Collections

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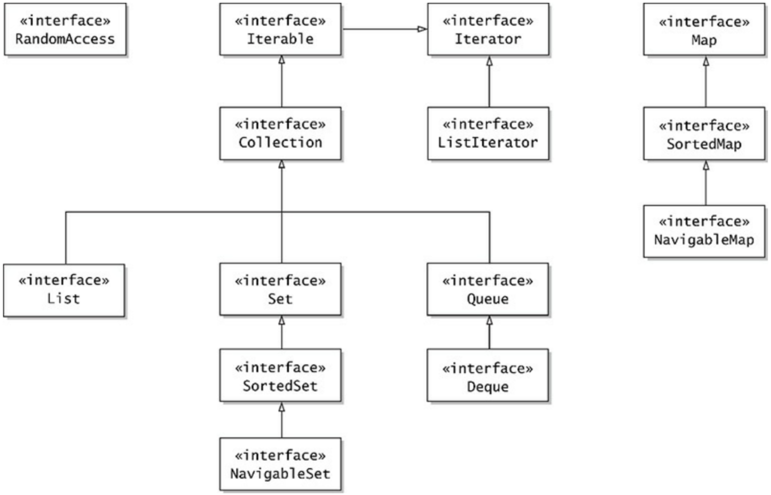
Java Collections. . .

Interfaces. . .



Interface Collection. . .

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```
boolean add(E e)
boolean addAll(Collection<? extends E> c)

void clear( )
boolean remove(Object o)
boolean remove(Collection<?> o)
boolean retainAll(Collection<?> o)
boolean removeIf(Predicate<? super E> filter)

int size( )
boolean isEmpty( )
boolean contains( Object o )
boolean containsAll(Collection<?> c)

Object[] toArray( )
T[] toArray(T[] a)
```

Interface List...

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```
boolean add(int index, E e)
boolean addAll(int index, Collection<? extends E> c)

E get(int index)
E set(int index, E e)
E remove(int index)

int indexOf(Object o)
int lastIndexOf(Object o)

void replaceAll(UnaryOperator<E> operator)

void sort(Comparator<? super E> c)

static List<E> of(E ... elements)

List<E> subList(int fromIndex, int toIndex)
```

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Class `ArrayList` implements both `List` and `RandomAccess`. Class `LinkedList` only implements `List`.

Utility methods. . .

Class Collections provides utility methods that implement recurrent operations:

```
boolean disjoint(Collection<?> c1, Collection<?> c2)

boolean addAll(Collection<? super T> c, T ... elements)

void copy(List<? super T> dest, List<? extends T> src)

boolean replaceAll(List<T> list, T oldVal, T newVal)

void fill(List<? extends T> list, T obj)

List<T> nCopies(int n, T obj)

int frequency(Collection<?> c, Object o)
```

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boolean hasNext( )
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T next( )
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Interface Iterator <T> provides the following methods:

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T next( )
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```
void remove( )
```

Warning: The default implementation of remove() throws an instance of UnsupportedOperationException and performs no other action.

Iterator. . .

Elements in a collection can be visited as follows:

```
Collection<String> coll = ...
...
Iterator<String> iterator = coll.iterator();
while (iterator.hasNext()) {
  String element = iterator.next();
  //Process element
  ...
}
```

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Alternatively, we can use the *for-each* loop:

```
Collection<String> coll = ...
...
for (String element: coll) {
  //Process element
  ...
}
```

Iterator. . .

Removing elements. . .

The iterator of a collection can implement a specific remove method:

```
Collection<String> coll = ...
...
Iterator<String> iterator = coll.iterator();
while (iterator.hasNext()) {
  String element = iterator.next();
  if (exp) {
    iter.remove();
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  String element = iterator.next();
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    iter.remove();
  }
}
```

The easier way to remove elements from a collection is to use removeIf method:

```
coll.removeIf( element -> exp );//exp is the same as above!
```

List iterator. . .

From an instance of List<T> we can get a ListIterator <T>. This is an iterator for lists that allows us to traverse the list in either direction, modify the list during iteration, and obtain the iterator's current position in the list.

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```
 void add(T e)
 boolean hasNext( )
 boolean hasPrevious( )
T next( )
 int nextIndex( )
T previous( )
 int previousIndex( )
 void remove( )
 void set(T e)
```

Sets. . .

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Two implementations of interface Set<T> are:

- TreeSet<T>, set implemented via binary trees;
- HashSet<T>, set implemented via hash table.

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Warning: a correct implementation of these methods is crucial to avoid unexpected behaviours!

Sets...

Class TreeSet<T> should be used when we want to traverse the set in order:

- implements interfaces SortedSet<T> and NavigableSet<T>;
- either T implements Comparable<T> or a Comparator<T> must be provided.

Maps. . .

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Method `get(Object k)` retrieves the value associated with key `k`. If this value does not exist, `null` is returned.

The method `getOrDefaultValue(Object k, V v)` can be used to get a default value if no value is associated with `k` (to avoid `NullPointerException`).

Maps. . .

Given a Map<K,V> we can get a view of keys, values and entries:

```
Set<K> keySet( )
Set<Map.Entry<K,V>> entrySet( )
Collection<V> values( )
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An instance of Map.Entry<K,V> stores the entry in a map.

To iterate through the entries of a Map<K,V> we can also use the forEach method:

```
void forEach(BiConsumer<? super K,? super V> action)
```

Other collections. . .

- Properties: is used to store a persistent list of properties (like application specific settings).
- BitSet: implements a vector of bits that grows as needed.
- Stack: represents a last-in-first-out (LIFO) stack of objects.
- Queue: this is an interface that represents a collection designed for holding elements prior to processing.
- Deque: this is an interface describing a linear collection that supports element insertion and removal at both ends.
- PriorityQueue: An unbounded priority queue based on a priority heap.
- WeakHashMap: Hash table based implementation of the Map interface, with weak keys. An entry in a WeakHashMap will automatically be removed when its key is no longer in ordinary use.

Views. . .

A collection view is a lightweight object that implements a collection interface, but doesn't store elements (examples are keySet and values methods of a map).

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Examples:

```
 List.of( v1,...,vn )
Set.of( v1,...,vn )
```

To be continued...