Overview of Java's Support for Inheritance

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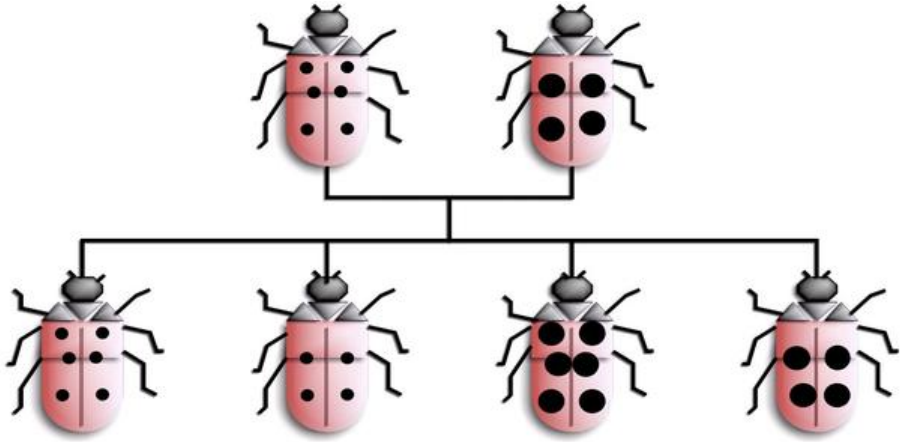
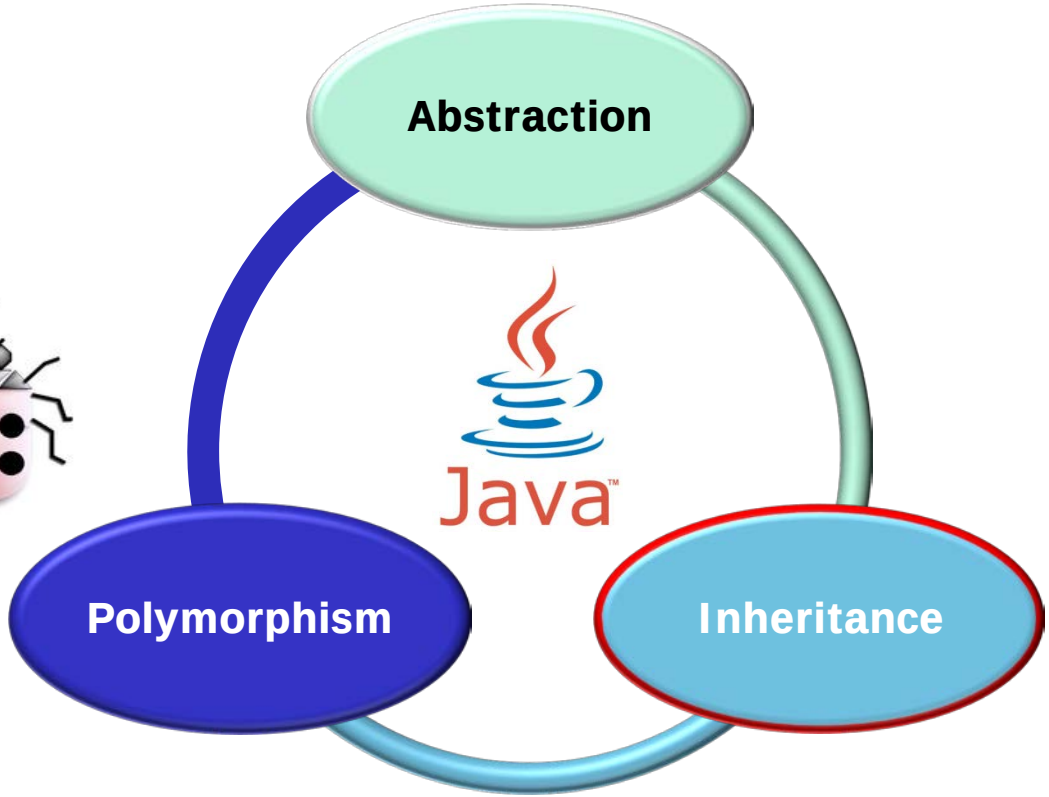
Learning Objectives in this Lesson

- Understand what inheritance is & how it's supported in Java





Overview of Java's Support for Inheritance

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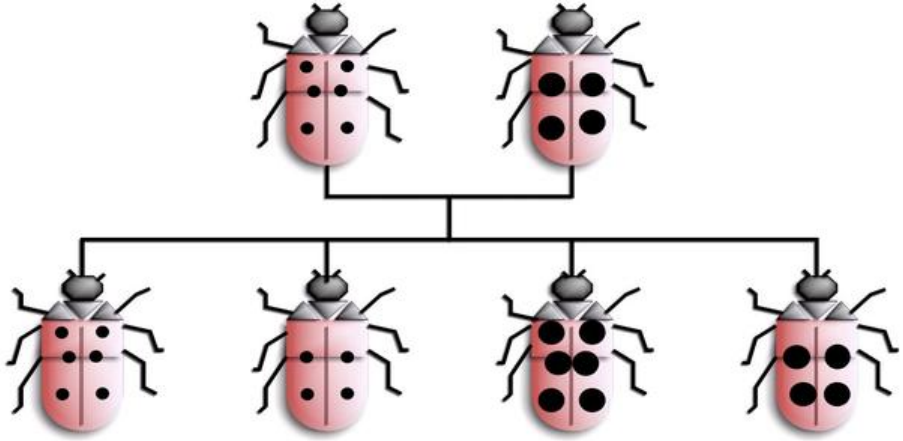
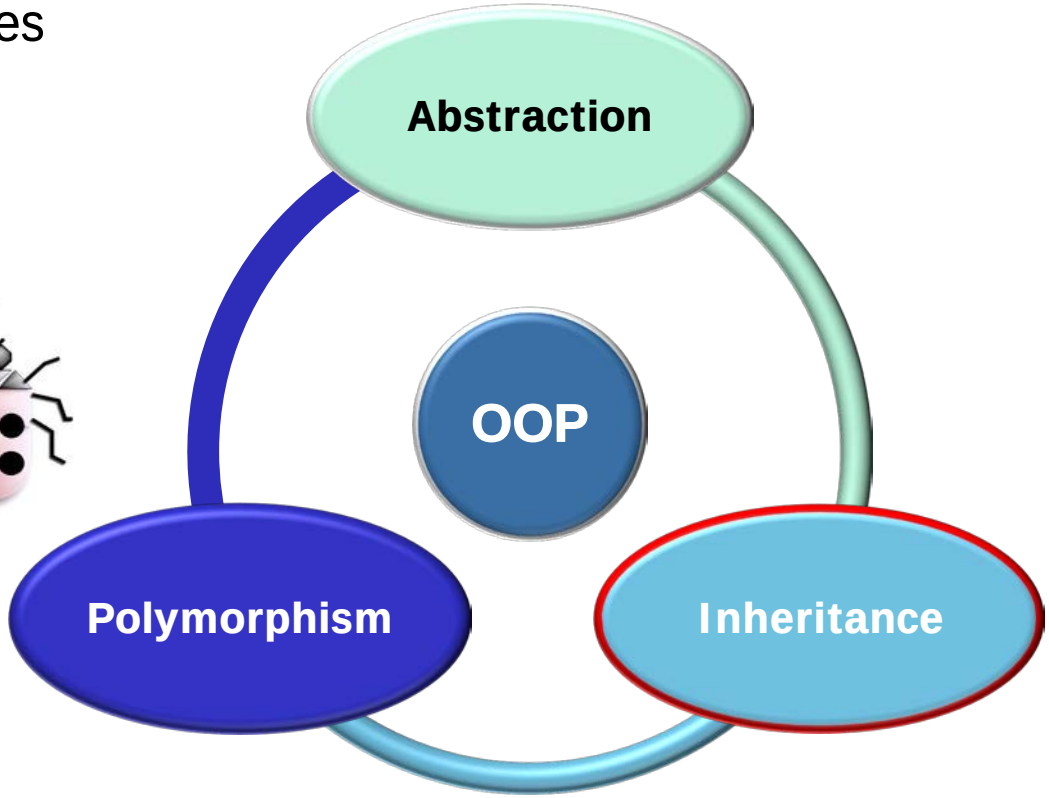
- OO languages enhance reuse by allowing classes to inherit commonly used state & behavior from other classes

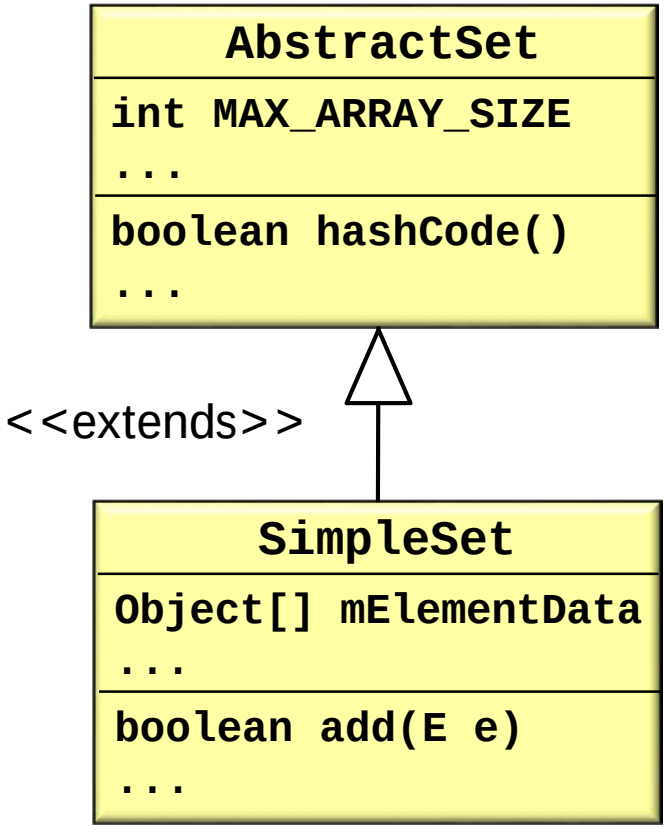




See en.wikipedia.org/wiki/Inheritance_(object-oriented_programming)

Overview of Java's Support for Inheritance

- Inheritance in Java is specified via its **`extends`** keyword



See docs.oracle.com/javase/tutorial/java/IandI/subclasses.html

Overview of Java's Support for Inheritance

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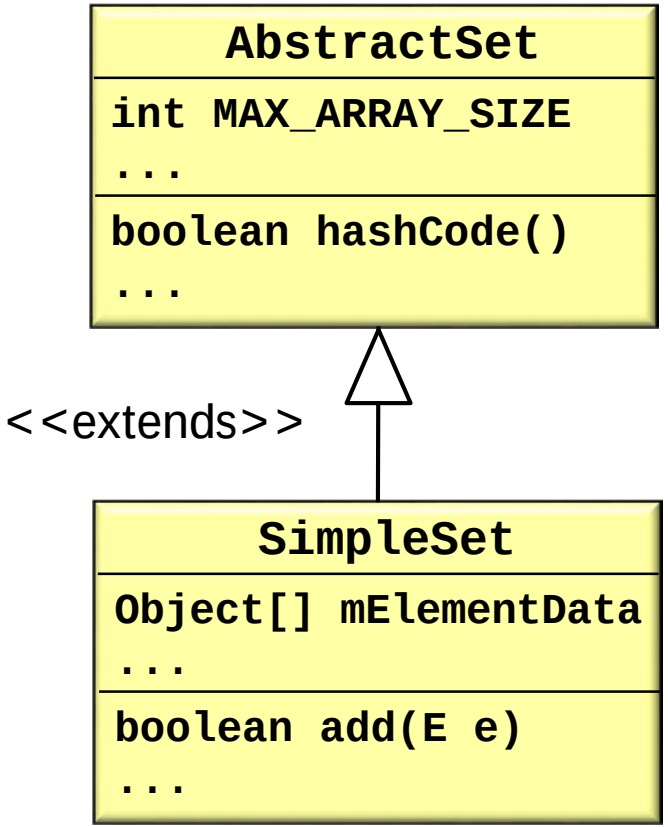

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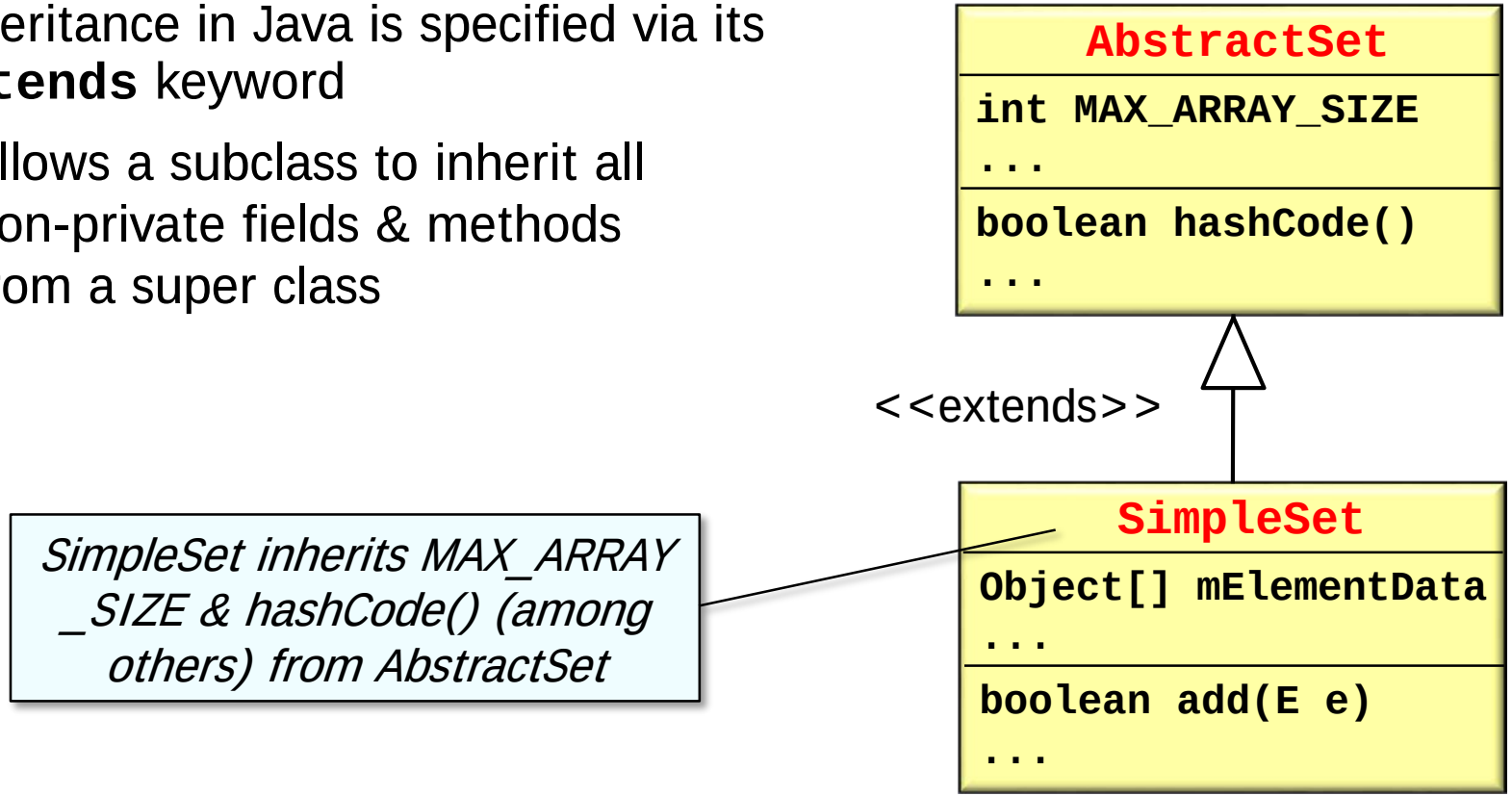

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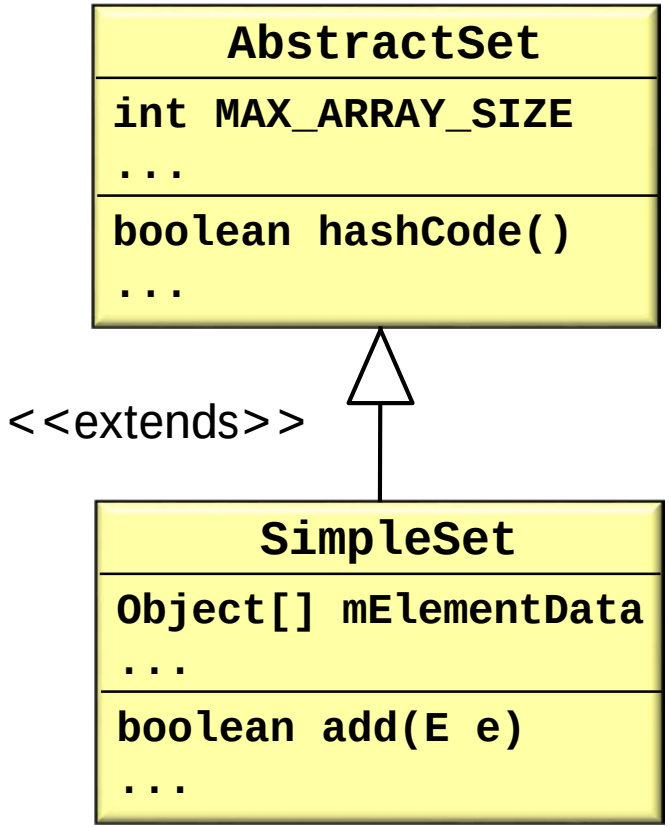


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Set<String> s =
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s.add(element);
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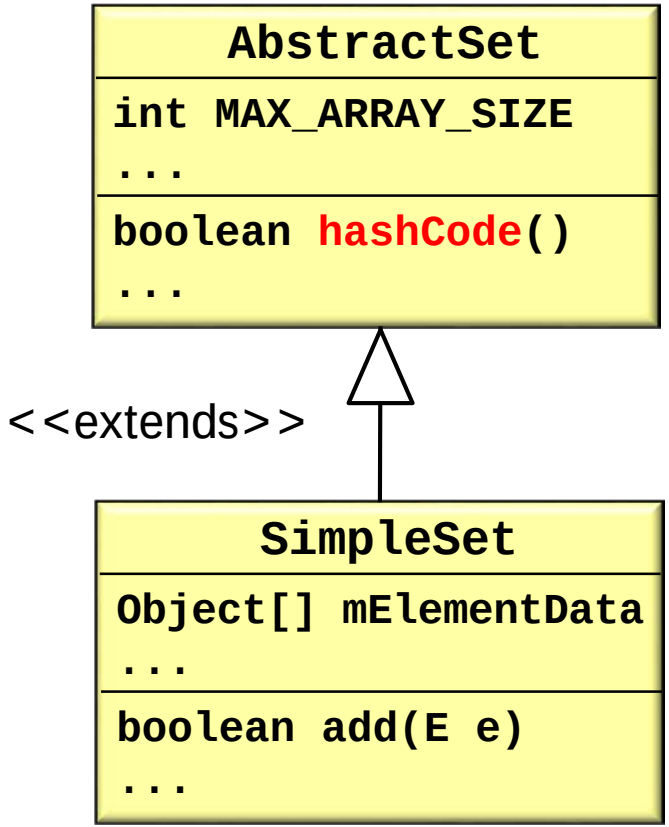


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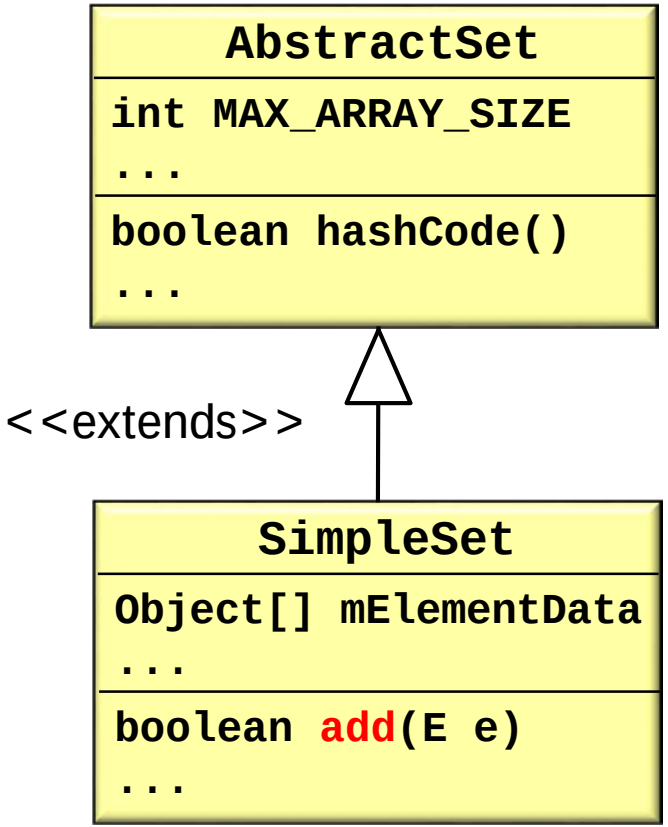


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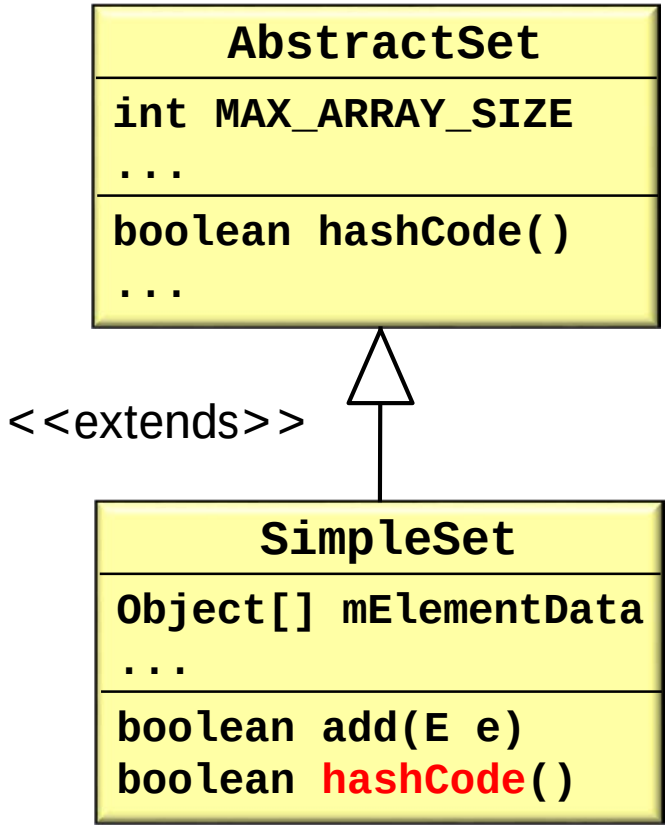


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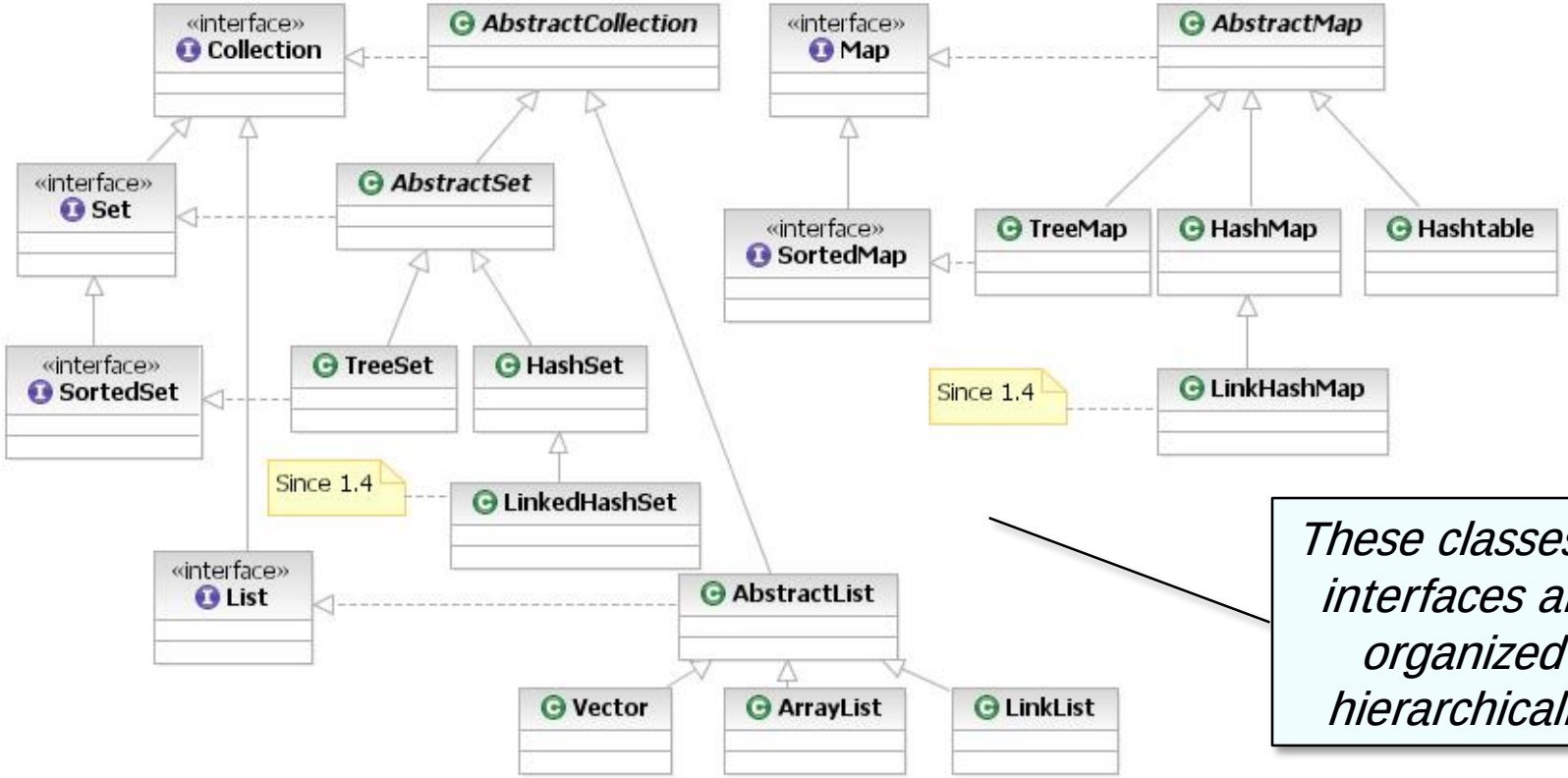
SimpleSet can also "override" hashCode(), as discussed in *Polymorphism* lesson

Overview of Java's Support for Inheritance

- Java Collections Framework demonstrates capabilities & benefits of inheritance



See docs.oracle.com/javase/8/docs/technotes/guides/collections

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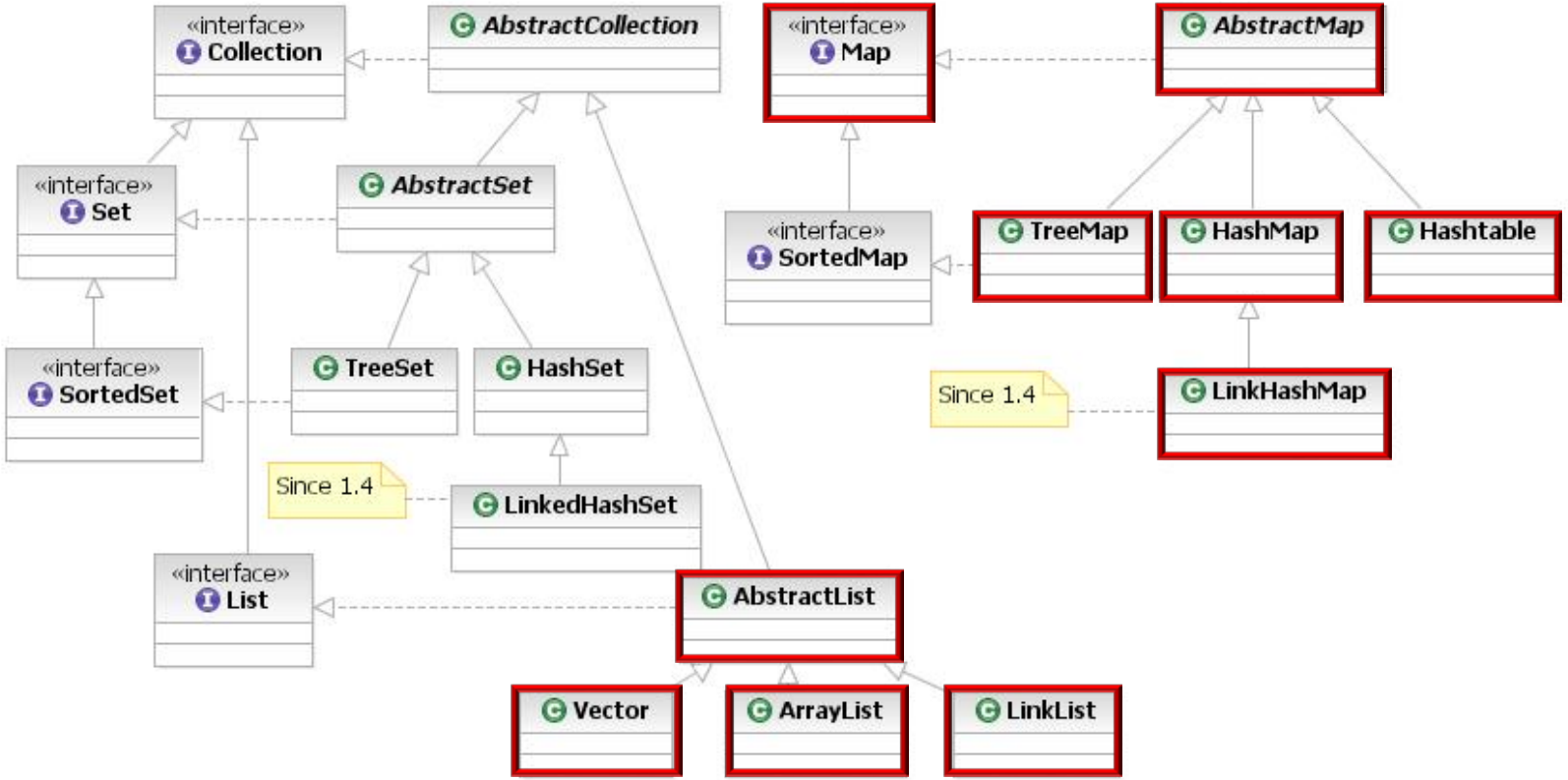
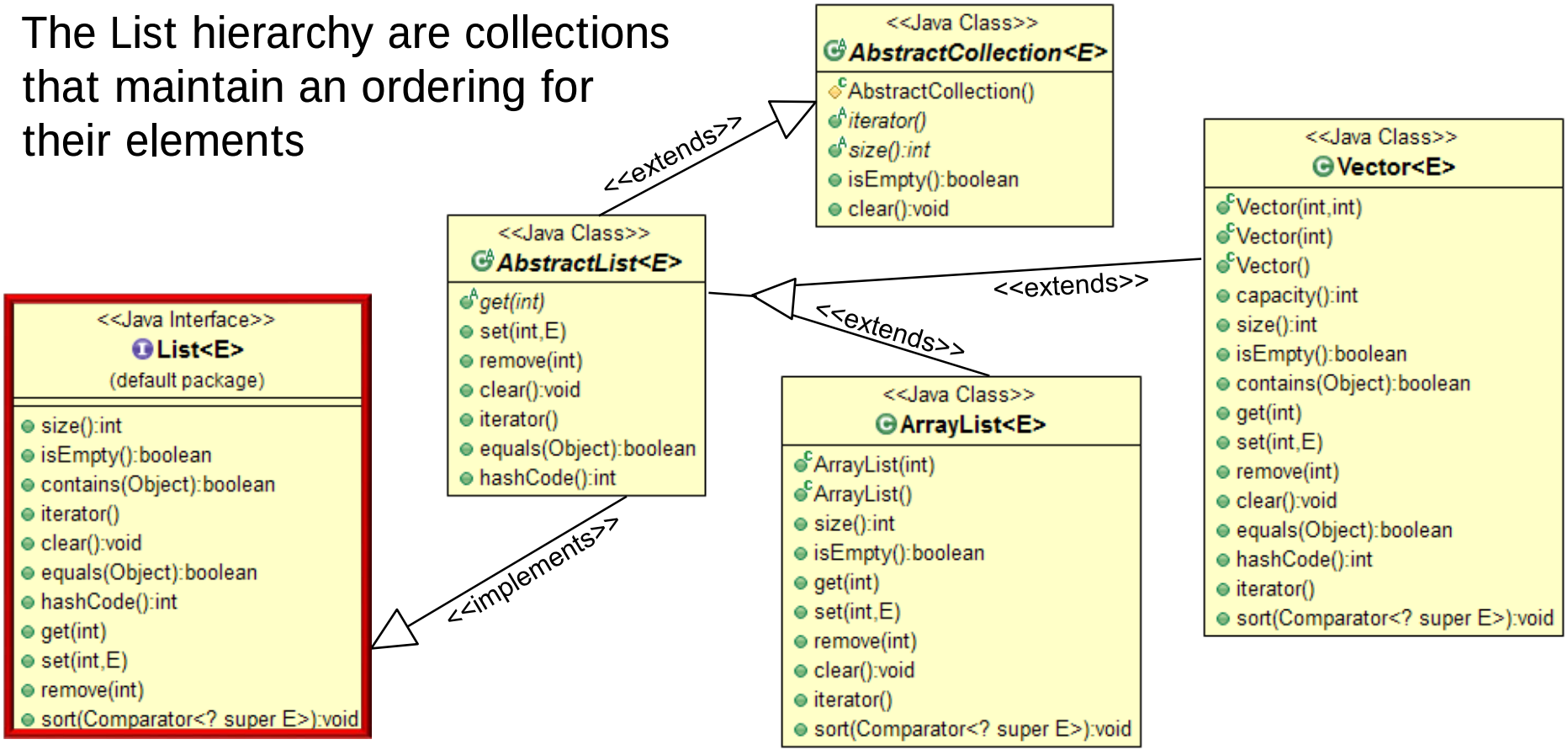


See the lesson on "*Overview of the Java Collections Framework*"

Overview of Java's Support for Inheritance

- The List hierarchy are collections that maintain an ordering for their elements



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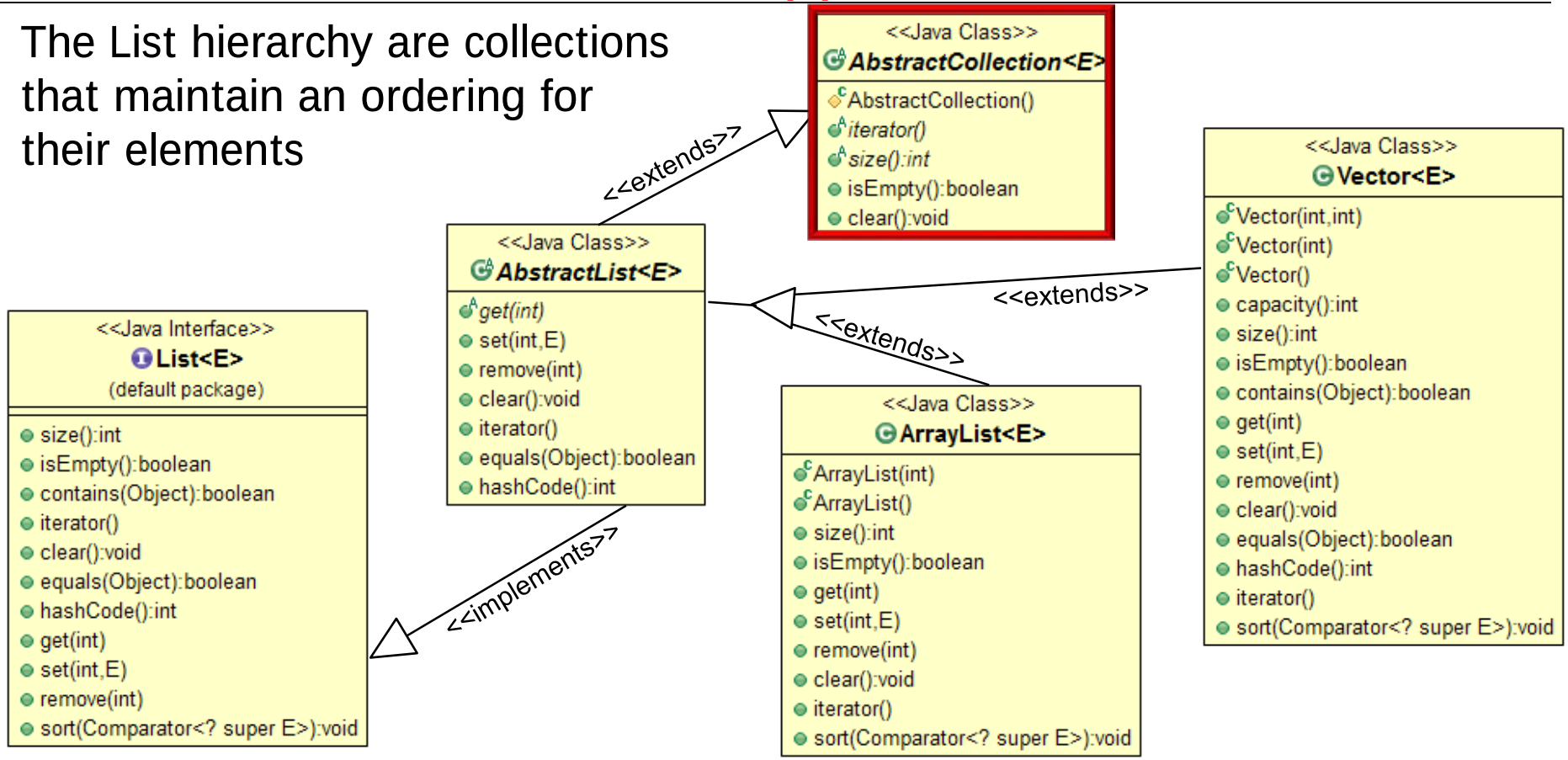

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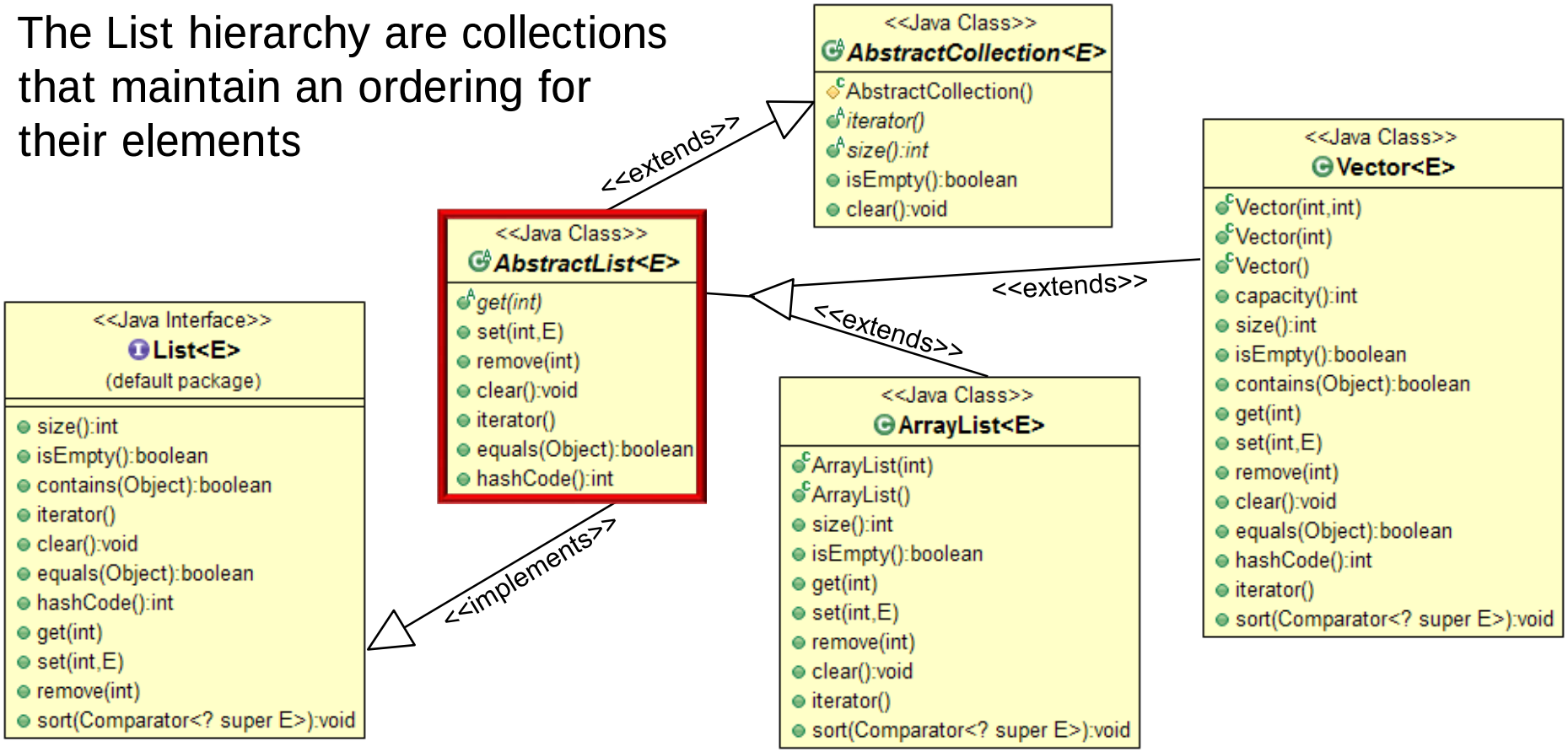

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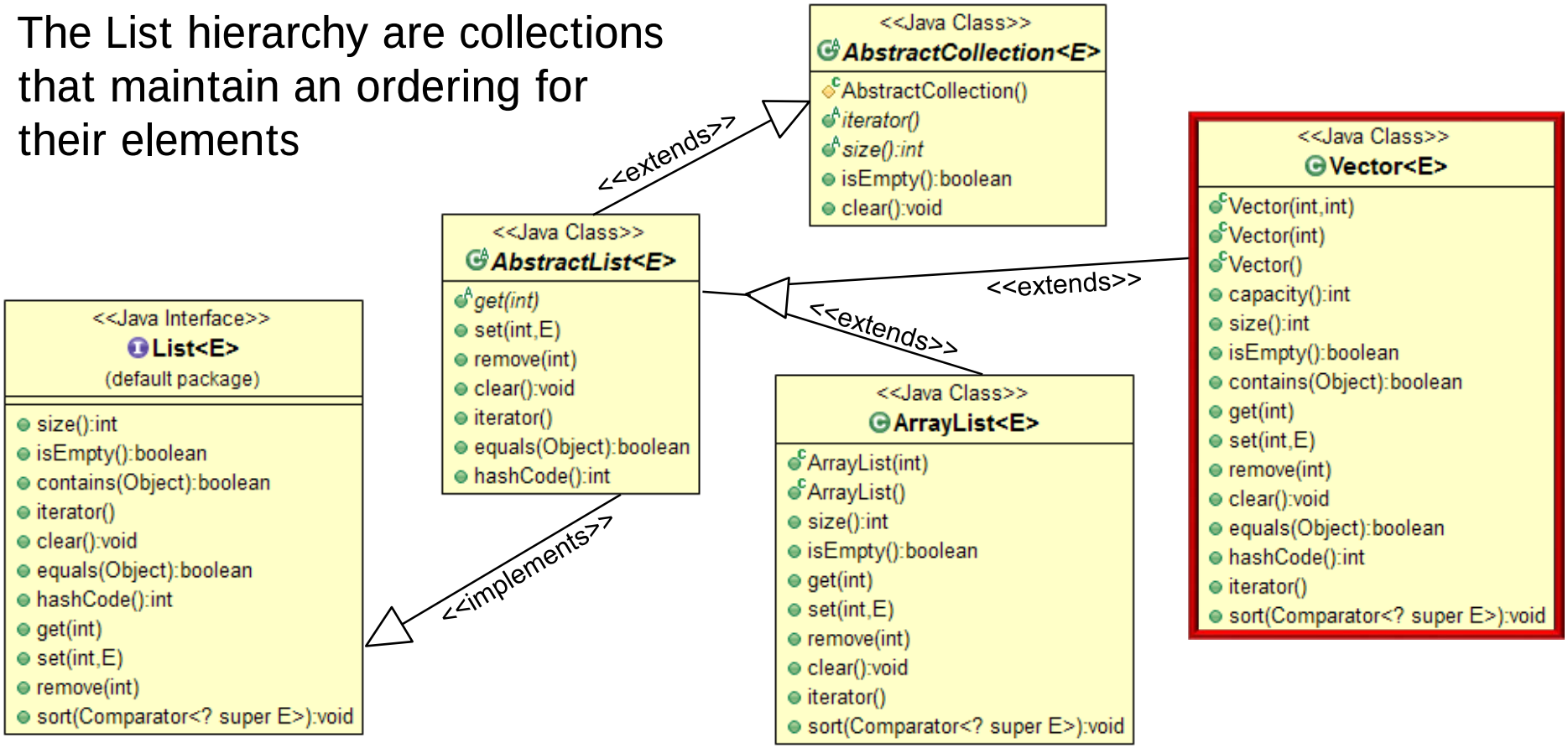

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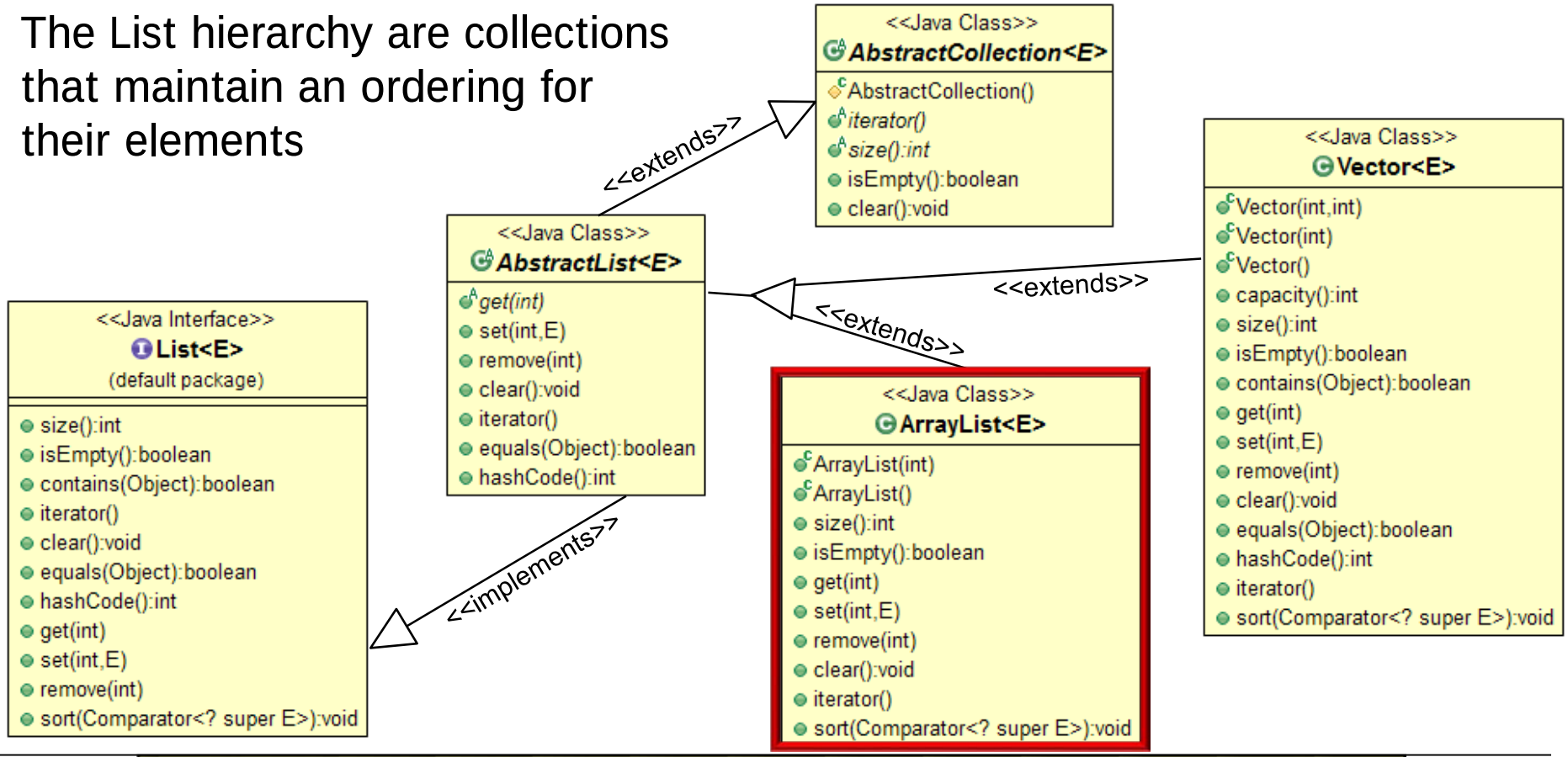

See docs.oracle.com/javase/8/docs/api/java/util/ArrayList.html

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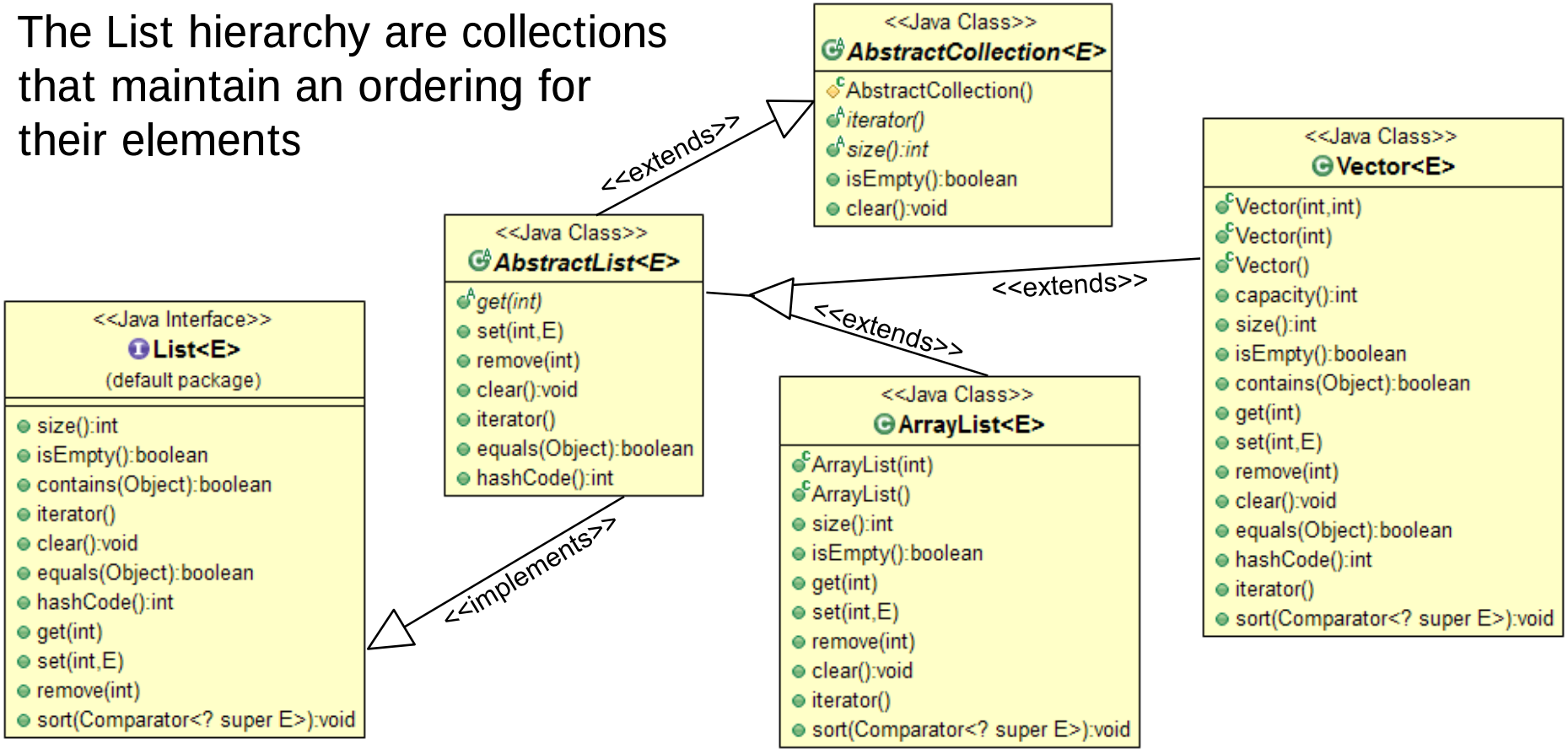

This inheritance hierarchy enhances systematic reuse of data fields & methods

The Role of the Java Object Super Class

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- All Java classes inherit from the java.lang.Object super class

```
package java.lang;

public class Object {
   ...
   public int hashCode();
   public boolean equals
                    (Object o);
   ...
   public final void wait();
   public final void notify();
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   ...
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See docs.oracle.com/javase/8/docs/api/java/lang/Object.html

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See docs.oracle.com/javase/tutorial/essential/concurrency/guardmeth.html

The Role of the Java Object Super Class

- Subclasses that don't explicitly extend a super class implicitly inherit from java.lang.Object

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public abstract class Process {
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  - java.lang.Process implicitly extends java.lang.Object

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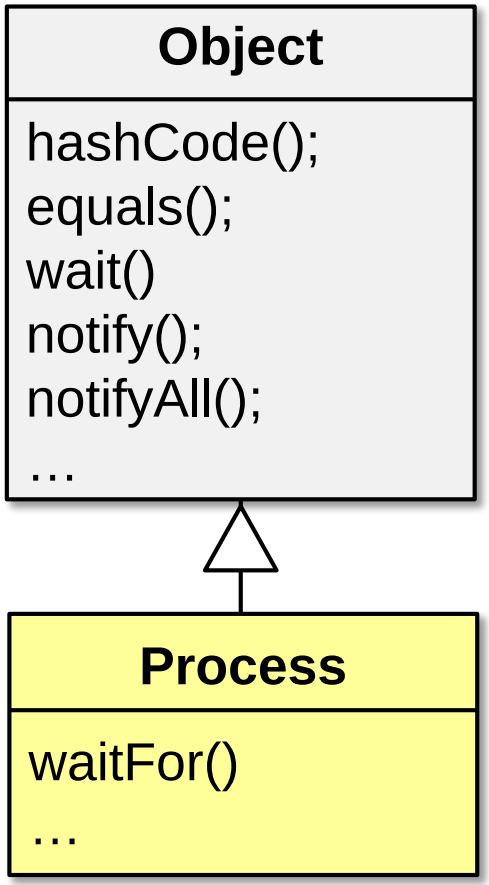
The Role of the Java Object Super Class

- Subclasses that don't explicitly extend a super class implicitly inherit from java.lang.Object, e.g.
  - java.lang.Process implicitly extends java.lang.Object
  - All instances of java.lang.Process therefore also provide clients access to inherited java.lang.Object methods
    - All objects, including arrays, implement the methods of this class



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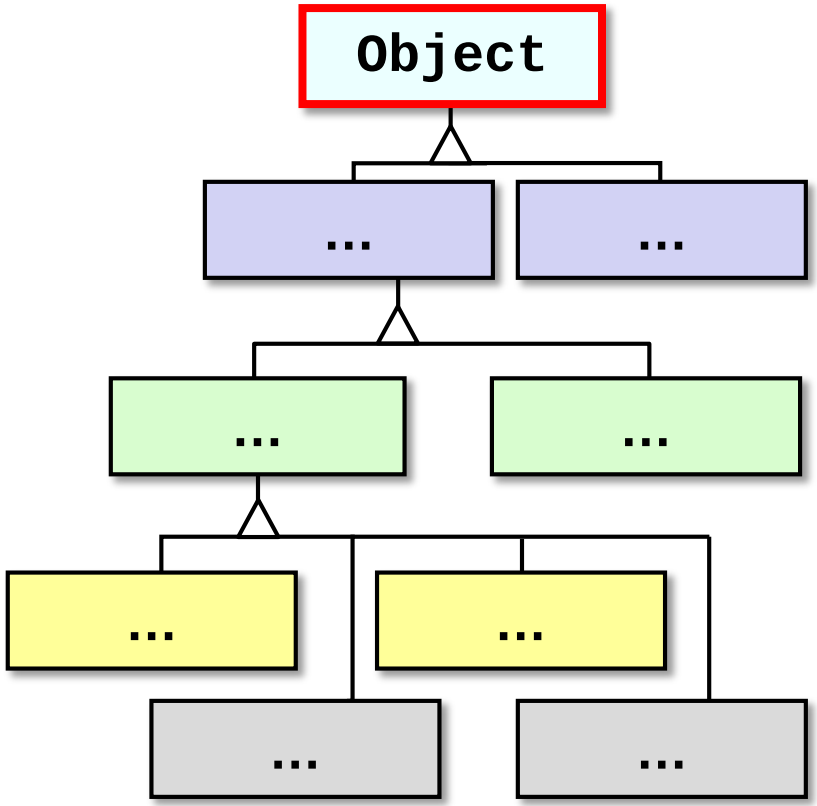

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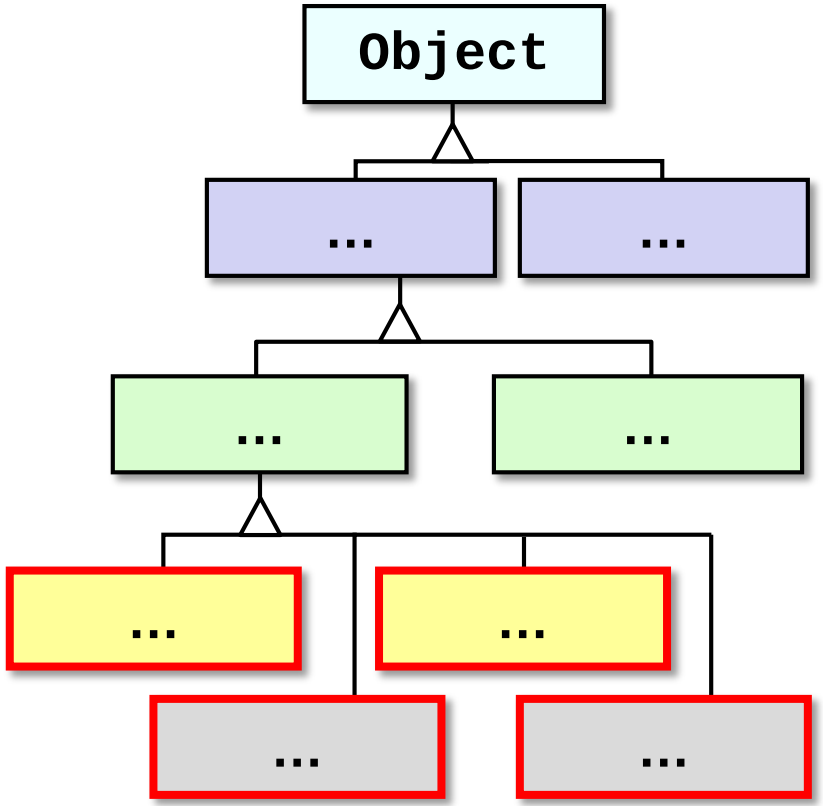

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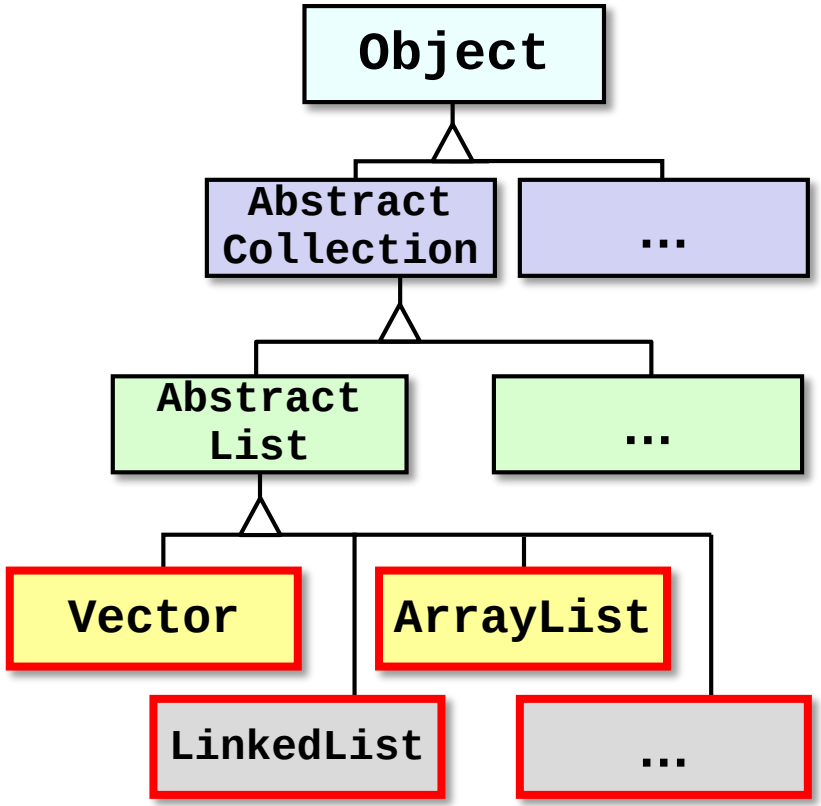
    - e.g., List-related subclasses override methods inherited from super classes



The Role of the Java Object Super Class

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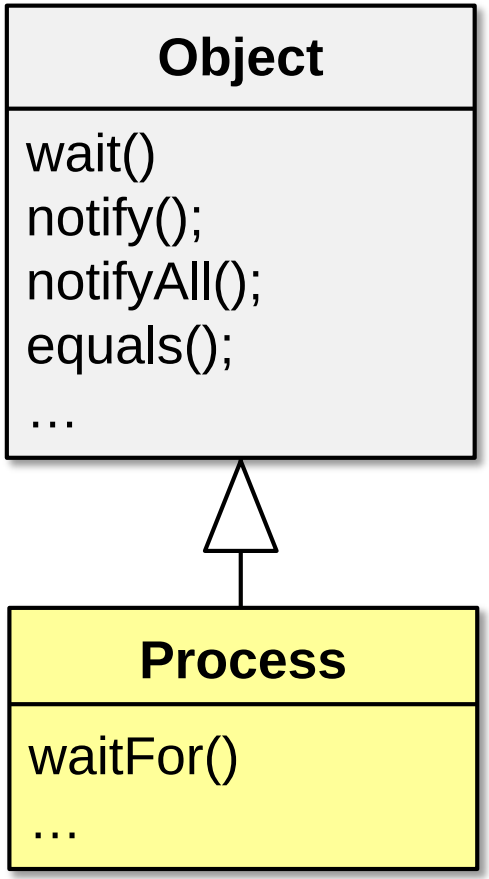

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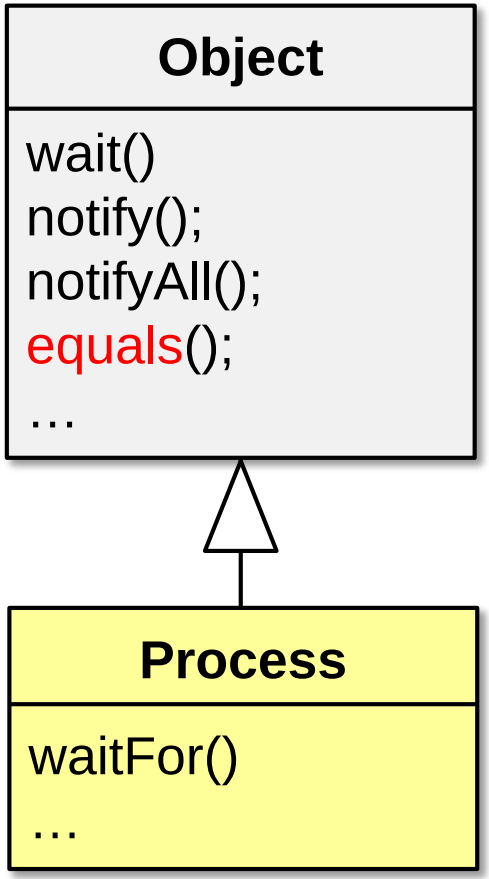
- java.lang.Object defines.equals()
  - If operator== is used to compare the equality of two objects it returns true if the two objects have the same memory address
  - Conversely, if you use .equals() to compare for equality, a subclass can override this method to do other things
    - e.g., check for equal values in a collection or string



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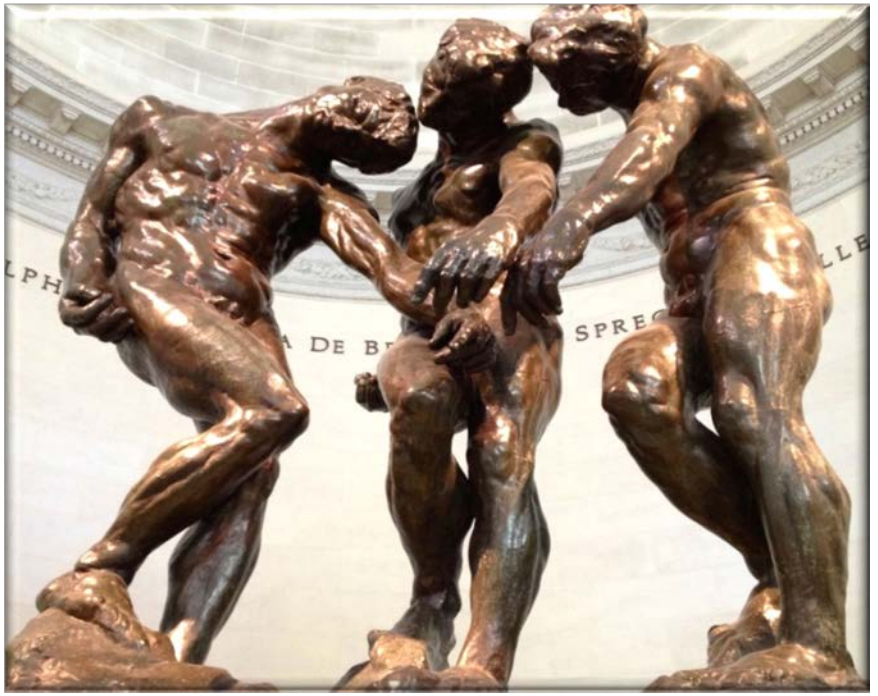
Extends Vector to define a last-in/first-out data structure that enables apps to pop & push items to/from a stack



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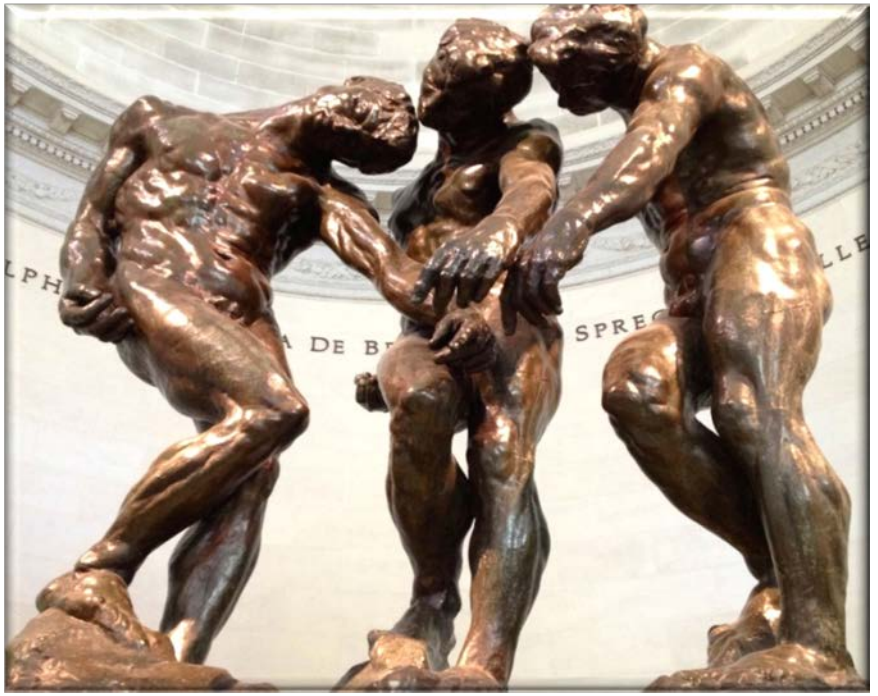

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public class Stack<E> {
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e.g.,

```
Stack<Integer> s =
  new Stack<>();
...

if(!s.isEmpty())
   s.pop();
```

isEmpty() method inherited from Vector can be invoked on a Stack instance

This Stack class uses so-called “implementation inheritance”

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A method can be invoked on an object instance

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  1. To augment the subclass API
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```
public class Stack<E> {
      extends Vector<E> {
  ...
  public Object push(E e){
    addElement(e);
    return e;
  }
  ...
```

Due to implementation inheritance methods like addElement() are visible to Stack clients..

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  1. To augment the subclass API
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     - A subclass may add new methods & data members

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The Stack's push() method is implemented via Vector's addElement() method

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public abstract class
       AbstractMap<K,V> ...
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HashMap's entrySet() method overrides AbstractMap's entrySet() abstract method

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See en.wikipedia.org/wiki/Type_signature#Java_2

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See docs.oracle.com/javase/tutorial/java/IandI/override.html

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See en.wikipedia.org/wiki/Method_overriding

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Method overriding is covered in the next lesson on *Java Polymorphism*

End of Overview of Java's Support for Inheritance