**Collection Interface**

**Types of Collections: ( there are 14 different Collection Interfaces )**

**Linear**: ordered by position

* Arrays ( does not implement Collection Interface – Array Utilities)
* ArrayLists ( you should know this by now )
* LinkedLists
* DoublyLinkedLists
* CircularlyLinkedLists

**Hierarchical**: parent/child relationship

* Trees

**Graphical**: each node may have multiple parents and children

* Graphs

**Unordered**:

* Sets ( interface shown below )
* Maps ( interface shown below )

**Figure 31.1 ( Schramm )**

**Collection**

**interface**

**List**

**interface**

**Set**

**interface**

**ArrayList**

**class**

**LinkedList**

**class**

**HashSet**

**class**

**TreeSet**

**class**

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| **Collection Method Summary ( collection implements Iterable interface )** | |
| boolean | [**add**](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html#add(E))([E](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html) e)            Ensures that this collection contains the specified element (optional operation). |
| boolean | [**addAll**](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html#addAll(java.util.Collection))([Collection](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html)<? extends [E](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html)> c)            Adds all of the elements in the specified collection to this collection (optional operation). |
| void | [**clear**](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html#clear())()            Removes all of the elements from this collection (optional operation). |
| boolean | [**contains**](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html#contains(java.lang.Object))([Object](http://docs.oracle.com/javase/6/docs/api/java/lang/Object.html) o)            Returns true if this collection contains the specified element. |
| boolean | [**containsAll**](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html#containsAll(java.util.Collection))([Collection](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html)<?> c)            Returns true if this collection contains all of the elements in the specified collection. |
| boolean | [**equals**](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html#equals(java.lang.Object))([Object](http://docs.oracle.com/javase/6/docs/api/java/lang/Object.html) o)            Compares the specified object with this collection for equality. |
| boolean | [**isEmpty**](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html#isEmpty())()            Returns true if this collection contains no elements. |
| [Iterator](http://docs.oracle.com/javase/6/docs/api/java/util/Iterator.html)<[E](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html)> | [**iterator**](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html#iterator())()            Returns an iterator over the elements in this collection. |
| boolean | [**remove**](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html#remove(java.lang.Object))([Object](http://docs.oracle.com/javase/6/docs/api/java/lang/Object.html) o)            Removes a single instance of the specified element from this collection, if it is present (optional operation). |
| boolean | [**removeAll**](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html#removeAll(java.util.Collection))([Collection](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html)<?> c)            Removes all of this collection's elements that are also contained in the specified collection (optional operation). |
| boolean | [**retainAll**](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html#retainAll(java.util.Collection))([Collection](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html)<?> c)            Retains only the elements in this collection that are contained in the specified collection (optional operation). |
| int | [**size**](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html#size())()            Returns the number of elements in this collection. |
| [Object](http://docs.oracle.com/javase/6/docs/api/java/lang/Object.html)[] | [**toArray**](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html#toArray())()            Returns an array containing all of the elements in this collection. |

**The LIST Interface ( which implements Collection and Iterable )**

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| **Method Summary** | |
| boolean | [**add**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#add(E))([E](http://docs.oracle.com/javase/6/docs/api/java/util/List.html) e)            Appends the specified element to the end of this list (optional operation). |
| void | [**add**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#add(int, E))(int index, [E](http://docs.oracle.com/javase/6/docs/api/java/util/List.html) element)            Inserts the specified element at the specified position in this list (optional operation). |
| boolean | [**addAll**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#addAll(java.util.Collection))([Collection](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html)<? extends [E](http://docs.oracle.com/javase/6/docs/api/java/util/List.html)> c)            Appends all of the elements in the specified collection to the end of this list, in the order that they are returned by the specified collection's iterator (optional operation). |
| boolean | [**addAll**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#addAll(int, java.util.Collection))(int index, [Collection](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html)<? extends [E](http://docs.oracle.com/javase/6/docs/api/java/util/List.html)> c)            Inserts all of the elements in the specified collection into this list at the specified position (optional operation). |
| void | [**clear**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#clear())()            Removes all of the elements from this list (optional operation). |
| boolean | [**contains**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#contains(java.lang.Object))([Object](http://docs.oracle.com/javase/6/docs/api/java/lang/Object.html) o)            Returns true if this list contains the specified element. |
| boolean | [**containsAll**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#containsAll(java.util.Collection))([Collection](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html)<?> c)            Returns true if this list contains all of the elements of the specified collection. |
| boolean | [**equals**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#equals(java.lang.Object))([Object](http://docs.oracle.com/javase/6/docs/api/java/lang/Object.html) o)            Compares the specified object with this list for equality. |
| [E](http://docs.oracle.com/javase/6/docs/api/java/util/List.html) | [**get**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#get(int))(int index)            Returns the element at the specified position in this list. |
| int | [**hashCode**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#hashCode())()            Returns the hash code value for this list. |
| int | [**indexOf**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#indexOf(java.lang.Object))([Object](http://docs.oracle.com/javase/6/docs/api/java/lang/Object.html) o)            Returns the index of the first occurrence of the specified element in this list, or -1 if this list does not contain the element. |
| boolean | [**isEmpty**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#isEmpty())()            Returns true if this list contains no elements. |
| [Iterator](http://docs.oracle.com/javase/6/docs/api/java/util/Iterator.html)<[E](http://docs.oracle.com/javase/6/docs/api/java/util/List.html)> | [**iterator**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#iterator())()            Returns an iterator over the elements in this list in proper sequence. |
| int | [**lastIndexOf**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#lastIndexOf(java.lang.Object))([Object](http://docs.oracle.com/javase/6/docs/api/java/lang/Object.html) o)            Returns the index of the last occurrence of the specified element in this list, or -1 if this list does not contain the element. |
| [ListIterator](http://docs.oracle.com/javase/6/docs/api/java/util/ListIterator.html" \o "interface in java.util)<[E](http://docs.oracle.com/javase/6/docs/api/java/util/List.html)> | [**listIterator**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#listIterator())()            Returns a list iterator over the elements in this list (in proper sequence). |
| [ListIterator](http://docs.oracle.com/javase/6/docs/api/java/util/ListIterator.html" \o "interface in java.util)<[E](http://docs.oracle.com/javase/6/docs/api/java/util/List.html)> | [**listIterator**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#listIterator(int))(int index)            Returns a list iterator of the elements in this list (in proper sequence), starting at the specified position in this list. |
| [E](http://docs.oracle.com/javase/6/docs/api/java/util/List.html) | [**remove**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#remove(int))(int index)            Removes the element at the specified position in this list (optional operation). |
| boolean | [**remove**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#remove(java.lang.Object))([Object](http://docs.oracle.com/javase/6/docs/api/java/lang/Object.html) o)            Removes the first occurrence of the specified element from this list, if it is present (optional operation). |
| boolean | [**removeAll**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#removeAll(java.util.Collection))([Collection](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html)<?> c)            Removes from this list all of its elements that are contained in the specified collection (optional operation). |
| boolean | [**retainAll**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#retainAll(java.util.Collection))([Collection](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html)<?> c)            Retains only the elements in this list that are contained in the specified collection (optional operation). |
| [E](http://docs.oracle.com/javase/6/docs/api/java/util/List.html) | [**set**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#set(int, E))(int index, [E](http://docs.oracle.com/javase/6/docs/api/java/util/List.html) element)            Replaces the element at the specified position in this list with the specified element (optional operation). |
| int | [**size**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#size())()            Returns the number of elements in this list. |
| [List](http://docs.oracle.com/javase/6/docs/api/java/util/List.html)<[E](http://docs.oracle.com/javase/6/docs/api/java/util/List.html)> | [**subList**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#subList(int, int))(int fromIndex, int toIndex)            Returns a view of the portion of this list between the specified fromIndex, inclusive, and toIndex, exclusive. |
| [Object](http://docs.oracle.com/javase/6/docs/api/java/lang/Object.html)[] | [**toArray**](http://docs.oracle.com/javase/6/docs/api/java/util/List.html#toArray())()            Returns an array containing all of the elements in this list in proper sequence (from first to last element). |

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| **Set Method Summary ( which implements Collection and Iterable )** | |
| boolean | [**add**](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html#add%28E%29)([E](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html) e)            Adds the specified element to this set if it is not already present (optional operation). |
| boolean | [**addAll**](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html#addAll%28java.util.Collection%29)([Collection](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html)<? extends [E](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html)> c)            Adds all of the elements in the specified collection to this set if they're not already present (optional operation). |
| void | [**clear**](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html#clear%28%29)()            Removes all of the elements from this set (optional operation). |
| boolean | [**contains**](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html#contains%28java.lang.Object%29)([Object](http://docs.oracle.com/javase/6/docs/api/java/lang/Object.html) o)            Returns true if this set contains the specified element. |
| boolean | [**containsAll**](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html#containsAll%28java.util.Collection%29)([Collection](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html)<?> c)            Returns true if this set contains all of the elements of the specified collection. |
| boolean | [**equals**](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html#equals%28java.lang.Object%29)([Object](http://docs.oracle.com/javase/6/docs/api/java/lang/Object.html) o)            Compares the specified object with this set for equality. |
| int | [**hashCode**](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html#hashCode%28%29)()            Returns the hash code value for this set. |
| boolean | [**isEmpty**](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html#isEmpty%28%29)()            Returns true if this set contains no elements. |
| [Iterator](http://docs.oracle.com/javase/6/docs/api/java/util/Iterator.html)<[E](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html)> | [**iterator**](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html#iterator%28%29)()            Returns an iterator over the elements in this set. |
| boolean | [**remove**](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html#remove%28java.lang.Object%29)([Object](http://docs.oracle.com/javase/6/docs/api/java/lang/Object.html) o)            Removes the specified element from this set if it is present (optional operation). |
| boolean | [**removeAll**](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html#removeAll%28java.util.Collection%29)([Collection](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html)<?> c)            Removes from this set all of its elements that are contained in the specified collection (optional operation). |
| boolean | [**retainAll**](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html#retainAll%28java.util.Collection%29)([Collection](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html)<?> c)            Retains only the elements in this set that are contained in the specified collection (optional operation). |
| int | [**size**](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html#size%28%29)()            Returns the number of elements in this set (its cardinality). |
| [Object](http://docs.oracle.com/javase/6/docs/api/java/lang/Object.html)[] | [**toArray**](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html#toArray%28%29)()            Returns an array containing all of the elements in this set. |
| |  | | --- | | <T> T[] | | [**toArray**](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html#toArray%28T[]%29)(T[] a)            Returns an array containing all of the elements in this set; the runtime type of the returned array is that of the specified array. |

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| **Map Method Summary ( does not implement Collection or Iterable )** | |
| void | [**clear**](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html#clear%28%29)()            Removes all of the mappings from this map (optional operation). |
| boolean | [**containsKey**](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html#containsKey%28java.lang.Object%29)([Object](http://docs.oracle.com/javase/6/docs/api/java/lang/Object.html) key)            Returns true if this map contains a mapping for the specified key. |
| boolean | [**containsValue**](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html#containsValue%28java.lang.Object%29)([Object](http://docs.oracle.com/javase/6/docs/api/java/lang/Object.html) value)            Returns true if this map maps one or more keys to the specified value. |
| [Set](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html)<[Map.Entry](http://docs.oracle.com/javase/6/docs/api/java/util/Map.Entry.html" \o "interface in java.util)<[K](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html),[V](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html)>> | [**entrySet**](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html#entrySet%28%29)()            Returns a [Set](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html) view of the mappings contained in this map. |
| boolean | [**equals**](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html#equals%28java.lang.Object%29)([Object](http://docs.oracle.com/javase/6/docs/api/java/lang/Object.html) o)            Compares the specified object with this map for equality. |
| [V](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html) | [**get**](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html#get%28java.lang.Object%29)([Object](http://docs.oracle.com/javase/6/docs/api/java/lang/Object.html) key)            Returns the value to which the specified key is mapped, or null if this map contains no mapping for the key. |
| int | [**hashCode**](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html#hashCode%28%29)()            Returns the hash code value for this map. |
| boolean | [**isEmpty**](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html#isEmpty%28%29)()            Returns true if this map contains no key-value mappings. |
| [Set](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html)<[K](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html)> | [**keySet**](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html#keySet%28%29)()            Returns a [Set](http://docs.oracle.com/javase/6/docs/api/java/util/Set.html) view of the keys contained in this map. |
| [V](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html) | [**put**](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html#put%28K,%20V%29)([K](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html) key, [V](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html) value)            Associates the specified value with the specified key in this map (optional operation). |
| void | [**putAll**](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html#putAll%28java.util.Map%29)([Map](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html)<? extends [K](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html),? extends [V](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html)> m)            Copies all of the mappings from the specified map to this map (optional operation). |
| [V](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html) | [**remove**](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html#remove%28java.lang.Object%29)([Object](http://docs.oracle.com/javase/6/docs/api/java/lang/Object.html) key)            Removes the mapping for a key from this map if it is present (optional operation). |
| int | [**size**](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html#size%28%29)()            Returns the number of key-value mappings in this map. |
| [Collection](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html)<[V](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html)> | [**values**](http://docs.oracle.com/javase/6/docs/api/java/util/Map.html#values%28%29)()            Returns a [Collection](http://docs.oracle.com/javase/6/docs/api/java/util/Collection.html) view of the values contained in this map. |