sharpen your understanding of Java Generics.

The aim of this activity is to implement a bidirectional HashMap.

A classic problem with the HashMap implementation found in the Java standard library is that, while it is easy to get the value a particular key maps to, it is not so easy to get the keys that a particular value maps to.

HashMap<String,String> map = new HashMap<String,String>();

map.put("Thomas","SWEN221");

map.put("Alex","COMP261");

map.put("Yi","SWEN221");

At this point, we can determine what course string the key "Alex" maps to by calling map.get("Alex"). But, how can we find the people involved with the course "SWEN221"? The only way is using something similar to the following:

ArrayList<String> people = new ArrayList<String>();

for(Map.Entry<String,String> e : map.entrySet()) {

if(e.second().equals("SWEN221")) {

people.add(e.first());

}

}

A bidirectional HashHap provides a method getKeys(V value). This method could be used instead

of the above code as follows:

BiHashMap<String,String> map = new BiHashMap<String,String>();

map.put("Thomas","SWEN221");

map.put("Alex","COMP261");

map.put("Yi","SWEN221");

Set<String> people = map.getKeys("SWEN221");  // get a set of keys mapping to SWEN221

Here, we see that map.getKeys("SWEN221") returns the set of keys whose value is "SWEN221" in map.

TO DO

An initial implementation of the bidirectional HashMap has been provided for you to help,

along with a small suite of unit tests. These can be downloaded from the course webpage, on the lecture schedule.

There **are several major problems with the given implementation of BiHashMap** which you must fix. These are:

1. The current implementation of BiHashMap does not use generics.
2. This is because it was developed before Java Generics were introduced into the Java language.
3. **Therefore, you should modify the implementation of BiHashMap to use Java generics appropriately.**
4. The given implementation of BiHashMap contains a number of errors and other problems. You should attempt to fix all problems that you encounter.