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Set Custom implementation in java - How HashSet works internally with diagrams and full program

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In this post i will be explaining **HashSet** custom implementation.

1) Methods used in custom HashMap >

public void **add**(E value)	Add objects in **setCustom**
public boolean **contains**(E obj)	Method returns true if **setCustom** contains the object.
public boolean **remove**(E obj)	Method removes object from **setCustom**.
public void **display**()	-Method displays all objects in setCustom. **-Insertion order is not guaranteed**, for maintaining insertion order refer LinkedHashSet.

*2) Let’s find out answer of few very **important** questions before proceeding >*

Q1. How HashSet implements **hashing?**

A. Method internally uses HashMap’s hash method for hasihng.

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Q2. How **add method** works internally?

A. **public void** add(E value){

```
        hashMapCustom.put(value, null);
          }
```

Method internally uses HashMap's put method for storing object.

Q3. How **contains method** works internally?

A. **public boolean contains(E obj){**

```
        return hashMapCustom.contains(obj) !=null ? true :false;
          }
```

Method internally uses HashMap's contains method for storing object.

Q4. How **remove method** works internally?

A. **public boolean remove(E obj){**

```
              return hashMapCustom.remove(obj);
 }
```

Method internally uses HashMap's put remove for storing object.

REFER: Set Custom implementation - add, contains, remove Employee object.

3) Full Program/SourceCode for implementing custom HashSet >

```
package com.ankit;
```

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```
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/**
* @author AnkitMittal
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* This class provides custom implementation of HashSet(without using java api's- we will be using HashMapCustom)- which
allows does not allow you to store duplicate values.
* Note- implementation does not allow you to store null values.
* does not maintain insertion order.
* @param <K>
* @param <V>
*/
class HashSetCustom<E>{


  private HashMapCustom<E, Object> hashMapCustom;

  public HashSetCustom(){
    hashMapCustom=new HashMapCustom<>();
  }

  /**
   * add objects in SetCustom.
   */
  public void add(E value){
      hashMapCustom.put(value, null);
  }

  /**
   * Method returns true if set contains the object.
   * @param key
   */
  public boolean contains(E obj){
      return hashMapCustom.contains(obj) !=null ? true :false;
  }

  /**
   * Method displays all objects in setCustom.
   * insertion order is not guaranteed, for maintaining insertion order refer LinkedHashSet.
   */
```

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```
    public void display(){
      hashMapCustom.displaySet();
    }

    /**
     * Method removes object from setCustom.
     * @param obj
     */
    public boolean remove(E obj){
      return hashMapCustom.remove(obj);
    }

}


/**
 * @author AnkitMittal
 * Copyright (c), AnkitMittal . All Contents are copyrighted and must not be reproduced in any form.
 * This class provides custom implementation of HashMap(without using java api's)- which allows us to store data in key-value
pair form..
 * @param <K>
 * @param <V>
 */
class HashMapCustom<K, V> {

    private Entry<K,V>[] table;   //Array of Entry.
    private int capacity= 4;  //Initial capacity of HashMap


    static class Entry<K, V> {
        K key;
        V value;
        Entry<K,V> next;

        public Entry(K key, V value, Entry<K,V> next){
            this.key = key;
            this.value = value;
            this.next = next;
        }
```

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```
}


@SuppressWarnings("unchecked")
public HashMapCustom(){
  table = new Entry[capacity];
}



/**
 * Method allows you put key-value pair in HashMapCustom.
 * If the map already contains a mapping for the key, the old value is replaced.
 * Note: method does not allows you to put null key thought it allows null values.
 * Implementation allows you to put custom objects as a key as well.
 * Key Features: implementation provides you with following features:-
 *     >provide complete functionality how to override equals method.
 *  >provide complete functionality how to override hashCode method.
 * @param newKey
 * @param data
 */
public void put(K newKey, V data){
  if(newKey==null)
      return;    //does not allow to store null.

  int hash=hash(newKey);
  Entry<K,V> newEntry = new Entry<K,V>(newKey, data, null);

   if(table[hash] == null){
    table[hash] = newEntry;
   }else{
      Entry<K,V> previous = null;
      Entry<K,V> current = table[hash];

      while(current != null){ //we have reached last entry of bucket.
      if(current.key.equals(newKey)){
          if(previous==null){  //node has to be insert on first of bucket.
                newEntry.next=current.next;
                table[hash]=newEntry;
```

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```
                return;
             }
             else{
             newEntry.next=current.next;
             previous.next=newEntry;
             return;
             }
           }
           previous=current;
             current = current.next;
         }
         previous.next = newEntry;
        }
    }

    /**
     * Method returns value corresponding to key.
     * @param key
     */
    public V get(K key){
        int hash = hash(key);
        if(table[hash] == null){
         return null;
        }else{
         Entry<K,V> temp = table[hash];
         while(temp!= null){
             if(temp.key.equals(key))
                 return temp.value;
             temp = temp.next; //return value corresponding to key.
         }
         return null;   //returns null if key is not found.
        }
    }


    /**
     * Method removes key-value pair from HashMapCustom.
     * @param key
     */
```

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```
public boolean remove(K deleteKey){

  int hash=hash(deleteKey);

 if(table[hash] == null){
       return false;
 }else{
   Entry<K,V> previous = null;
   Entry<K,V> current = table[hash];

   while(current != null){ //we have reached last entry node of bucket.
      if(current.key.equals(deleteKey)){
          if(previous==null){  //delete first entry node.
                table[hash]=table[hash].next;
                return true;
          }
          else{
                previous.next=current.next;
             return true;
          }
      }
      previous=current;
        current = current.next;
     }
   return false;
 }

}


/**
 * Method displays all key-value pairs present in HashMapCustom.,
 * insertion order is not guaranteed, for maintaining insertion order refer LinkedHashMapCustom.
 * @param key
 */
public void display(){

  for(int i=0;i<capacity;i++){
      if(table[i]!=null){
            Entry<K, V> entry=table[i];
            while(entry!=null){
                System.out.print("{"+entry.key+"="+entry.value+"}" +" ");
                entry=entry.next;
            }
        }
    }

}


/**
 * Method returns null if set does not contain object.
 * @param key
 */
public K contains(K key){
   int hash = hash(key);
   if(table[hash] == null){
    return null;
   }else{
    Entry<K,V> temp = table[hash];
    while(temp!= null){
       if(temp.key.equals(key))
          return key;
       temp = temp.next; //return value corresponding to key.
    }
    return null;   //returns null if key is not found.
   }
}


/**
 * Method displays all objects in setCustom.
 * insertion order is not guaranteed, for maintaining insertion order refer LinkedHashSet.
 */
public void displaySet(){

  for(int i=0;i<capacity;i++){
     if(table[i]!=null){
```

```
                Entry<K, V> entry=table[i];
                while(entry!=null){
                    System.out.print(entry.key+" ");
                    entry=entry.next;
                }
            }
        }

    }

    /**
     * Method implements hashing functionality, which helps in finding the appropriate bucket location to store our data.
     * This is very important method, as performance of HashMapCustom is very much dependent on  this method's
implementation.
     * @param key
     */
    private int hash(K key){
        return Math.abs(key.hashCode()) % capacity;
    }

}



/**
 * Main class- to test HashMap functionality.
 */
public class HashSetCustomApp {


    public static void main(String[] args) {
       HashSetCustom<Integer> hashSetCustom = new HashSetCustom<Integer>();
       hashSetCustom.add(21);
       hashSetCustom.add(25);
       hashSetCustom.add(30);
       hashSetCustom.add(33);
       hashSetCustom.add(35);

       System.out.println("HashSetCustom contains 21 ="+hashSetCustom.contains(21));
```

```
        System.out.println("HashSetCustom contains 51 ="+hashSetCustom.contains(51));

        System.out.print("Displaying HashSetCustom: ");
        hashSetCustom.display();

        System.out.println("\n\n21 removed: "+hashSetCustom.remove(21));
        System.out.println("22 removed: "+hashSetCustom.remove(22));

        System.out.print("Displaying HashSetCustom: ");
        hashSetCustom.display();

    }
}

/*Output

HashSetCustom contains 21 =true
HashSetCustom contains 51 =false
Displaying HashSetCustom: 21 25 33 30 35

21 removed: true
22 removed: false
Displaying HashSetCustom: 25 33 30 35

*/
```

Summary of article >

In this tutorial we learned how to create and implement own/custom Set in java with full program, diagram and examples to insert and retrieve values in it.

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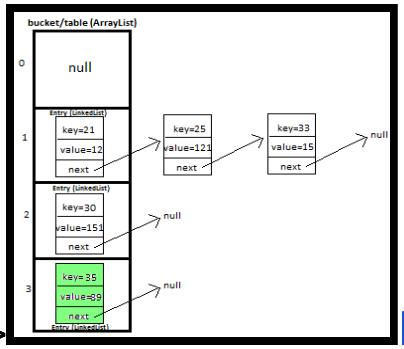
1 > 

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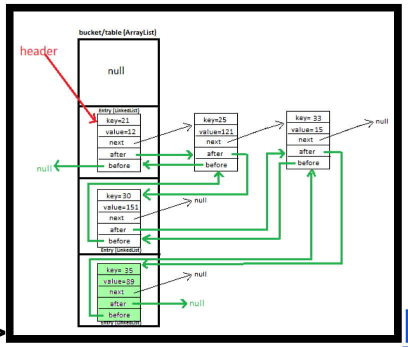
2 > 

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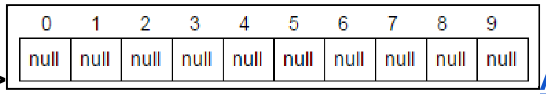
3 > 

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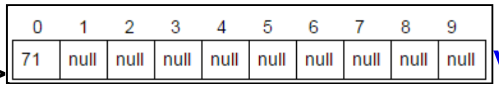
6 > 

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