**Source Code for Data Structures and Problem Solving Using Java, Third Edition**

**LAST UPDATE: March 1, 2005**   
**BUG REPORTS ARE APPRECIATED!!**

Here is the source code for Data Structures and Algorithm Analysis in Java (Third Edition), by Mark Allen Weiss. The materials here are copyrighted. I have successfully compiled and tested the programs with JDK 1.5.0.

**Organization of Files**

1. Most of the general, standalone, code is in the root directory.
2. There is an implementation of a large subset of java.util in package weiss.util. Its purpose is to illustrate how the concepts are used in an actual library implementation. This can be found in the **weiss\util** folder. Some of the sample code imports classes in weiss.util, but you can freely replace all occurrences of weiss.util with java.util. Needless to say, everything in weiss.util has a name clash with java.util, so you should not use wild-card import directives. These files are displayed in **BOLDFACE** font.
3. The package **weiss.nonstandard**, in the **weiss\nonstandard** folder, contains nonstandard implementations of various data structures. The code is generally simpler that the code in the Java Collections API, and there are occasional name clashes (e.g. LinkedList and Stack). This package also contains priority queue implementations, since that is not part of the Java Collections API. These files are display in *ITALICS* font.

**CLASSPATH Info**

The code in the root directory should automatically compile if there is no CLASSPATH. Other code will be trickier to compile/run unless you use full names relative to the root directory. Otherwise, the easiest fix is to make sure that the root directory (i.e. the directory in which the weiss folder is found) is on your CLASSPATH, along with **.**. Let us assume you have extracted everything into the bookcode folder.

* For MS-DOS: **set CLASSPATH=C:\bookcode;.**
* For Unix: **setenv CLASSPATH bookcode:.**

Note that case-sensitivity may matter, and there is a difference between colons and semicolons.   
If you are using an IDE, you will need to update the CLASSPATH using the IDE's own mechanism.

**Jar files**

An alternative is to install these two jar files ([wutil.jar](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/wutil.jar) and [wnonstandard.jar](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/wnonstandard.jar)) in the Java extensions directory. A typical location would be C:\jdk1.5.0\jre\lib\ext. Once this is done, you can run any of the programs that require weiss.util or weiss.nonstandard from pretty much any location. (This is every program in the main distribution directory, except MyContainerTest.java).

**Complete Bundle**

[code.zip](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/code.zip)   
[code.tar](http://users.cs.fiu.edu/%7Eweiss/dsj3/code.tar)   
[code.tar.Z](http://users.cs.fiu.edu/%7Eweiss/dsj3/code.tar.Z)

**Package Documentation**

[docs](http://users.cs.fiu.edu/%7Eweiss/dsj3/docs/index.html)   
[docs.tar](http://users.cs.fiu.edu/%7Eweiss/dsj3/docs.tar)   
[docs.tar.Z](http://users.cs.fiu.edu/%7Eweiss/dsj3/docs.tar.Z)

**Chapter 1: Basic Java**

[FirstProgram.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/FirstProgram.java)   
[MinTest.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/MinTest.java)   
[OperatorTest.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/OperatorTest.java)

**Chapter 2: References**

[RandomNumbers.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/RandomNumbers.java)   
[ReadStrings.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/ReadStrings.java)   
[ReadStringsWithArrayList.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/ReadStringsWithArrayList.java)   
[MatrixDemo.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/MatrixDemo.java)   
[Echo.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Echo.java)   
[ForeachDemo.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/ForeachDemo.java)   
[DivideByTwo.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/DivideByTwo.java)   
[MaxTest.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/MaxTest.java)   
[ListFiles.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/ListFiles.java)   
[DoubleSpace.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/DoubleSpace.java)

**Chapter 3: Classes**

[IntCell.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/IntCell.java) [TestIntCell.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/TestIntCell.java)   
[Date.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Date.java)   
[Exiting.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/Exiting.java)   
[Ticket.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Ticket.java)   
[Squares.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Squares.java)   
[StringArrayList.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/StringArrayList.java) [ReadStringsWithStringArrayList.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/ReadStringsWithStringArrayList.java)

**Chapter 4: Inheritance**

[**ConcurrentModificationException.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/ConcurrentModificationException.java) [**EmptyStackException.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/EmptyStackException.java) [**NoSuchElementException.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/NoSuchElementException.java)   
[DecoratorDemo.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/DecoratorDemo.java)   
[PersonDemo.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/PersonDemo.java)   
[Shape.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Shape.java) [Circle.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Circle.java) [Rectangle.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Rectangle.java) [Square.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Square.java) [ShapeDemo.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/ShapeDemo.java)   
[MemoryCell.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/MemoryCell.java) [TestMemoryCell.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/TestMemoryCell.java)   
[SimpleArrayList.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/SimpleArrayList.java) [ReadStringsWithSimpleArrayList.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/ReadStringsWithSimpleArrayList.java)   
[WrapperDemo.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/WrapperDemo.java)   
[StorageCellDemo.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/StorageCellDemo.java)   
[FindMaxDemo.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/FindMaxDemo.java)   
[GenericMemoryCell.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/GenericMemoryCell.java) [TestGenericMemoryCell.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/TestGenericMemoryCell.java)   
[GenericSimpleArrayList.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/GenericSimpleArrayList.java) [ReadStringsWithGenericSimpleArrayList.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/ReadStringsWithGenericSimpleArrayList.java)   
[BoxingDemo.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/BoxingDemo.java)   
[GenericFindMaxDemo.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/GenericFindMaxDemo.java)   
[Comparator.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/Comparator.java) [SimpleRectangle.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/SimpleRectangle.java) [CompareTest.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/CompareTest.java) [CompareTestInner1.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/CompareTestInner1.java) [CompareTestInner2.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/CompareTestInner2.java) [CompareTestInner3.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/CompareTestInner3.java)   
[StaticParamsDemo.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/StaticParamsDemo.java)   
[BadEqualsDemo.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/BadEqualsDemo.java)

**Chapter 5: Running Times**

[MaxSumTest.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/MaxSumTest.java)   
[BinarySearch.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/BinarySearch.java)

**Chapter 6: The Collections API**

[*Stack.java*](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/Stack.java)   
[*UnderflowException.java*](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/UnderflowException.java)   
[*Queue.java*](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/Queue.java)   
[**Collection.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/Collection.java)   
[**Iterator.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/Iterator.java)**, extends java.util.Iterator**   
[**Collections.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/Collections.java)   
[**Arrays.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/Arrays.java)   
[**List.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/List.java)   
[**ListIterator.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/ListIterator.java)   
[**TestArrayList.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/TestArrayList.java)   
[**Set.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/Set.java)   
[**SortedSet.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/SortedSet.java)   
[**TreeSetDemo.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/TreeSetDemo.java)   
[IteratorTest.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/IteratorTest.java)   
[EqualsWithInheritance.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/EqualsWithInheritance.java)   
[**Map.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/Map.java) [MapDemo.java](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/MapDemo.java)   
[**Queue.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/Queue.java)[**PriorityQueueDemo.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/PriorityQueueDemo.java)

**Chapter 7: Recursion**

[**RecSum.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/RecSum.java)[**PrintInt.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/PrintInt.java)[**Factorial.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Factorial.java)[**BinarySearchRecursive.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/BinarySearchRecursive.java)[**Ruler.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Ruler.java)[**FractalStar.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/FractalStar.java)[**Numerical.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Numerical.java)[**RSA.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/RSA.java)[**MaxSumTest.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/MaxSumTest.java)[**MakeChange.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/MakeChange.java)[**Best.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Best.java)[**TicTacToeSlow.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/TicTacToeSlow.java)[**TicTacMainSlow.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/TicTacMainSlow.java)

**Chapter 8: Sorting**

[**DuplicateTest.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/DuplicateTest.java)[**Sort.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Sort.java)[**TestSort.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/TestSort.java)

**Chapter 9: Randomization**

[**Random.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/Random.java)[**Numerical.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Numerical.java)[**RSA.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/RSA.java)

**Chapter 10: Fun and Games**

[**WordSearch.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/WordSearch.java)[**puz.txt**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/puz.txt)[**Best.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Best.java)[**TicTacToe.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/TicTacToe.java)[**TicTacMain.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/TicTacMain.java)

**Chapter 11: Applications of Stacks -- Compilers and Parsing**

[**Tokenizer.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Tokenizer.java)[**Balance.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Balance.java)[**Evaluator.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Evaluator.java)

**Chapter 12: Utilities**

[**Hzip.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Hzip.java)[**HZIPInputStream.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/HZIPInputStream.java)[**HZIPOutputStream.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/HZIPOutputStream.java)[**Tokenizer.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Tokenizer.java)[**Xref.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Xref.java)

**Chapter 13: Simulation**

[**Josephus.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Josephus.java)[**ModemSim.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/ModemSim.java)

**Chapter 14: Shortest Path Algorithms**

[**Graph.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/Graph.java)[**graph1.txt**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/graph1.txt)[**graph2.txt**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/graph2.txt)[**graph3.txt**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/graph3.txt)

**Chapter 15: Inner Classes and ArrayList Implementation**

[**MyContainerTest.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/MyContainerTest.java)[**Iterator.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/ds/Iterator.java)[**MyContainer.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/ds/MyContainer.java)[**AbstractCollection.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/AbstractCollection.java)[**ArrayList.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/ArrayList.java)

**Chapter 16: Stacks**

[***UnderflowException.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/UnderflowException.java)[***ArrayStack.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/ArrayStack.java)[***ListNode.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/ListNode.java)[***ListStack.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/ListStack.java)[***ArrayQueue.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/ArrayQueue.java)[***ListQueue.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/ListQueue.java)[**EmptyStackException**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/EmptyStackException.java)[**Stack.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/Stack.java)

**Chapter 17: Linked Lists**

[***ListNode.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/ListNode.java)[***LinkedList.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/LinkedList.java)[***LinkedListIterator.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/LinkedListIterator.java)[***SortedLinkedList.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/SortedLinkedList.java)[**LinkedList.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/LinkedList.java)

**Chapter 18: Trees**

[**BinaryNode.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/BinaryNode.java)[**BinaryTree.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/BinaryTree.java)[**TestTreeIterators.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/TestTreeIterators.java)

**Chapter 19: Search Trees**

[***DuplicateItemException.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/DuplicateItemException.java)[***BinaryNode.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/BinaryNode.java)[***BinarySearchTree.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/BinarySearchTree.java)[***BinarySearchTreeWithRank.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/BinarySearchTreeWithRank.java)[***Rotations.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/Rotations.java)[***RedBlackTree.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/RedBlackTree.java)[***AATree.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/AATree.java)[**Set.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/Set.java)[**TreeSet.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/TreeSet.java)[**MapImpl.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/MapImpl.java)[**TreeMap.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/TreeMap.java)

**Chapter 20: Hash Tables**

[**HashSet.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/HashSet.java)[**MapImpl.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/MapImpl.java)[**HashMap.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/HashMap.java)

**Chapter 21: Heaps**

[**PriorityQueue.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/util/PriorityQueue.java)

**Chapter 22: Splay Trees**

[***SplayTree.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/SplayTree.java)

**Chapter 23: Pairing Heaps**

[***IllegalValueException.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/IllegalValueException.java)[***PairingHeap.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/PairingHeap.java)

**Chapter 24: Disjoint Sets**

[***DisjointSetsSlow.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/DisjointSetsSlow.java)[***DisjointSets.java***](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/weiss/nonstandard/DisjointSets.java)

**Appendix D: Swing**

[**BasicGUI.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/BasicGUI.java)[**BorderTest.java**](http://users.cs.fiu.edu/%7Eweiss/dsj3/code/BorderTest.java)