overview

- The **Collections Framework** is a Java library for working with groups of individual objects
- `Collection` is the name of the framework's main interface
- It defines methods that are common between all collection types

The Collection Interface

METHODS



`boolean add(E e)`	Adds element e into the collection; returns true/false depending on wether the result of the operation is successful or not
`boolean addAll(Collection c)`	Adds all of the elements in c into the collection; returns true/false depending on wether the result of the operation is successful or not
`void clear()`	Removes all of the element in the collection
`boolean contains(Object o)`	Returns true/false depending on whether object o is found in the collection or not
`boolean containsAll(Collection c)`	Returns true/false depending on whether all of the objects in collection c are found in the collection or not

The Collection Interface

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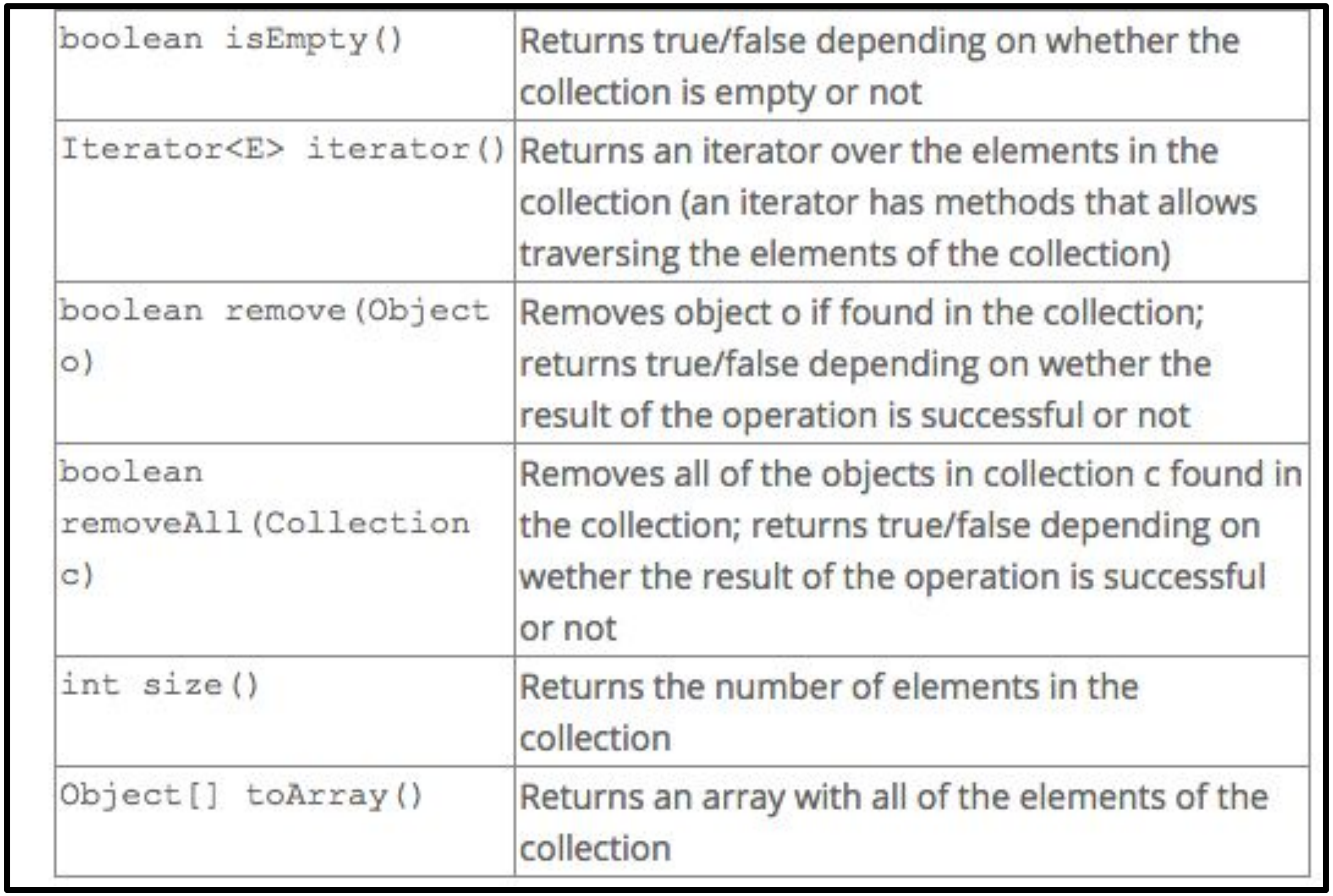


`boolean isEmpty()`	Returns true/false depending on whether the collection is empty or not
`Iterator<E> iterator()`	Returns an iterator over the elements in the collection (an iterator has methods that allows traversing the elements of the collection)
`boolean remove(Object o)`	Removes object o if found in the collection; returns true/false depending on wether the result of the operation is successful or not
`boolean removeAll(Collection c)`	Removes all of the objects in collection c found in the collection; returns true/false depending on wether the result of the operation is successful or not
`int size()`	Returns the number of elements in the collection
`Object[] toArray()`	Returns an array with all of the elements of the collection

The Collection Interface

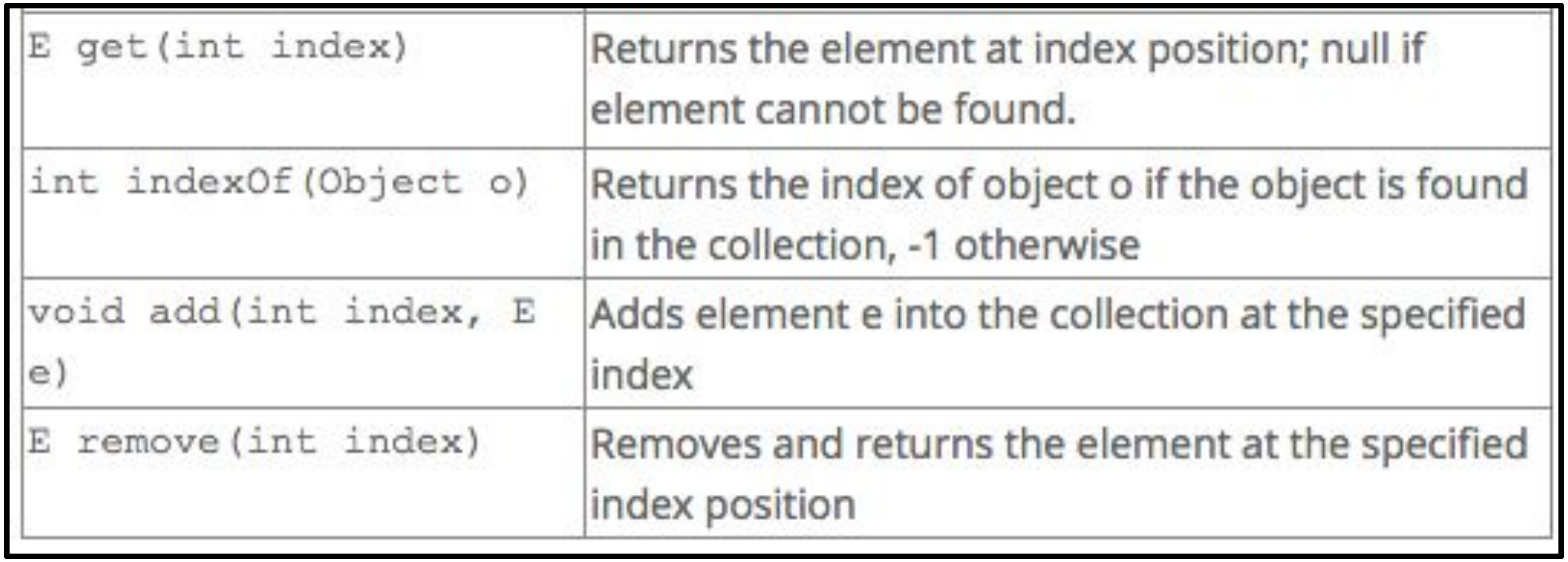
- Specialized Interfaces:
  - `List`
  - `Set`
  - `Map`

The List Interface

- Enables the definition of an ordered collection of objects of the same type

The List Interface

METHODS



`E get(int index)`	Returns the element at index position; null if element cannot be found.
`int indexOf(Object o)`	Returns the index of object o if the object is found in the collection, -1 otherwise
`void add(int index, E e)`	Adds element e into the collection at the specified index
`E remove(int index)`	Removes and returns the element at the specified index position

The List Interface

- Implementations:
    - `ArrayList`
    - `LinkedList`
    - `Stack`

The Set Interface

- Enables the definition of an unordered collection of objects where duplicates are not allowed

The Set Interface

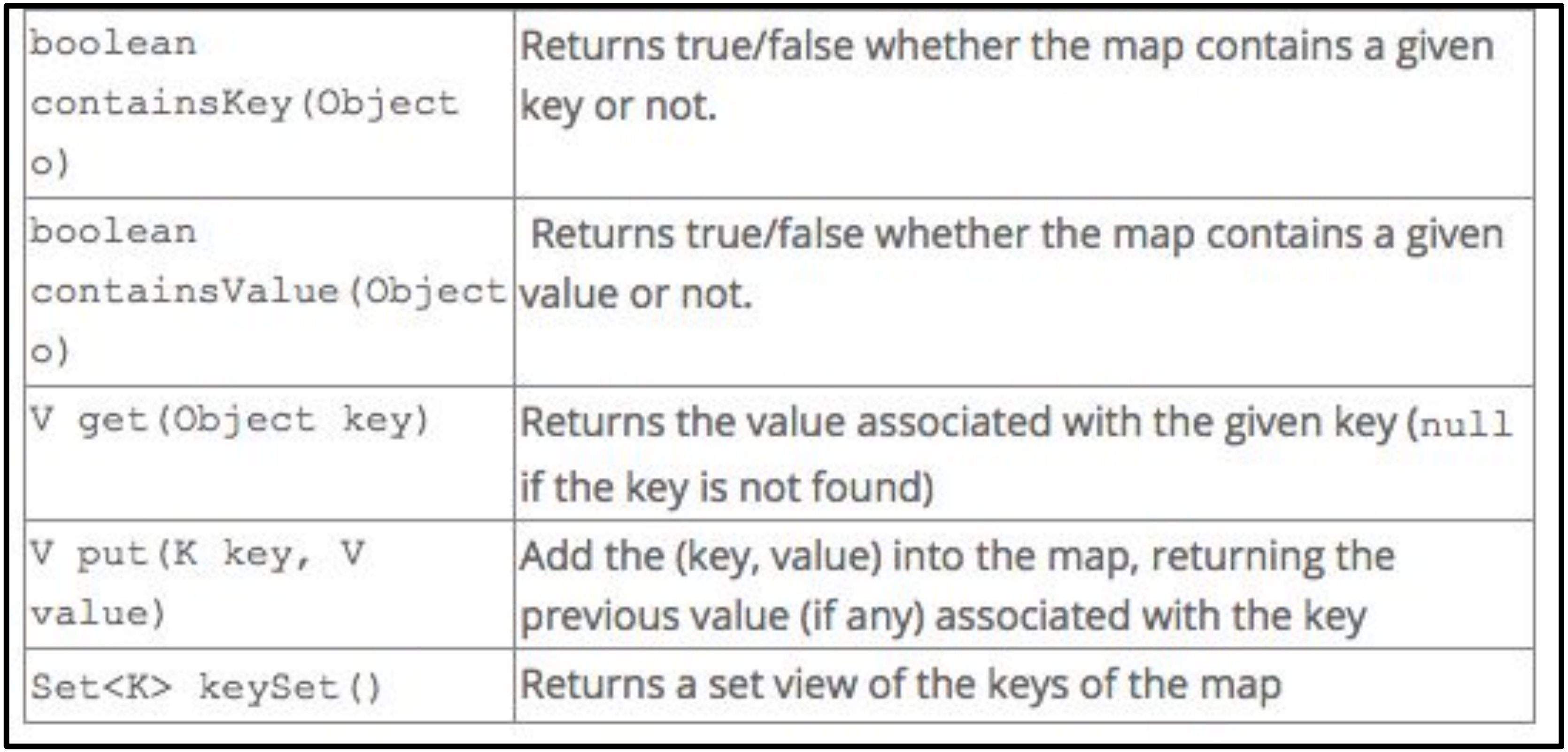
- Implementations:
  - `HashSet`
  - `LinkedHashSet`
  - `TreeSet`

The Map Interface

- Enables the definition of a mapping of keys to values

The Map Interface

METHODS

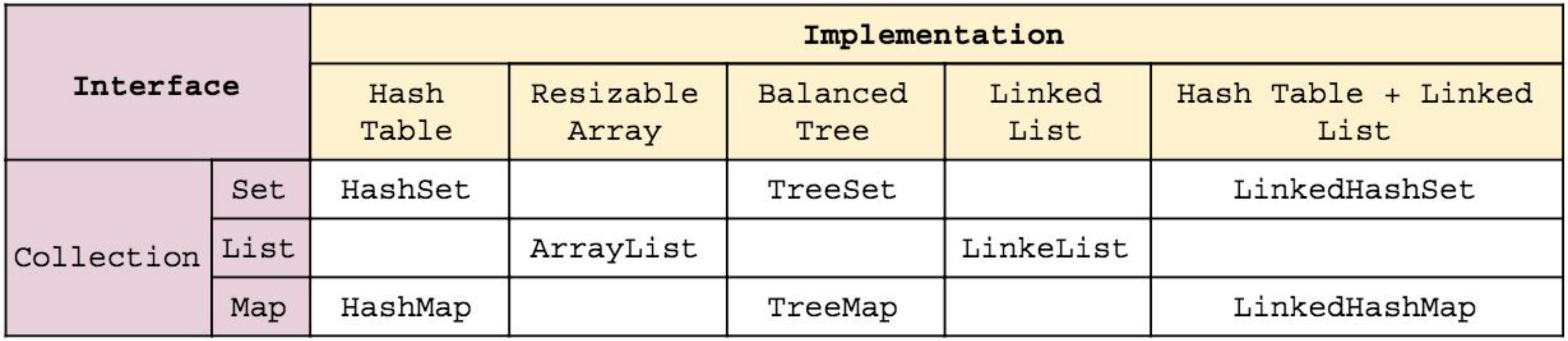


boolean containsKey(Object o)	Returns true/false whether the map contains a given key or not.
boolean containsValue(Object o)	Returns true/false whether the map contains a given value or not.
V get(Object key)	Returns the value associated with the given key (null if the key is not found)
V put(K key, V value)	Add the (key, value) into the map, returning the previous value (if any) associated with the key
Set<K> keySet()	Returns a set view of the keys of the map

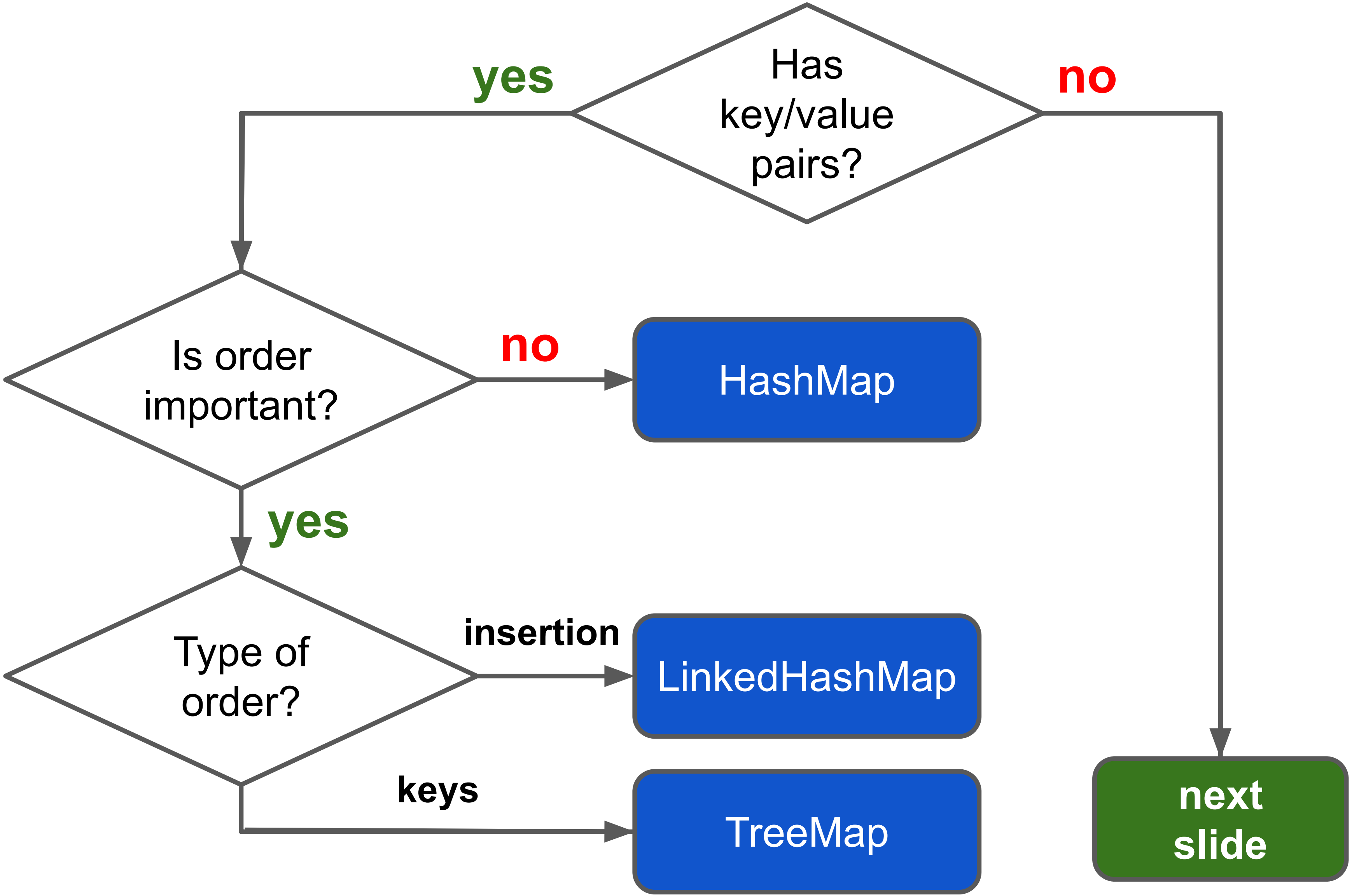
The Map Interface

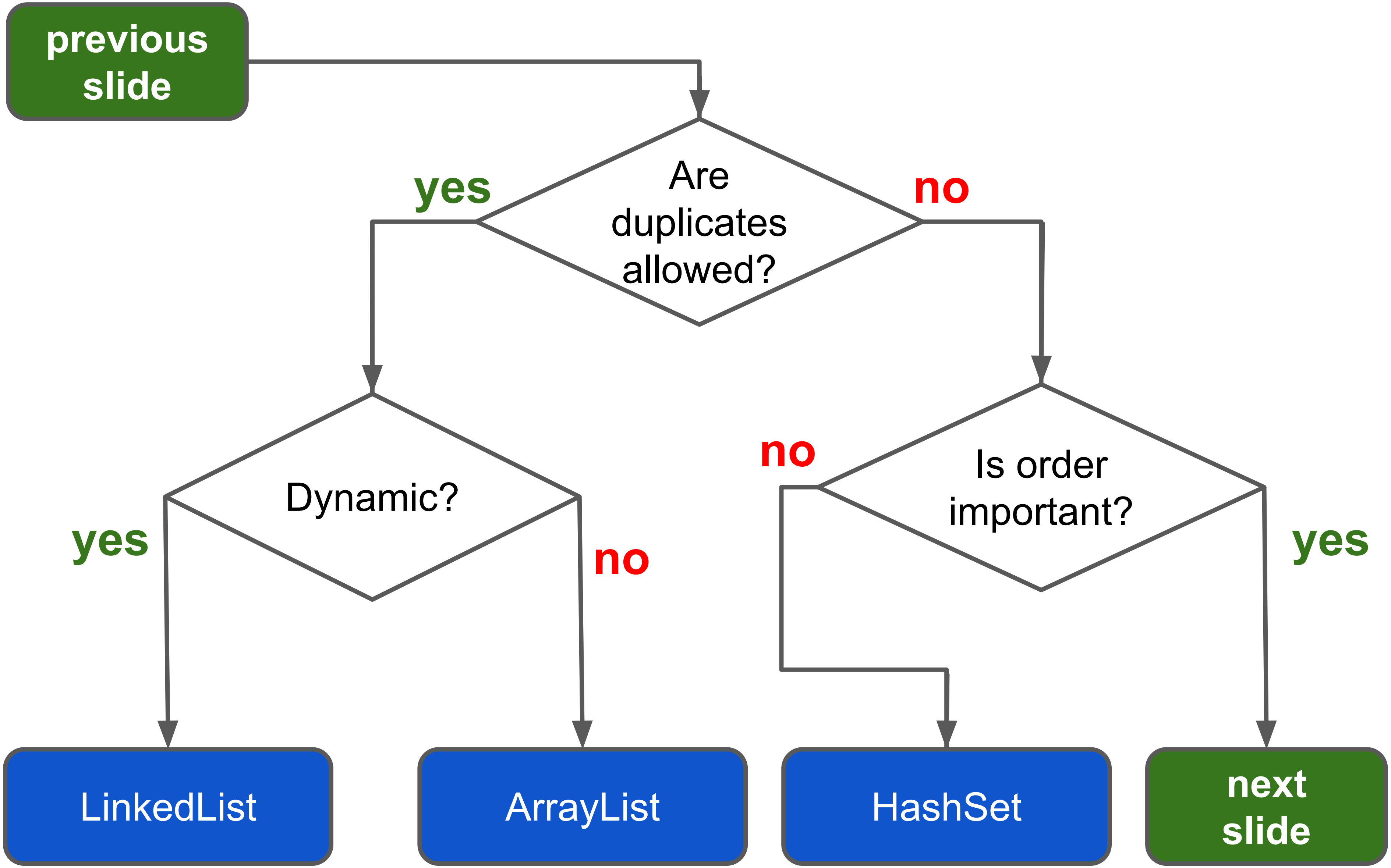
- Implementations:
  - `HashMap`
  - `LinkedHashMap`
  - `TreeMap`

Summary



Interface		Implementation				
		Hash Table	Resizable Array	Balanced Tree	Linked List	Hash Table + Linked List
Collection	Set	HashSet		TreeSet		LinkedHashSet
	List		ArrayList		LinkeList	
	Map	HashMap		TreeMap		LinkedHashMap


Has key/value pairs?
yes
no
Is order important?
no
HashMap
yes
Type of order?
insertion
LinkedHashMap
keys
TreeMap
next slide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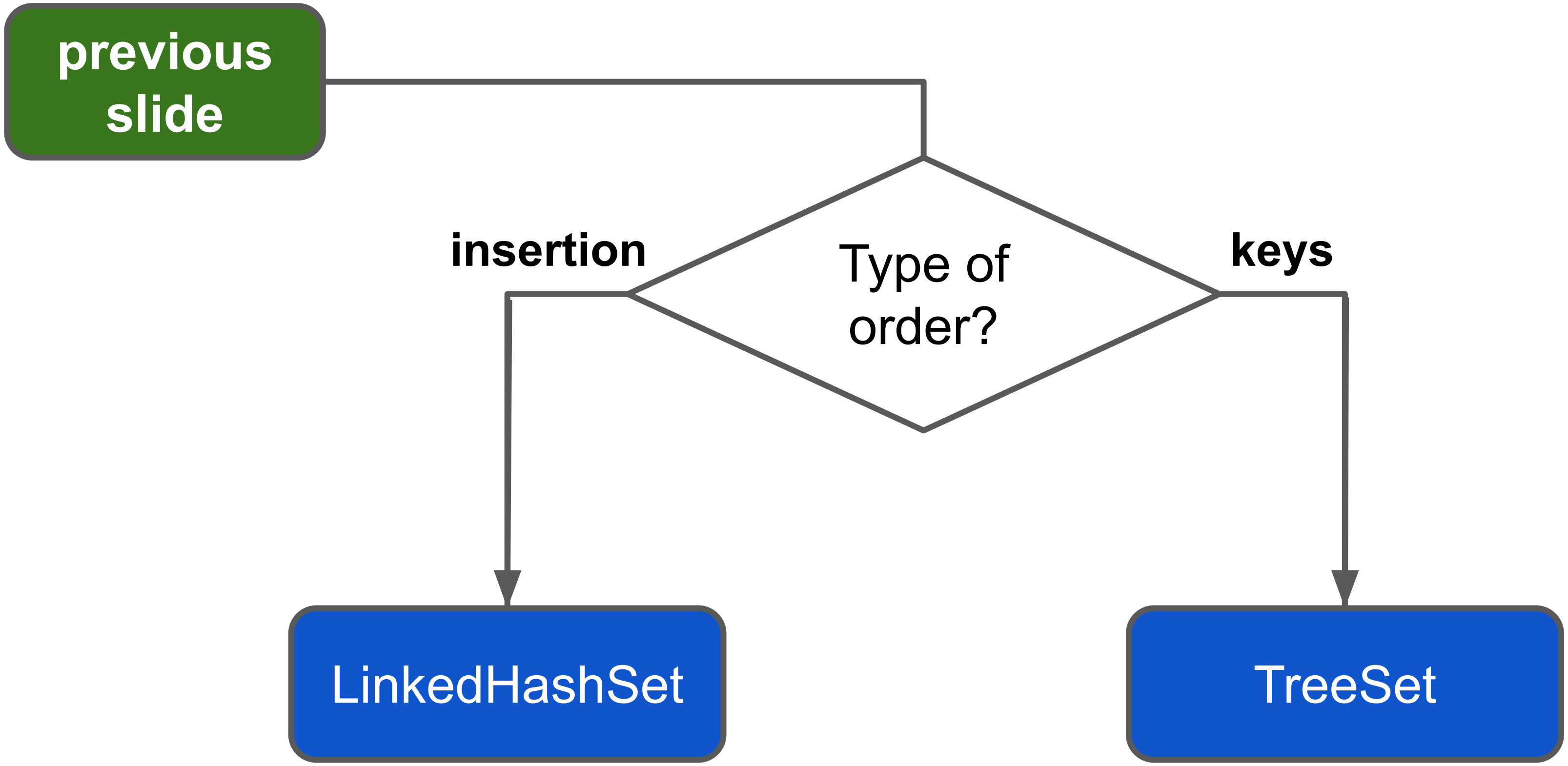
Are duplicates allowed?
yes
no
Dynamic?
yes
no
Is order important?
no
yes
LinkedList
ArrayList
HashSet
next slide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Type of order?

insertion

keys

LinkedHashSet

TreeSet

Practice

- To illustrate how the most important classes in the `Collections Framework` differ from each other, finish the TO-DO's in the activity called "collections" available on GitHub