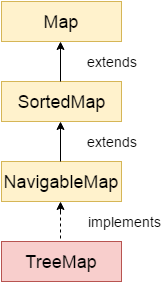
Java TreeMap class



Java TreeMap class is a red-black tree based implementation. It provides an efficient means of storing key-value pairs in sorted order.

The important points about Java TreeMap class are:

* Java TreeMap contains values based on the key. It implements the NavigableMap interface and extends AbstractMap class.
* Java TreeMap contains only unique elements.
* Java TreeMap cannot have a null key but can have multiple null values.
* Java TreeMap is non synchronized.
* Java TreeMap maintains ascending order.

TreeMap class declaration

Let's see the declaration for java.util.TreeMap class.

1. **public** **class** TreeMap<K,V> **extends** AbstractMap<K,V> **implements** NavigableMap<K,V>, Cloneable, Serializable

TreeMap class Parameters

Let's see the Parameters for java.util.TreeMap class.

* **K**: It is the type of keys maintained by this map.
* **V**: It is the type of mapped values.

Constructors of Java TreeMap class

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| **Constructor** | **Description** |
| TreeMap() | It is used to construct an empty tree map that  will be sorted using the natural order of its key. |
| TreeMap(Comparator<? super K> comparator) | It is used to construct an empty tree-based map that  will be sorted using the comparator comp. |
| TreeMap(Map<? extends K,? extends V> m) | It is used to initialize a treemap with the entries from  **m**, which will be sorted using the natural order of  the keys. |
| TreeMap(SortedMap<K,? extends V> m) | It is used to initialize a treemap with the entries from the SortedMap **sm**, which will be sorted in the same order as **sm.** |

Methods of Java TreeMap class

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| **Method** | **Description** |
| Map.Entry<K,V> ceilingEntry(K key) | It returns the key-value pair having the least key, greater than or equal to the specified key, or null if there is no such key. |
| K ceilingKey(K key) | It returns the least key, greater than the specified key or null if there is no such key. |
| void clear() | It removes all the key-value pairs from a map. |
| Object clone() | It returns a shallow copy of TreeMap instance. |
| Comparator<? super K> comparator() | It returns the comparator that arranges the key in order, or null if the map uses the natural ordering. |
| NavigableSet<K> descendingKeySet() | It returns a reverse order NavigableSet view of the keys contained in the map. |
| NavigableMap<K,V> descendingMap() | It returns the specified key-value pairs in descending order. |
| Map.Entry firstEntry() | It returns the key-value pair having the least key. |
| Map.Entry<K,V> floorEntry(K key) | It returns the greatest key, less than or equal to the specified key, or null if there is no such key. |
| void forEach(BiConsumer<? super K,? super V> action) | It performs the given action for each entry in the map until all entries have been processed or the action throws an exception. |
| SortedMap<K,V> headMap(K toKey) | It returns the key-value pairs whose keys are strictly less than toKey. |
| NavigableMap<K,V> headMap(K toKey, boolean inclusive) | It returns the key-value pairs whose keys are less than (or equal to if inclusive is true) toKey. |
| Map.Entry<K,V> higherEntry(K key) | It returns the least key strictly greater than the given key, or null if there is no such key. |
| K higherKey(K key) | It is used to return true if this map contains a mapping for the specified key. |
| Set keySet() | It returns the collection of keys exist in the map. |
| Map.Entry<K,V> lastEntry() | It returns the key-value pair having the greatest key, or null if there is no such key. |
| Map.Entry<K,V> lowerEntry(K key) | It returns a key-value mapping associated with the greatest key strictly less than the given key, or null if there is no such key. |
| K lowerKey(K key) | It returns the greatest key strictly less than the given key, or null if there is no such key. |
| NavigableSet<K> navigableKeySet() | It returns a NavigableSet view of the keys contained in this map. |
| Map.Entry<K,V> pollFirstEntry() | It removes and returns a key-value mapping associated with the least key in this map, or null if the map is empty. |
| Map.Entry<K,V> pollLastEntry() | It removes and returns a key-value mapping associated with the greatest key in this map, or null if the map is empty. |
| V put(K key, V value) | It inserts the specified value with the specified key in the map. |
| void putAll(Map<? extends K,? extends V> map) | It is used to copy all the key-value pair from one map to another map. |
| V replace(K key, V value) | It replaces the specified value for a specified key. |
| boolean replace(K key, V oldValue, V newValue) | It replaces the old value with the new value for a specified key. |
| void replaceAll(BiFunction<? super K,? super V,? extends V> function) | It replaces each entry's value with the result of invoking the given function on that entry until all entries have been processed or the function throws an exception. |
| NavigableMap<K,V> subMap(K fromKey, boolean fromInclusive, K toKey, boolean toInclusive) | It returns key-value pairs whose keys range from fromKey to toKey. |
| SortedMap<K,V> subMap(K fromKey, K toKey) | It returns key-value pairs whose keys range from fromKey, inclusive, to toKey, exclusive. |
| SortedMap<K,V> tailMap(K fromKey) | It returns key-value pairs whose keys are greater than or equal to fromKey. |
| NavigableMap<K,V> tailMap(K fromKey, boolean inclusive) | It returns key-value pairs whose keys are greater than (or equal to, if inclusive is true) fromKey. |
| boolean containsKey(Object key) | It returns true if the map contains a mapping for the specified key. |
| boolean containsValue(Object value) | It returns true if the map maps one or more keys to the specified value. |
| K firstKey() | It is used to return the first (lowest) key currently in this sorted map. |
| V get(Object key) | It is used to return the value to which the map maps the specified key. |
| K lastKey() | It is used to return the last (highest) key currently in the sorted map. |
| V remove(Object key) | It removes the key-value pair of the specified key from the map. |
| Set<Map.Entry<K,V>> entrySet() | It returns a set view of the mappings contained in the map. |
| int size() | It returns the number of key-value pairs exists in the hashtable. |
| Collection values() | It returns a collection view of the values contained in the map. |

Java TreeMap Example

1. **import** java.util.\*;
2. **class** TreeMap1{
3. **public** **static** **void** main(String args[]){
4. TreeMap<Integer,String> map=**new** TreeMap<Integer,String>();
5. map.put(100,"Amit");
6. map.put(102,"Ravi");
7. map.put(101,"Vijay");
8. map.put(103,"Rahul");
10. **for**(Map.Entry m:map.entrySet()){
11. System.out.println(m.getKey()+" "+m.getValue());
12. }
13. }
14. }

Output:100 Amit

101 Vijay

102 Ravi

103 Rahul

Java TreeMap Example: remove()

1. **import** java.util.\*;
2. **public** **class** TreeMap2 {
3. **public** **static** **void** main(String args[]) {
4. TreeMap<Integer,String> map=**new** TreeMap<Integer,String>();
5. map.put(100,"Amit");
6. map.put(102,"Ravi");
7. map.put(101,"Vijay");
8. map.put(103,"Rahul");
9. System.out.println("Before invoking remove() method");
10. **for**(Map.Entry m:map.entrySet())
11. {
12. System.out.println(m.getKey()+" "+m.getValue());
13. }
14. map.remove(102);
15. System.out.println("After invoking remove() method");
16. **for**(Map.Entry m:map.entrySet())
17. {
18. System.out.println(m.getKey()+" "+m.getValue());
19. }
20. }
21. }

Output:

Before invoking remove() method

100 Amit

101 Vijay

102 Ravi

103 Rahul

After invoking remove() method

100 Amit

101 Vijay

103 Rahul

Java TreeMap Example: NavigableMap

1. **import** java.util.\*;
2. **class** TreeMap3{
3. **public** **static** **void** main(String args[]){
4. NavigableMap<Integer,String> map=**new** TreeMap<Integer,String>();
5. map.put(100,"Amit");
6. map.put(102,"Ravi");
7. map.put(101,"Vijay");
8. map.put(103,"Rahul");
9. //Maintains descending order
10. System.out.println("descendingMap: "+map.descendingMap());
11. //Returns key-value pairs whose keys are less than or equal to the specified key.
12. System.out.println("headMap: "+map.headMap(102,**true**));
13. //Returns key-value pairs whose keys are greater than or equal to the specified key.
14. System.out.println("tailMap: "+map.tailMap(102,**true**));
15. //Returns key-value pairs exists in between the specified key.
16. System.out.println("subMap: "+map.subMap(100, **false**, 102, **true**));
17. }
18. }

descendingMap: {103=Rahul, 102=Ravi, 101=Vijay, 100=Amit}

headMap: {100=Amit, 101=Vijay, 102=Ravi}

tailMap: {102=Ravi, 103=Rahul}

subMap: {101=Vijay, 102=Ravi}

Java TreeMap Example: SortedMap

1. **import** java.util.\*;
2. **class** TreeMap4{
3. **public** **static** **void** main(String args[]){
4. SortedMap<Integer,String> map=**new** TreeMap<Integer,String>();
5. map.put(100,"Amit");
6. map.put(102,"Ravi");
7. map.put(101,"Vijay");
8. map.put(103,"Rahul");
9. //Returns key-value pairs whose keys are less than the specified key.
10. System.out.println("headMap: "+map.headMap(102));
11. //Returns key-value pairs whose keys are greater than or equal to the specified key.
12. System.out.println("tailMap: "+map.tailMap(102));
13. //Returns key-value pairs exists in between the specified key.
14. System.out.println("subMap: "+map.subMap(100, 102));
15. }
16. }

headMap: {100=Amit, 101=Vijay}

tailMap: {102=Ravi, 103=Rahul}

subMap: {100=Amit, 101=Vijay}

What is difference between HashMap and TreeMap?

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| **HashMap** | **TreeMap** |
| 1) HashMap can contain one null key. | TreeMap cannot contain any  null key. |
| 2) HashMap maintains no order. | TreeMap maintains ascending order. |

Java TreeMap Example: Book

1. **import** java.util.\*;
2. **class** Book {
3. **int** id;
4. String name,author,publisher;
5. **int** quantity;
6. **public** Book(**int** id, String name, String author, String publisher, **int** quantity) {
7. **this**.id = id;
8. **this**.name = name;
9. **this**.author = author;
10. **this**.publisher = publisher;
11. **this**.quantity = quantity;
12. }
13. }
14. **public** **class** MapExample {
15. **public** **static** **void** main(String[] args) {
16. //Creating map of Books
17. Map<Integer,Book> map=**new** TreeMap<Integer,Book>();
18. //Creating Books
19. Book b1=**new** Book(101,"Let us C","Yashwant Kanetkar","BPB",8);
20. Book b2=**new** Book(102,"Data Communications & Networking","Forouzan","Mc Graw Hill",4);
21. Book b3=**new** Book(103,"Operating System","Galvin","Wiley",6);
22. //Adding Books to map
23. map.put(2,b2);
24. map.put(1,b1);
25. map.put(3,b3);
27. //Traversing map
28. **for**(Map.Entry<Integer, Book> entry:map.entrySet()){
29. **int** key=entry.getKey();
30. Book b=entry.getValue();
31. System.out.println(key+" Details:");
32. System.out.println(b.id+" "+b.name+" "+b.author+" "+b.publisher+" "+b.quantity);
33. }
34. }
35. }

Output:

1 Details:

101 Let us C Yashwant Kanetkar BPB 8

2 Details:

102 Data Communications & Networking Forouzan Mc Graw Hill 4

3 Details:

103 Operating System Galvin Wiley 6