Java Set Interface

In this tutorial, we will learn about the Set interface in Java and its methods.

The `Set` interface of the Java `Collections` framework provides the features of the mathematical set in Java. It extends the `Collection` interface.

Unlike the `List` interface, sets cannot contain duplicate elements.

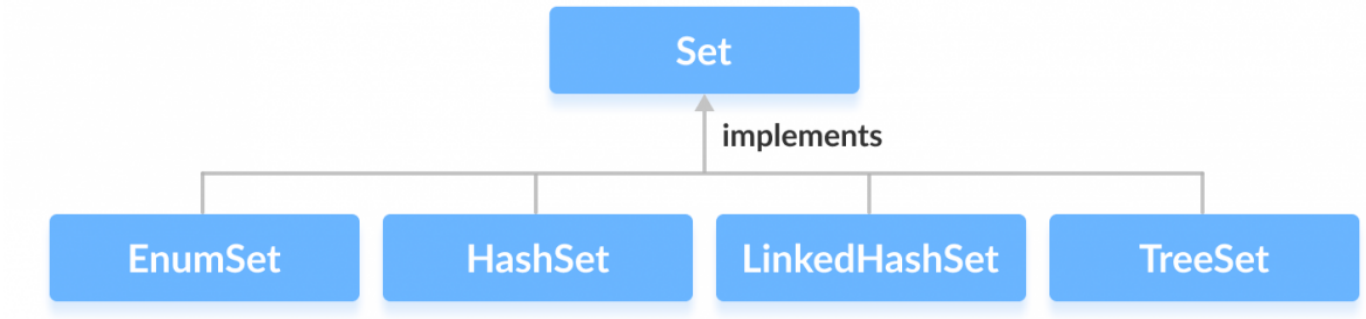
Classes that implement Set

Since `Set` is an interface, we cannot create objects from it.

In order to use functionalities of the `Set` interface, we can use these classes:

- HashSet
- LinkedHashSet
- EnumSet
- TreeSet

These classes are defined in the `Collections` framework and implement the `Set` interface.

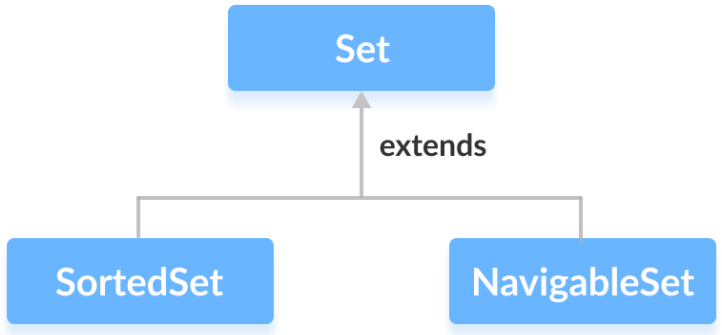


Interfaces that extend Set

The `Set` interface is also extended by these subinterfaces:

- SortedSet

- NavigableSet



How to use Set?

In Java, we must import `java.util.Set` package in order to use `Set`.

```
// Set implementation using HashSet
Set<String> animals = new HashSet<>();
```

Here, we have created a `Set` called `animals`. We have used the `HashSet` class to implement the `Set` interface.

Methods of Set

The `Set` interface includes all the methods of the `Collection` interface. It's because `Collection` is a super interface of `Set`.

Some of the commonly used methods of the `Collection` interface that's also available in the `Set` interface are:

- **add()** - adds the specified element to the set
- **addAll()** - adds all the elements of the specified collection to the set
- **iterator()** - returns an iterator that can be used to access elements of the set sequentially
- **remove()** - removes the specified element from the set
- **removeAll()** - removes all the elements from the set that is present in another specified set
- **retainAll()** - retains all the elements in the set that are also present in another specified set
- **clear()** - removes all the elements from the set

- **size()** - returns the length (number of elements) of the set
- **toArray()** - returns an array containing all the elements of the set
- **contains()** - returns `true` if the set contains the specified element
- **containsAll()** - returns `true` if the set contains all the elements of the specified collection
- **hashCode()** - returns a hash code value (address of the element in the set)

To learn about more methods of the `Set` interface, visit Java Set (official Java documentation).

Set Operations

The Java `Set` interface allows us to perform basic mathematical set operations like union, intersection, and subset.

- **Union** - to get the union of two sets `x` and `y`, we can use `x.addAll(y)`
- **Intersection** - to get the intersection of two sets `x` and `y`, we can use `x.retainAll(y)`
- **Subset** - to check if `x` is a subset of `y`, we can use `y.containsAll(x)`

Implementation of the Set Interface

1. Implementing HashSet Class

```java
import java.util.Set;
import java.util.HashSet;

class Main {

    public static void main(String[] args) {
        // Creating a set using the HashSet class
        Set<Integer> set1 = new HashSet<>();

        // Add elements to the set1
        set1.add(2);
        set1.add(3);
        System.out.println("Set1: " + set1);

        // Creating another set using the HashSet class
        Set<Integer> set2 = new HashSet<>();

        // Add elements
        set2.add(1);
        set2.add(2);
        System.out.println("Set2: " + set2);

        // Union of two sets
        set2.addAll(set1);
        System.out.println("Union is: " + set2);
    }
}
```

Output

```
Set1: [2, 3]
Set2: [1, 2]
Union is: [1, 2, 3]
```

To learn more about `HashSet`, visit Java HashSet.

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2. Implementing TreeSet Class

```java
import java.util.Set;
import java.util.TreeSet;
import java.util.Iterator;

class Main {

    public static void main(String[] args) {
        // Creating a set using the TreeSet class
        Set<Integer> numbers = new TreeSet<>();

        // Add elements to the set
        numbers.add(2);
        numbers.add(3);
        numbers.add(1);
        System.out.println("Set using TreeSet: " + numbers);

        // Access Elements using iterator()
        System.out.print("Accessing elements using iterator(): ");
        Iterator<Integer> iterate = numbers.iterator();
        while(iterate.hasNext()) {
            System.out.print(iterate.next());
            System.out.print(", ");
        }

    }
}
```

Output

```
Set using TreeSet: [1, 2, 3]
Accessing elements using iterator(): 1, 2, 3,
```