GIT Department of Computer Engineering

CSE 222/505 - Spring 2022

Homework 6 Report

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Question-1

Problem Solution Approach

1.1

I used book implementations for bst tree and chaining hash table but I made some redesign onto the implementations. Firstly I changed bst tree node data numbers, I added key data beside of value data. So node has two data after that I redesigned. So I redesinged all of the bst tree methods in order to new node design.

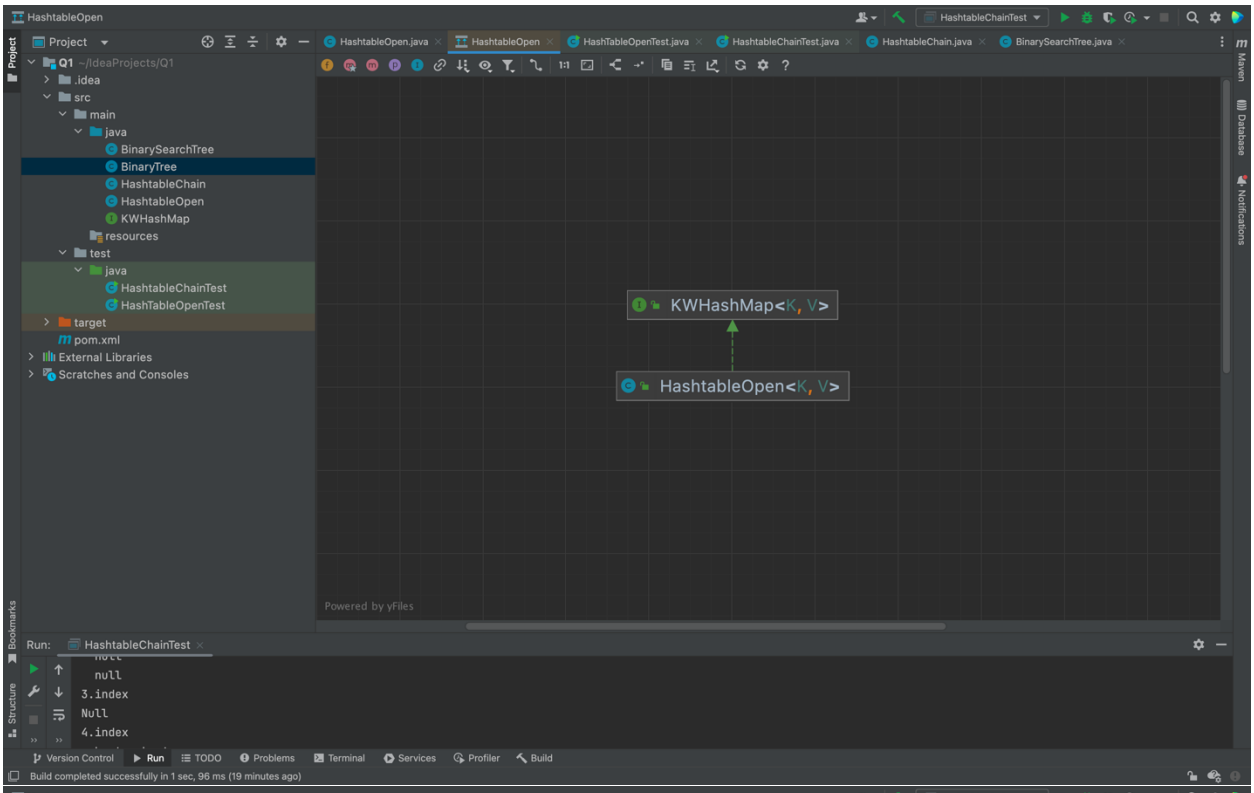
1.2

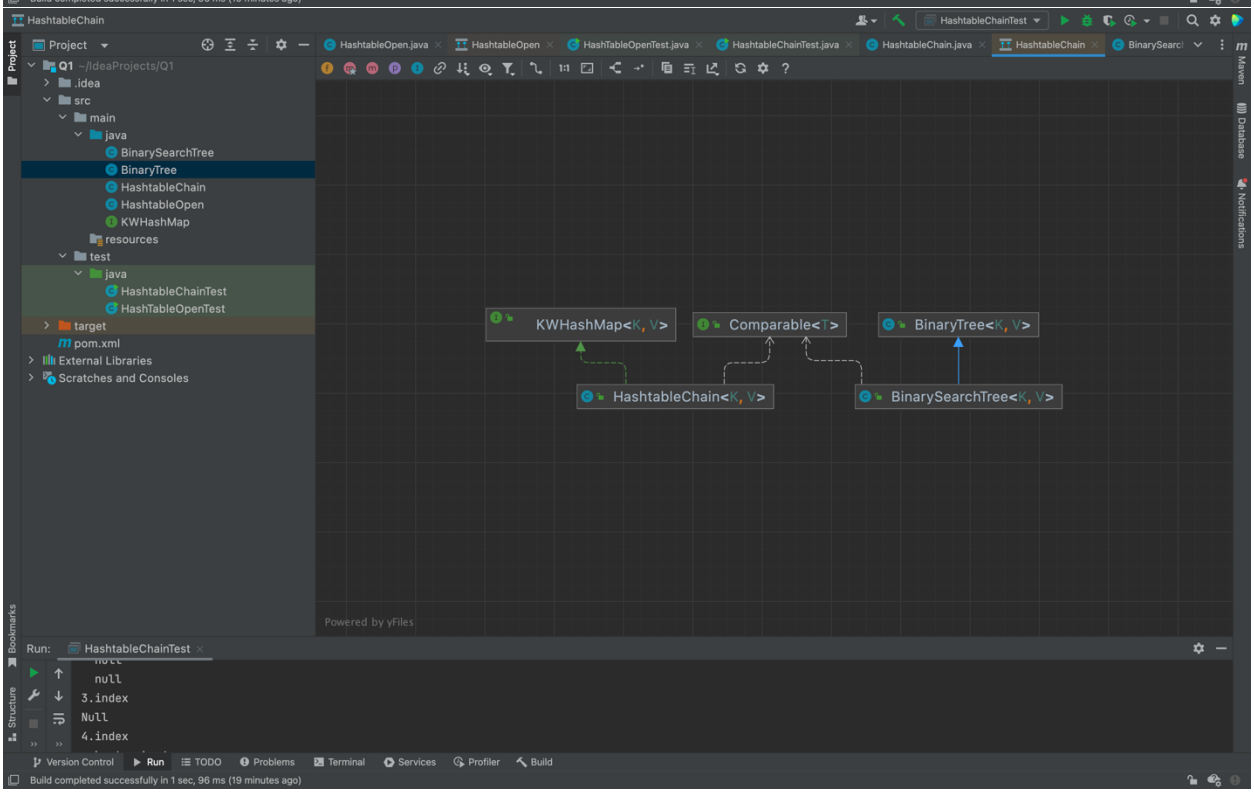
First I make some research about coalesced and double hashing. Double hashing is like a hash code algorithm technic for solving colliding items. Coalesced hashing is making easier to getting colliding items because you don't need to traverse all of the table , you have to go to chaing direction in order to next index value that belongs to entry class. So I redesing two situation for combining those two algorithms. First I added next index value to entry class and second I added one hashing function for getting index value in order to double hashing algorithm technic. Exactly when I added next index data value I had to make some improvement to my hashtableopen function and I added extra findnext helper function for using it in the remove function.

System Requirements

Requirement ID	Requirement Definition
R01	Hash table capacity have to give in the main initialize because of testing.

Class Diagram


HashtableOpen
HashtableChainTest
Project
HashtableOpen.java
HashtableOpen
HashTableOpenTest.java
HashtableChainTest.java
HashtableChain.java
BinarySearchTree.java
Q1 ~/IdeaProjects/Q1
.idea
src
main
java
BinarySearchTree
BinaryTree
HashtableChain
HashtableOpen
KWHashMap
resources
test
java
HashtableChainTest
HashTableOpenTest
target
pom.xml
External Libraries
Scratches and Consoles
KWHashMap<K, V>
HashtableOpen<K, V>
Powered by yFiles
Run:
HashtableChainTest
null
3.index
Null
4.index
Version Control
Run
TODO
Problems
Terminal
Services
Profiler
Build
Build completed successfully in 1 sec, 96 ms (19 minutes ago)


HashtableChain
HashtableChainTest
Project
HashtableOpen.java
HashtableOpen
HashTableOpenTest.java
HashtableChainTest.java
HashtableChain.java
HashtableChain
Q1 ~/IdeaProjects/Q1
.idea
src
main
java
BinarySearchTree
BinaryTree
HashtableChain
HashtableOpen
KWHashMap
resources
test
java
HashtableChainTest
HashTableOpenTest
target
pom.xml
External Libraries
Scratches and Consoles
KWHashMap<K, V>
Comparable<T>
BinaryTree<K, V>
HashtableChain<K, V>
BinarySearchTree<K, V>
Powered by yFiles
Run:
HashtableChainTest
null
3.index
Null
4.index
Version Control
Run
TODO
Problems
Terminal
Services
Profiler
Build
Build completed successfully in 1 sec, 96 ms (19 minutes ago)

Test Cases

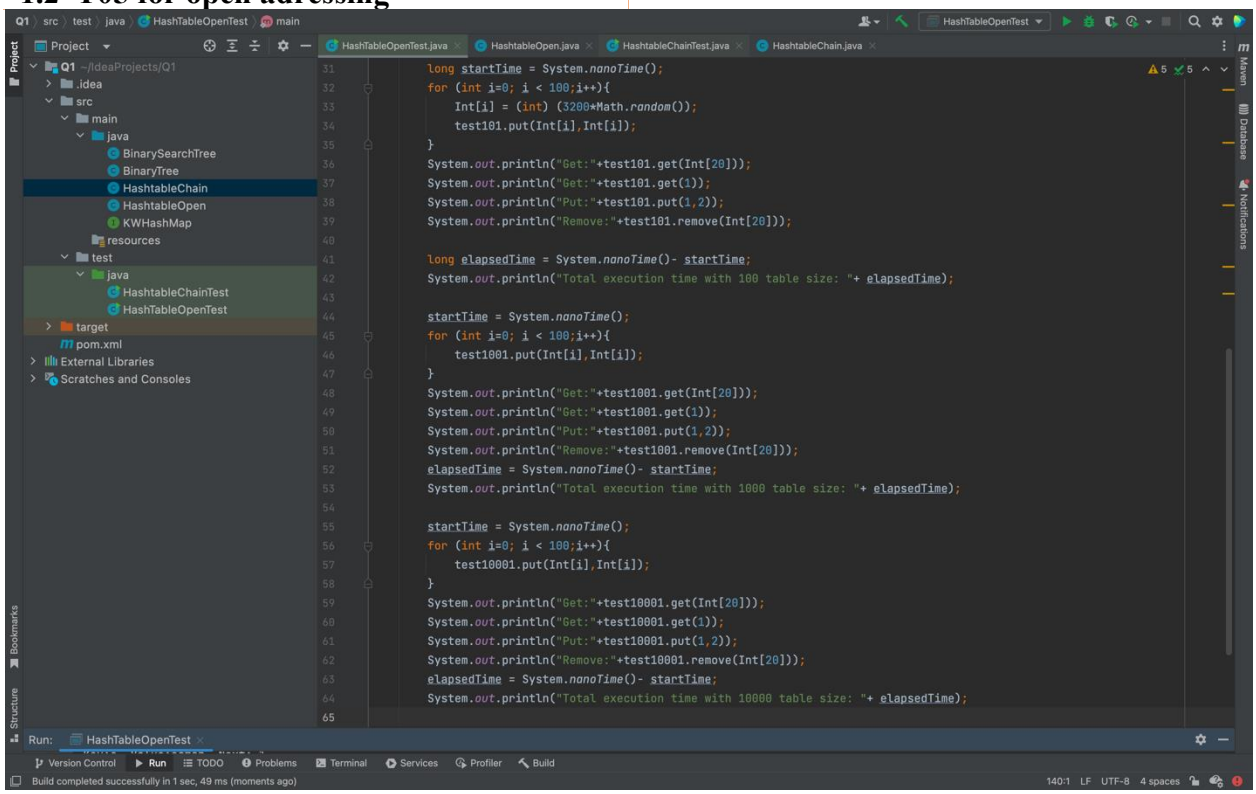
1.1

Test ID	Test Definition
T01	Put item to table.
T02	Rehash table.
T03	Remove item from table.
T04	Find item in the table.
T05	Test for different size of table(100,1000,10000)

1.2

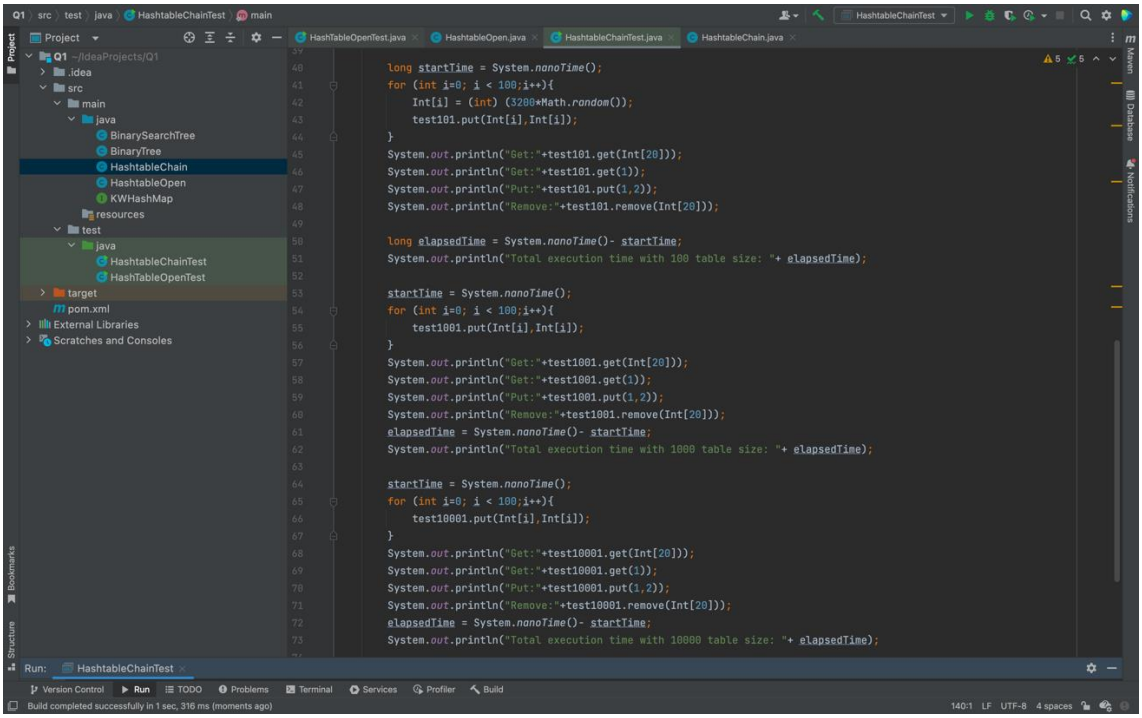
Test ID	Test Definition
T01	Put item to table.
T02	Rehash table.
T03	Remove item from table.
T04	Find item in the table.
T05	Test for different size of table(100,1000,10000)

1.2 T05 for open adressing



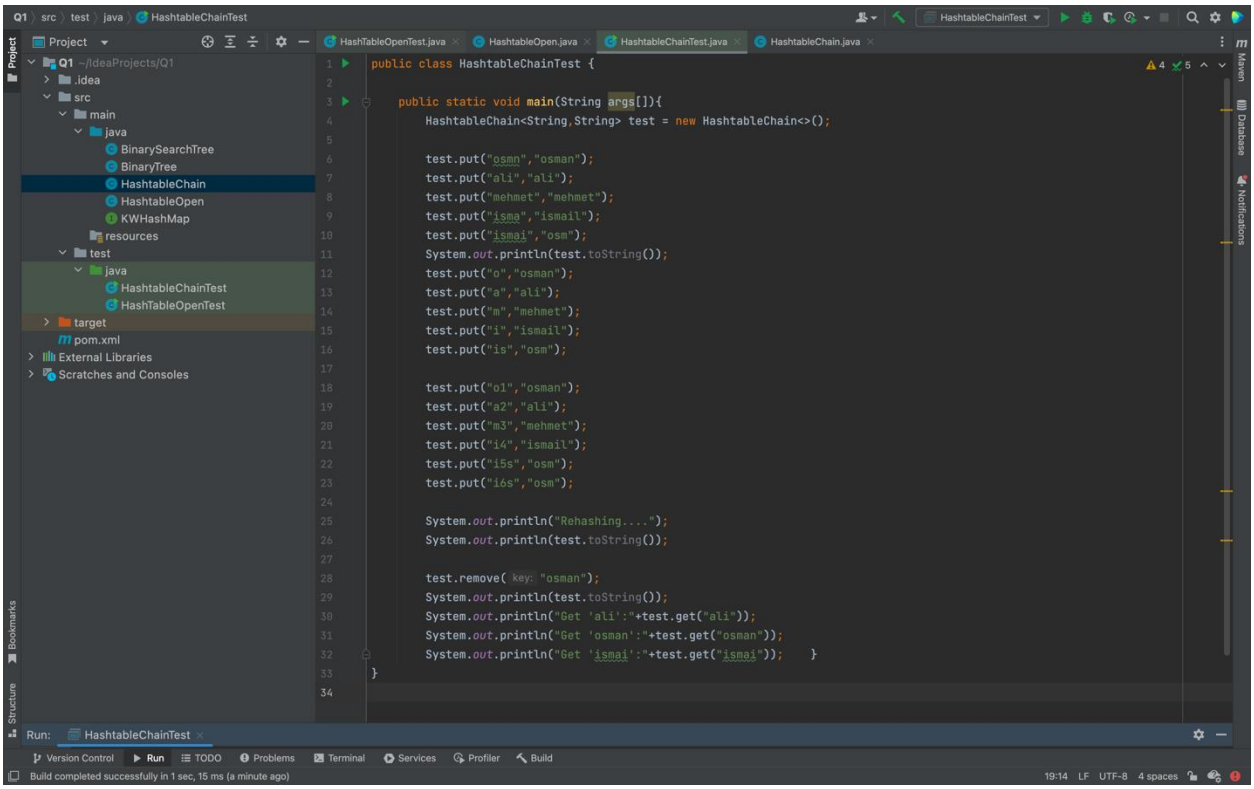
```
Get:1505
Get:null
Put:null
Remove:1505
Total execution time with 100 table size: 532375
Get:1505
Get:null
Put:null
Remove:1505
Total execution time with 1000 table size: 181709
Get:1505
Get:null
Put:null
Remove:1505
Total execution time with 10000 table size: 178084
```

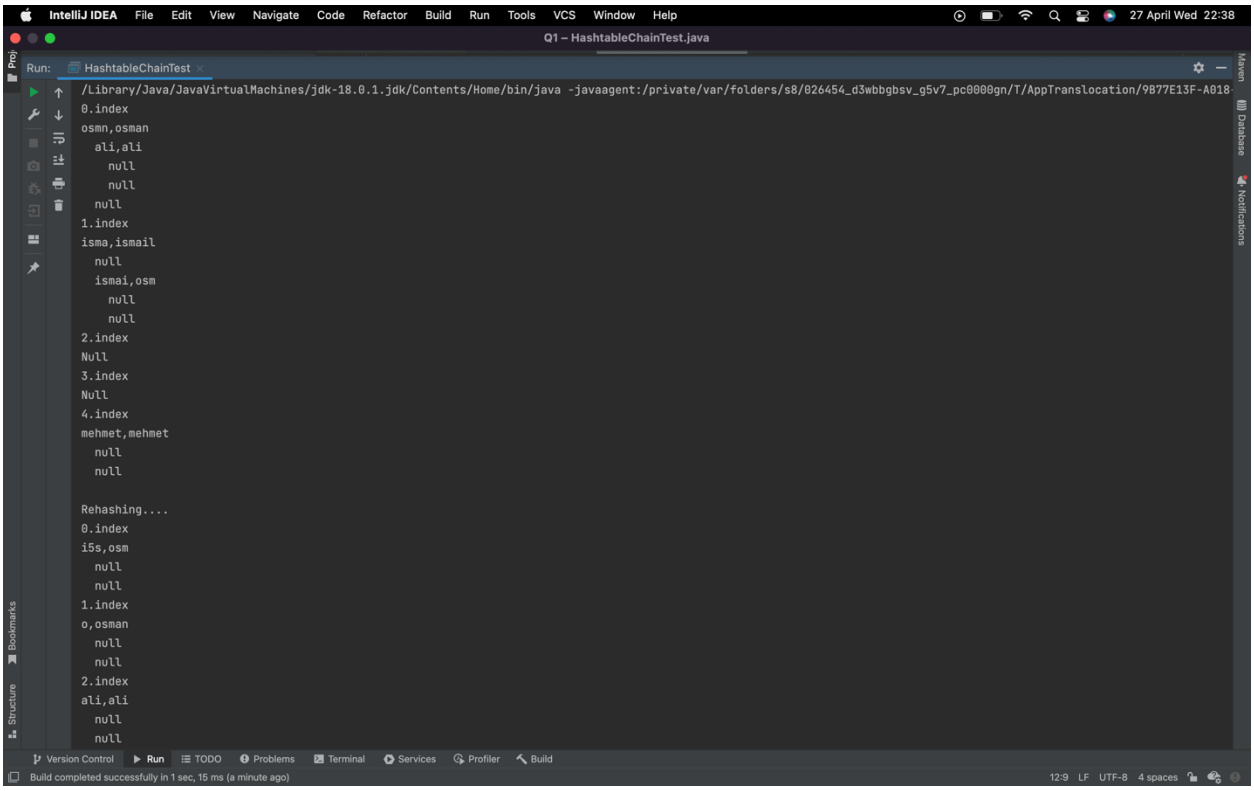
1.1 T05 for Chaining

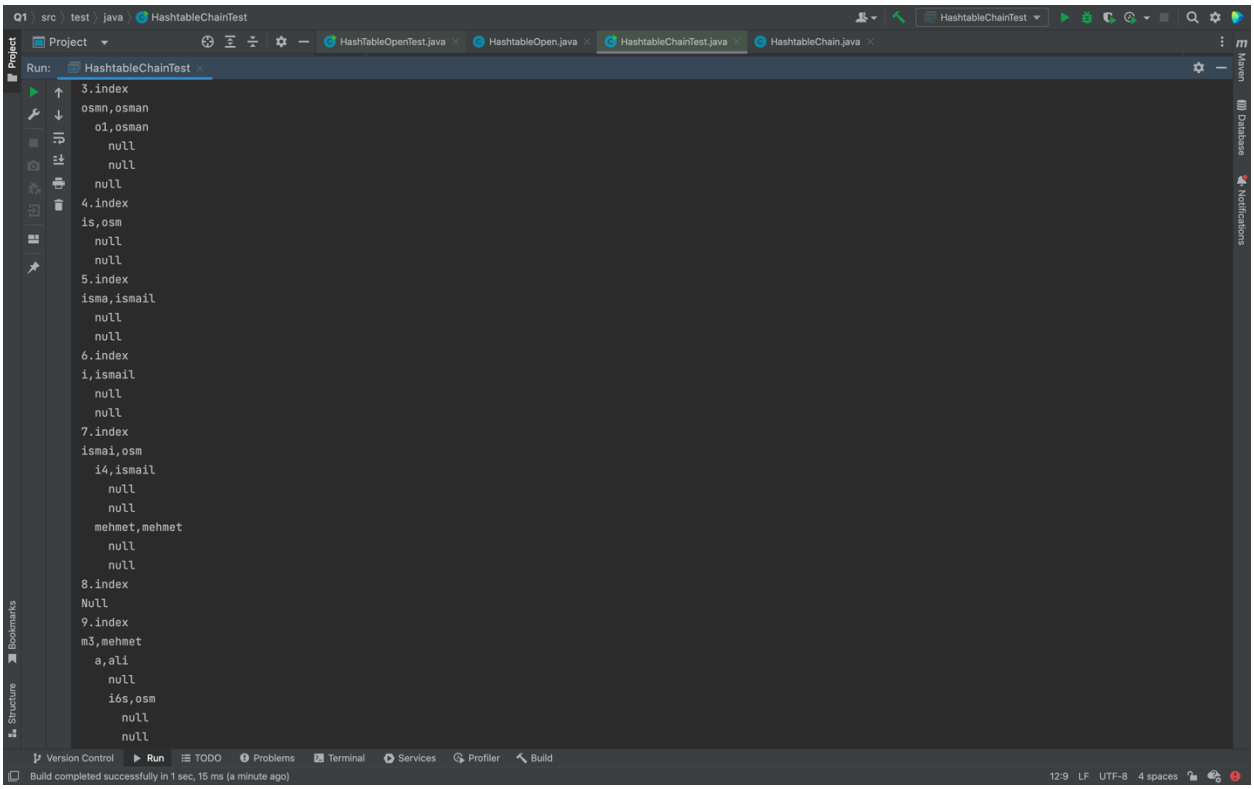


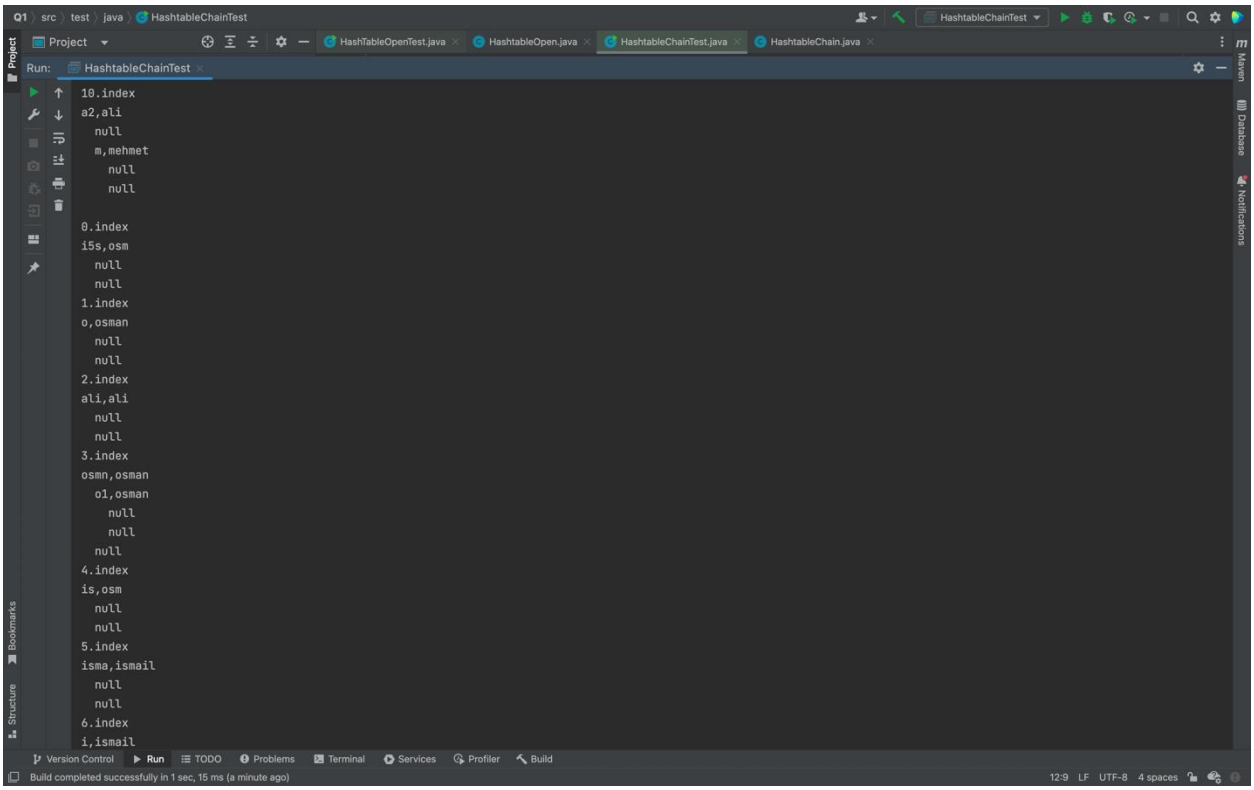
```
Get:161
Get:null
Put:null
Remove:161
Total execution time with 100 table size: 869125
Get:161
Get:null
Put:null
Remove:161
Total execution time with 1000 table size: 189292
Get:161
Get:null
Put:null
Remove:161
Total execution time with 10000 table size: 176834
```

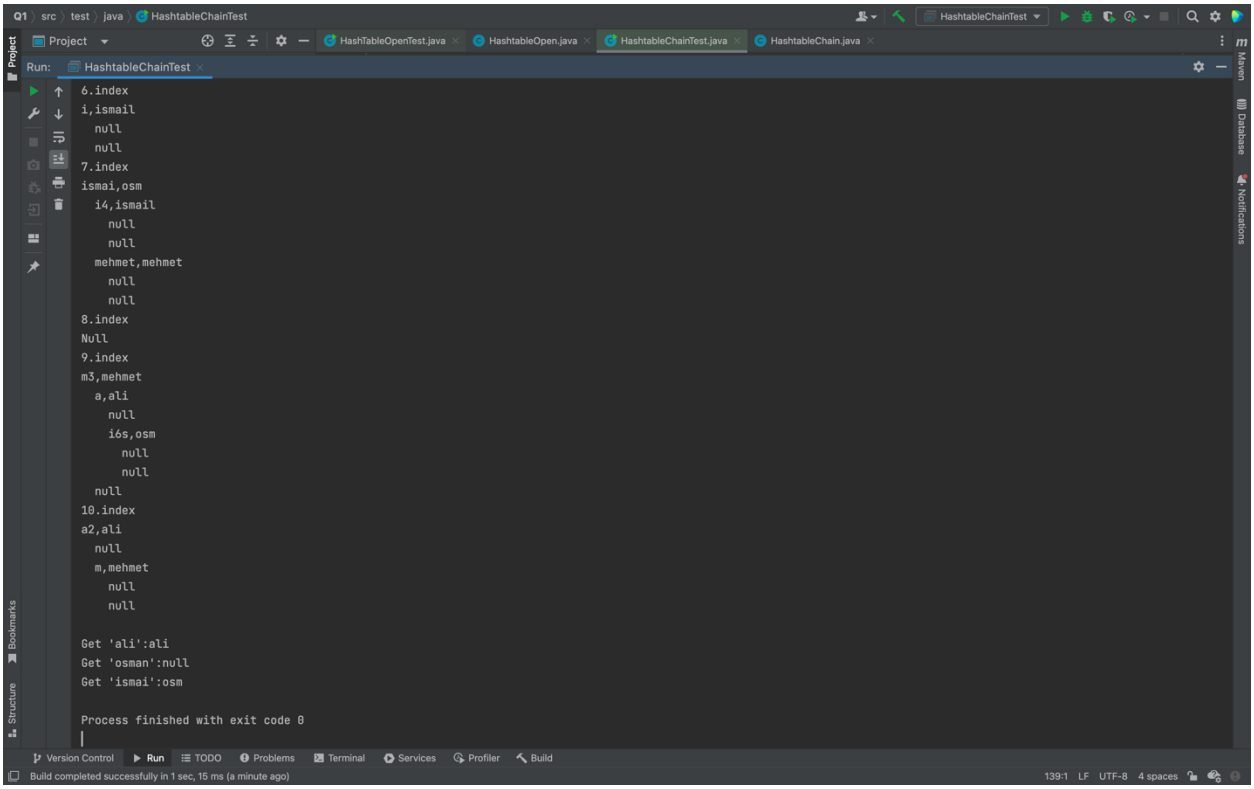
Running Command and Results
1.1


Q1 src test java HashtableChainTest
HashtableChainTest
Project
HashTableOpenTest.java
HashtableOpen.java
HashtableChainTest.java
HashtableChain.java
Q1 ~/IdeaProjects/Q1
.idea
src
main
java
BinarySearchTree
BinaryTree
HashtableChain
HashtableOpen
KWHashMap
resources
test
java
HashtableChainTest
HashTableOpenTest
target
pom.xml
External Libraries
Scratches and Consoles
public class HashtableChainTest {
public static void main(String args[]){
HashtableChain<String,String> test = new HashtableChain<>();
test.put("osmn","osman");
test.put("ali","ali");
test.put("mehmet","mehmet");
test.put("isma","ismail");
test.put("ismai","osm");
System.out.println(test.toString());
test.put("o","osman");
test.put("a","ali");
test.put("m","mehmet");
test.put("i","ismail");
test.put("is","osm");
test.put("o1","osman");
test.put("a2","ali");
test.put("m3","mehmet");
test.put("i4","ismail");
test.put("i5s","osm");
test.put("i6s","osm");
System.out.println("Rehashing....");
System.out.println(test.toString());
test.remove(key: "osman");
System.out.println(test.toString());
System.out.println("Get 'ali':"+test.get("ali"));
System.out.println("Get 'osman':"+test.get("osman"));
System.out.println("Get 'ismai':"+test.get("ismai"));
}
Run: HashtableChainTest
Version Control
Run
TODO
Problems
Terminal
Services
Profiler
Build
Build completed successfully in 1 sec, 15 ms (a minute ago)
19:14 LF UTF-8 4 spaces

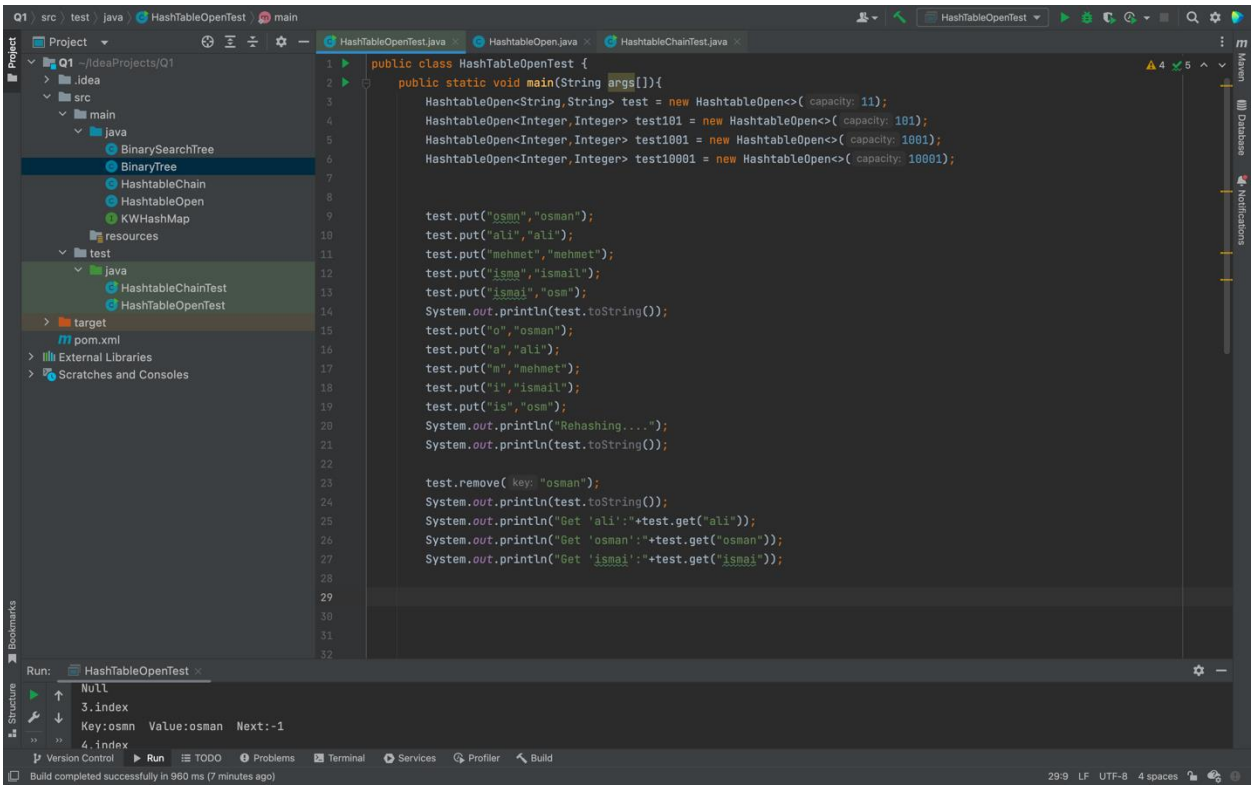

IntelliJ IDEA File Edit View Navigate Code Refactor Build Run Tools VCS Window Help
27 April Wed 22:38
Q1 – HashtableChainTest.java
Run: HashtableChainTest
/Library/Java/JavaVirtualMachines/jdk-18.0.1.jdk/Contents/Home/bin/java -javaagent:/private/var/folders/s8/026454_d3wbbgbsv_g5v7_pc0000gn/T/AppTranslocation/9B77E13F-A018
0.index
osmn,osman
ali,ali
null
null
null
1.index
isma,ismail
null
ismai,osm
null
null
2.index
Null
3.index
Null
4.index
mehmet,mehmet
null
null
Rehashing....
0.index
i5s,osm
null
null
1.index
o,osman
null
null
2.index
ali,ali
null
null
Version Control
Run
TODO
Problems
Terminal
Services
Profiler
Build
Build completed successfully in 1 sec, 15 ms (a minute ago)
12:9 LF UTF-8 4 spaces

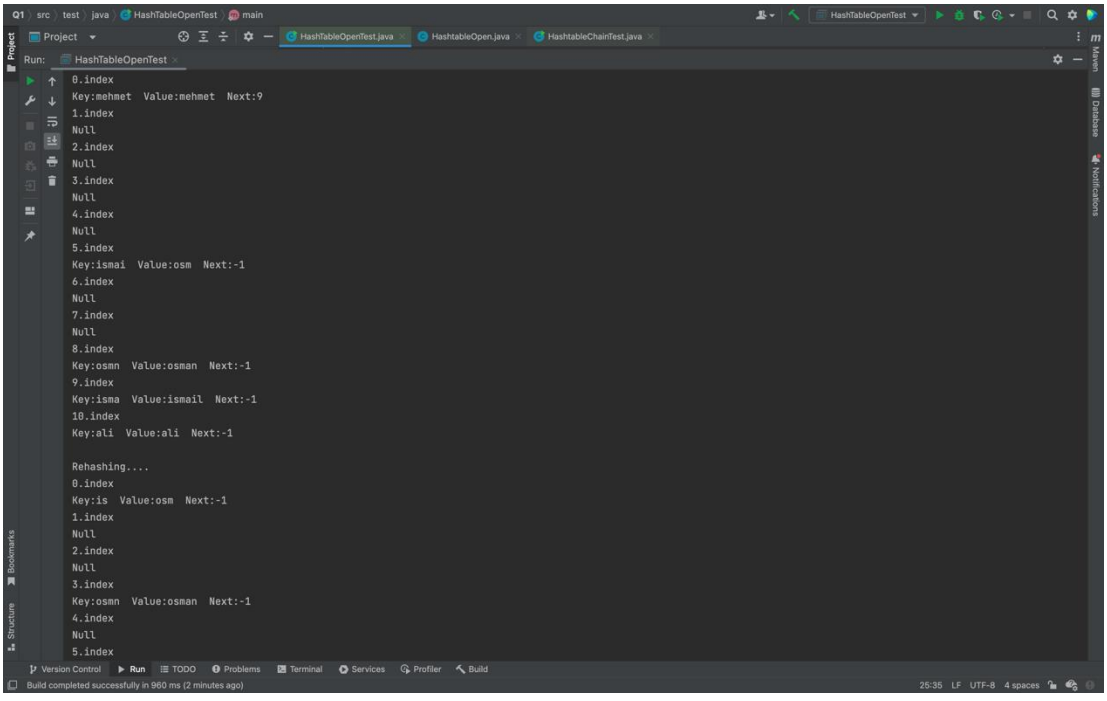

Q1 src test java HashtableChainTest
HashtableChainTest
Project
HashTableOpenTest.java
HashtableOpen.java
HashtableChainTest.java
HashtableChain.java
Run: HashtableChainTest
3.index
osmn,osman
o1,osman
null
null
null
4.index
is,osm
null
null
5.index
isma,ismail
null
null
6.index
i,ismail
null
null
7.index
ismai,osm
i4,ismail
null
null
mehmet,mehmet
null
null
8.index
Null
9.index
m3,mehmet
a,ali
null
i6s,osm
null
null
Version Control
Run
TODO
Problems
Terminal
Services
Profiler
Build
Build completed successfully in 1 sec, 15 ms (a minute ago)
12:9 LF UTF-8 4 spaces

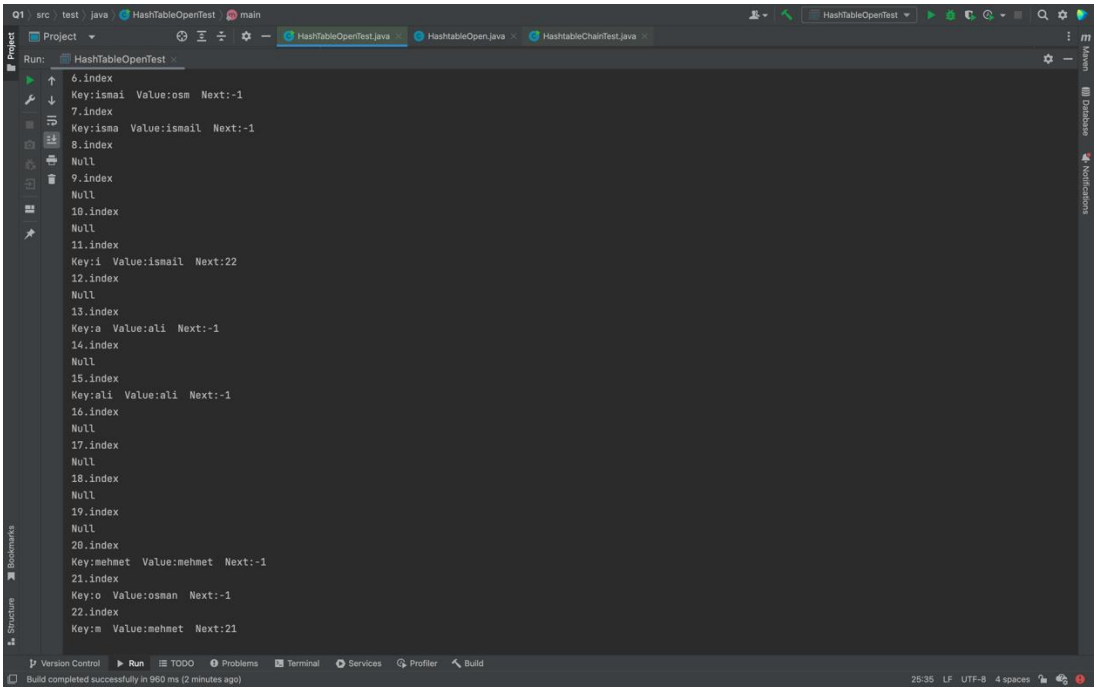

Q1 src test java HashtableChainTest
HashtableChainTest
Project
HashTableOpenTest.java
HashtableOpen.java
HashtableChainTest.java
HashtableChain.java
Run: HashtableChainTest
10.index
a2,ali
null
m,mehmet
null
null
0.index
i5s,osm
null
null
1.index
o,osman
null
null
2.index
ali,ali
null
null
3.index
osmn,osman
o1,osman
null
null
null
4.index
is,osm
null
null
5.index
isma,ismail
null
null
6.index
i,ismail
Version Control
Run
TODO
Problems
Terminal
Services
Profiler
Build
Build completed successfully in 1 sec, 15 ms (a minute ago)
12:9 LF UTF-8 4 spaces

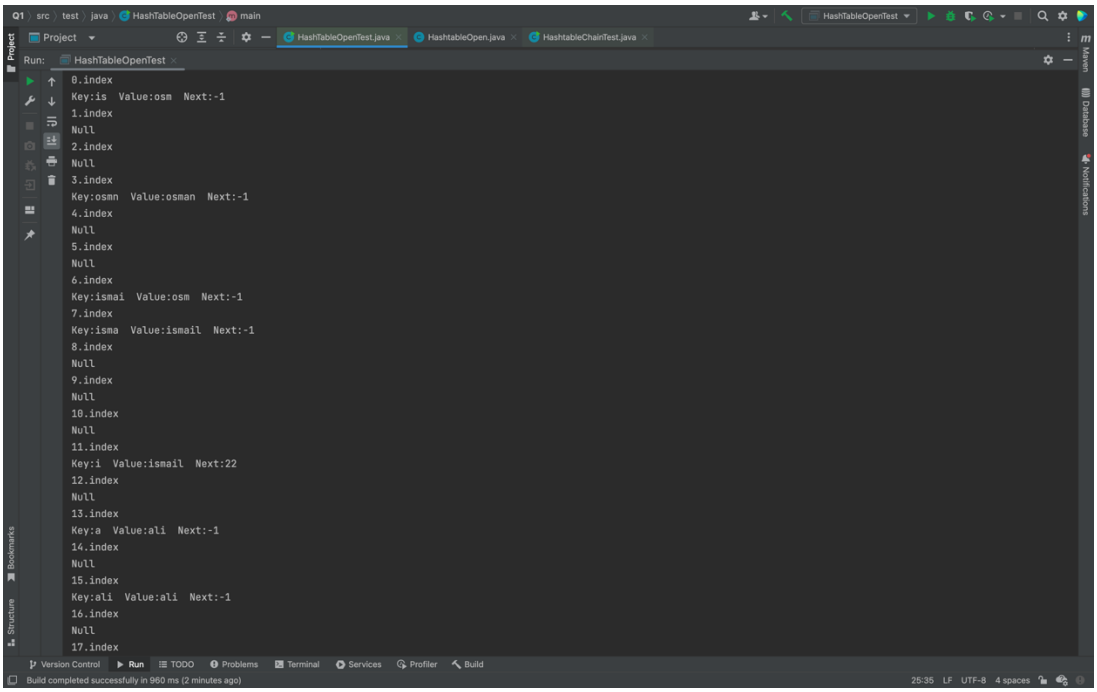

Q1 src test java HashtableChainTest
HashtableChainTest
Project
HashTableOpenTest.java
HashtableOpen.java
HashtableChainTest.java
HashtableChain.java
Run: HashtableChainTest
6.index
i,ismail
null
null
7.index
ismai,osm
i4,ismail
null
null
mehmet,mehmet
null
null
8.index
Null
9.index
m3,mehmet
a,ali
null
i6s,osm
null
null
null
10.index
a2,ali
null
m,mehmet
null
null
Get 'ali':ali
Get 'osman':null
Get 'ismai':osm
Process finished with exit code 0
Version Control
Run
TODO
Problems
Terminal
Services
Profiler
Build
Build completed successfully in 1 sec, 15 ms (a minute ago)
139:1 LF UTF-8 4 spaces
Maven
Database
Notifications
Bookmarks
Structure

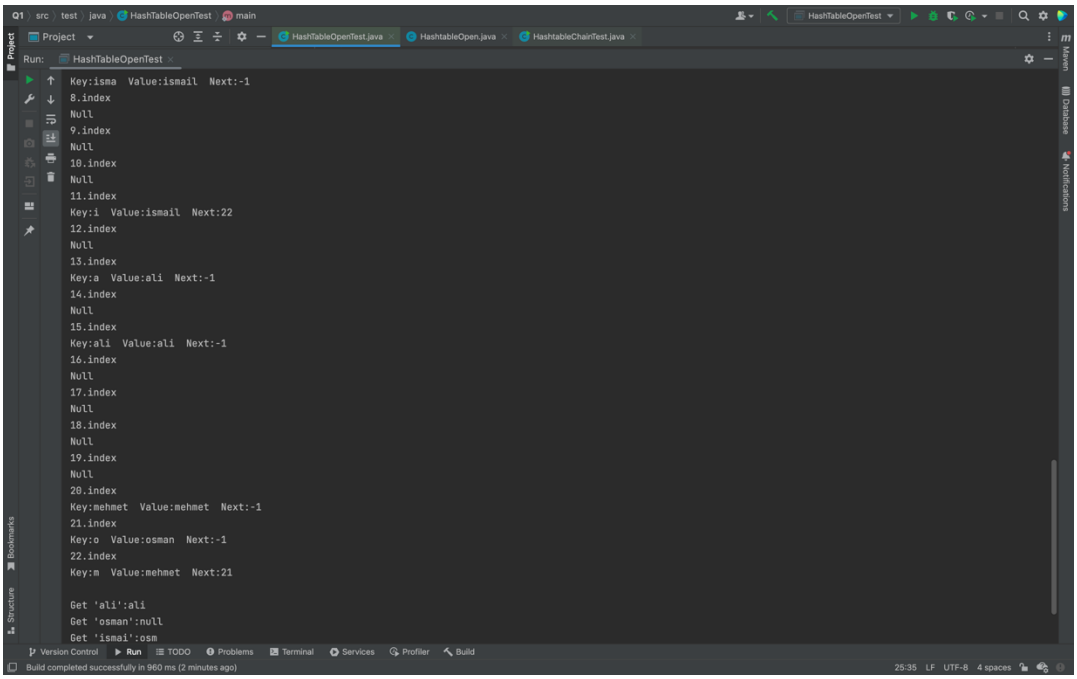
1.2


Q1 src test java HashTableOpenTest main
HashTableOpenTest
Project
HashTableOpenTest.java
HashtableOpen.java
HashtableChainTest.java
Q1 ~/IdeaProjects/Q1
.idea
src
main
java
BinarySearchTree
BinaryTree
HashtableChain
HashtableOpen
KWHashMap
resources
test
java
HashtableChainTest
HashTableOpenTest
target
pom.xml
External Libraries
Scratches and Consoles
public class HashTableOpenTest {
public static void main(String args[]){
HashtableOpen<String,String> test = new HashtableOpen<>(capacity: 11);
HashtableOpen<Integer,Integer> test101 = new HashtableOpen<>(capacity: 101);
HashtableOpen<Integer,Integer> test1001 = new HashtableOpen<>(capacity: 1001);
HashtableOpen<Integer,Integer> test10001 = new HashtableOpen<>(capacity: 10001);
test.put("osmn","osman");
test.put("ali","ali");
test.put("mehmet","mehmet");
test.put("isma","ismail");
test.put("ismai","osm");
System.out.println(test.toString());
test.put("o","osman");
test.put("a","ali");
test.put("m","mehmet");
test.put("i","ismail");
test.put("is","osm");
System.out.println("Rehashing....");
System.out.println(test.toString());
test.remove(key: "osman");
System.out.println(test.toString());
System.out.println("Get 'ali':"+test.get("ali"));
System.out.println("Get 'osman':"+test.get("osman"));
System.out.println("Get 'ismai':"+test.get("ismai"));
Run: HashTableOpenTest
Null
3.index
Key:osmn Value:osman Next:-1
4.index
Version Control
Run
TODO
Problems
Terminal
Services
Profiler
Build
Build completed successfully in 960 ms (7 minutes ago)
29:9 LF UTF-8 4 spaces


Q1 src test java HashTableOpenTest main
Project
Run: HashTableOpenTest
0.index
Key:mehmet Value:mehmet Next:9
1.index
Null
2.index
Null
3.index
Null
4.index
Null
5.index
Key:ismai Value:osm Next:-1
6.index
Null
7.index
Null
8.index
Key:osmn Value:osman Next:-1
9.index
Key:isma Value:ismail Next:-1
10.index
Key:ali Value:ali Next:-1
Rehashing....
0.index
Key:is Value:osm Next:-1
1.index
Null
2.index
Null
3.index
Key:osmn Value:osman Next:-1
4.index
Null
5.index
Version Control
Run
TODO
Problems
Terminal
Services
Profiler
Build
Build completed successfully in 960 ms (2 minutes ago)
25:35 LF UTF-8 4 spaces


Q1 src test java HashTableOpenTest main
HashTableOpenTest
Project
HashTableOpenTest.java
HashtableOpen.java
HashtableChainTest.java
Run: HashTableOpenTest
6.index
Key:ismai Value:osm Next:-1
7.index
Key:isma Value:ismail Next:-1
8.index
Null
9.index
Null
10.index
Null
11.index
Key:i Value:ismail Next:22
12.index
Null
13.index
Key:a Value:ali Next:-1
14.index
Null
15.index
Key:ali Value:ali Next:-1
16.index
Null
17.index
Null
18.index
Null
19.index
Null
20.index
Key:mehmet Value:mehmet Next:-1
21.index
Key:o Value:osman Next:-1
22.index
Key:m Value:mehmet Next:21
Version Control
Run
TODO
Problems
Terminal
Services
Profiler
Build
Build completed successfully in 960 ms (2 minutes ago)
25:35 LF UTF-8 4 spaces
Maven
Database
Notifications
Bookmarks
Structure


Q1 src test java HashTableOpenTest main
HashTableOpenTest
Project
HashTableOpenTest.java
HashtableOpen.java
HashtableChainTest.java
Run: HashTableOpenTest
0.index
Key:is Value:osm Next:-1
1.index
Null
2.index
Null
3.index
Key:osmn Value:osman Next:-1
4.index
Null
5.index
Null
6.index
Key:ismai Value:osm Next:-1
7.index
Key:isma Value:ismail Next:-1
8.index
Null
9.index
Null
10.index
Null
11.index
Key:i Value:ismail Next:22
12.index
Null
13.index
Key:a Value:ali Next:-1
14.index
Null
15.index
Key:ali Value:ali Next:-1
16.index
Null
17.index
Version Control
Run
TODO
Problems
Terminal
Services
Profiler
Build
Build completed successfully in 960 ms (2 minutes ago)
25:35 LF UTF-8 4 spaces
Maven
Database
Notifications
Bookmarks
Structure


Q1 src test java HashTableOpenTest main
HashTableOpenTest
Project
HashTableOpenTest.java
HashtableOpen.java
HashtableChainiTest.java
Run: HashTableOpenTest
Key:isma Value:ismail Next:-1
8.index
Null
9.index
Null
10.index
Null
11.index
Key:i Value:ismail Next:22
12.index
Null
13.index
Key:a Value:ali Next:-1
14.index
Null
15.index
Key:ali Value:ali Next:-1
16.index
Null
17.index
Null
18.index
Null
19.index
Null
20.index
Key:mehmet Value:mehmet Next:-1
21.index
Key:o Value:osman Next:-1
22.index
Key:m Value:mehmet Next:21
Get 'ali':ali
Get 'osman':null
Get 'ismai':osm
Version Control
Run
TODO
Problems
Terminal
Services
Profiler
Build
Build completed successfully in 960 ms (2 minutes ago)
25:35 LF UTF-8 4 spaces
Maven
Database
Notifications
Bookmarks
Structure