Java HashMap



Java **HashMap** class implements the Map interface which allows us *to store key and value pair*, where keys should be unique. If you try to insert the duplicate key, it will replace the element of the corresponding key. It is easy to perform operations using the key index like updation, deletion, etc. HashMap class is found in the java.util package.

HashMap in Java is like the legacy Hashtable class, but it is not synchronized. It allows us to store the null elements as well, but there should be only one null key. Since Java 5, it is denoted as HashMap<K,V>, where K stands for key and V for value. It inherits the AbstractMap class and implements the Map interface.

Points to remember

* Java HashMap contains values based on the key.
* Java HashMap contains only unique keys.
* Java HashMap may have one null key and multiple null values.
* Java HashMap is non synchronized.
* Java HashMap maintains no order.
* The initial default capacity of Java HashMap class is 16 with a load factor of 0.75.

Hierarchy of HashMap class

As shown in the above figure, HashMap class extends AbstractMap class and implements Map interface.

HashMap class declaration

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

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1. **public** **class** HashMap<K,V> **extends** AbstractMap<K,V> **implements** Map<K,V>, Cloneable, Serializable

HashMap class Parameters

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

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

Constructors of Java HashMap class

|  |  |
| --- | --- |
| **Constructor** | **Description** |
| HashMap() | It is used to construct a default HashMap. |
| HashMap(Map<? extends K,? extends V> m) | It is used to initialize the hash map by using the elements of the given Map object m. |
| HashMap(int capacity) | It is used to initializes the capacity of the hash map to the given integer value, capacity. |
| HashMap(int capacity, float loadFactor) | It is used to initialize both the capacity and load factor of the hash map by using its arguments. |

Methods of Java HashMap class

|  |  |
| --- | --- |
| **Method** | **Description** |
| void clear() | It is used to remove all of the mappings from this map. |
| boolean isEmpty() | It is used to return true if this map contains no key-value mappings. |
| Object clone() | It is used to return a shallow copy of this HashMap instance: the keys and values themselves are not cloned. |
| Set entrySet() | It is used to return a collection view of the mappings contained in this map. |
| Set keySet() | It is used to return a set view of the keys contained in this map. |
| V put(Object key, Object value) | It is used to insert an entry in the map. |
| void putAll(Map map) | It is used to insert the specified map in the map. |
| V putIfAbsent(K key, V value) | It inserts the specified value with the specified key in the map only if it is not already specified. |
| V remove(Object key) | It is used to delete an entry for the specified key. |
| boolean remove(Object key, Object value) | It removes the specified values with the associated specified keys from the map. |
| V compute(K key, BiFunction<? super K,? super V,? extends V> remappingFunction) | It is used to compute a mapping for the specified key and its current mapped value (or null if there is no current mapping). |
| V computeIfAbsent(K key, Function<? super K,? extends V> mappingFunction) | It is used to compute its value using the given mapping function, if the specified key is not already associated with a value (or is mapped to null), and enters it into this map unless null. |
| V computeIfPresent(K key, BiFunction<? super K,? super V,? extends V> remappingFunction) | It is used to compute a new mapping given the key and its current mapped value if the value for the specified key is present and non-null. |
| boolean containsValue(Object value) | This method returns true if some value equal to the value exists within the map, else return false. |
| boolean containsKey(Object key) | This method returns true if some key equal to the key exists within the map, else return false. |
| boolean equals(Object o) | It is used to compare the specified Object with the Map. |
| 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. |
| V get(Object key) | This method returns the object that contains the value associated with the key. |
| V getOrDefault(Object key, V defaultValue) | It returns the value to which the specified key is mapped, or defaultValue if the map contains no mapping for the key. |
| boolean isEmpty() | This method returns true if the map is empty; returns false if it contains at least one key. |
| V merge(K key, V value, BiFunction<? super V,? super V,? extends V> remappingFunction) | If the specified key is not already associated with a value or is associated with null, associates it with the given non-null value. |
| 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. |
| Collection<V> values() | It returns a collection view of the values contained in the map. |
| int size() | This method returns the number of entries in the map. |

Java HashMap Example

Let's see a simple example of HashMap to store key and value pair.

1. **import** java.util.\*;
2. **public** **class** HashMapExample1{
3. **public** **static** **void** main(String args[]){
4. HashMap<Integer,String> map=**new** HashMap<Integer,String>();//Creating HashMap
5. map.put(1,"Mango");  //Put elements in Map
6. map.put(2,"Apple");
7. map.put(3,"Banana");
8. map.put(4,"Grapes");
10. System.out.println("Iterating Hashmap...");
11. **for**(Map.Entry m : map.entrySet()){
12. System.out.println(m.getKey()+" "+m.getValue());
13. }
14. }
15. }

[**Test it Now**](https://www.javatpoint.com/opr/test.jsp?filename=HashMapExample1)

Iterating Hashmap...

1 Mango

2 Apple

3 Banana

4 Grapes

In this example, we are storing Integer as the key and String as the value, so we are using HashMap<Integer,String> as the type. The put() method inserts the elements in the map.

To get the key and value elements, we should call the getKey() and getValue() methods. The Map.Entry interface contains the *getKey()* and *getValue()* methods. But, we should call the entrySet() method of Map interface to get the instance of Map.Entry.

No Duplicate Key on HashMap

You cannot store duplicate keys in HashMap. However, if you try to store duplicate key with another value, it will replace the value.

1. **import** java.util.\*;
2. **public** **class** HashMapExample2{
3. **public** **static** **void** main(String args[]){
4. HashMap<Integer,String> map=**new** HashMap<Integer,String>();//Creating HashMap
5. map.put(1,"Mango");  //Put elements in Map
6. map.put(2,"Apple");
7. map.put(3,"Banana");
8. map.put(1,"Grapes"); //trying duplicate key
10. System.out.println("Iterating Hashmap...");
11. **for**(Map.Entry m : map.entrySet()){
12. System.out.println(m.getKey()+" "+m.getValue());
13. }
14. }
15. }

[**Test it Now**](https://www.javatpoint.com/opr/test.jsp?filename=HashMapExample2)

Iterating Hashmap...

1 Grapes

2 Apple

3 Banana

Java HashMap example to add() elements

Here, we see different ways to insert elements.

1. **import** java.util.\*;
2. **class** HashMap1{
3. **public** **static** **void** main(String args[]){
4. HashMap<Integer,String> hm=**new** HashMap<Integer,String>();
5. System.out.println("Initial list of elements: "+hm);
6. hm.put(100,"Amit");
7. hm.put(101,"Vijay");
8. hm.put(102,"Rahul");
10. System.out.println("After invoking put() method ");
11. **for**(Map.Entry m:hm.entrySet()){
12. System.out.println(m.getKey()+" "+m.getValue());
13. }
15. hm.putIfAbsent(103, "Gaurav");
16. System.out.println("After invoking putIfAbsent() method ");
17. **for**(Map.Entry m:hm.entrySet()){
18. System.out.println(m.getKey()+" "+m.getValue());
19. }
20. HashMap<Integer,String> map=**new** HashMap<Integer,String>();
21. map.put(104,"Ravi");
22. map.putAll(hm);
23. System.out.println("After invoking putAll() method ");
24. **for**(Map.Entry m:map.entrySet()){
25. System.out.println(m.getKey()+" "+m.getValue());
26. }
27. }
28. }

Initial list of elements: {}

After invoking put() method

100 Amit

101 Vijay

102 Rahul

After invoking putIfAbsent() method

100 Amit

101 Vijay

102 Rahul

103 Gaurav

After invoking putAll() method

100 Amit

101 Vijay

102 Rahul

103 Gaurav

104 Ravi

Java HashMap example to remove() elements

Here, we see different ways to remove elements.

1. **import** java.util.\*;
2. **public** **class** HashMap2 {
3. **public** **static** **void** main(String args[]) {
4. HashMap<Integer,String> map=**new** HashMap<Integer,String>();
5. map.put(100,"Amit");
6. map.put(101,"Vijay");
7. map.put(102,"Rahul");
8. map.put(103, "Gaurav");
9. System.out.println("Initial list of elements: "+map);
10. //key-based removal
11. map.remove(100);
12. System.out.println("Updated list of elements: "+map);
13. //value-based removal
14. map.remove(101);
15. System.out.println("Updated list of elements: "+map);
16. //key-value pair based removal
17. map.remove(102, "Rahul");
18. System.out.println("Updated list of elements: "+map);
19. }
20. }

Output:

Initial list of elements: {100=Amit, 101=Vijay, 102=Rahul, 103=Gaurav}

Updated list of elements: {101=Vijay, 102=Rahul, 103=Gaurav}

Updated list of elements: {102=Rahul, 103=Gaurav}

Updated list of elements: {103=Gaurav}

Java HashMap example to replace() elements

Here, we see different ways to replace elements.

1. **import** java.util.\*;
2. **class** HashMap3{
3. **public** **static** **void** main(String args[]){
4. HashMap<Integer,String> hm=**new** HashMap<Integer,String>();
5. hm.put(100,"Amit");
6. hm.put(101,"Vijay");
7. hm.put(102,"Rahul");
8. System.out.println("Initial list of elements:");
9. **for**(Map.Entry m:hm.entrySet())
10. {
11. System.out.println(m.getKey()+" "+m.getValue());
12. }
13. System.out.println("Updated list of elements:");
14. hm.replace(102, "Gaurav");
15. **for**(Map.Entry m:hm.entrySet())
16. {
17. System.out.println(m.getKey()+" "+m.getValue());
18. }
19. System.out.println("Updated list of elements:");
20. hm.replace(101, "Vijay", "Ravi");
21. **for**(Map.Entry m:hm.entrySet())
22. {
23. System.out.println(m.getKey()+" "+m.getValue());
24. }
25. System.out.println("Updated list of elements:");
26. hm.replaceAll((k,v) -> "Ajay");
27. **for**(Map.Entry m:hm.entrySet())
28. {
29. System.out.println(m.getKey()+" "+m.getValue());
30. }
31. }
32. }

Initial list of elements:

100 Amit

101 Vijay

102 Rahul

Updated list of elements:

100 Amit

101 Vijay

102 Gaurav

Updated list of elements:

100 Amit

101 Ravi

102 Gaurav

Updated list of elements:

100 Ajay

101 Ajay

102 Ajay

Difference between HashSet and HashMap

HashSet contains only values whereas HashMap contains an entry(key and value).

Java HashMap 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** HashMap<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(1,b1);
24. map.put(2,b2);
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. }

[**Test it Now**](https://www.javatpoint.com/opr/test.jsp?filename=MapExample)

Output:

1 Details:

101 Let us C Yashwant Kanetkar BPB 8

2 Details:

102 Data Communications and Networking Forouzan Mc Graw Hill 4

3 Details:

103 Operating System Galvin Wiley 6