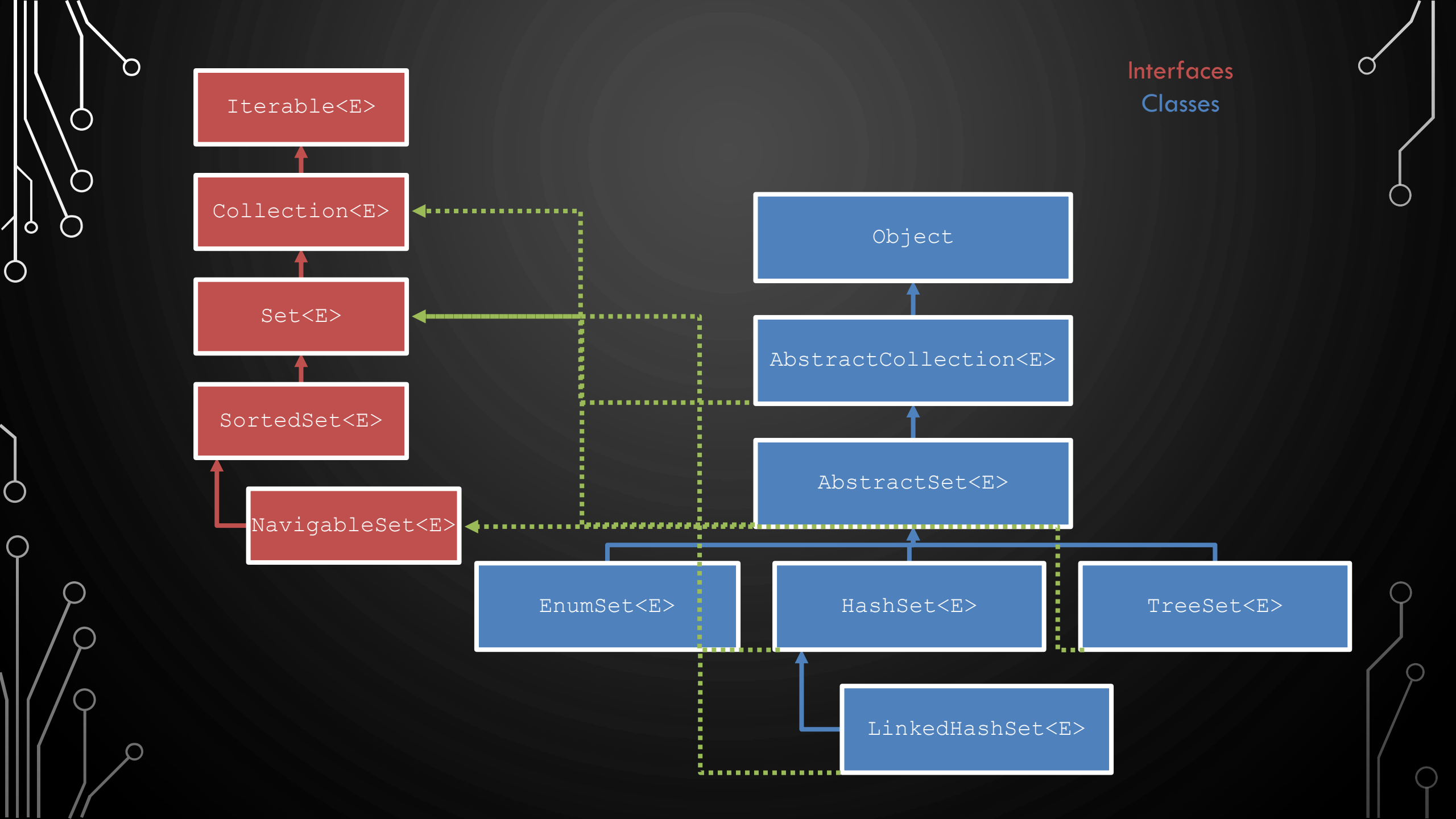
JAVA SETS AND MAPS

SUMMARY OF CLASSES (SETS)

- **`EnumSet<E>`** - Specialized set for enumerated types. Implemented as bit-vector.
- **`HashSet<E>`** - Set implemented with chained hash table – no guaranteed iteration order
  - **`LinkedHashSet<E>`** - Same, but with guaranteed iteration order. No complexity overhead
  - ***`E` should override both `hashCode()` and `equals()`! Default `hashCode()` hashes memory address of object (typically, not always) and default `equals()` compares memory address***
- **`TreeSet<E>`** - Set implemeneted with red-black tree. Needs `Comparator<E>` or `E` should implement `Comparable<E>`
- There are no multisets in the Java library. Some external libraries have them.
- To find how to use them, go to the Java API!


Interfaces
Classes
Iterable<E>
Collection<E>
Set<E>
SortedSet<E>
NavigableSet<E>
Object
AbstractCollection<E>
AbstractSet<E>
EnumSet<E>
HashSet<E>
TreeSet<E>
LinkedHashSet<E>

EXAMPLE OF USING SET<E>

```
1. Scanner s = new Scanner(new File("numbers.txt"));
2. HashSet<Integer> numbers = new HashSet<>();
3. while(s.hasNextInt())
4.   numbers.add(s.nextInt());
5. …elsewhere…
6. int sumOfUnique = 0;
7. for(Integer i : numbers)
8.   sum += i;
```

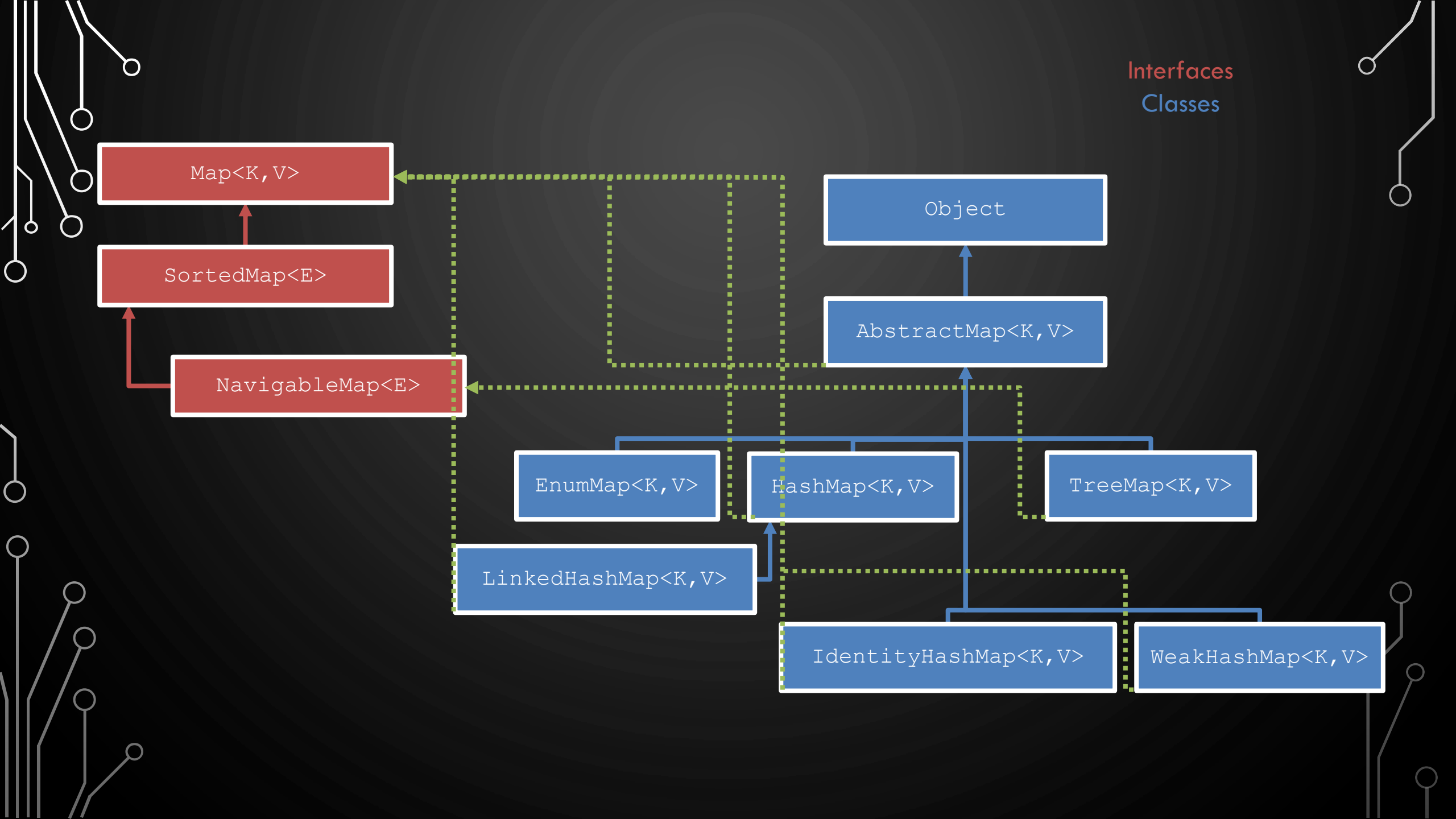
EXAMPLE OF OVERRIDING HASCODE()

```
1.  public class Student {
2.    String id; //unique!
3.    String name;
4.    List<Courses> courses;
5.    …stuff…
6.    public boolean equals(Object obj) {
7.      if(obj != null && obj instanceof Student)
8.        return id.equals(((Student)obj).id);
9.      return false;
10.   }
11.   public int hashCode() {
12.     return id.hashCode();
13.   }
14. }
```

Really great stackoverflow answer about creating hash codes.

SUMMARY OF CLASSES (MAPS)

- **`EnumMap<K,V>`** - Specialized set for enumerated types. Implemented as bit-vector.
- **`HashMap<K,V>`** - Set implemented with chained hash table – no guaranteed iteration order
  - **`LinkedHashMap<K,V>`** - Same, but with guaranteed iteration order. No complexity overhead
  - ***K should override both `hashCode()` and `equals()`! Default `hashCode()` hashes memory address of object (typically, not always) and default `equals()` compares memory address***
- **`TreeMap<K,V>`** - Set implemeneted with red-black tree. Needs `Comparator<K>` or `K` should implement `Comparable<K>`
- **`IdentityHashMap<K,V>`** - hash map specifically for objects that use reference equality instead of object equality
- **`WeakHashMap<K,V>`** - Like a hash map, but does not prevent garbage collector from removing keys
- There are no multisets in the Java library. Can fake with `Map<K, List<V>>`
- To find how to use them, go to the Java API!


Interfaces
Classes
Map<K,V>
SortedMap<E>
NavigableMap<E>
Object
AbstractMap<K,V>
EnumMap<K,V>
HashMap<K,V>
TreeMap<K,V>
LinkedHashMap<K,V>
IdentityHashMap<K,V>
WeakHashMap<K,V>

EXAMPLE OF USING MAP<K,V>

```
1. Scanner s = new Scanner(new File("numbers.txt"));
2. HashMap<Integer,String> numbers = new HashMap<>();
3. while(s.hasNextInt())
4.   numbers.put(s.nextInt(),s.next());
5. …elsewhere…
6. System.out.println(numbers.get(5)); //get a value
```

PROBLEM

- Design a barcode scanner for a super market: Given the barcodes of the items in your shopping list, look up in the inventory database for its availability and if available print the quantity.
- What will be the underlying container?
- Read the inventory data (item barcode, quantity, per item cost) from the file given in the website.
- Bonus: Prepare the receipt (total cost) for the shopping list.
  - You may format a shopping list any way you want. Be sure to handle the case where the item does not exist!