ДОМАШНЕЕ ЗАДАНИЕ по курсу "JAVA"

Выполнил: Губенко Антон
ЗАДАНИЕ:

Необходимо написать собственную реализацию HashMap. Обязательные методы: get, put, remove.

Реализация HashMap.

Листинг класс MyHashMapImp.

```
package org.example;

import java.util.*;

public class MyHashMapImp<K,V> implements Map<K,V> {
    private static final int DEFAULT_CAPACITY=16;
    private int capacity;
    private double loadFactor=0.8;
    private int size;
    private Node [] table;

    public MyHashMapImp(){
        table=new Node[DEFAULT_CAPACITY];
        size=0;
        capacity=DEFAULT_CAPACITY;
    }
```

```java
private static class Node<K,V>{
    int hash;
    K key;
    V value;
    Node next;

    Node(int hash,K key,V value, Node next){
        this.hash=hash;
        this.key=key;
        this.value=value;
        this.next=next;
    }
}

@Override
public int size() {
    return size;
}

@Override
public boolean isEmpty() {
    return (size==0);
}
```

```java
@Override
public boolean containsKey(Object key) {
    if(size==0){
        return false;
    }
    return checkKey(key);
}

@Override
public boolean containsValue(Object value) {
    boolean result=false;
    if(size==0){
        return false;
    }
    for(int i=0;i<capacity;i++){
        if(table[i]!=null){
            result=checkValue(table[i],value);
        }
        if(result){break;}
    }
    return result;
}
```

```java
@Override
public V get(Object key) {
    if(size==0){
        return null;
    }
    int hash=getHashCode(key);
    int index=getIndex(hash);
    V resVal=null;
    if(table[index]!=null){
        resVal=getNode(index,hash,key);
    }
    return resVal;
}
```

```java
@Override
public V put(K key, V value) {
    int hash=getHashCode(key);
    int index=getIndex(hash);
    V resVal=null;

    if(table[index]==null){
        Node <K,V>newNode=new Node(hash,key,value,null);
        table[index]=newNode;
        size++;
    }
    else {
        resVal=addNode(index,hash,key,value);
    }
    resize();
    return resVal;
}
```

```java
@Override
public V remove(Object key) {
    if(size==0){
        return null;
    }
    int hash=getHashCode(key);
    int index=getIndex(hash);
    V resVal=null;
    if(table[index]!=null){
        resVal=removeNode(index,hash,key);
    }
    resize();
    return resVal;
}

@Override
public void putAll(Map<? extends K, ? extends V> m) {
Set<? extends K>keys=m.keySet();
for(K key:keys){
    V value=m.get(key);
    this.put(key,value);
}
}
```

```java
@Override
public void clear() {
for(int i=0;i<capacity;i++){
    table[i]=null;
}
size=0;
}

@Override
public Set<K> keySet() {
    if(size==0){
        return Collections.emptySet();
    }
    Set<K>keys=new HashSet<>();
    for(int i=0;i<capacity;i++){
        if(table[i]!=null){
        addKeys(table[i],keys);
        }
    }
    return keys;
}
```

```java
@Override
public Collection<V> values() {
    if(size==0){
        return Collections.emptySet();
    }
    Set<V>values=new HashSet<>();
    Set<K>keys=keySet();
    for(K key:keys){
        values.add(get(key));
    }
    return values;
}

@Override
public Set<Entry<K, V>> entrySet() {
    if(size==0){
        return Collections.emptySet();
    }
    Set<Entry<K,V>>entries=new HashSet<>();
    Set<K>keys=keySet();
    for(K key:keys){
        V value=get(key);
        Entry<K,V>entry=new AbstractMap.SimpleEntry(key,value);
        entries.add(entry);
    }
    return entries;
}
```

```java
//дополнительные утильные методы для работы мапы

private <K> int getHashCode(K key){
    return Objects.hashCode(key);
}

private int getIndex(int hash){
    return hash & (capacity-1);
}

private V addNode(int index,int hash,K key,V value){
    V resVal=null;
    Node<K, V> currentNode = table[index];
    Node<K, V> lastNode = null;

    while (currentNode != null) {
        if (currentNode.hash == hash &&
                (currentNode.key == key || (key != null && key.equals(currentNode.key)))) {
            resVal = currentNode.value;
            currentNode.value = value;
            break;
        }
        lastNode = currentNode;
        currentNode = currentNode.next;
    }
    if(resVal == null && lastNode != null && lastNode.next == null) {
        lastNode.next = new Node<>(hash, key, value, null);
        size++;
    }
    return resVal;
```

```
}

private V getNode(int index,int hash,Object key) {
    V resVal=null;
    Node<K, V> currentNode = table[index];
    while(currentNode!=null){
        if (currentNode.hash == hash &&
                (currentNode.key == key || (key != null && key.equals(currentNode.key)))){
            resVal=currentNode.value;
            break;
        }
            currentNode = currentNode.next;
    }
    return resVal;
}

private V removeNode(int index,int hash,Object key) {
    V resVal = null;
    Node<K, V> currentNode = table[index];
    Node<K, V> lastNode = null;

    while (currentNode != null) {
        if (currentNode.hash == hash &&
                (currentNode.key == key || (key != null && key.equals(currentNode.key)))) {
            resVal = currentNode.value;
            size--;
            break;
        }
        lastNode = currentNode;
        currentNode = currentNode.next;
```

```
    }
    if(resVal!=null && lastNode!=null && currentNode!=null){
    lastNode.next=currentNode.next;
    }
    else if(resVal!=null && lastNode==null){
        table[index]=currentNode.next;
    }
    return resVal;
}

private boolean checkKey(Object key) {
    int hash=getHashCode(key);
    int index=getIndex(hash);
    boolean result=false;
    if(table[index]!=null) {
        Node<K, V> currentNode = table[index];
        while (currentNode != null) {
            if (currentNode.hash == hash &&
                    (currentNode.key == key || (key != null && key.equals(currentNode.key)))) {
                result=true;
                break;
            }
            currentNode = currentNode.next;
        }
    }
    return result;
}
```

```
private boolean checkValue(Node<K,V>node,Object value){
    boolean result=false;
    while (node != null) {
        if (value == null ? node.value == null : value.equals(node.value)) {
            result=true;
            break;
        }
        node = node.next;
    }
    return result;
}

void addKeys(Node<K,V>node,Set<K>set){
    while(node!=null) {
        set.add(node.key);
        node = node.next;
    }
}

private void resize(){
    if(size>=capacity*loadFactor){
        int oldCapacity=capacity;
        int newCapacity=(int)(capacity*1.5);
        Node[]oldTable=table;
        table=new Node[newCapacity];
        capacity=newCapacity;
        addAllNodes(oldTable,oldCapacity);
    }
    else if(size<((capacity/1.5)*loadFactor-1) && capacity>16){
        int oldCapacity=capacity;
```

```
        int newCapacity=(int)(capacity/1.5);
        Node[]oldTable=table;
        table=new Node[newCapacity];
        capacity=newCapacity;
        addAllNodes(oldTable,oldCapacity);
    }
}

private void addAllNodes(Node[]oldTable,int oldCapacity){
    for(int i=0;i<oldCapacity;i++){
        if(oldTable[i]!=null){
            Node<K,V>currentNode=oldTable[i];
            while(currentNode!=null) {
                this.putResize(currentNode.key, currentNode.value);
                currentNode=currentNode.next;
            }
        }
    }
}

public void putResize(K key, V value) {
    int hash=getHashCode(key);
    int index=getIndex(hash);

    if(table[index]==null){
        Node <K,V>newNode=new Node(hash,key,value,null);
        table[index]=newNode;
    }
    else {
        addNodeResize(index,hash,key,value);
```

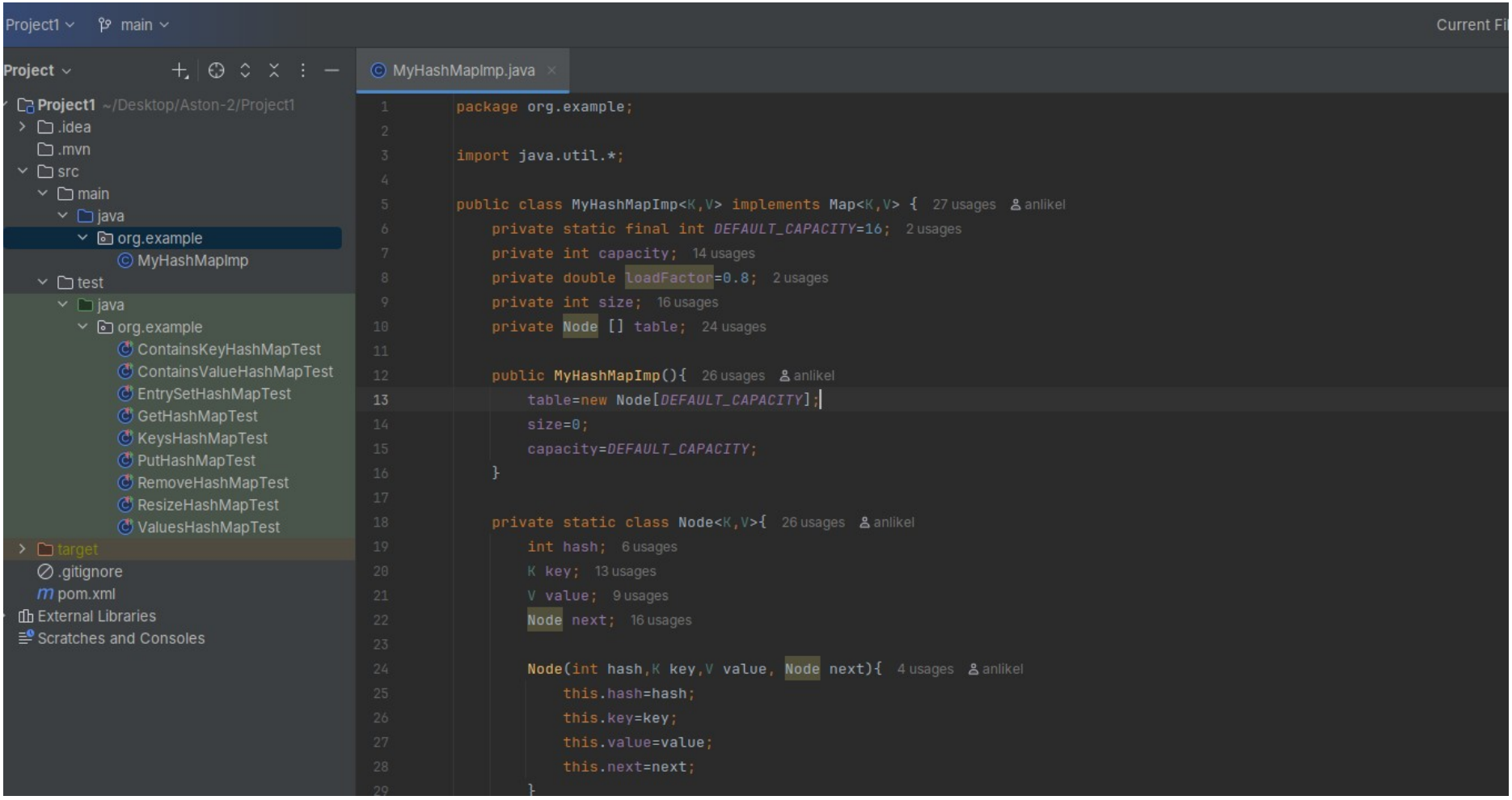
```
        }
    }

    private void addNodeResize(int index,int hash,K key,V value){
        Node<K, V> currentNode = table[index];
        Node<K, V> lastNode = null;
        int flag=0;
        while (currentNode != null) {
            if (currentNode.hash == hash &&
                    (currentNode.key == key || (key != null && key.equals(currentNode.key)))) {
                currentNode.value = value;
                flag=1;
                break;
            }
            lastNode = currentNode;
            currentNode = currentNode.next;
        }
        if(flag==0 && lastNode != null && lastNode.next == null) {
            lastNode.next = new Node<>(hash, key, value, null);
        }
    }

    //утильный метод для проверки метода resize

    public int getTableSize(){
        return table.length;
    }
}
```

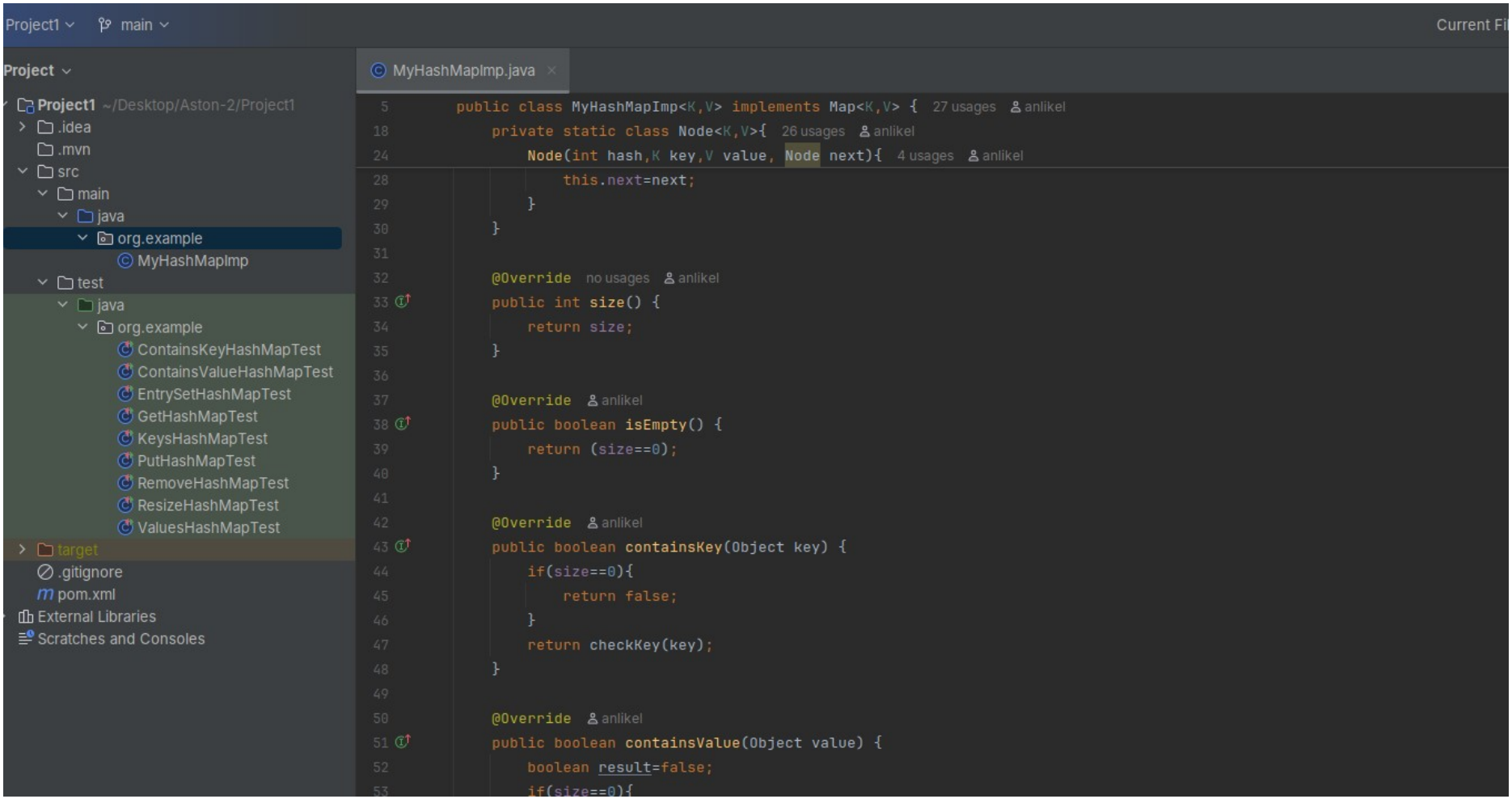
Реализованы методы:

public int size(),
public boolean isEmpty(),
public boolean containsKey(Object key),
public boolean containsValue(Object value),
public V get(Objet key),
public V put(K key,V value),
public V remove(Object key),
public void putAll(Map<? Extends K,? extends V>m),
public void clear(),
public Set<K>keySet(),
public Collection<V>values(),
public Set<Entry<K,V>>entrySet().

Так же был реализован внутренний статический класс
private static class Node<K,V> для хранения элементов коллекции.

Скриншоты MyHashMapImp;

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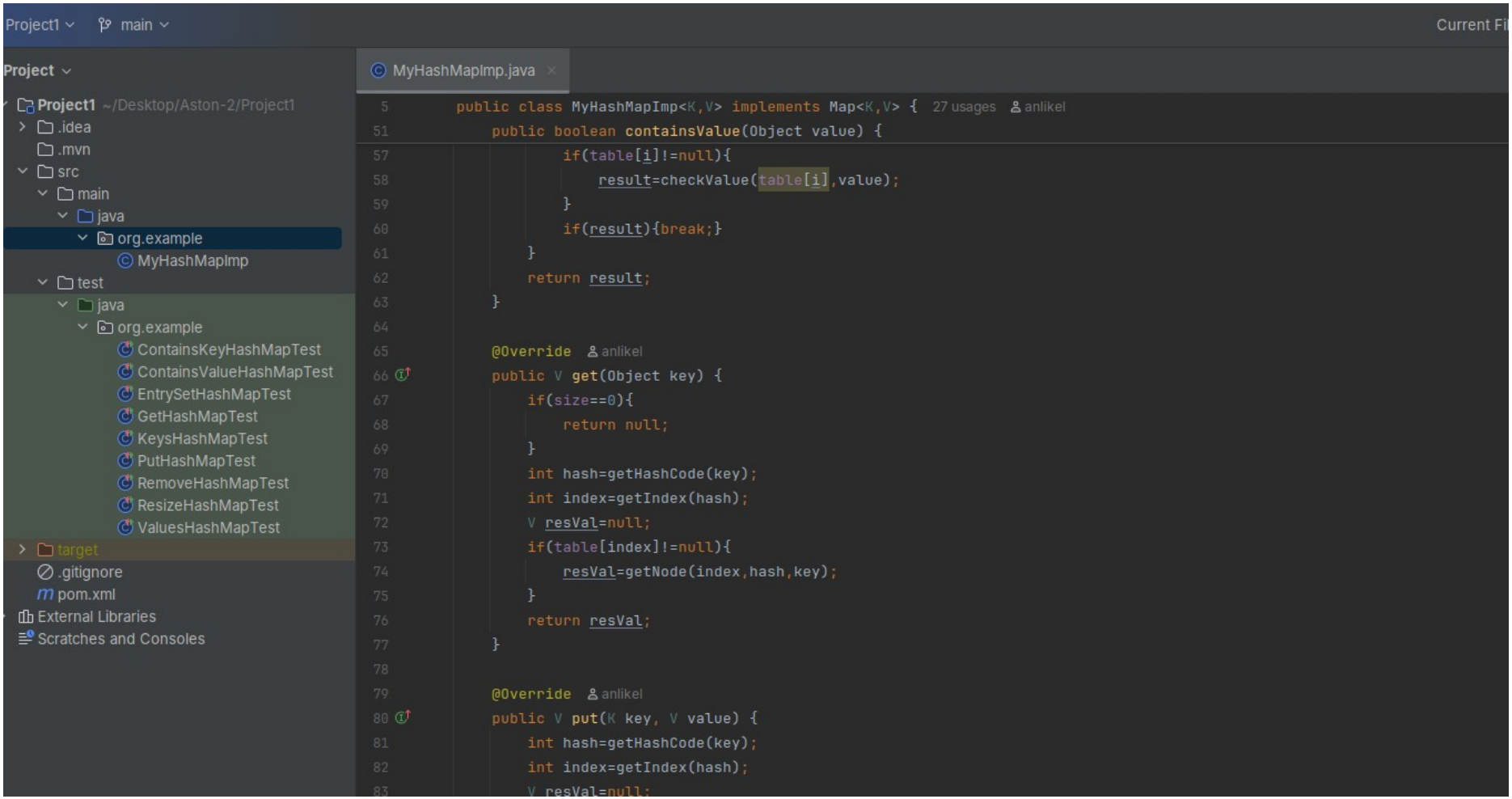
MyHashMapImp.java
public class MyHashMapImp<K,V> implements Map<K,V> { 27 usages anlikel
private static class Node<K,V>{ 26 usages anlikel
Node(int hash,K key,V value, Node next){ 4 usages anlikel
this.next=next;
}
}
@Override no usages anlikel
public int size() {
return size;
}
@Override anlikel
public boolean isEmpty() {
return (size==0);
}
@Override anlikel
public boolean containsKey(Object key) {
if(size==0){
return false;
}
return checkKey(key);
}
@Override anlikel
public boolean containsValue(Object value) {
boolean result=false;
if(size==0){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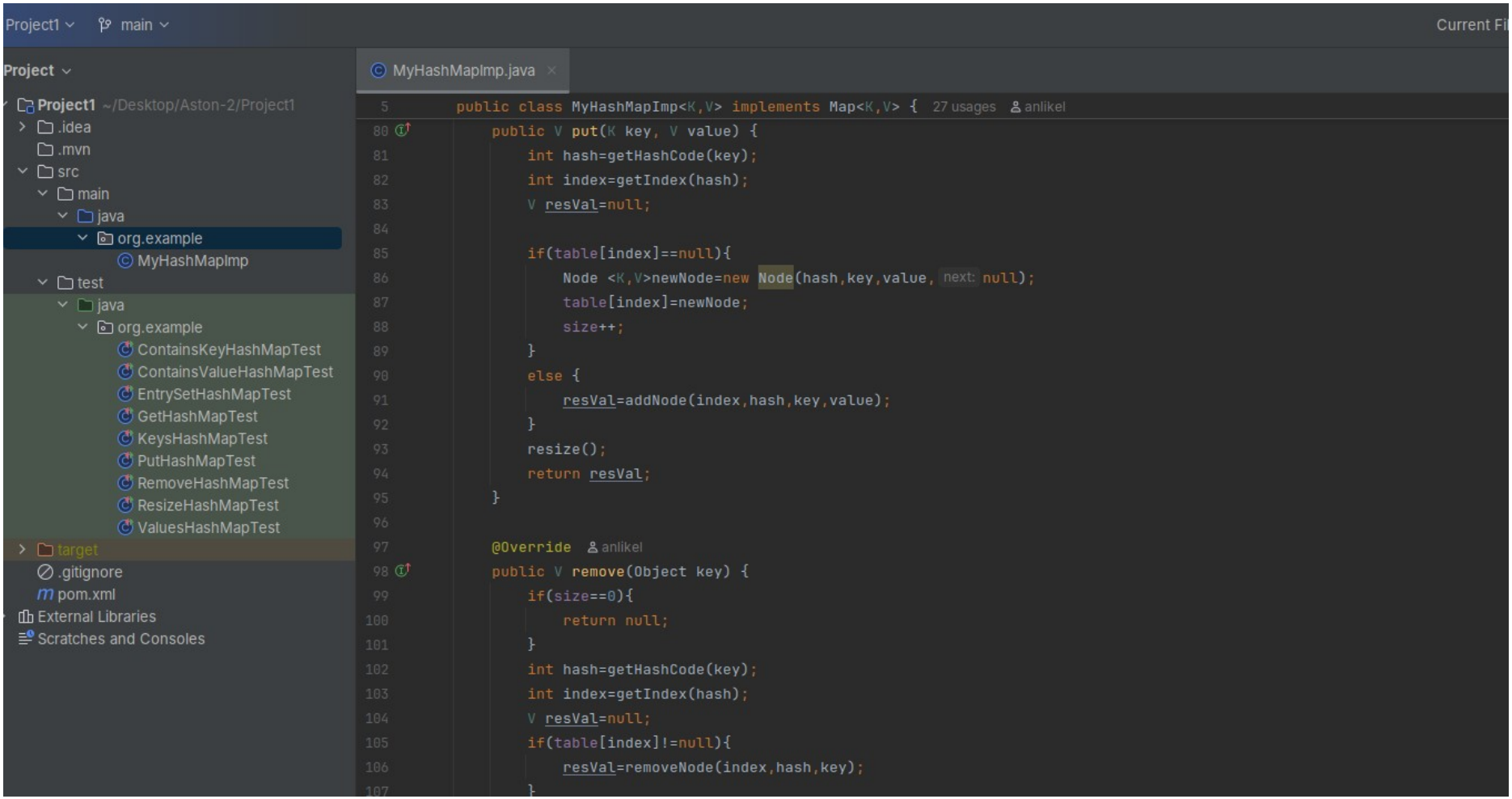
5 public class MyHashMapImp<K,V> implements Map<K,V> { 27 usages anlikel
51 public boolean containsValue(Object value) {
57 if(table[i]!=null){
58 result=checkValue(table[i],value);
59 }
60 if(result){break;}
61 }
62 return result;
63 }
64
65 @Override anlikel
66 public V get(Object key) {
67 if(size==0){
68 return null;
69 }
70 int hash=getHashCode(key);
71 int index=getIndex(hash);
72 V resVal=null;
73 if(table[index]!=null){
74 resVal=getNode(index,hash,key);
75 }
76 return resVal;
77 }
78
79 @Override anlikel
80 public V put(K key, V value) {
81 int hash=getHashCode(key);
82 int index=getIndex(hash);
83 V resVal=null;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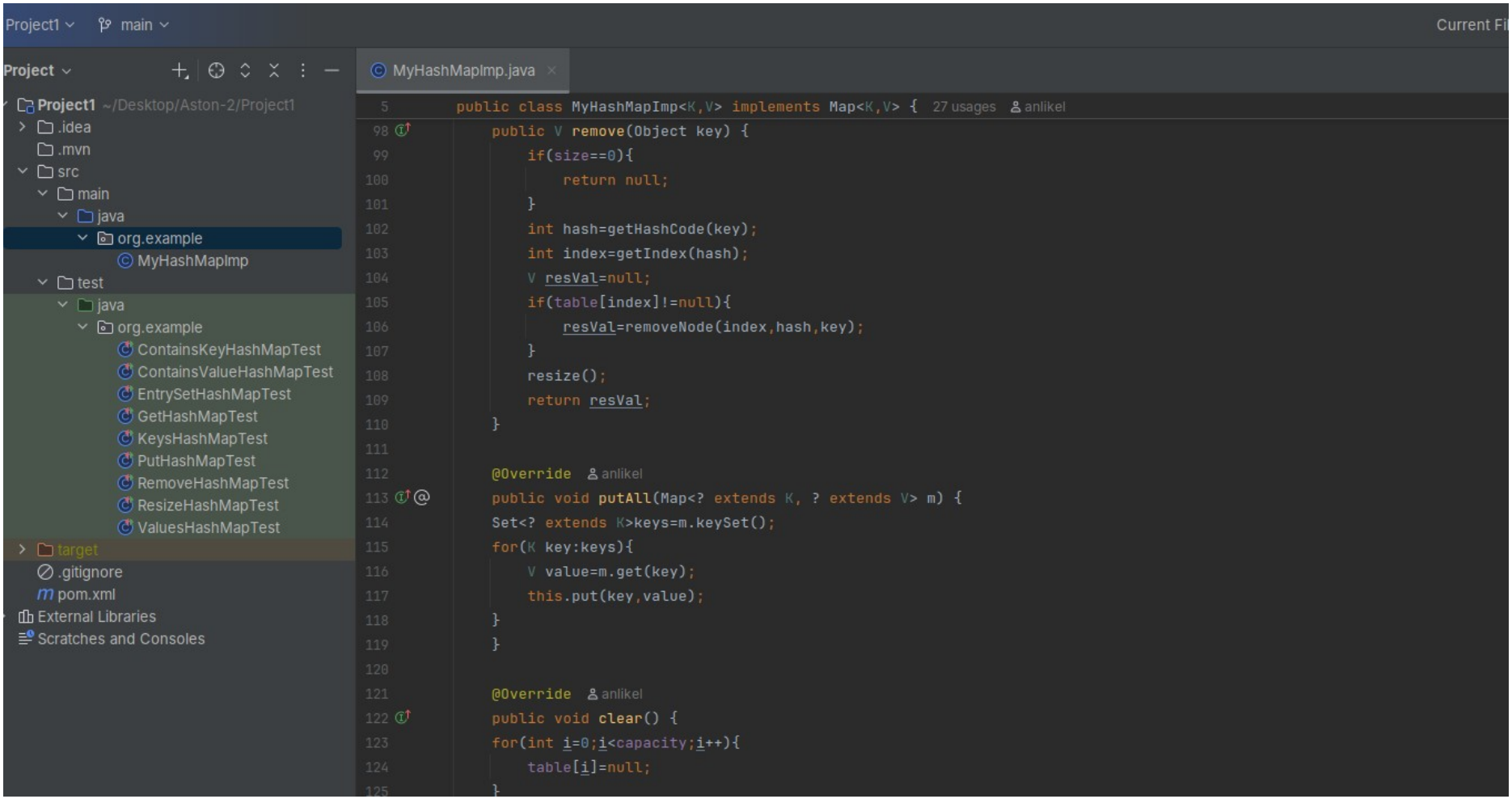
public V put(K key, V value) {
int hash=getHashCode(key);
int index=getIndex(hash);
V resVal=null;
if(table[index]==null){
Node <K,V>newNode=new Node(hash,key,value, next: null);
table[index]=newNode;
size++;
}
else {
resVal=addNode(index,hash,key,value);
}
resize();
return resVal;
}
@Override anlikel
public V remove(Object key) {
if(size==0){
return null;
}
int hash=getHashCode(key);
int index=getIndex(hash);
V resVal=null;
if(table[index]!=null){
resVal=removeNode(index,hash,key);
}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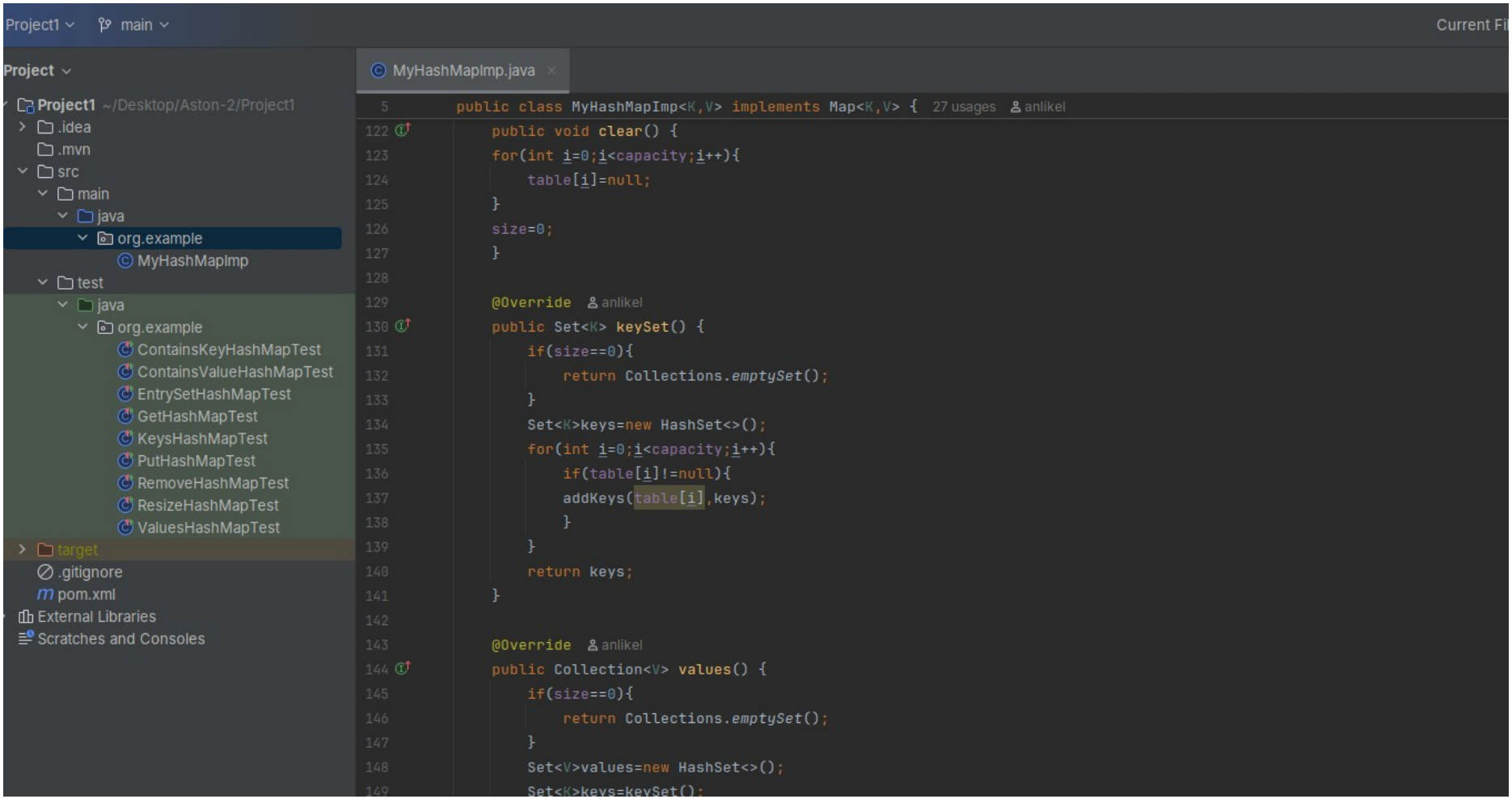
98 public V remove(Object key) {
99 if(size==0){
100 return null;
101 }
102 int hash=getHashCode(key);
103 int index=getIndex(hash);
104 V resVal=null;
105 if(table[index]!=null){
106 resVal=removeNode(index,hash,key);
107 }
108 resize();
109 return resVal;
110 }
111
112 @Override anlikel
113 public void putAll(Map<? extends K, ? extends V> m) {
114 Set<? extends K>keys=m.keySet();
115 for(K key:keys){
116 V value=m.get(key);
117 this.put(key,value);
118 }
119 }
120
121 @Override anlikel
122 public void clear() {
123 for(int i=0;i<capacity;i++){
124 table[i]=null;
125 }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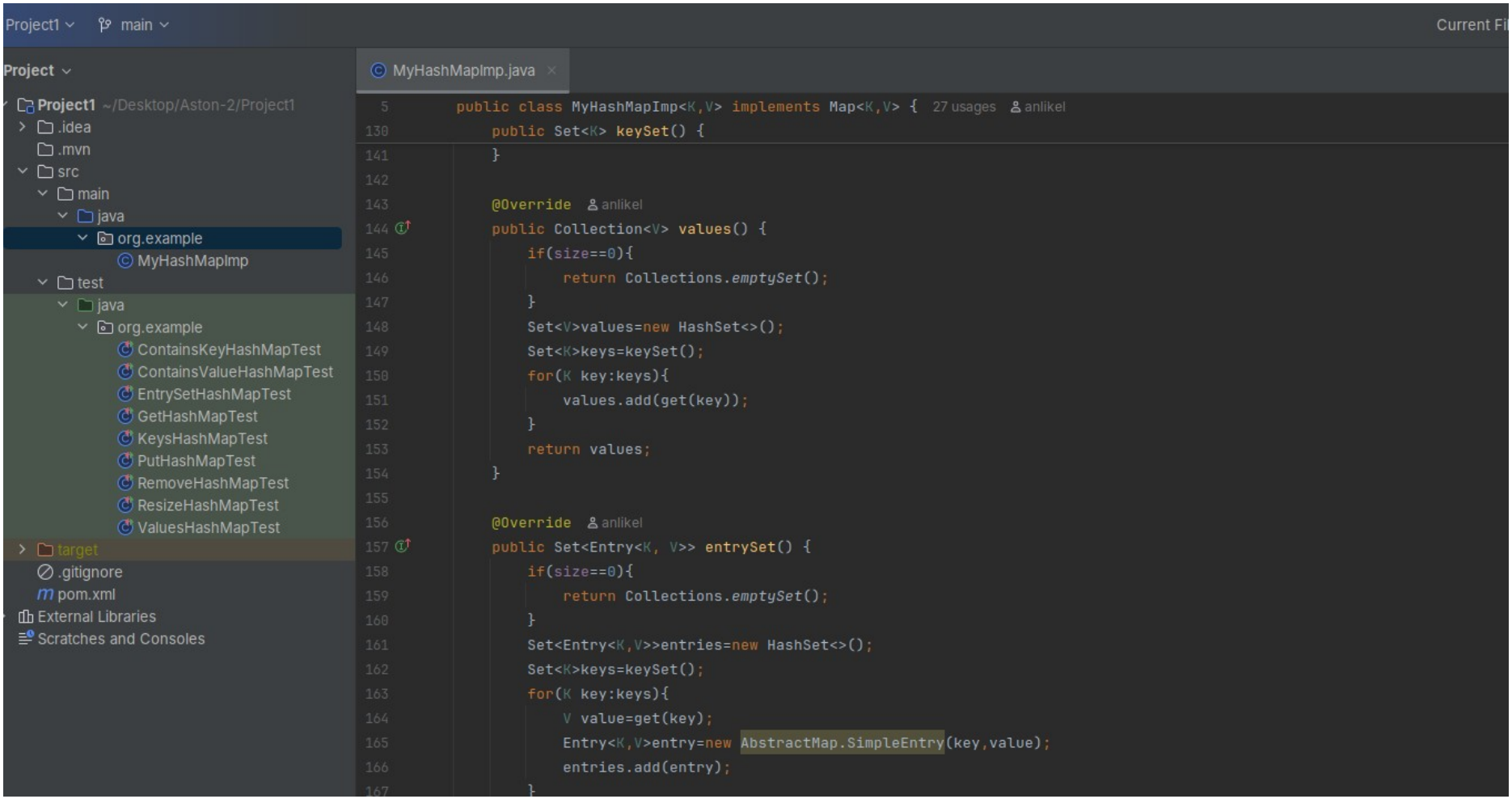
122 public void clear() {
123 for(int i=0;i<capacity;i++){
124 table[i]=null;
125 }
126 size=0;
127 }
128
129 @Override anlikel
130 public Set<K> keySet() {
131 if(size==0){
132 return Collections.emptySet();
133 }
134 Set<K>keys=new HashSet<>();
135 for(int i=0;i<capacity;i++){
136 if(table[i]!=null){
137 addKeys(table[i],keys);
138 }
139 }
140 return keys;
141 }
142
143 @Override anlikel
144 public Collection<V> values() {
145 if(size==0){
146 return Collections.emptySet();
147 }
148 Set<V>values=new HashSet<>();
149 Set<K>keys=keySet();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130 public Set<K> keySet() {
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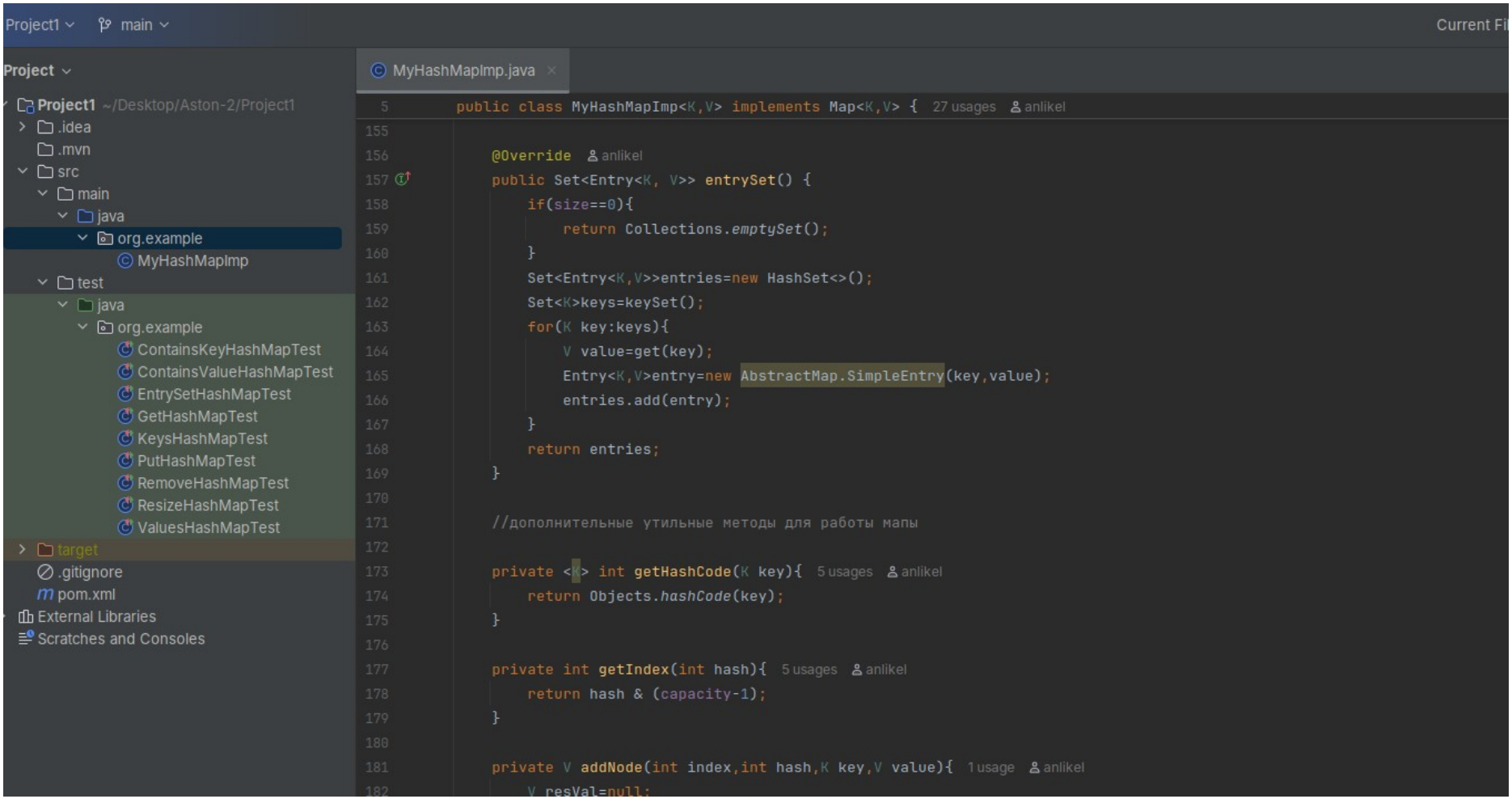
144 public Collection<V> values() {
145 if(size==0){
146 return Collections.emptySet();
147 }
148 Set<V>values=new HashSet<>();
149 Set<K>keys=keySet();
150 for(K key:keys){
151 values.add(get(key));
152 }
153 return values;
154 }
155
156 @Override anlikel
157 public Set<Entry<K, V>> entrySet() {
158 if(size==0){
159 return Collections.emptySet();
160 }
161 Set<Entry<K,V>>entries=new HashSet<>();
162 Set<K>keys=keySet();
163 for(K key:keys){
164 V value=get(key);
165 Entry<K,V>entry=new AbstractMap.SimpleEntry(key,value);
166 entries.add(entry);
167 }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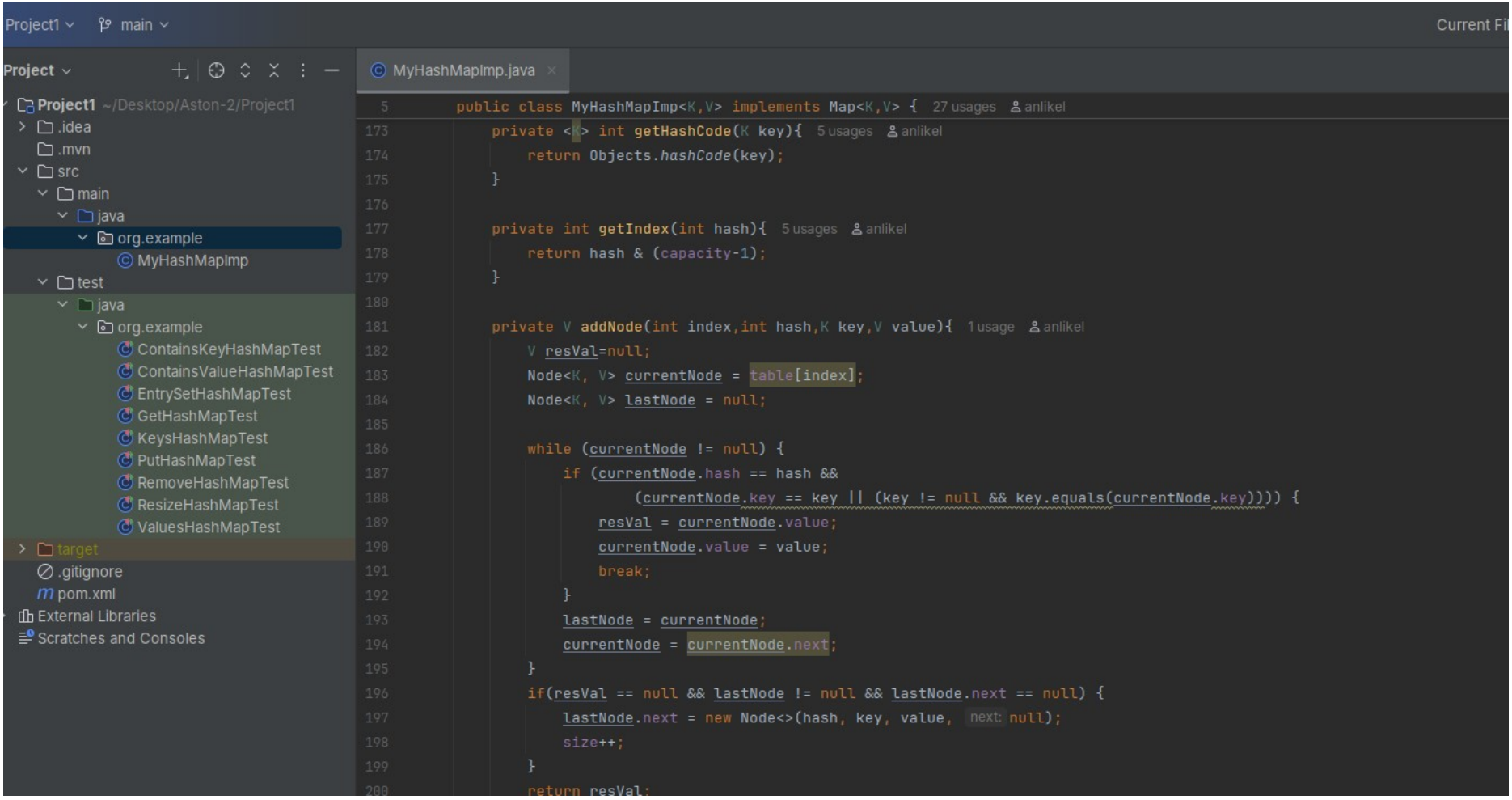
159 return Collections.emptySet();
160 }
161 Set<Entry<K,V>>entries=new HashSet<>();
162 Set<K>keys=keySet();
163 for(K key:keys){
164 V value=get(key);
165 Entry<K,V>entry=new AbstractMap.SimpleEntry(key,value);
166 entries.add(entry);
167 }
168 return entries;
169 }
170
171 //дополнительные утильные методы для работы мапы
172
173 private <K> int getHashCode(K key){ 5 usages anlikel
174 return Objects.hashCode(key);
175 }
176
177 private int getIndex(int hash){ 5 usages anlikel
178 return hash & (capacity-1);
179 }
180
181 private V addNode(int index,int hash,K key,V value){ 1 usage anlikel
182 V resVal=null;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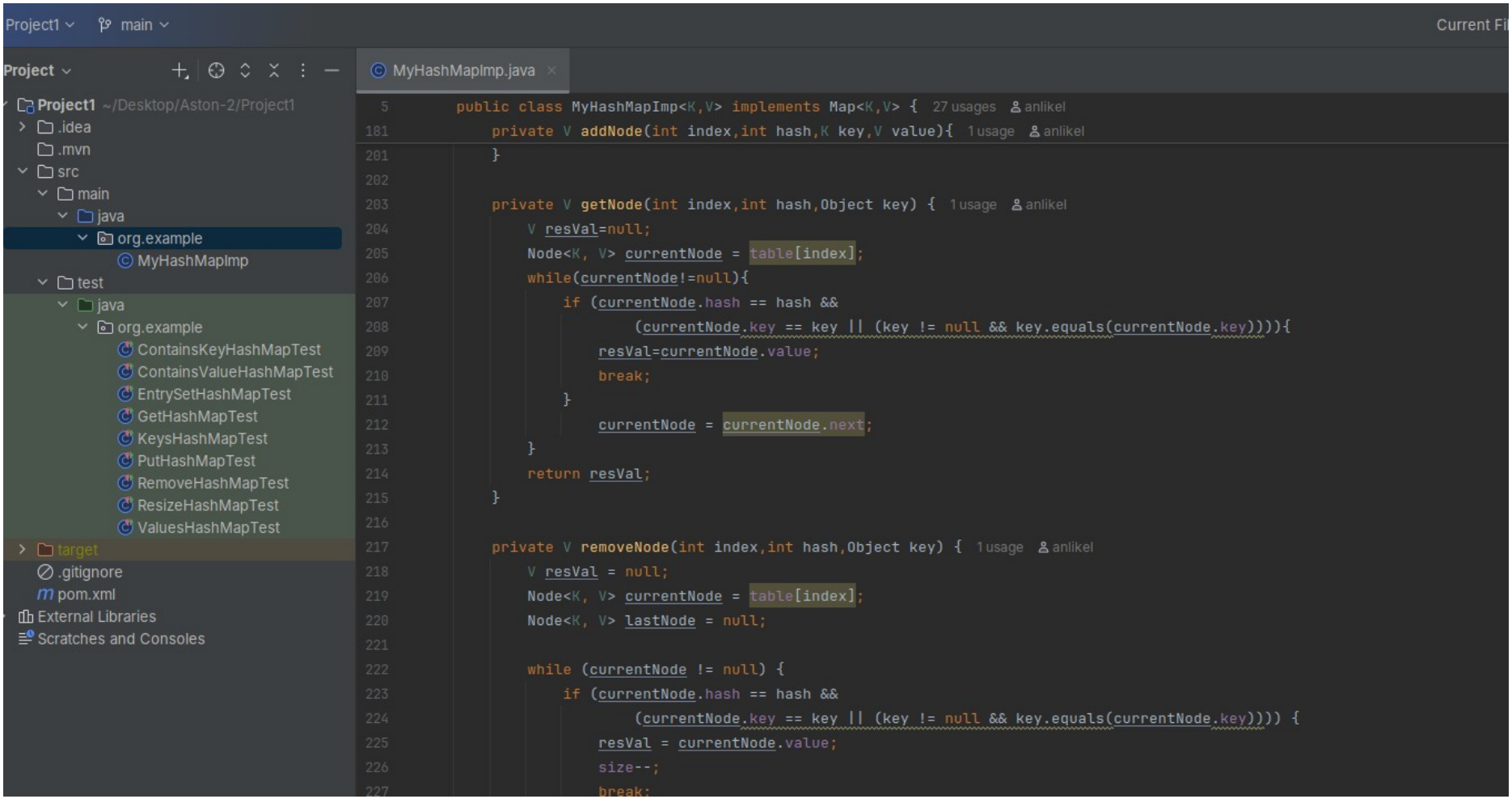
174 return Objects.hashCode(key);
175 }
176
177 private int getIndex(int hash){ 5 usages anlikel
178 return hash & (capacity-1);
179 }
180
181 private V addNode(int index,int hash,K key,V value){ 1 usage anlikel
182 V resVal=null;
183 Node<K, V> currentNode = table[index];
184 Node<K, V> lastNode = null;
185
186 while (currentNode != null) {
187 if (currentNode.hash == hash &&
188 (currentNode.key == key || (key != null && key.equals(currentNode.key)))) {
189 resVal = currentNode.value;
190 currentNode.value = value;
191 break;
192 }
193 lastNode = currentNode;
194 currentNode = currentNode.next;
195 }
196 if(resVal == null && lastNode != null && lastNode.next == null) {
197 lastNode.next = new Node<>(hash, key, value, next: null);
198 size++;
199 }
200 return resVal;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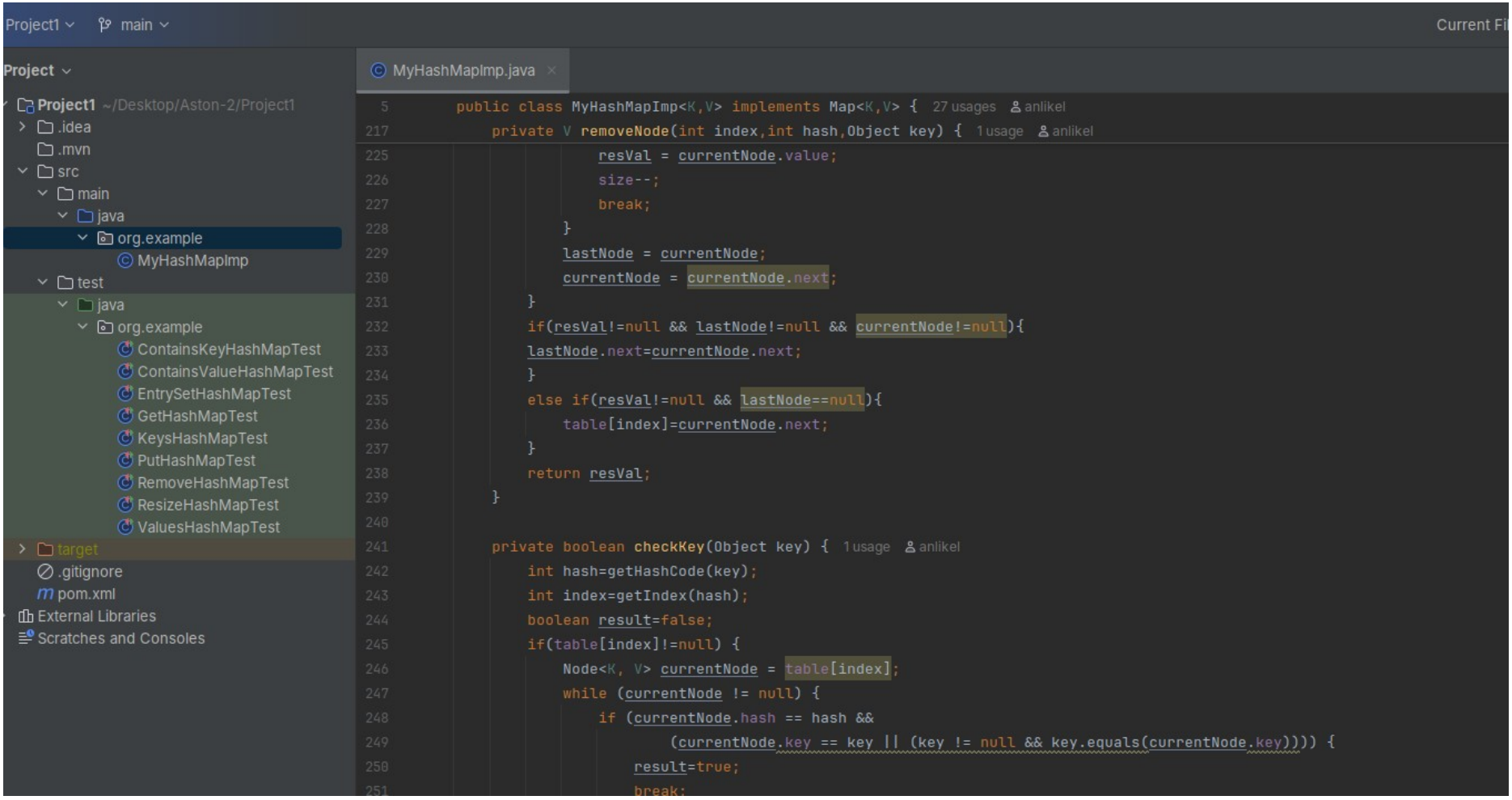
KeysHashMapTest
PutHashMapTest
RemoveHashMapTest
ResizeHashMapTest
ValuesHashMapTest
target
.gitignore
pom.xml
External Libraries
Scratches and Consoles
5 public class MyHashMapImp<K,V> implements Map<K,V> { 27 usages anlikel
181 private V addNode(int index,int hash,K key,V value){ 1 usage anlikel
201 }
202
203 private V getNode(int index,int hash,Object key) { 1 usage anlikel
204 V resVal=null;
205 Node<K, V> currentNode = table[index];
206 while(currentNode!=null){
207 if (currentNode.hash == hash &&
208 (currentNode.key == key || (key != null && key.equals(currentNode.key)))){
209 resVal=currentNode.value;
210 break;
211 }
212 currentNode = currentNode.next;
213 }
214 return resVal;
215 }
216
217 private V removeNode(int index,int hash,Object key) { 1 usage anlikel
218 V resVal = null;
219 Node<K, V> currentNode = table[index];
220 Node<K, V> lastNode = null;
221
222 while (currentNode != null) {
223 if (currentNode.hash == hash &&
224 (currentNode.key == key || (key != null && key.equals(currentNode.key)))) {
225 resVal = currentNode.value;
226 size--;
227 break;


Project1
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ContainsKeyHashMapTest
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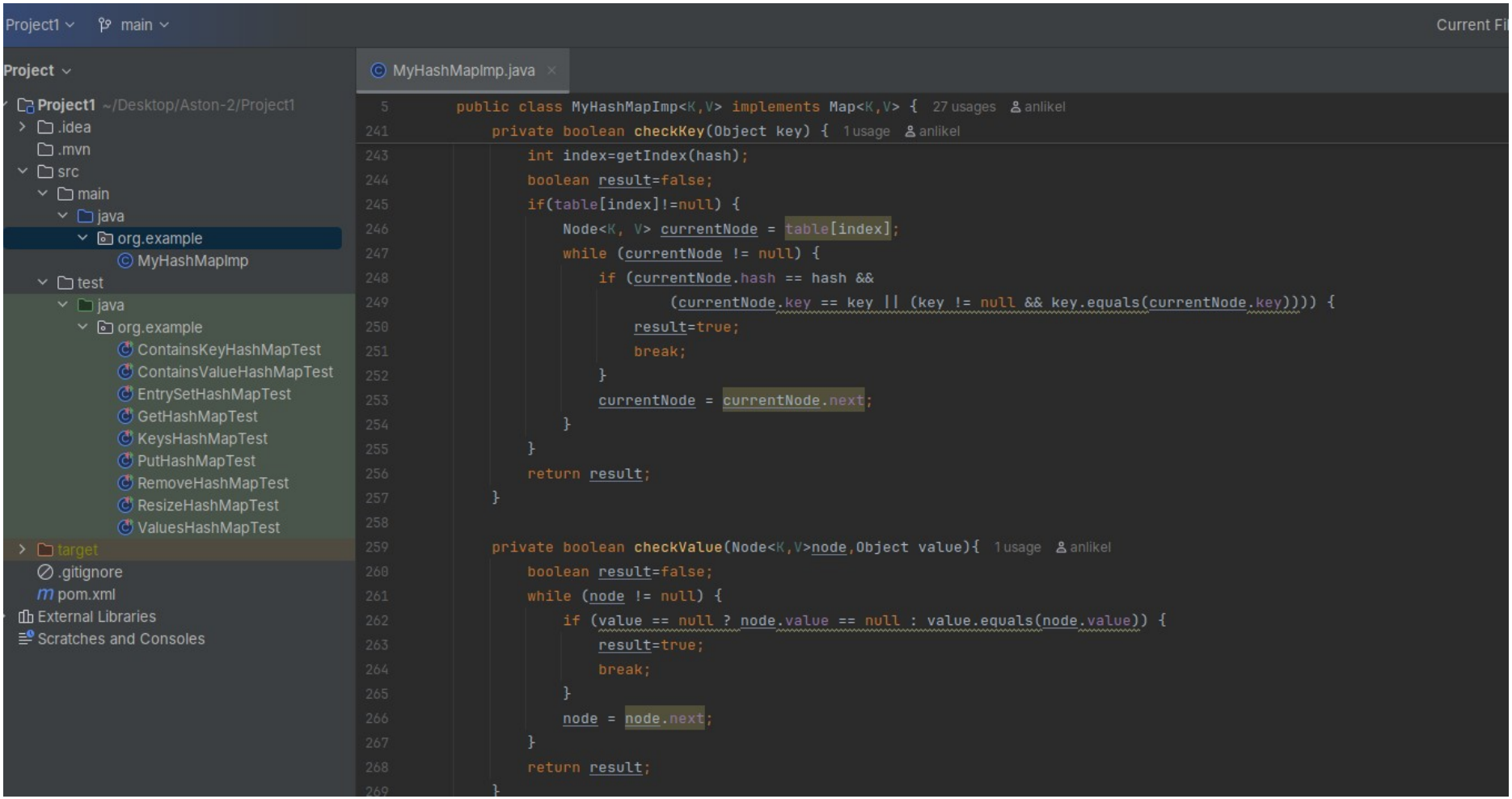
External Libraries
Scratches and Consoles
MyHashMapImp.java
5 public class MyHashMapImp<K,V> implements Map<K,V> { 27 usages anlikel
217 private V removeNode(int index,int hash,Object key) { 1 usage anlikel
225 resVal = currentNode.value;
226 size--;
227 break;
228 }
229 lastNode = currentNode;
230 currentNode = currentNode.next;
231 }
232 if(resVal!=null && lastNode!=null && currentNode!=null){
233 lastNode.next=currentNode.next;
234 }
235 else if(resVal!=null && lastNode==null){
236 table[index]=currentNode.next;
237 }
238 return resVal;
239 }
240
241 private boolean checkKey(Object key) { 1 usage anlikel
242 int hash=getHashCode(key);
243 int index=getIndex(hash);
244 boolean result=false;
245 if(table[index]!=null) {
246 Node<K, V> currentNode = table[index];
247 while (currentNode != null) {
248 if (currentNode.hash == hash &&
249 (currentNode.key == key || (key != null && key.equals(currentNode.key)))) {
250 result=true;
251 break;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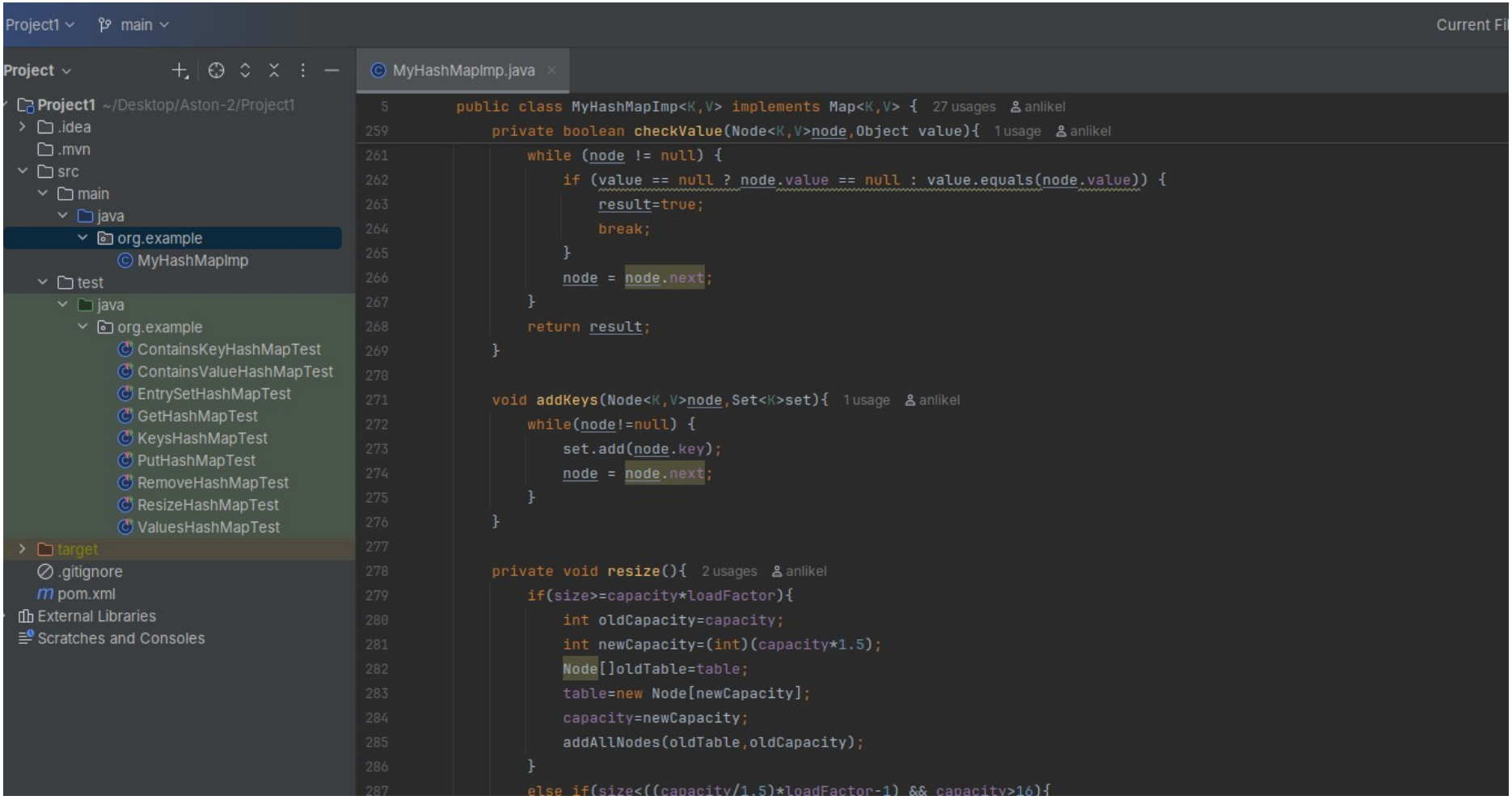
External Libraries
Scratches and Consoles
5 public class MyHashMapImp<K,V> implements Map<K,V> { 27 usages anlikel
241 private boolean checkKey(Object key) { 1 usage anlikel
243 int index=getIndex(hash);
244 boolean result=false;
245 if(table[index]!=null) {
246 Node<K, V> currentNode = table[index];
247 while (currentNode != null) {
248 if (currentNode.hash == hash &&
249 (currentNode.key == key || (key != null && key.equals(currentNode.key)))) {
250 result=true;
251 break;
252 }
253 currentNode = currentNode.next;
254 }
255 }
256 return result;
257 }
258
259 private boolean checkValue(Node<K,V>node,Object value){ 1 usage anlikel
260 boolean result=false;
261 while (node != null) {
262 if (value == null ? node.value == null : value.equals(node.value)) {
263 result=true;
264 break;
265 }
266 node = node.next;
267 }
268 return result;
269 }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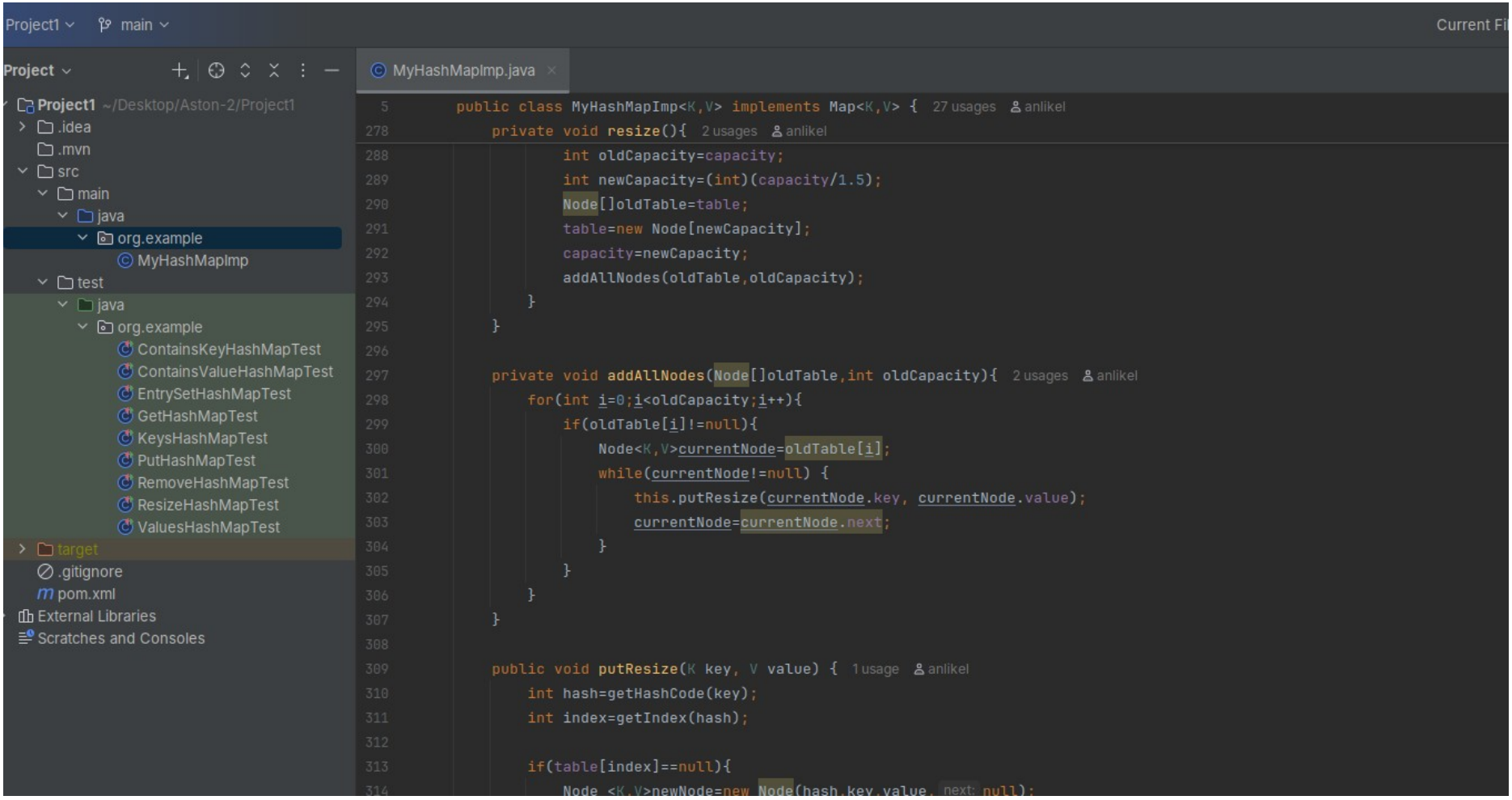
5 public class MyHashMapImp<K,V> implements Map<K,V> { 27 usages anlikel
259 private boolean checkValue(Node<K,V>node,Object value){ 1 usage anlikel
261 while (node != null) {
262 if (value == null ? node.value == null : value.equals(node.value)) {
263 result=true;
264 break;
265 }
266 node = node.next;
267 }
268 return result;
269 }
270
271 void addKeys(Node<K,V>node,Set<K>set){ 1 usage anlikel
272 while(node!=null) {
273 set.add(node.key);
274 node = node.next;
275 }
276 }
277
278 private void resize(){ 2 usages anlikel
279 if(size>=capacity*loadFactor){
280 int oldCapacity=capacity;
281 int newCapacity=(int)(capacity*1.5);
282 Node[]oldTable=table;
283 table=new Node[newCapacity];
284 capacity=newCapacity;
285 addAllNodes(oldTable,oldCapacity);
286 }
287 else if(size<((capacity/1.5)*loadFactor-1) && capacity>16){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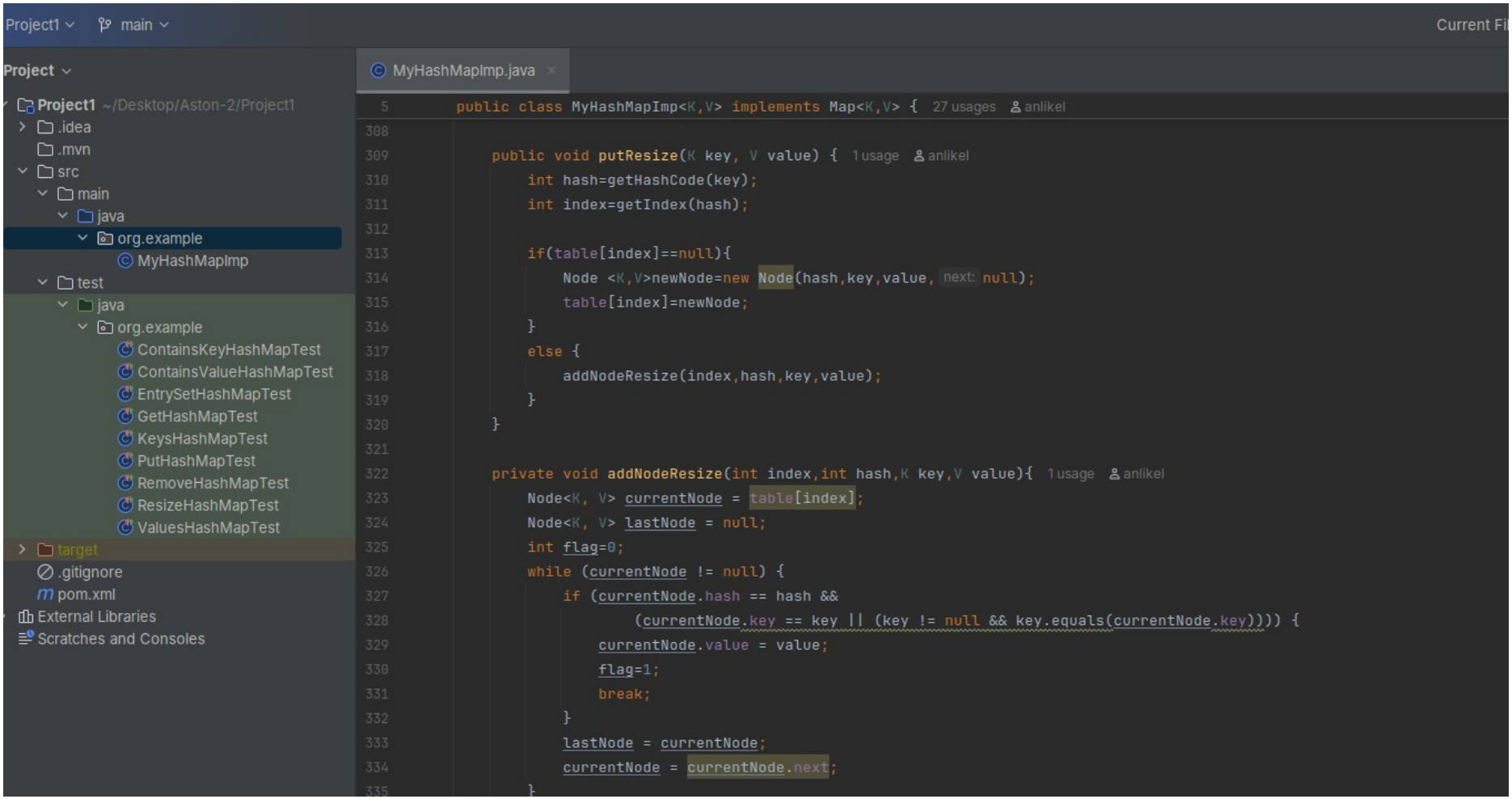
Scratches and Consoles
5 public class MyHashMapImp<K,V> implements Map<K,V> { 27 usages anlikel
278 private void resize(){ 2 usages anlikel
288 int oldCapacity=capacity;
289 int newCapacity=(int)(capacity/1.5);
290 Node[]oldTable=table;
291 table=new Node[newCapacity];
292 capacity=newCapacity;
293 addAllNodes(oldTable,oldCapacity);
294 }
295 }
296
297 private void addAllNodes(Node[]oldTable,int oldCapacity){ 2 usages anlikel
298 for(int i=0;i<oldCapacity;i++){
299 if(oldTable[i]!=null){
300 Node<K,V>currentNode=oldTable[i];
301 while(currentNode!=null) {
302 this.putResize(currentNode.key, currentNode.value);
303 currentNode=currentNode.next;
304 }
305 }
306 }
307 }
308
309 public void putResize(K key, V value) { 1 usage anlikel
310 int hash=getHashCode(key);
311 int index=getIndex(hash);
312
313 if(table[index]==null){
314 Node <K,V>newNode=new Node(hash,key,value, next: null);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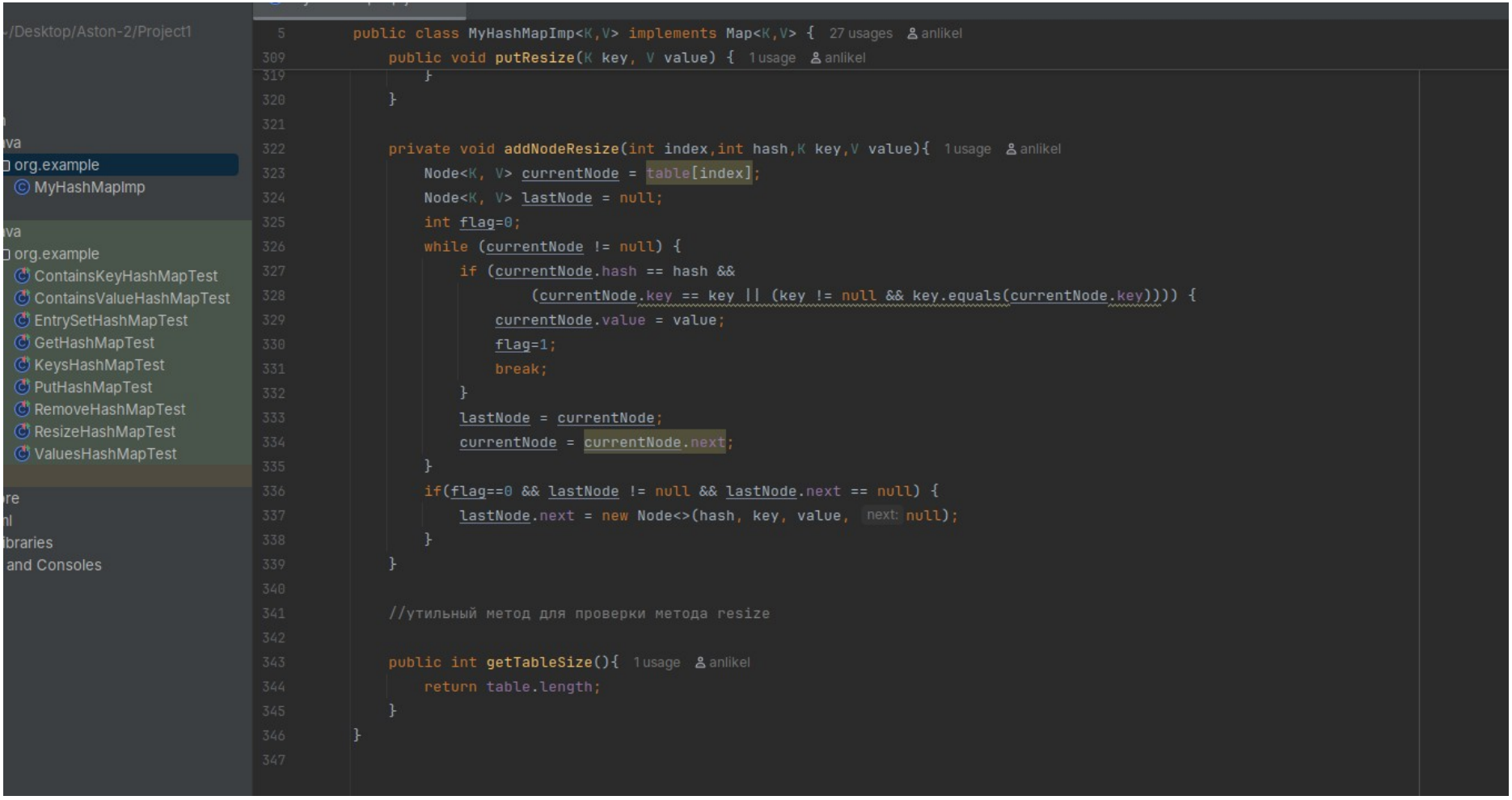
External Libraries
Scratches and Consoles
MyHashMapImp.java
5 public class MyHashMapImp<K,V> implements Map<K,V> { 27 usages anlikel
308
309 public void putResize(K key, V value) { 1 usage anlikel
310 int hash=getHashCode(key);
311 int index=getIndex(hash);
312
313 if(table[index]==null){
314 Node <K,V>newNode=new Node(hash,key,value, next: null);
315 table[index]=newNode;
316 }
317 else {
318 addNodeResize(index,hash,key,value);
319 }
320 }
321
322 private void addNodeResize(int index,int hash,K key,V value){ 1 usage anlikel
323 Node<K, V> currentNode = table[index];
324 Node<K, V> lastNode = null;
325 int flag=0;
326 while (currentNode != null) {
327 if (currentNode.hash == hash &&
328 (currentNode.key == key || (key != null && key.equals(currentNode.key)))) {
329 currentNode.value = value;
330 flag=1;
331 break;
332 }
333 lastNode = currentNode;
334 currentNode = currentNode.next;
335 }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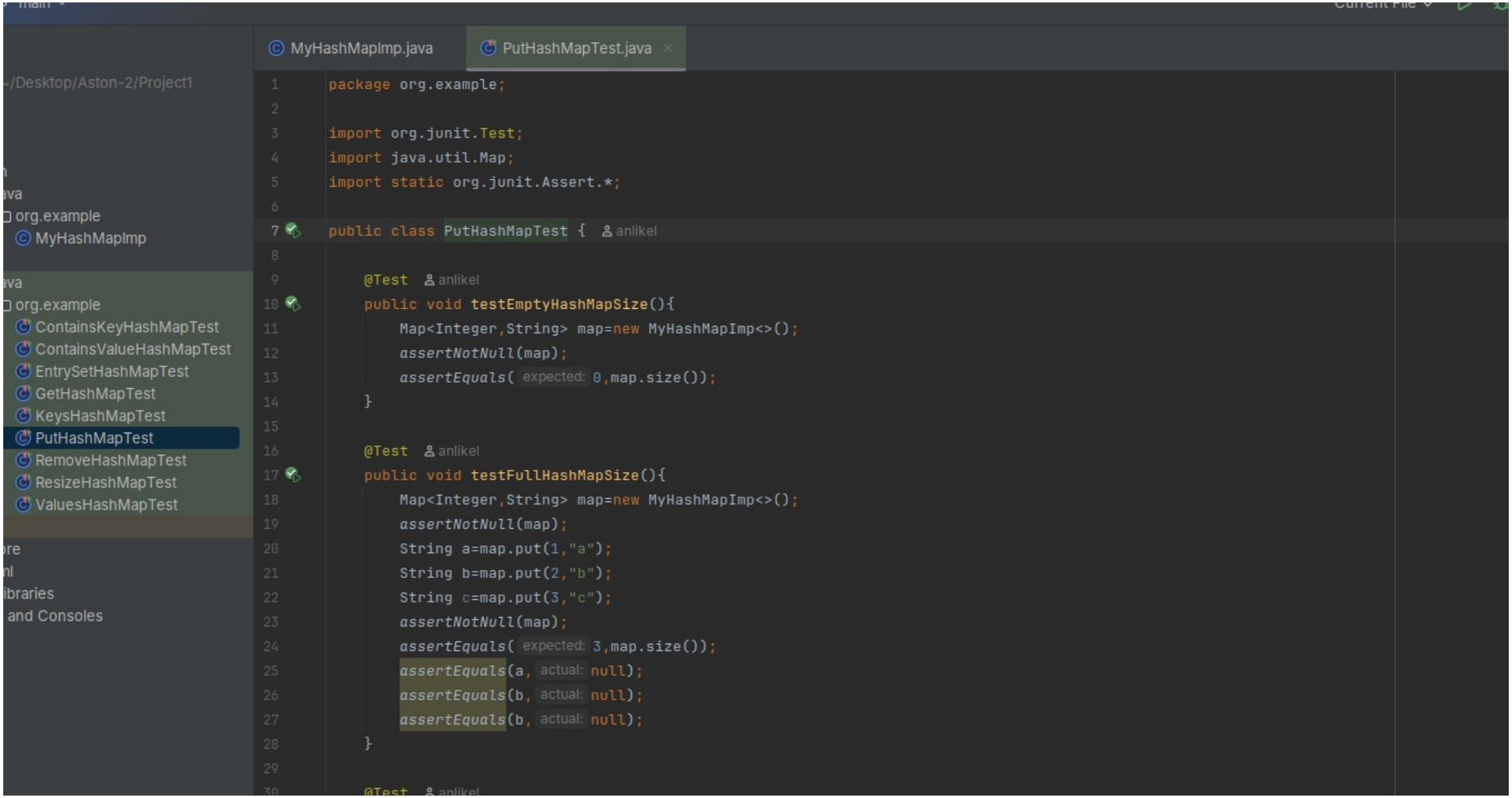
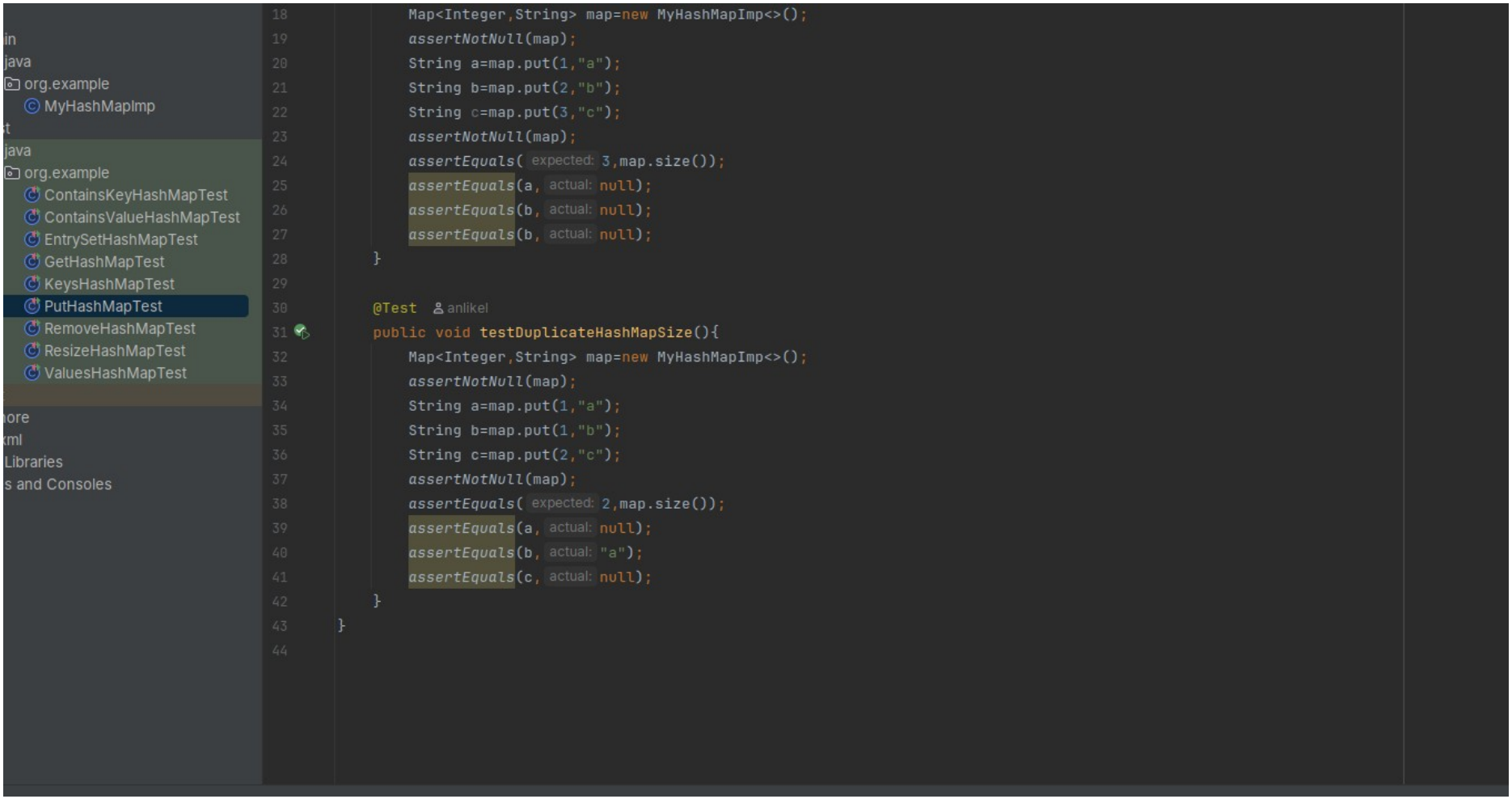
and Consoles
5 public class MyHashMapImp<K,V> implements Map<K,V> { 27 usages anlikel
309 public void putResize(K key, V value) { 1 usage anlikel
319 }
320 }
321
322 private void addNodeResize(int index,int hash,K key,V value){ 1 usage anlikel
323 Node<K, V> currentNode = table[index];
324 Node<K, V> lastNode = null;
325 int flag=0;
326 while (currentNode != null) {
327 if (currentNode.hash == hash &&
328 (currentNode.key == key || (key != null && key.equals(currentNode.key)))) {
329 currentNode.value = value;
330 flag=1;
331 break;
332 }
333 lastNode = currentNode;
334 currentNode = currentNode.next;
335 }
336 if(flag==0 && lastNode != null && lastNode.next == null) {
337 lastNode.next = new Node<>(hash, key, value, next: null);
338 }
339 }
340
341 //утильный метод для проверки метода resize
342
343 public int getTableSize(){ 1 usage anlikel
344 return table.length;
345 }
346 }
347

Скриншоты Тестов;

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EntrySetHashMapTest
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KeysHashMapTest
PutHashMapTest
RemoveHashMapTest
ResizeHashMapTest
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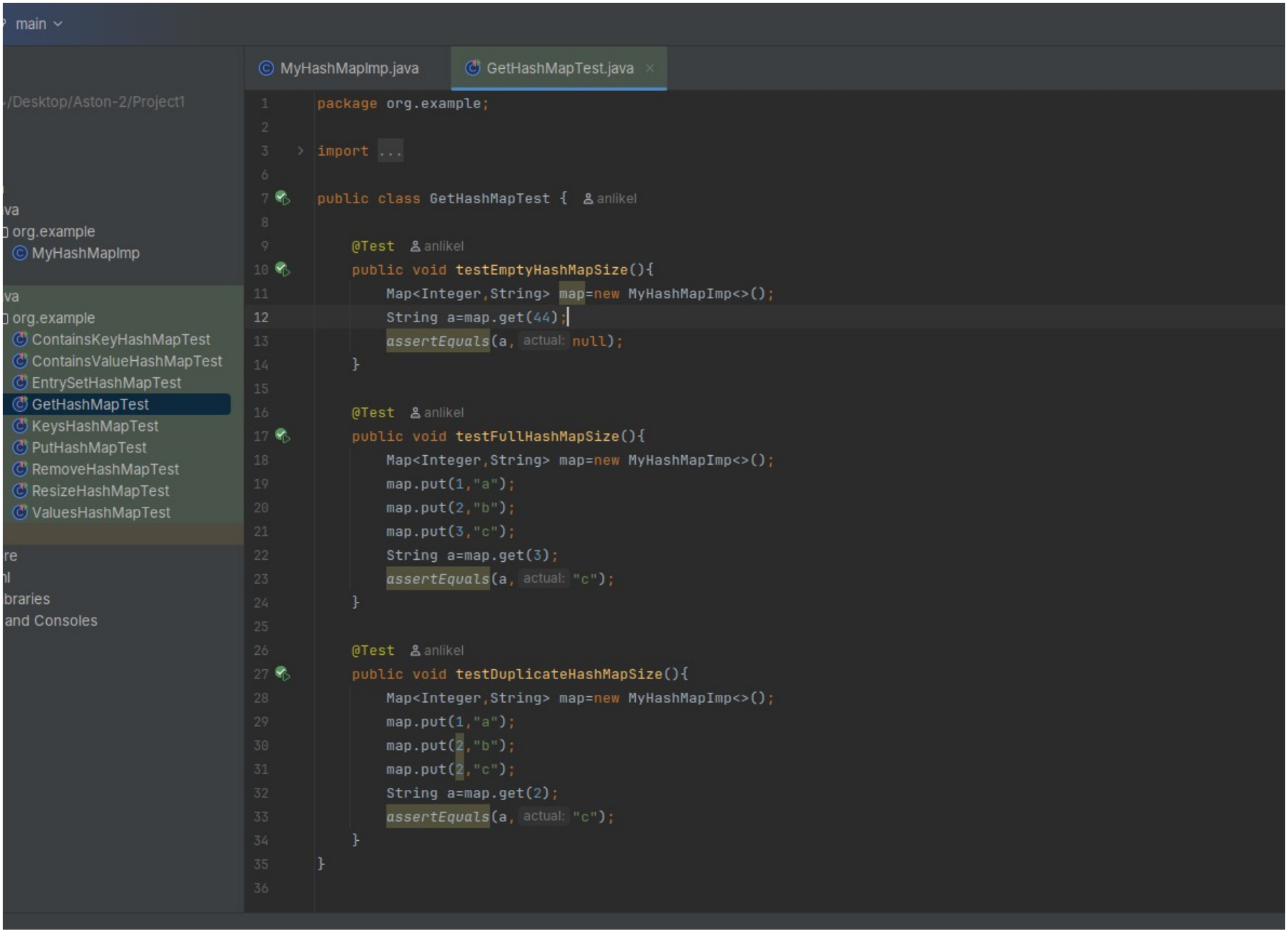
Libraries
s and Consoles
18 Map<Integer,String> map=new MyHashMapImp<>();
19 assertNotNull(map);
20 String a=map.put(1,"a");
21 String b=map.put(2,"b");
22 String c=map.put(3,"c");
23 assertNotNull(map);
24 assertEquals(expected: 3,map.size());
25 assertEquals(a, actual: null);
26 assertEquals(b, actual: null);
27 assertEquals(b, actual: null);
28 }
29
30 @Test anlikel
31 public void testDuplicateHashMapSize(){
32 Map<Integer,String> map=new MyHashMapImp<>();
33 assertNotNull(map);
34 String a=map.put(1,"a");
35 String b=map.put(1,"b");
36 String c=map.put(2,"c");
37 assertNotNull(map);
38 assertEquals(expected: 2,map.size());
39 assertEquals(a, actual: null);
40 assertEquals(b, actual: "a");
41 assertEquals(c, actual: null);
42 }
43 }
44


main
MyHashMapImp.java
GetHashMapTest.java
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MyHashMapImp
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ContainsKeyHashMapTest
ContainsValueHashMapTest
EntrySetHashMapTest
GetHashMapTest
KeysHashMapTest
PutHashMapTest
RemoveHashMapTest
ResizeHashMapTest
ValuesHashMapTest
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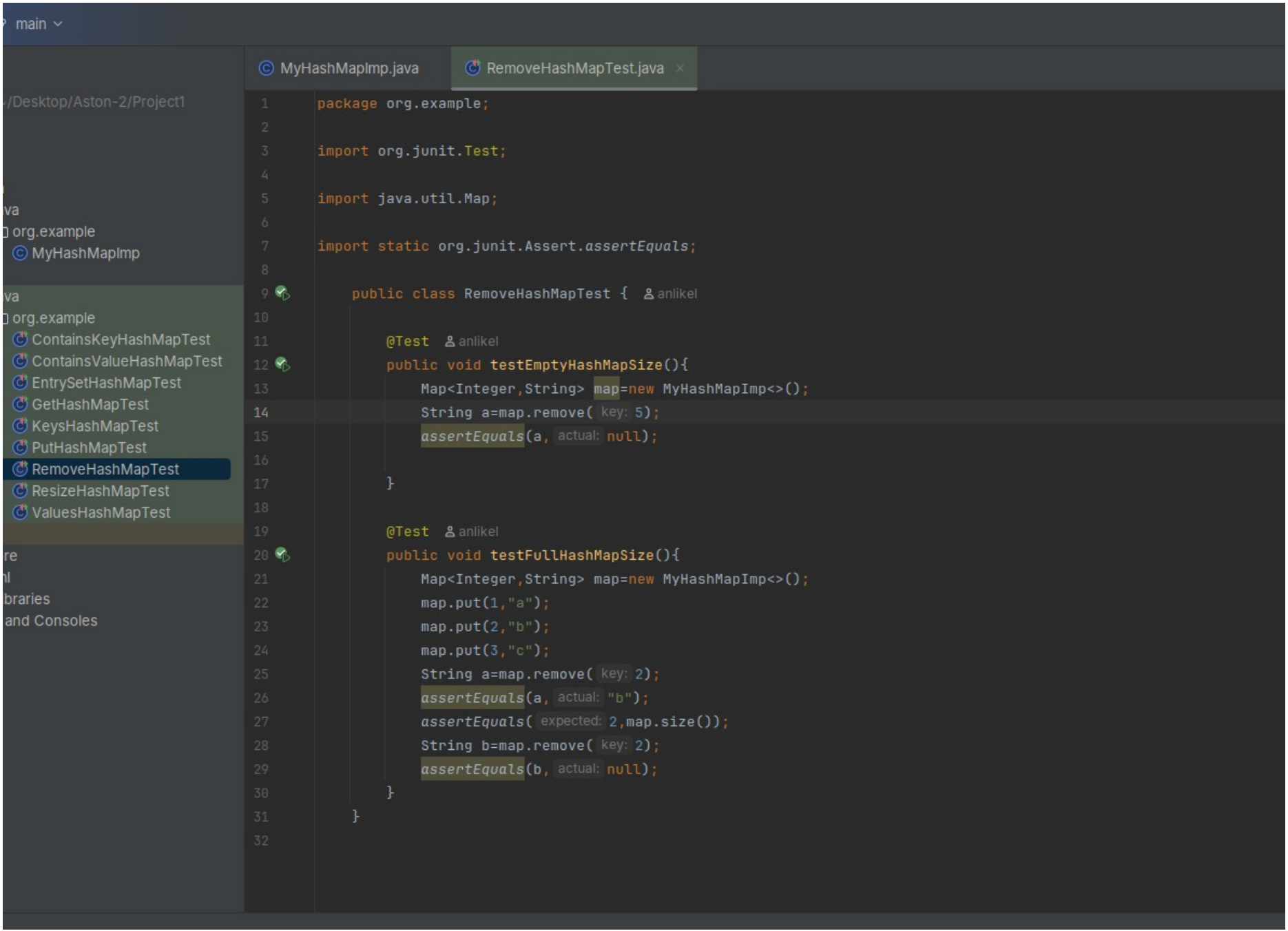
and Consoles
package org.example;
import ...
public class GetHashMapTest { anlikel
@Test anlikel
public void testEmptyHashMapSize(){
Map<Integer,String> map=new MyHashMapImp<>();
String a=map.get(44);
assertEquals(a, actual: null);
}
@Test anlikel
public void testFullHashMapSize(){
Map<Integer,String> map=new MyHashMapImp<>();
map.put(1,"a");
map.put(2,"b");
map.put(3,"c");
String a=map.get(3);
assertEquals(a, actual: "c");
}
@Test anlikel
public void testDuplicateHashMapSize(){
Map<Integer,String> map=new MyHashMapImp<>();
map.put(1,"a");
map.put(2,"b");
map.put(2,"c");
String a=map.get(2);
assertEquals(a, actual: "c");
}
}


main
MyHashMapImp.java
RemoveHashMapTest.java
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ContainsKeyHashMapTest
ContainsValueHashMapTest
EntrySetHashMapTest
GetHashMapTest
KeysHashMapTest
PutHashMapTest
RemoveHashMapTest
ResizeHashMapTest
ValuesHashMapTest
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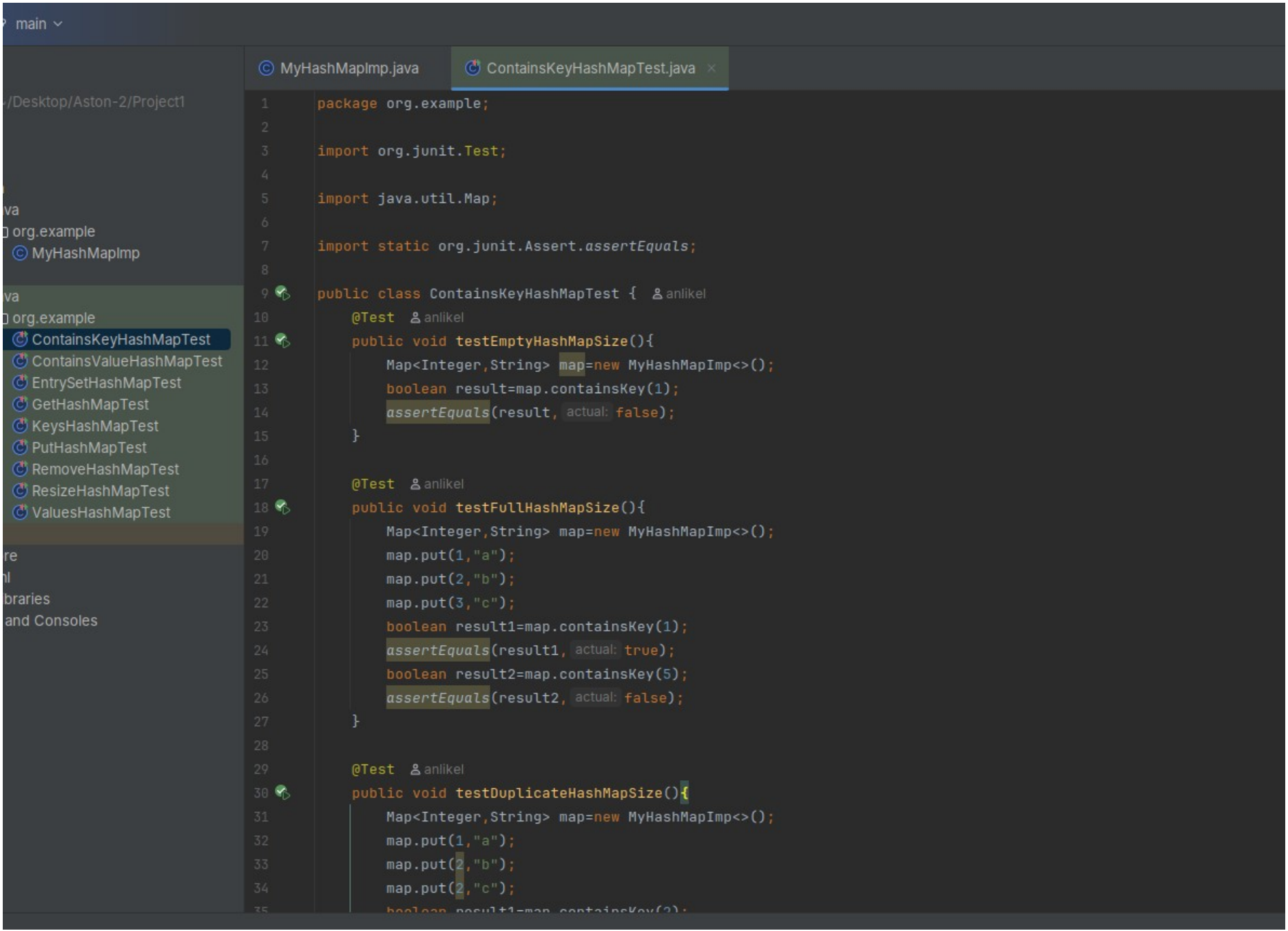
and Consoles
package org.example;
import org.junit.Test;
import java.util.Map;
import static org.junit.Assert.assertEquals;
public class RemoveHashMapTest { anlikel
@Test anlikel
public void testEmptyHashMapSize(){
Map<Integer,String> map=new MyHashMapImp<>();
String a=map.remove(key: 5);
assertEquals(a, actual: null);
}
@Test anlikel
public void testFullHashMapSize(){
Map<Integer,String> map=new MyHashMapImp<>();
map.put(1,"a");
map.put(2,"b");
map.put(3,"c");
String a=map.remove(key: 2);
assertEquals(a, actual: "b");
assertEquals(expected: 2,map.size());
String b=map.remove(key: 2);
assertEquals(b, actual: null);
}
}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ContainsKeyHashMapTest.java
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EntrySetHashMapTest
GetHashMapTest
KeysHashMapTest
PutHashMapTest
RemoveHashMapTest
ResizeHashMapTest
ValuesHashMapTest
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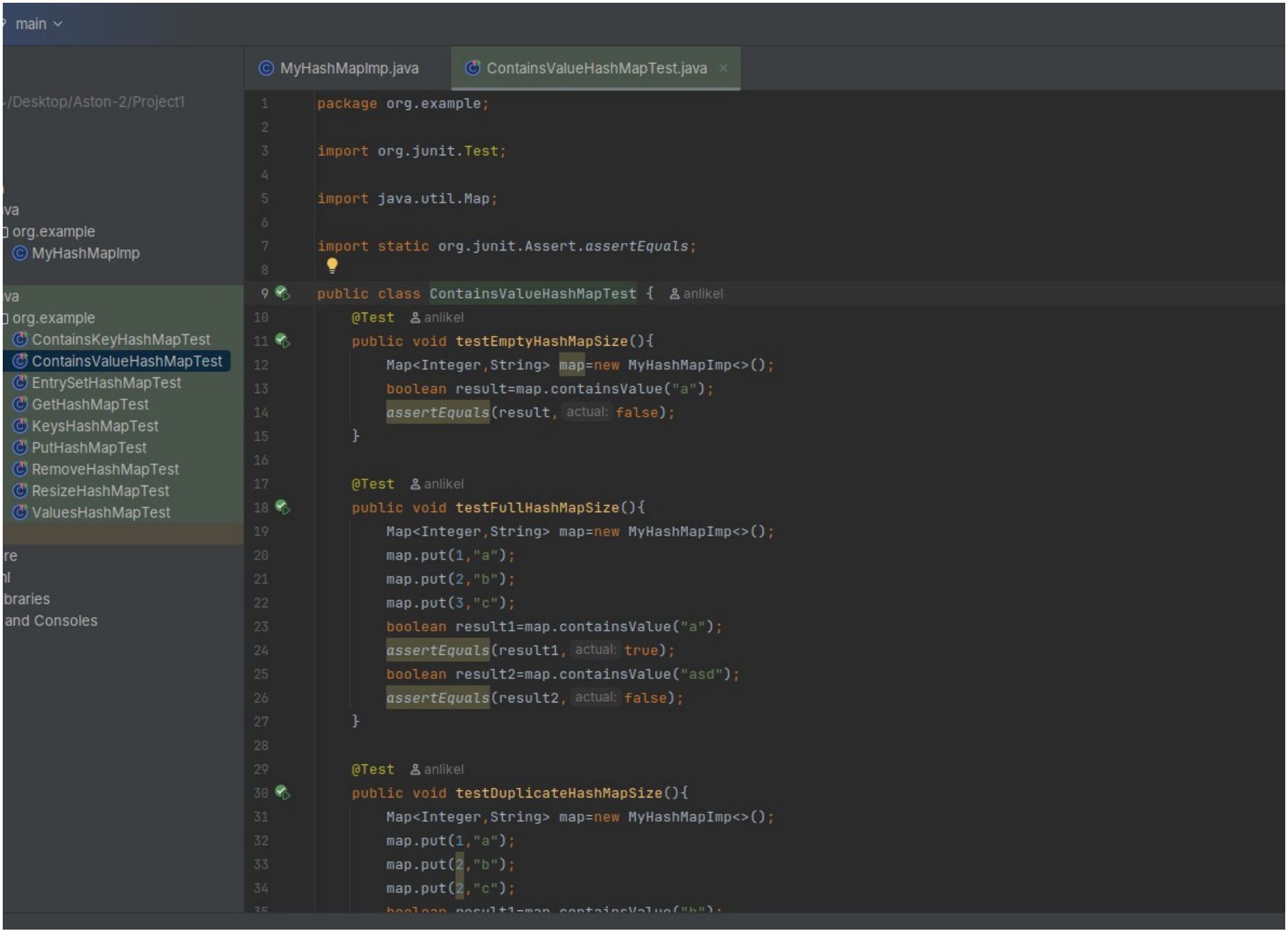
and Consoles
package org.example;
import org.junit.Test;
import java.util.Map;
import static org.junit.Assert.assertEquals;
public class ContainsKeyHashMapTest { anlikel
@Test anlikel
public void testEmptyHashMapSize(){
Map<Integer,String> map=new MyHashMapImp<>();
boolean result=map.containsKey(1);
assertEquals(result, actual: false);
}
@Test anlikel
public void testFullHashMapSize(){
Map<Integer,String> map=new MyHashMapImp<>();
map.put(1,"a");
map.put(2,"b");
map.put(3,"c");
boolean result1=map.containsKey(1);
assertEquals(result1, actual: true);
boolean result2=map.containsKey(5);
assertEquals(result2, actual: false);
}
@Test anlikel
public void testDuplicateHashMapSize(){
Map<Integer,String> map=new MyHashMapImp<>();
map.put(1,"a");
map.put(2,"b");
map.put(2,"c");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ContainsValueHashMapTest.java
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ContainsValueHashMapTest
EntrySetHashMapTest
GetHashMapTest
KeysHashMapTest
PutHashMapTest
RemoveHashMapTest
ResizeHashMapTest
ValuesHashMapTest
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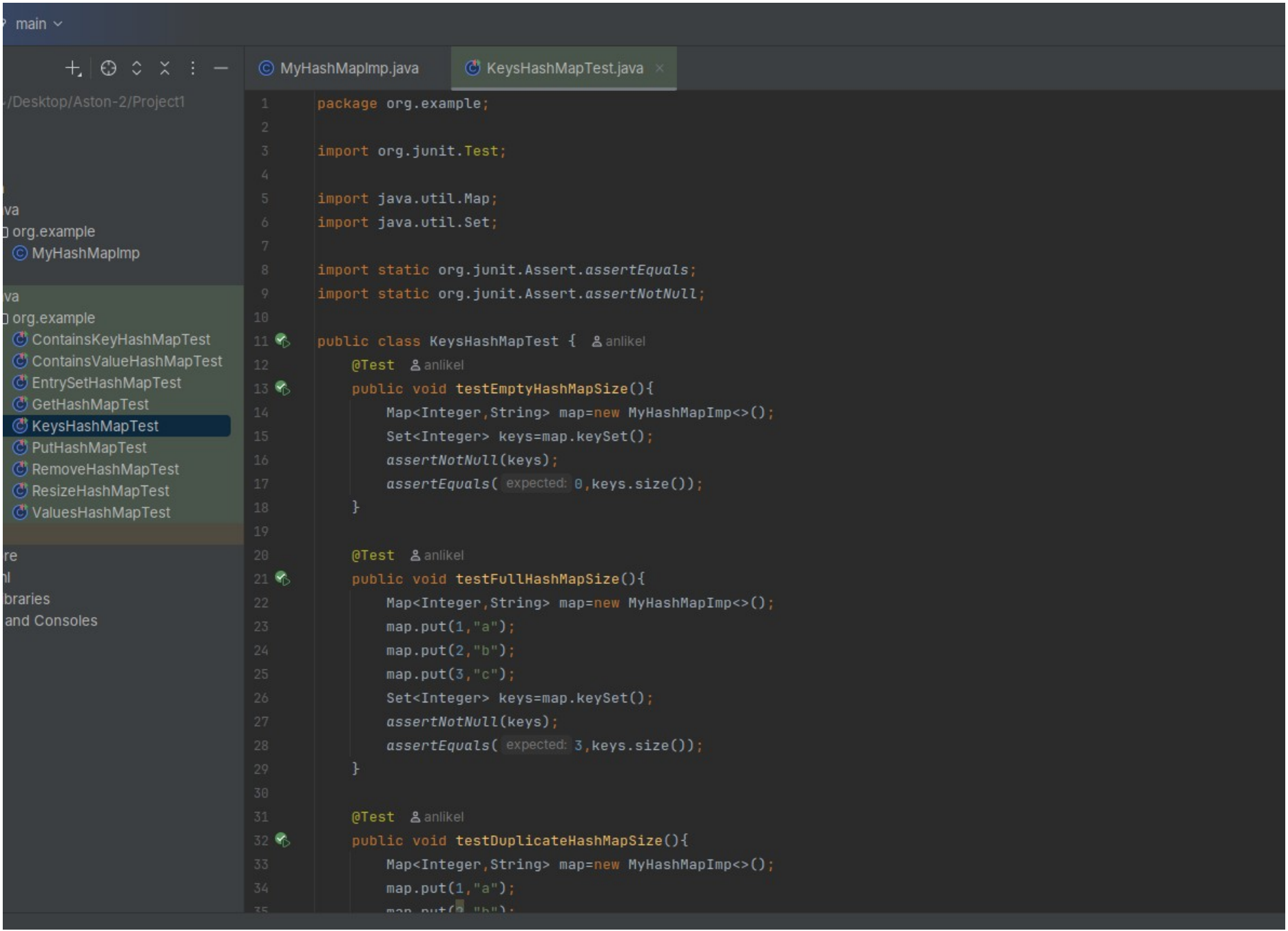
and Consoles
package org.example;
import org.junit.Test;
import java.util.Map;
import static org.junit.Assert.assertEquals;
public class ContainsValueHashMapTest { anlikel
@Test anlikel
public void testEmptyHashMapSize(){
Map<Integer,String> map=new MyHashMapImp<>();
boolean result=map.containsValue("a");
assertEquals(result, actual: false);
}
@Test anlikel
public void testFullHashMapSize(){
Map<Integer,String> map=new MyHashMapImp<>();
map.put(1,"a");
map.put(2,"b");
map.put(3,"c");
boolean result1=map.containsValue("a");
assertEquals(result1, actual: true);
boolean result2=map.containsValue("asd");
assertEquals(result2, actual: false);
}
@Test anlikel
public void testDuplicateHashMapSize(){
Map<Integer,String> map=new MyHashMapImp<>();
map.put(1,"a");
map.put(2,"b");
map.put(2,"c");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KeysHashMapTest.java
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MyHashMapImp
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RemoveHashMapTest
ResizeHashMapTest
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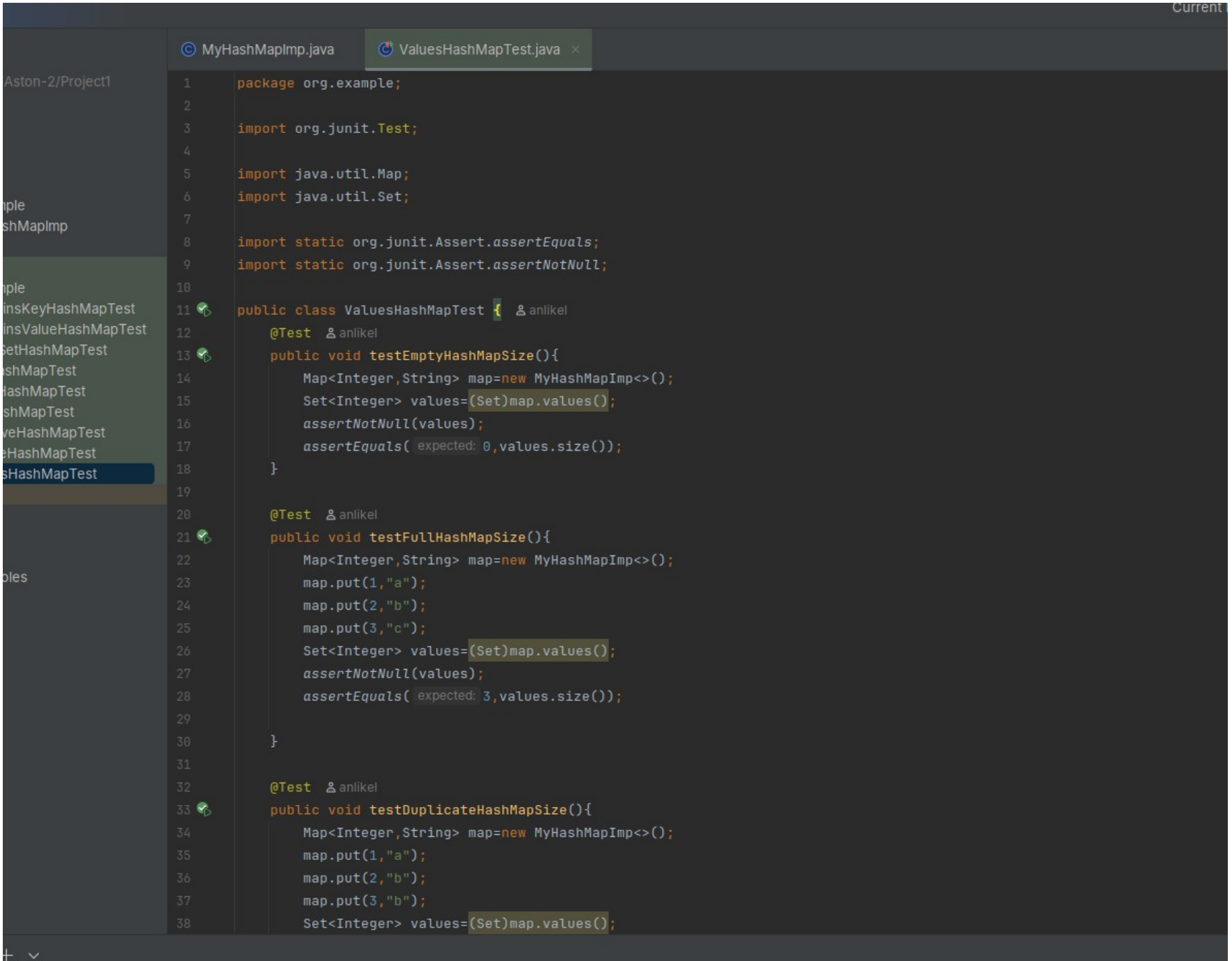
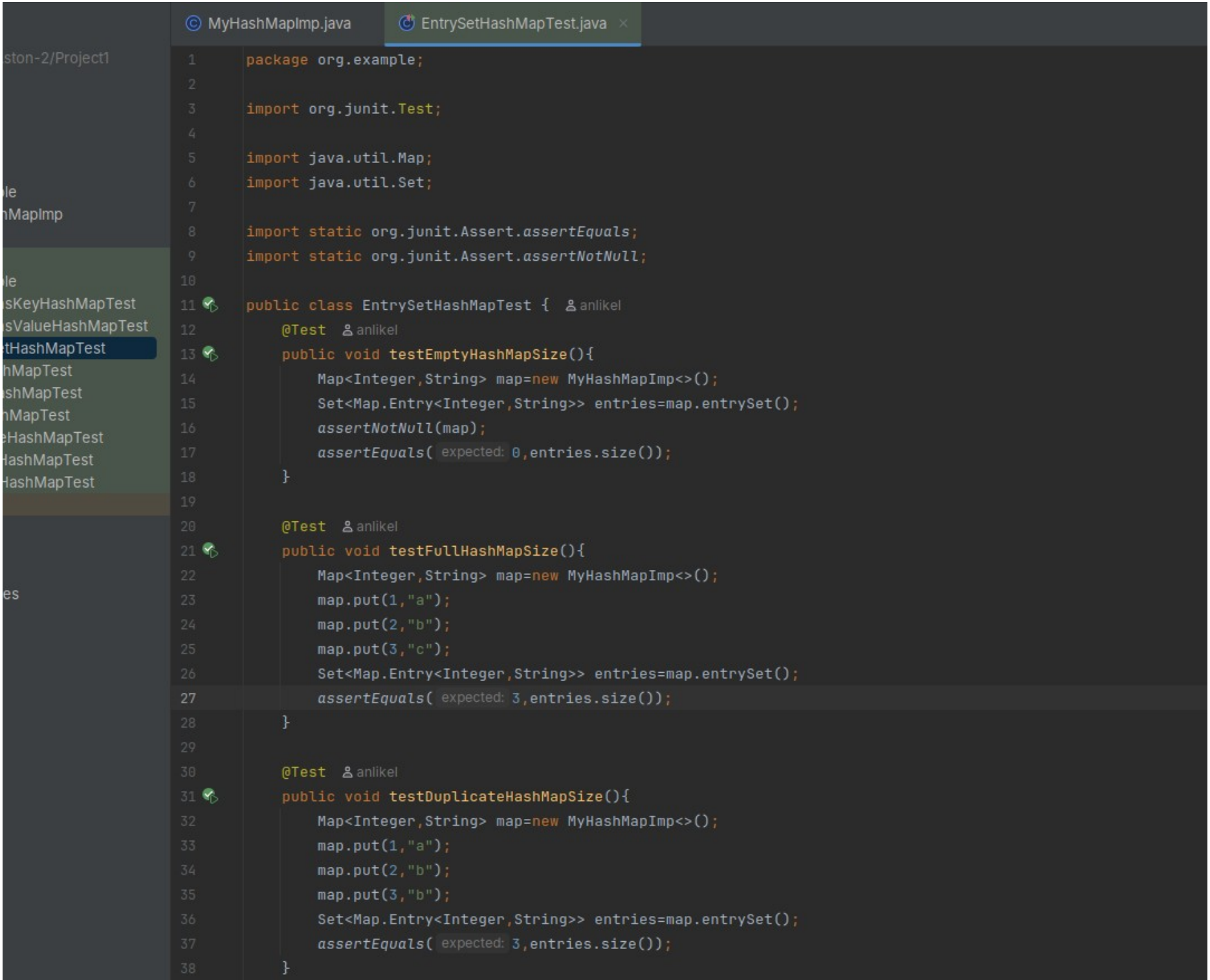
and Consoles
package org.example;
import org.junit.Test;
import java.util.Map;
import java.util.Set;
import static org.junit.Assert.assertEquals;
import static org.junit.Assert.assertNotNull;
public class KeysHashMapTest { anlikel
@Test anlikel
public void testEmptyHashMapSize(){
Map<Integer,String> map=new MyHashMapImp<>();
Set<Integer> keys=map.keySet();
assertNotNull(keys);
assertEquals(expected: 0,keys.size());
}
@Test anlikel
public void testFullHashMapSize(){
Map<Integer,String> map=new MyHashMapImp<>();
map.put(1,"a");
map.put(2,"b");
map.put(3,"c");
Set<Integer> keys=map.keySet();
assertNotNull(keys);
assertEquals(expected: 3,keys.size());
}
@Test anlikel
public void testDuplicateHashMapSize(){
Map<Integer,String> map=new MyHashMapImp<>();
map.put(1,"a");


MyHashMapImp.java
ValuesHashMapTest.java
Aston-2/Project1
package org.example;
import org.junit.Test;
import java.util.Map;
import java.util.Set;
import static org.junit.Assert.assertEquals;
import static org.junit.Assert.assertNotNull;
public class ValuesHashMapTest {
@Test
public void testEmptyHashMapSize(){
Map<Integer,String> map=new MyHashMapImp<>();
Set<Integer> values=(Set)map.values();
assertNotNull(values);
assertEquals(expected: 0,values.size());
}
@Test
public void testFullHashMapSize(){
Map<Integer,String> map=new MyHashMapImp<>();
map.put(1,"a");
map.put(2,"b");
map.put(3,"c");
Set<Integer> values=(Set)map.values();
assertNotNull(values);
assertEquals(expected: 3,values.size());
}
@Test
public void testDuplicateHashMapSize(){
Map<Integer,String> map=new MyHashMapImp<>();
map.put(1,"a");
map.put(2,"b");
map.put(3,"b");
Set<Integer> values=(Set)map.values();


MyHashMapImp.java
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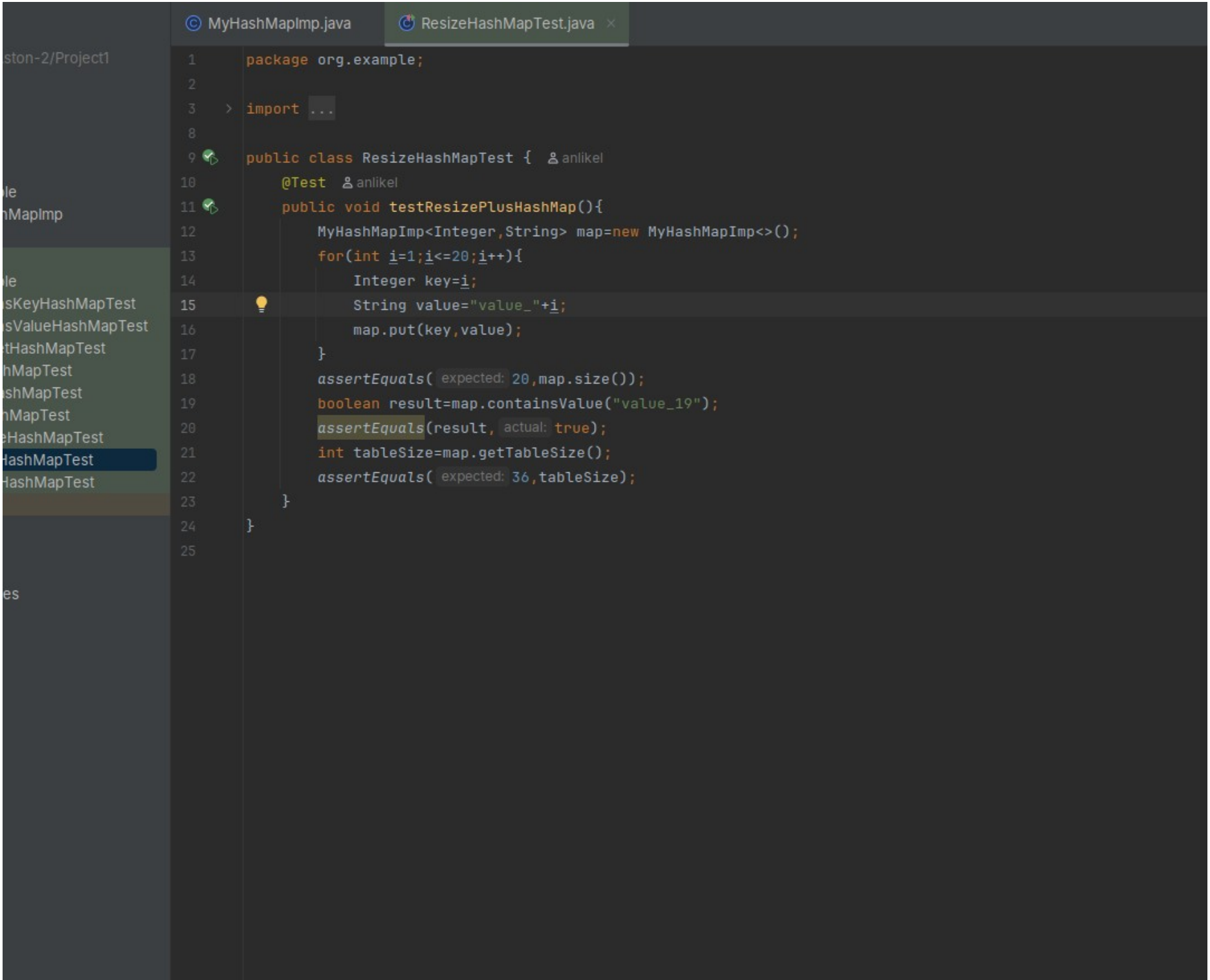
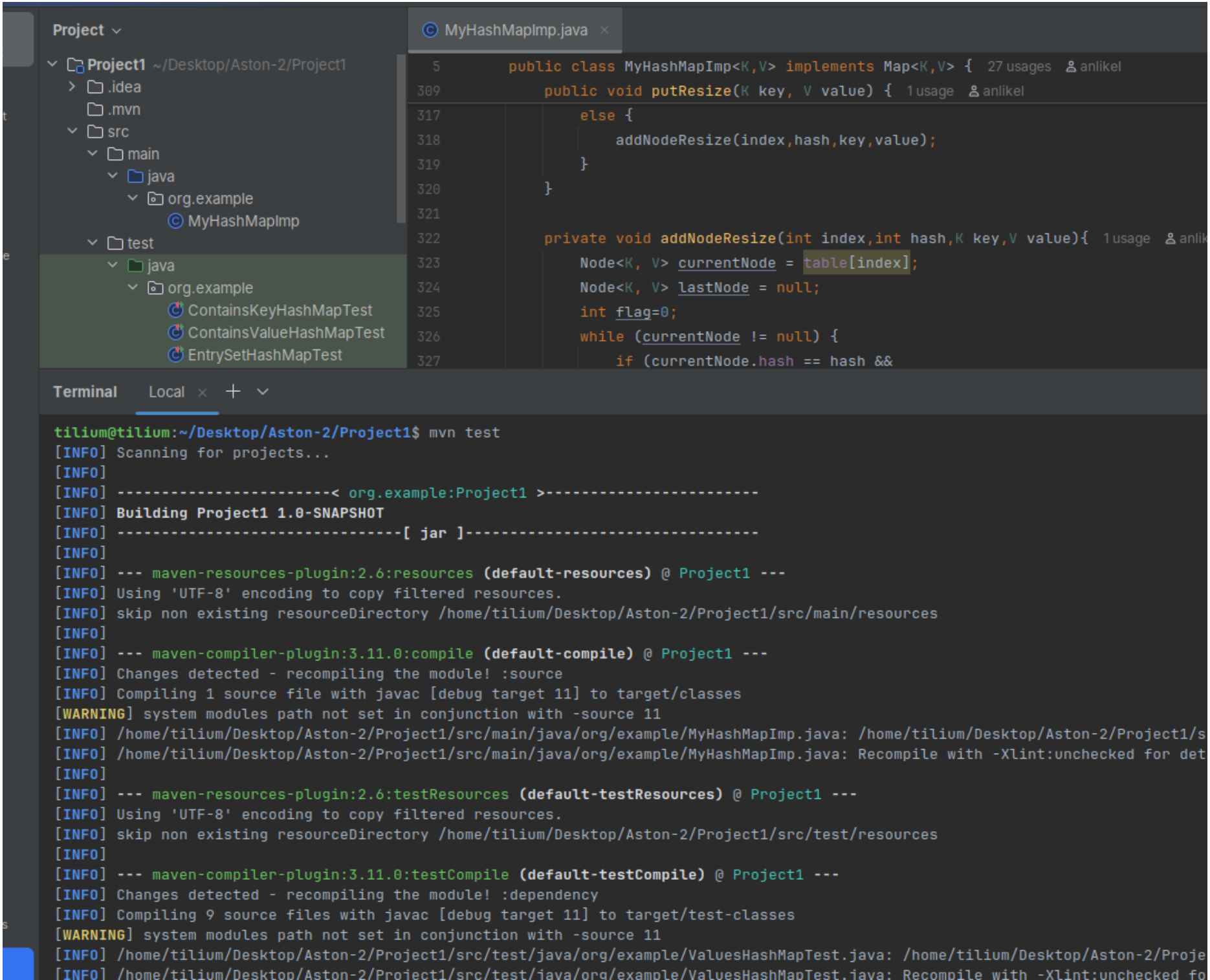
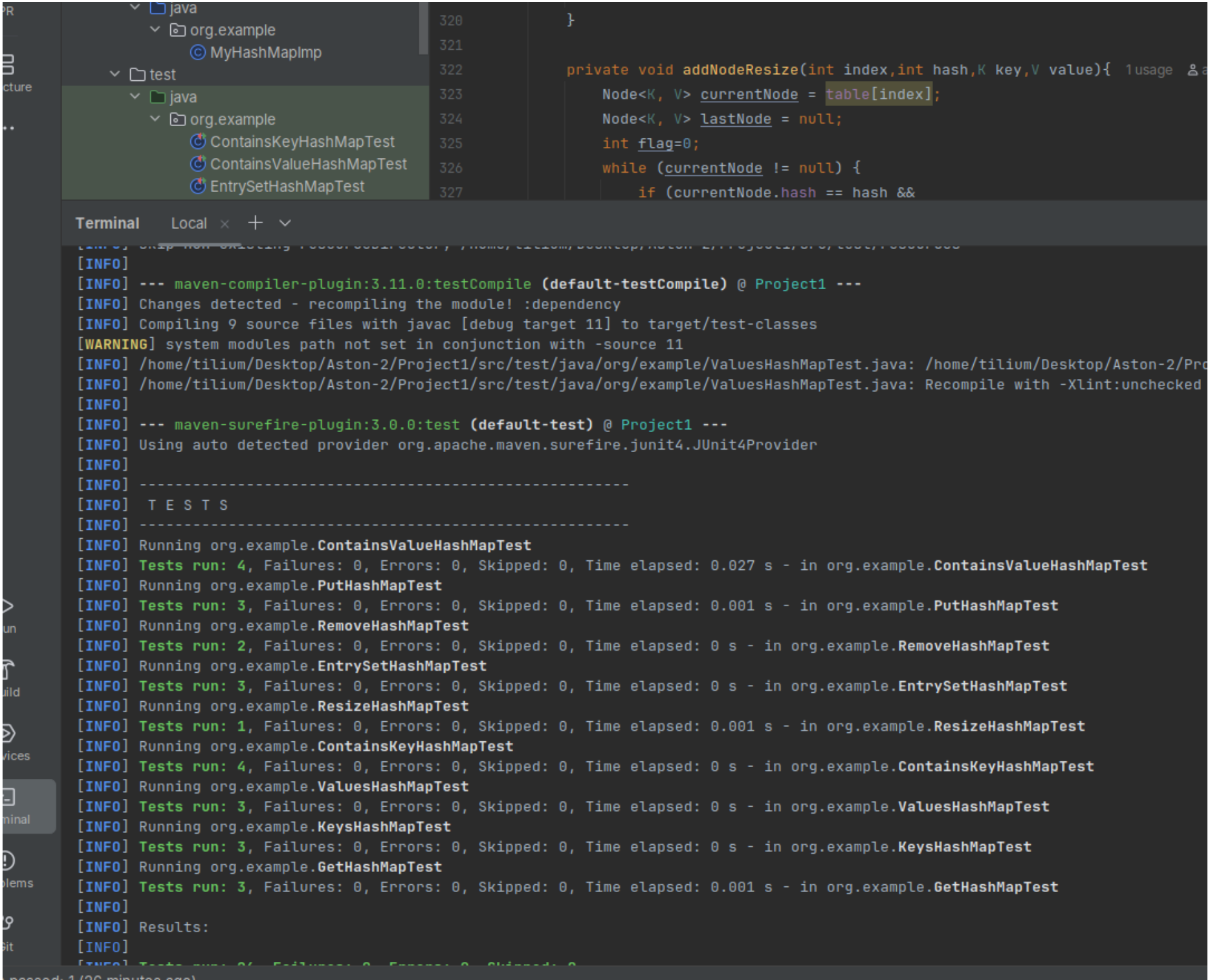
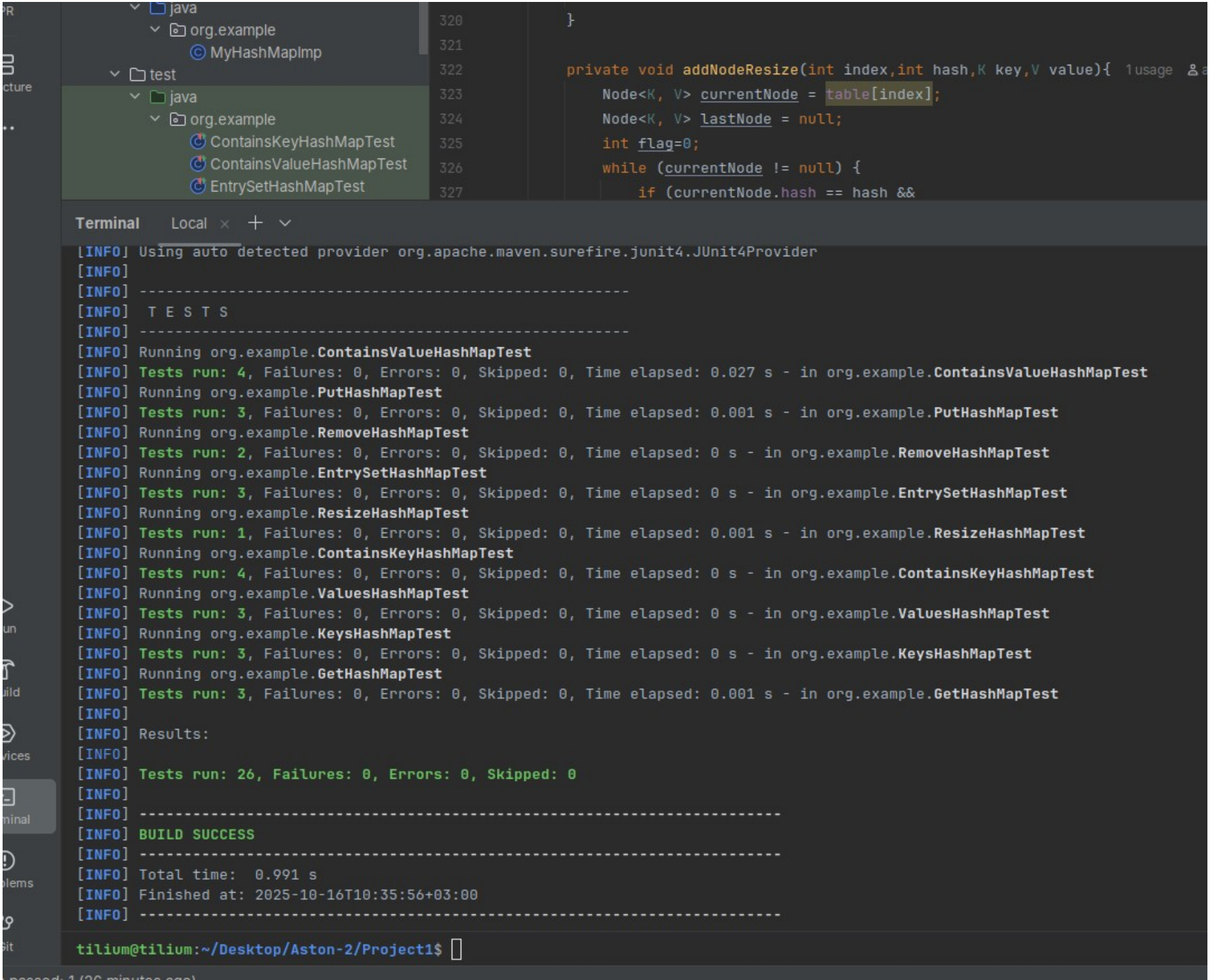
es
1 package org.example;
2
3 import org.junit.Test;
4
5 import java.util.Map;
6 import java.util.Set;
7
8 import static org.junit.Assert.assertEquals;
9 import static org.junit.Assert.assertNotNull;
10
11 public class EntrySetHashMapTest { anlikel
12 @Test anlikel
13 public void testEmptyHashMapSize(){
14 Map<Integer,String> map=new MyHashMapImp<>();
15 Set<Map.Entry<Integer,String>> entries=map.entrySet();
16 assertNotNull(map);
17 assertEquals(expected: 0,entries.size());
18 }
19
20 @Test anlikel
21 public void testFullHashMapSize(){
22 Map<Integer,String> map=new MyHashMapImp<>();
23 map.put(1,"a");
24 map.put(2,"b");
25 map.put(3,"c");
26 Set<Map.Entry<Integer,String>> entries=map.entrySet();
27 assertEquals(expected: 3,entries.size());
28 }
29
30 @Test anlikel
31 public void testDuplicateHashMapSize(){
32 Map<Integer,String> map=new MyHashMapImp<>();
33 map.put(1,"a");
34 map.put(2,"b");
35 map.put(3,"b");
36 Set<Map.Entry<Integer,String>> entries=map.entrySet();
37 assertEquals(expected: 3,entries.size());
38 }


MyHashMapImp.java
ResizeHashMapTest.java
ston-2/Project1
MapImp
sKeyHashMapTest
sValueHashMapTest
tHashMapTest
hMapTest
shMapTest
MapTest
HashMapTest
HashMapTest
HashMapTest
es
1 package org.example;
2
3 import ...
8
9 public class ResizeHashMapTest { anlikel
10 @Test anlikel
11 public void testResizePlusHashMap(){
12 MyHashMapImp<Integer,String> map=new MyHashMapImp<>();
13 for(int i=1;i<=20;i++){
14 Integer key=i;
15 String value="value_"+i;
16 map.put(key,value);
17 }
18 assertEquals(expected: 20,map.size());
19 boolean result=map.containsValue("value_19");
20 assertEquals(result, actual: true);
21 int tableSize=map.getTableSize();
22 assertEquals(expected: 36,tableSize);
23 }
24 }
25

Результат выполнения тестов:


Project
Project1 ~/Desktop/Aston-2/Project1
.idea
.mvn
src
main
java
org.example
MyHashMapImp
test
java
org.example
ContainsKeyHashMapTest
ContainsValueHashMapTest
EntrySetHashMapTest
MyHashMapImp.java
5 public class MyHashMapImp<K,V> implements Map<K,V> { 27 usages anlikel
309 public void putResize(K key, V value) { 1 usage anlikel
317 else {
318 addNodeResize(index,hash,key,value);
319 }
320 }
321
322 private void addNodeResize(int index,int hash,K key,V value){ 1 usage
323 Node<K, V> currentNode = table[index];
324 Node<K, V> lastNode = null;
325 int flag=0;
326 while (currentNode != null) {
327 if (currentNode.hash == hash &&
Terminal
Local
tilium@tilium:~/Desktop/Aston-2/Project1$ mvn test
[INFO] Scanning for projects...
[INFO]
[INFO] ------------------------< org.example:Project1 >------------------------
[INFO] Building Project1 1.0-SNAPSHOT
[INFO] --------------------------------[jar]---------------------------------
[INFO]
[INFO] --- maven-resources-plugin:2.6:resources (default-resources) @ Project1 ---
[INFO] Using 'UTF-8' encoding to copy filtered resources.
[INFO] skip non existing resourceDirectory /home/tilium/Desktop/Aston-2/Project1/src/main/resources
[INFO]
[INFO] --- maven-compiler-plugin:3.11.0:compile (default-compile) @ Project1 ---
[INFO] Changes detected - recompiling the module! :source
[INFO] Compiling 1 source file with javac [debug target 11] to target/classes
[WARNING] system modules path not set in conjunction with -source 11
[INFO] /home/tilium/Desktop/Aston-2/Project1/src/main/java/org/example/MyHashMapImp.java: /home/tilium/Desktop/Aston-2/Project1/s
[INFO] /home/tilium/Desktop/Aston-2/Project1/src/main/java/org/example/MyHashMapImp.java: Recompile with -Xlint:unchecked for det
[INFO]
[INFO] --- maven-resources-plugin:2.6:testResources (default-testResources) @ Project1 ---
[INFO] Using 'UTF-8' encoding to copy filtered resources.
[INFO] skip non existing resourceDirectory /home/tilium/Desktop/Aston-2/Project1/src/test/resources
[INFO]
[INFO] --- maven-compiler-plugin:3.11.0:testCompile (default-testCompile) @ Project1 ---
[INFO] Changes detected - recompiling the module! :dependency
[INFO] Compiling 9 source files with javac [debug target 11] to target/test-classes
[WARNING] system modules path not set in conjunction with -source 11
[INFO] /home/tilium/Desktop/Aston-2/Project1/src/test/java/org/example/ValuesHashMapTest.java: /home/tilium/Desktop/Aston-2/Proje
[INFO] /home/tilium/Desktop/Aston-2/Project1/src/test/java/org/example/ValuesHashMapTest.java: Recompile with -Xlint:unchecked fo


java
org.example
MyHashMapImp
test
java
org.example
ContainsKeyHashMapTest
ContainsValueHashMapTest
EntrySetHashMapTest
}
private void addNodeResize(int index,int hash,K key,V value){ 1 usage
Node<K, V> currentNode = table[index];
Node<K, V> lastNode = null;
int flag=0;
while (currentNode != null) {
if (currentNode.hash == hash &&
Terminal
Local
[INFO]
[INFO] --- maven-compiler-plugin:3.11.0:testCompile (default-testCompile) @ Project1 ---
[INFO] Changes detected - recompiling the module! :dependency
[INFO] Compiling 9 source files with javac [debug target 11] to target/test-classes
[WARNING] system modules path not set in conjunction with -source 11
[INFO] /home/tilium/Desktop/Aston-2/Project1/src/test/java/org/example/ValuesHashMapTest.java: /home/tilium/Desktop/Aston-2/Pro
[INFO] /home/tilium/Desktop/Aston-2/Project1/src/test/java/org/example/ValuesHashMapTest.java: Recompile with -Xlint:unchecked
[INFO]
[INFO] --- maven-surefire-plugin:3.0.0:test (default-test) @ Project1 ---
[INFO] Using auto detected provider org.apache.maven.surefire.junit4.JUnit4Provider
[INFO]
[INFO] ---
[INFO] T E S T S
[INFO] ---
[INFO] Running org.example.ContainsValueHashMapTest
[INFO] Tests run: 4, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.027 s - in org.example.ContainsValueHashMapTest
[INFO] Running org.example.PutHashMapTest
[INFO] Tests run: 3, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.001 s - in org.example.PutHashMapTest
[INFO] Running org.example.RemoveHashMapTest
[INFO] Tests run: 2, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0 s - in org.example.RemoveHashMapTest
[INFO] Running org.example.EntrySetHashMapTest
[INFO] Tests run: 3, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0 s - in org.example.EntrySetHashMapTest
[INFO] Running org.example.ResizeHashMapTest
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.001 s - in org.example.ResizeHashMapTest
[INFO] Running org.example.ContainsKeyHashMapTest
[INFO] Tests run: 4, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0 s - in org.example.ContainsKeyHashMapTest
[INFO] Running org.example.ValuesHashMapTest
[INFO] Tests run: 3, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0 s - in org.example.ValuesHashMapTest
[INFO] Running org.example.KeysHashMapTest
[INFO] Tests run: 3, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0 s - in org.example.KeysHashMapTest
[INFO] Running org.example.GetHashMapTest
[INFO] Tests run: 3, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.001 s - in org.example.GetHashMapTest
[INFO]
[INFO] Results:
[INFO]


java
org.example
MyHashMapImp
test
java
org.example
ContainsKeyHashMapTest
ContainsValueHashMapTest
EntrySetHashMapTest
320 }
321
322 private void addNodeResize(int index,int hash,K key,V value){ 1usage
323 Node<K, V> currentNode = table[index];
324 Node<K, V> lastNode = null;
325 int flag=0;
326 while (currentNode != null) {
327 if (currentNode.hash == hash &&
Terminal
Local
[INFO] Using auto detected provider org.apache.maven.surefire.junit4.JUnit4Provider
[INFO]
[INFO] ---
[INFO] T E S T S
[INFO] ---
[INFO] Running org.example.ContainsValueHashMapTest
[INFO] Tests run: 4, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.027 s - in org.example.ContainsValueHashMapTest
[INFO] Running org.example.PutHashMapTest
[INFO] Tests run: 3, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.001 s - in org.example.PutHashMapTest
[INFO] Running org.example.RemoveHashMapTest
[INFO] Tests run: 2, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0 s - in org.example.RemoveHashMapTest
[INFO] Running org.example.EntrySetHashMapTest
[INFO] Tests run: 3, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0 s - in org.example.EntrySetHashMapTest
[INFO] Running org.example.ResizeHashMapTest
[INFO] Tests run: 1, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.001 s - in org.example.ResizeHashMapTest
[INFO] Running org.example.ContainsKeyHashMapTest
[INFO] Tests run: 4, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0 s - in org.example.ContainsKeyHashMapTest
[INFO] Running org.example.ValuesHashMapTest
[INFO] Tests run: 3, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0 s - in org.example.ValuesHashMapTest
[INFO] Running org.example.KeysHashMapTest
[INFO] Tests run: 3, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0 s - in org.example.KeysHashMapTest
[INFO] Running org.example.GetHashMapTest
[INFO] Tests run: 3, Failures: 0, Errors: 0, Skipped: 0, Time elapsed: 0.001 s - in org.example.GetHashMapTest
[INFO]
[INFO] Results:
[INFO]
[INFO] Tests run: 26, Failures: 0, Errors: 0, Skipped: 0
[INFO]
[INFO] --
[INFO] BUILD SUCCESS
[INFO] --
[INFO] Total time: 0.991 s
[INFO] Finished at: 2025-10-16T10:35:56+03:00
[INFO] --
tilium@tilium:~/Desktop/Aston-2/Project1$