Eclipse and Java: Introducing Persistence Companion Tutorial Document

Version 1.3 (February 5, 2008)

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Introduction & Setup

This document is designed to accompany the “Eclipse And Java: Introducing Persistence” video tutorial, which is available at http://eclipsetutorial.sourceforge.net/. Before starting this tutorial, please download the following files from the website:

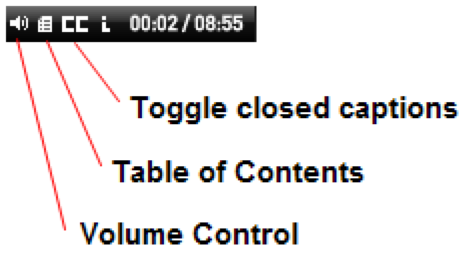
- Persistence-Tutorial-Companion-Document.PDF – this document.
- persistencetutorial.zip – zip file for importing the Eclipse PersistenceTutorial project. This is done as part of Lesson 1.
- persistence-lesson01.zip through persistence-lesson12.zip – zip files for the 12 lessons in the tutorial

Playing the Lessons

1. Unzip each lesson's zip file into a directory on your system.
2. Find the file called “lessonxx.html”, where xx is the lesson number 01-12.
3. Open this file with your browser (e.g., Internet Explorer or Firefox) and press the large play button on the video thumbnail. The lesson should play inside the browser. Note that you need to have the Adobe Flash player installed on your system. This can be downloaded from Adobe at http://www.adobe.com/products/flashplayer/.

Alternatively, you can just open the file “lessonxx.swf” with your browser. In Windows Internet Explorer you might get a security warning and need to click and select “Allow blocked content”. If you open the lessonxx.swf file directly (as opposed to lessonxx.html), you can resize the video to any desired size, making it larger or smaller. Note that playing the video from the lessonxx.html file will provide the clearest rendition of the video but does not allow resizing.

Closed Captions and Lesson Table of Contents



The audio track of each lesson can be accompanied by closed captions (subtitles), which display in the lower portion of the video. Press the “CC” button in the lower right corner to toggle them on and off. Each lesson also contains a table of contents that allows you to jump to a specified point inside the video. To access the table of contents, click on the Table of Contents icon in the lower right corner of the video. Next to the Table of Contents control is the Volume control. The controls are shown above.

Tutorial Target Audience

This tutorial is targeted for people who have complete the tutorial “Eclipse and Java for Total Beginners” or who have some familiarity with Eclipse and Java.

Tutorial Objectives

The objectives of this tutorial are to:

- Demonstrate how to save Java objects to disk files, using either XML or object serialization
- Demonstrate how to use the JUnit 4.0 unit testing framework in Eclipse and how to convert from JUnit 3.8 to 4.0 in Eclipse
- Demonstrate time-saving Eclipse features related to Java development
- Demonstrate using Eclipse to explore the Java class libraries

Tutorial Approach

The tutorial is organized around the following activities. We will start with the MyLibrary project which was created in the “Total Beginners” tutorial.

- Import the MyLibrary project
- Write methods to save and retrieve text files, to convert objects to XML strings, and to save and retrieve serialized objects
- Use the “test-first” approach to develop all methods.
- Write a “test drive” program and create an executable JAR file, and run the JAR file from the

system console.

Concepts are introduced as needed during the development of the sample application.

Getting The Most From This Tutorial

This tutorial can be used as an in-depth demonstration of persistence in Java. However, if you want to learn how to program in Java, the following approach is recommended:

- Have Eclipse installed and ready to go.
- Work side-by-side with the lessons, pausing and rewinding as needed.
- Use this guide as needed.
- Consult other resources as needed to understand the topics covered in greater depth.
- Keep a positive attitude!

Downloading and Installing Eclipse

Before Installing Eclipse, you need to have the Java JDK (Java development kit) installed on your computer. This are available at http://java.sun.com/javase/downloads/index.jsp. IMPORTANT NOTE: You need to install Java version 1.5 or later to run the tutorial. Earlier versions do not support generics (used in the MyLibrary project) or the JUnit 4.0 unit test framework. Also, although you can run Eclipse with the JRE, we need the JDK for this tutorial, since we'll be using the attached Java source code.

Installing the JDK is reasonably simple. Detailed, step-by-step instructions, if needed, are available in the PDF Eclipse Tutorial at the https://www.arctechsoftware.com/tutorial/welcomePage.do. (Follow the link to "Beginning Eclipse".)

This tutorial is based on Eclipse 3.3. Here are the steps to install Eclipse 3.3 from www.eclipse.org:

- Navigate to www.eclipse.org/downloads
- Select "Eclipse IDE for Java Developers". If your platform is Linux or MacOSX, be sure to select the link to the right. Note that you can use "Eclipse IDE for Java EE Developers", "Eclipse for RCP/Plug-in Developers", or "Eclipse Classic" as well. All of these include the Java development portions of Eclipse used in this tutorial.
- On the www.eclipse.org/downloads page, follow the link "Find out more". Scroll your browser to display the far right-hand side of the screen to the column "Tutorials and Help". The first tutorial is a Screencam tutorial that steps you through downloading and installing Eclipse on Windows.

The Eclipse installation is very straightforward. There is no installation program. Instead, you just create the top-level folder and the unzip the file inside this folder. In Windows XP, for example, just copy the zip file to your root directory (e.g., "C:\") and then unzip the downloaded zip file. Note: You need to use an unzip program. Do not use the Windows File Explorer unzip This will create a folder called "C:\eclipse". The Eclipse programs will be created in several subfolders (configuration, features, plugins, readme). The procedure for Linux is similar, except your unzip the .tar.gz file.

Another option is to install the EasyEclipse distribution of Eclipse (http://www.easyeclipse.org). This is a free third-party distribution that includes a Windows installation program that installs Java and Eclipse all in one step. You should install version 1.3 (based on Eclipse 3.3) or later of the Expert Java or Desktop Java distributions.

Lesson Outlines

Lesson 1

- Create Java project in Eclipse using Import from archive file
- Learn how to export a project
- Review of MyLibrary classes
- Introduce try / catch blocks
- Create a Scrapbook page
- Run try / catch blocks inside Scrapbook
- Check Javadoc location and Source attachment

Lesson 2

- Convert from JUnit 3 to JUnit 4
- Introduce Java Annotations
- Plan methods for converting objects to XML text files
- Discuss Static Methods
- Start test method for saveStringToFile() method

Lesson 3

- Complete test method for saveStringToFile() method
- Discuss unit tests as class documentation in agile software development
- Start actual saveStringToFile() method

Lesson 4

- Finish on saveStringToFile() method
- Discuss BufferedWriter and FileWriter classes
- Discuss exceptions and throws keyword

Lesson 5

- Finish getStringFromFile() method
- Look at TODO and Tasks View
- Run MyUtilitiesTest JUnit test
- Read a Stack Trace

Lesson 6

- Download and add XStream XML program library to our project
- Attach source code to Java language classes to our project
- Learn how to browse the Java source code
- Learn how to use the Eclipse Hierarchy view
- Discuss the benefits of XML format
- Write createMyLibrary() method in MyUtilitiesTest class

Lesson 7

- Write test method for convertToXML() and convertFromXML() methods
- Create convertToXML() and convertFromXML() methods
- Look at XStream web tutorial
- Test conversion methods

Lesson 8

- Write test method to test conversion to and from XML disk file
- Create saveMyLibraryToXMLFile() and getMyLibraryFromXMLFile() methods
- Test our methods

Lesson 9

- Use Eclipse XML editor to examine XML file
- Explore XML object reference options in XStream
- Use the Eclipse Compare With Local History feature to compare versions of XML files

Lesson 10

- Use History View and Compare With Local for Java Source
- Modify MyLibrary main method and run as Java application in Eclipse
- Learn about Java class and JAR files
- Create JAR manifest file with Class-Path
- Set Java compiler compliance level
- Create JAR file in Eclipse
- Execute JAR file in Windows and Linux

Lesson 11

- Overview of Java Object Serialization
- Discuss the pros and cons of object serialization and XML
- Create test method for saveMyLibraryToSerialFile() and getMyLibraryFromSerialFile() methods
- Write saveMyLibraryToSerialFile() method

Lesson 12

- Write getMyLibraryToSerialFile() method
- Add Serializable interface and serialVersionUID to classes
- Modify and run AllTests to test the entire application
- Look at Java Compiler Errors/Warning options

Additional Resources

Lesson-Specific Resources

This section lists resources that relate specifically to topics covered in different lessons.

Lesson 2

- http://today.java.net/pub/a/today/2006/12/07/junit-reloaded.html. JUnit Reloaded article that compares JUnit 4 to JUnit 3 with simple examples.
- Annotations are discussed in Sun Java Tutorials at http://java.sun.com/docs/books/tutorial/java/javaOO/annotations.html.
- For a more in-depth discussion of Java annotations, see “Thinking in Java”, by Bruce Eckel.

Lesson 6

- http://xstream.codehaus.org/. XStream XML library web site.

Lessons 7 - 9

- http://xstream.codehaus.org/tutorial.html. XStream XML library web site “2-Minute Tutorial”.

General Resources

There are many general resources available for learning more about Eclipse and Java. These are just a few that I’ve found helpful.

Eclipse Websites

- www.eclipse.org/resources. This lists a number of articles, books, presentations, demonstrations and other resources on a variety of topics related to Eclipse.
- eclipse.newcomer newsgroup. This is a friendly, active newsgroup where newcomers to Eclipse can ask questions. The search feature of this and other newsgroups can be especially valuable, since there is a good chance that your question has already been asked and answered.
- Beginning Eclipse Tutorial on ArcTech Software LLC website. Written tutorial to help you install Eclipse and Java. Login required to download. It has a very good section on downloading and installing the Java JDK. Link to tutorial is https://www.arctechsoftware.com/tutorial/tutorial.do?subcatId=1. Link to home page is https://www.arctechsoftware.com/tutorial/welcomePage.do.

Java Websites

- The Java Tutorials from Sun (http://java.sun.com/docs/books/tutorial/java/index.html). The gold standard for learning Java, and it’s free.

- JavaRanch Big Moose Saloon web site (http://saloon.javaranch.com/cgi-bin/ubb/ultimatebb.cgi?category=1). This has a variety of forums, including Java in General (beginner), Java in General (intermediate), and many other Java topics. Very active and friendly, with knowledgeable moderators.
- The Java Developers Almanac 1.4 (http://www.exampledepot.com/). Contains Java code samples for many topics.

Java Books

- Head First Java, by Kathy Sierra & Bert Bates. Excellent, fun, creative book for Java and OOP beginners.
- Thinking In Java, by Bruce Eckel. Excellent, thorough reference for Java. For all levels of programmer.
- Effective Java, by Joshua Bloch. Concise book documents specific recommendations for Java best practices. For intermediate to advanced programmers.

Alphabetical Index by Lesson

Code Snapshots

The following pages contain code snapshots as of the end of each lesson. Use these to check your code or to help you fix any problems you might have. If needed, you can copy and past this code into your Eclipse Java source files. Also, if you want to start the tutorial in the middle, these can help you catch up to the correct point.

Lesson 1 – Scrapbook

```
long x = 1;
try {
	x = 1 / 0;
}
catch (ArithmeticException e) {
	x = 0;
	e.printStackTrace();
}
finally {
System.out.println("This will print. x=" + x);
}
System.out.println("Life goes on...");
```

Lesson 2 – AllTests

```
package org.persistence.tutorial;

import org.junit.runner.*;
import org.junit.runners.*;

@RunWith(Suite.class)
@Suite.SuiteClasses(value={
		PersonTest.class,
		BookTest.class,
		MyLibraryTest.class
})

public class AllTests {

}
```

Lesson 2 – MyUtilitiesTest (in process)

```
package org.persistence.tutorial;
import org.junit.*;
import static org.junit.Assert.*;

public class MyUtilitiesTest {

	@Test
	public void saveStringToFile() {

	}
}
```

Lesson 3 – MyUtiltiesTest (test saveStringToFile)

```
package org.persistence.tutorial;

import java.io.File;

import org.junit.*;
import static org.junit.Assert.*;

public class MyUtilitiesTest {

	@Test
	public void saveStringToFile() {
		String saveString = "this is test line one\n" +
			"this is test line two\n";

		File testFile = new File("testsavetostring.txt");
		testFile.delete();
		assertFalse("File should not exist",
				testFile.exists());

		assertTrue("File should have been saved",
				MyUtilities.saveStringToFile("testsavestring.txt",
						saveString));

		String newString = MyUtilities.getStringFromFile(
				"testsavestring.txt");
		assertTrue("Save and get strings should be equal",
				saveString.equals(newString));

		assertFalse("File should not be saved",
				MyUtilities.saveStringToFile(
						"non-existent directory/thisshouldfail.txt",
						saveString));

		String emptyString = MyUtilities.getStringFromFile(
				"badfilename.txt");
		assertTrue("String should be empty",
				emptyString.length() == 0);
	}
}
```

Lesson 3 – MyUtilties (Auto-generated method stubs from Quick Fix)

```
package org.persistence.tutorial;

public class MyUtilities {

	public static boolean saveStringToFile(String string, String saveString) {
		// TODO Auto-generated method stub
		return false;
	}

	public static String getStringFromFile(String string) {
		// TODO Auto-generated method stub
		return null;
	}
}
```

Lesson 4 – MyUtilties (saveStringToFile complete)

```
package org.persistence.tutorial;

import java.io.*;

public class MyUtilities {

	public static boolean saveStringToFile(String fileName,
			String saveString) {
		boolean saved = false;
		BufferedWriter bw = null;

		try {
			bw = new BufferedWriter(
					new FileWriter(fileName));

			try {
				bw.write(saveString);
				saved = true;
			}
			finally {
				bw.close();
			}
		}
		catch (IOException ex) {
			ex.printStackTrace();
		}
		return saved;
	}

	public static String getStringFromFile(String string) {
		// TODO Auto-generated method stub
		return null;
	}

}
```

Lesson 4 – Optional Scrapbook Examples

Below are some examples of code to try in the scrapbook to demonstrate how nested try / catch blocks work. In the example below, there is an error in the outer try block. Nothing in the inner try / finally block will execute. Only the catch block will execute.

```
// example 1: error in outer try block
long x = 0;
try {
	x = 1 / 0;
   try {
	x = 1 / 1;
```

```
    }
    finally {
            x = 1 / 1;
            System.out.println("inner finally executes");
    }
}
catch (Exception e) {
        System.out.println("exception caught by outer block");
}
System.out.println("life goes on...");
```

Change the example as follows to put an error in the inner try block. Now, the inner finally block will execute, as well as the catch block.

```
/ example 2: error in inner try block
long x = 0;
try {
        x = 1 / 1;
    try {
            x = 1 / 0;
    }
    finally {
            x = 1 / 1;
            System.out.println("inner finally executes");
    }
}
catch (Exception e) {
        System.out.println("exception caught by outer block");
}
System.out.println("life goes on...");
```

On your own, try putting the error in the finally block to see what happens. Also, try the example with no errors to prove that the finally block executes.

Lesson 5 – MyUtilities (saveStringToFile() and getStringFromFile() complete)

```
package org.persistence.tutorial;

import java.io.*;

public class MyUtilities {

        public static boolean saveStringToFile(String fileName,
                        String saveString) {
                boolean saved = false;
                BufferedWriter bw = null;

                try {
                        bw = new BufferedWriter(
                                        new FileWriter(fileName));

                        try {
                                bw.write(saveString);
                                saved = true;
                        }
                        finally {
```

```
                        bw.close();
                    }
            }
            catch (IOException ex) {
                    ex.printStackTrace();
            }
            return saved;
    }



    public static String getStringFromFile(String fileName) {
            BufferedReader br = null;
            StringBuilder sb = new StringBuilder();

            try {
                    br = new BufferedReader(
                                    new FileReader(fileName));
                    try {
                            String s;
                            while ((s = br.readLine()) != null) {
                                    // add linefeed back since stripped by readline()
                                    sb.append(s);
                                    sb.append("\n");
                            }
                    }
                    finally {
                            br.close();
                    }
            }
            catch (IOException ex) {
                    ex.printStackTrace();
            }
            return sb.toString();
    }
}
```

Lesson 6 – MyUtilitiesTest (with createMyLibrary() method)

```
package org.persistence.tutorial;

import java.io.File;

import org.junit.*;
import static org.junit.Assert.*;

public class MyUtilitiesTest {

        @Test
        public void saveStringToFile() {
                String saveString = "this is test line one\n" +
                        "this is test line two\n";

                File testFile = new File("testsavetostring.txt");
                testFile.delete();
                assertFalse("File should not exist",
                                testFile.exists());

                assertTrue("File should have been saved",
                          MyUtilities.saveStringToFile("testsavestring.txt",
                                        saveString));

             String newString = MyUtilities.getStringFromFile(
                          "testsavestring.txt");
             assertTrue("Save and get strings should be equal",
                          saveString.equals(newString));

             assertFalse("File should not be saved",
                          MyUtilities.saveStringToFile(
                                        "non-existent directory/thisshouldfail.txt",
                                        saveString));

             String emptyString = MyUtilities.getStringFromFile(
                          "badfilename.txt");
             assertTrue("String should be empty",
                          emptyString.length() == 0);

      }

      public MyLibrary createMyLibrary() {
             Book b1;
             Book b2;
             Person p1;
             Person p2;
             MyLibrary ml;

             b1 = new Book("Book1");
             b2 = new Book("Book2");
             p1 = new Person();
             p1.setName("Fred");
             p2 = new Person();
             p2.setName("Sue");
             ml = new MyLibrary("Test");

             ml.addBook(b1);
             ml.addBook(b2);
             ml.addPerson(p1);
             ml.addPerson(p2);
             ml.checkOut(b1, p1);
             return ml;
      }

}
```

Lesson 7 – MyUtilitiesTest (with convertToXML() method)

```
package org.persistence.tutorial;

import java.io.File;

import org.junit.*;
import static org.junit.Assert.*;

public class MyUtilitiesTest {

      @Test
      public void saveStringToFile() {
             String saveString = "this is test line one\n" +
                     "this is test line two\n";

             File testFile = new File("testsavetostring.txt");
             testFile.delete();
             assertFalse("File should not exist",
                         testFile.exists());

             assertTrue("File should have been saved",
                         MyUtilities.saveStringToFile("testsavestring.txt",
                                     saveString));

             String newString = MyUtilities.getStringFromFile(
                         "testsavestring.txt");
             assertTrue("Save and get strings should be equal",
                         saveString.equals(newString));

             assertFalse("File should not be saved",
                         MyUtilities.saveStringToFile(
                                     "non-existent directory/thisshouldfail.txt",
                                     saveString));

             String emptyString = MyUtilities.getStringFromFile(
                         "badfilename.txt");
             assertTrue("String should be empty",
                         emptyString.length() == 0);

      }

      public MyLibrary createMyLibrary() {
             Book b1;
             Book b2;
             Person p1;
             Person p2;
             MyLibrary ml;

             b1 = new Book("Book1");
             b2 = new Book("Book2");
             p1 = new Person();
             p1.setName("Fred");
             p2 = new Person();
             p2.setName("Sue");
             ml = new MyLibrary("Test");

             ml.addBook(b1);
             ml.addBook(b2);
             ml.addPerson(p1);
             ml.addPerson(p2);
             ml.checkOut(b1, p1);
             return ml;
      }

      @Test public void convertToXML() {
             MyLibrary startMyLibrary = createMyLibrary();
             String testXMLOut = MyUtilities.convertToXML(startMyLibrary);
             MyLibrary endMyLibrary =
                 MyUtilities.convertFromXML(testXMLOut);
             assertEquals("Test", endMyLibrary.getName());
             assertEquals(2, endMyLibrary.getBooks().size());
             assertEquals(2, endMyLibrary.getPeople().size());
             assertEquals("Fred", endMyLibrary.getBooks().
                         get(0).getPerson().getName());
      }
```

```
}
```

Lesson 7 – MyUtilities (with completed convertToXML() and convertFromXML() methods)

```
package org.persistence.tutorial;

import java.io.*;

import com.thoughtworks.xstream.XStream;
import com.thoughtworks.xstream.io.xml.DomDriver;


public class MyUtilities {

	public static boolean saveStringToFile(String fileName,
			String saveString) {
		boolean saved = false;
		BufferedWriter bw = null;

		try {
			bw = new BufferedWriter(
					new FileWriter(fileName));

			try {
				bw.write(saveString);
				saved = true;
			}
			finally {
				bw.close();
			}
		}
		catch (IOException ex) {
			ex.printStackTrace();
		}
		return saved;
	}

	public static String getStringFromFile(String fileName) {
		BufferedReader br = null;
		StringBuilder sb = new StringBuilder();

		try {
			br = new BufferedReader(
					new FileReader(fileName));
			try {
				String s;
				while ((s = br.readLine()) != null) {
					// add linefeed back since stripped by readline()
					sb.append(s);
					sb.append("\n");
				}
			}
			finally {
				br.close();
			}
		}
		catch (IOException ex) {
			ex.printStackTrace();
		}
		return sb.toString();
	}

	public static String convertToXML(MyLibrary ml) {
		XStream xstream = new XStream(new DomDriver());
		return xstream.toXML(ml);
	}

	public static MyLibrary convertFromXML(String XMLString) {
		MyLibrary ml = null;
		XStream xstream = new XStream(new DomDriver());
		Object obj = xstream.fromXML(XMLString);
		if (obj instanceof MyLibrary) {
			ml = (MyLibrary) obj;
		}
		return ml;
	}
}
```

Lesson 8 – MyUtilities (with completed saveMyLibraryToXMLFile() and getMyLibraryFromXMLFile() methods)

```
package org.persistence.tutorial;

import java.io.*;

import com.thoughtworks.xstream.XStream;
import com.thoughtworks.xstream.io.xml.DomDriver;

public class MyUtilities {

	public static boolean saveStringToFile(String fileName,
			String saveString) {
		boolean saved = false;
		BufferedWriter bw = null;

		try {
			bw = new BufferedWriter(
					new FileWriter(fileName));

			try {
				bw.write(saveString);
				saved = true;
			}
			finally {
				bw.close();
			}
		}
		catch (IOException ex) {
			ex.printStackTrace();
		}
		return saved;
	}

	public static String getStringFromFile(String fileName) {
		BufferedReader br = null;
		StringBuilder sb = new StringBuilder();
		try {
			br = new BufferedReader(
					new FileReader(fileName));
			try {
				String s;
				while ((s = br.readLine()) != null) {
					// add linefeed back since stripped by readline()
					sb.append(s);
					sb.append("\n");
				}
			}
			finally {
				br.close();
			}
		}
		catch (IOException ex) {
			ex.printStackTrace();
		}
		return sb.toString();
	}

	public static String convertToXML(MyLibrary ml) {
		XStream xstream = new XStream(new DomDriver());
		return xstream.toXML(ml);
	}

	public static MyLibrary convertFromXML(String XMLString) {
		MyLibrary ml = null;
		XStream xstream = new XStream(new DomDriver());
		Object obj = xstream.fromXML(XMLString);
		if (obj instanceof MyLibrary) {
			ml = (MyLibrary) obj;
		}
		return ml;
	}

	public static boolean saveMyLibraryToXMLFile(String fileName,
			MyLibrary ml) {
		return saveStringToFile(fileName, convertToXML(ml));
	}

	public static MyLibrary getMyLibraryFromXMLFile(String fileName) {
		return convertFromXML(getStringFromFile(fileName));
	}

}
```

Lesson 8 – MyUtilitiesTest (with completed saveToXMLFile() method)

```
package org.persistence.tutorial;

import java.io.File;
import org.junit.*;
import static org.junit.Assert.*;

public class MyUtilitiesTest {

	@Test
	public void saveStringToFile() {
		String saveString = "this is test line one\n" +
			"this is test line two\n";

		File testFile = new File("testsavetostring.txt");
		testFile.delete();
		assertFalse("File should not exist",
				testFile.exists());

		assertTrue("File should have been saved",
				MyUtilities.saveStringToFile("testsavestring.txt",
						saveString));

		String newString = MyUtilities.getStringFromFile(
				"testsavestring.txt");
		assertTrue("Save and get strings should be equal",
				saveString.equals(newString));

		assertFalse("File should not be saved",
				MyUtilities.saveStringToFile(
						"non-existent directory/thisshouldfail.txt",
						saveString));

		String emptyString = MyUtilities.getStringFromFile(
				"badfilename.txt");
		assertTrue("String should be empty",
				emptyString.length() == 0);

	}

	public MyLibrary createMyLibrary() {
		Book b1;
		Book b2;
		Person p1;
		Person p2;
		MyLibrary ml;

		b1 = new Book("Book1");
		b2 = new Book("Book2");
		p1 = new Person();
		p1.setName("Fred");
		p2 = new Person();
		p2.setName("Sue");
		ml = new MyLibrary("Test");

		ml.addBook(b1);
		ml.addBook(b2);
		ml.addPerson(p1);
		ml.addPerson(p2);
		ml.checkOut(b1, p1);
		return ml;
	}

	@Test public void convertToXML() {
		MyLibrary startMyLibrary = createMyLibrary();
		String testXMLOut = MyUtilities.convertToXML(startMyLibrary);
		MyLibrary endMyLibrary =
			MyUtilities.convertFromXML(testXMLOut);
		assertEquals("Test", endMyLibrary.getName());
		assertEquals(2, endMyLibrary.getBooks().size());
		assertEquals(2, endMyLibrary.getPeople().size());
		assertEquals("Fred", endMyLibrary.getBooks().
                          get(0).getPerson().getName());

       }

       @Test public void saveToXMLFile() {
              MyLibrary startMyLibrary = createMyLibrary();
              String fileName = "testmylibrary.xml";
              File testFile = new File(fileName);
              testFile.delete();
              assertFalse("File should not exist",
                          testFile.exists());
              assertTrue("File should have been saved",
                          MyUtilities.saveMyLibraryToXMLFile(
                                       fileName, startMyLibrary));
              MyLibrary endMyLibrary =
                     MyUtilities.getMyLibraryFromXMLFile(fileName);
              assertEquals("Test", endMyLibrary.getName());
              assertEquals(2, endMyLibrary.getBooks().size());
              assertEquals(2, endMyLibrary.getPeople().size());
              assertEquals("Fred", endMyLibrary.getBooks().
                          get(0).getPerson().getName());
       }
}
```

Lesson 9 – MyUtilities (convertToXML() and convertFromXML() methods modified)

```
package org.persistence.tutorial;

import java.io.File;
import org.junit.*;
import static org.junit.Assert.*;

public class MyUtilitiesTest {

       @Test
       public void saveStringToFile() {
              String saveString = "this is test line one\n" +
                     "this is test line two\n";

              File testFile = new File("testsavetostring.txt");
              testFile.delete();
              assertFalse("File should not exist",
                          testFile.exists());

              assertTrue("File should have been saved",
                          MyUtilities.saveStringToFile("testsavestring.txt",
                                       saveString));

              String newString = MyUtilities.getStringFromFile(
                          "testsavestring.txt");
              assertTrue("Save and get strings should be equal",
                          saveString.equals(newString));

              assertFalse("File should not be saved",
                          MyUtilities.saveStringToFile(
                                       "non-existent directory/thisshouldfail.txt",
                                       saveString));
```

```
		String emptyString = MyUtilities.getStringFromFile(
				"badfilename.txt");
		assertTrue("String should be empty",
				emptyString.length() == 0);

	}

	public MyLibrary createMyLibrary() {
		Book b1;
		Book b2;
		Person p1;
		Person p2;
		MyLibrary ml;

		b1 = new Book("Book1");
		b2 = new Book("Book2");
		p1 = new Person();
		p1.setName("Fred");
		p2 = new Person();
		p2.setName("Sue");
		ml = new MyLibrary("Test");

		ml.addBook(b1);
		ml.addBook(b2);
		ml.addPerson(p1);
		ml.addPerson(p2);
		ml.checkOut(b1, p1);
		return ml;
	}

	@Test public void convertToXML() {
		MyLibrary startMyLibrary = createMyLibrary();
		String testXMLOut = MyUtilities.convertToXML(startMyLibrary);
		MyLibrary endMyLibrary =
			MyUtilities.convertFromXML(testXMLOut);
		assertEquals("Test", endMyLibrary.getName());
		assertEquals(2, endMyLibrary.getBooks().size());
		assertEquals(2, endMyLibrary.getPeople().size());
		assertEquals("Fred", endMyLibrary.getBooks().
				get(0).getPerson().getName());
	}

	@Test public void saveToXMLFile() {
		MyLibrary startMyLibrary = createMyLibrary();
		String fileName = "testmylibrary.xml";
		File testFile = new File(fileName);
		testFile.delete();
		assertFalse("File should not exist",
				testFile.exists());
		assertTrue("File should have been saved",
				MyUtilities.saveMyLibraryToXMLFile(
						fileName, startMyLibrary));
		MyLibrary endMyLibrary =
			MyUtilities.getMyLibraryFromXMLFile(fileName);
		assertEquals("Test", endMyLibrary.getName());
		assertEquals(2, endMyLibrary.getBooks().size());
		assertEquals(2, endMyLibrary.getPeople().size());
		assertEquals("Fred", endMyLibrary.getBooks().
				get(0).getPerson().getName());
	}
}
```

Lesson 10 – manifest.txt file

```
Manifest-Version: 1.0
Main-Class: org.persistence.tutorial.MyLibrary
Class-Path: xstream-1.2.2.jar
```

Lesson 10 – MyLibrary (with updated main() method)

```java
package org.persistence.tutorial;

import java.util.ArrayList;


public class MyLibrary {

	String name;
	ArrayList<Book> books;
	ArrayList<Person> people;

	public MyLibrary(String name) {
		this.name = name;
		books = new ArrayList<Book>();
		people = new ArrayList<Person>();

	}

	public String getName() {
		return name;
	}

	public ArrayList<Book> getBooks() {
		return books;
	}

	public ArrayList<Person> getPeople() {
		return people;
	}

	public void addBook(Book b1) {
		this.books.add(b1);

	}

	public void removeBook(Book b1) {
		this.books.remove(b1);

	}

	public void addPerson(Person p1) {
		this.people.add(p1);
	}

	public void removePerson(Person p1) {
		this.people.remove(p1);
	}
	public boolean checkOut(Book b1, Person p1) {
		int booksOut = this.getBooksForPerson(p1).size();
		if ((b1.getPerson() == null) &&
				(booksOut < p1.getMaximumBooks()))
		{
			b1.setPerson(p1);
			return true;
		}
		else {
			return false;
		}
	}

	public boolean checkIn(Book b1) {
		if (b1.getPerson() != null) {
			b1.setPerson(null);
			return true;
		}
		else {
			return false;
		}
	}

	public ArrayList<Book> getBooksForPerson(Person p1) {
		ArrayList<Book> result = new ArrayList<Book>();
		for (Book aBook : this.getBooks()) {
			if ((aBook.getPerson() != null) &&
					(aBook.getPerson().getName() == p1.getName()))
			{
				result.add(aBook);
			}
//			if (aBook.getPerson().getName() ==
//				p1.getName()) {
//				result.add(aBook);
//			}

		}
		return result;
	}

	public ArrayList<Book> getAvailableBooks() {
		ArrayList<Book> result = new ArrayList<Book>();
		for (Book book : this.getBooks()) {
			if (book.getPerson() == null) {
				result.add(book);
			}
		}
		return result;
	}

	public ArrayList<Book> getUnavailableBooks() {
		ArrayList<Book> result = new ArrayList<Book>();
		for (Book book : this.getBooks()) {
			if (book.getPerson() != null) {
				result.add(book);
			}
		}

		return result;
	}
	public static void main(String[] args) {
		// create a new mylibrary
		MyLibrary testLibrary = new MyLibrary("Test Drive Library");
		Book b1 = new Book("War and Peace");
		b1.setAuthor("Tolstoy");
		Book b2 = new Book("Great Expectations");
		b2.setAuthor("Charles Dickens");

		Person jim = new Person();
		jim.setName("Jim");
		Person sue = new Person();
		sue.setName("Sue");

		testLibrary.addBook(b1);
		testLibrary.addBook(b2);
		testLibrary.addPerson(jim);
		testLibrary.addPerson(sue);

		System.out.println("Just Created New Library");
		testLibrary.printStatus();

		testLibrary.checkOut(b1, sue);
		System.out.println("Checked out War and Peace to Sue");
		testLibrary.printStatus();

		testLibrary.checkIn(b1);
		testLibrary.checkOut(b2, jim);

		testLibrary.printStatus();

		MyUtilities.
			saveMyLibraryToXMLFile("testmain.xml", testLibrary);
		MyLibrary newMyLibrary = MyUtilities.
			getMyLibraryFromXMLFile("testmain.xml");
		System.out.println("Printing information from saved xml file");
		newMyLibrary.printStatus();

	}

	private void printStatus() {
		System.out.println("Status Report of MyLibrary: \n" +
				this.toString());

		for (Book thisBook : this.getBooks()) {
			System.out.println(thisBook);
		}

		for (Person thisPerson : this.getPeople()) {
			int count = this.getBooksForPerson(thisPerson).size();
			System.out.println(thisPerson + " (has " + count +
					" of my books)");
		}

		System.out.println("Books Available: "
				+ this.getAvailableBooks().size());
		System.out.println("--- End of Status Report---\n");


	}

	@Override
	public String toString() {
```

```
            return this.getName() +
            ": " + this.getBooks().size() + " books; "
            + this.getPeople().size() + " people.";
    }
}
```

Lesson 11 – Final MyUtilitiesTest (with saveToSerialFile() method)

```
package org.persistence.tutorial;

import java.io.File;
import org.junit.*;
import static org.junit.Assert.*;

public class MyUtilitiesTest {

    @Test
    public void saveStringToFile() {
        String saveString = "this is test line one\n" +
            "this is test line two\n";

        File testFile = new File("testsavetostring.txt");
        testFile.delete();
        assertFalse("File should not exist",
                testFile.exists());

        assertTrue("File should have been saved",
                MyUtilities.saveStringToFile("testsavestring.txt",
                        saveString));

        String newString = MyUtilities.getStringFromFile(
                "testsavestring.txt");
        assertTrue("Save and get strings should be equal",
                saveString.equals(newString));

        assertFalse("File should not be saved",
                MyUtilities.saveStringToFile(
                        "non-existent directory/thisshouldfail.txt",
                        saveString));

        String emptyString = MyUtilities.getStringFromFile(
                "badfilename.txt");
        assertTrue("String should be empty",
                emptyString.length() == 0);

    }

    public MyLibrary createMyLibrary() {
        Book b1;
        Book b2;
        Person p1;
        Person p2;
        MyLibrary ml;

        b1 = new Book("Book1");
        b2 = new Book("Book2");
        p1 = new Person();
        p1.setName("Fred");
        p2 = new Person();
        p2.setName("Sue");
        ml = new MyLibrary("Test");

        ml.addBook(b1);
        ml.addBook(b2);
        ml.addPerson(p1);
        ml.addPerson(p2);
        ml.checkOut(b1, p1);
        return ml;
    }

    @Test public void convertToXML() {
        MyLibrary startMyLibrary = createMyLibrary();
        String testXMLOut = MyUtilities.convertToXML(startMyLibrary);
        MyLibrary endMyLibrary =
            MyUtilities.convertFromXML(testXMLOut);
        assertEquals("Test", endMyLibrary.getName());
        assertEquals(2, endMyLibrary.getBooks().size());
        assertEquals(2, endMyLibrary.getPeople().size());
        assertEquals("Fred", endMyLibrary.getBooks().
                get(0).getPerson().getName());

    }

    @Test public void saveToXMLFile() {
        MyLibrary startMyLibrary = createMyLibrary();
        String fileName = "testmylibrary.xml";
        File testFile = new File(fileName);
        testFile.delete();
        assertFalse("File should not exist",
                testFile.exists());
        assertTrue("File should have been saved",
                MyUtilities.saveMyLibraryToXMLFile(
                        fileName, startMyLibrary));
        MyLibrary endMyLibrary =
            MyUtilities.getMyLibraryFromXMLFile(fileName);
        assertEquals("Test", endMyLibrary.getName());
        assertEquals(2, endMyLibrary.getBooks().size());
        assertEquals(2, endMyLibrary.getPeople().size());
        assertEquals("Fred", endMyLibrary.getBooks().
                get(0).getPerson().getName());

    }

    @Test public void saveToSerialFile() {
        MyLibrary startMyLibrary = createMyLibrary();
        String fileName = "testmylibrary.ser";
        File testFile = new File(fileName);
        testFile.delete();
        assertFalse("File should not exist",
                testFile.exists());
        assertTrue("File should have been saved",
                MyUtilities.saveMyLibraryToSerialFile(
                        fileName, startMyLibrary));
        MyLibrary endMyLibrary =
            MyUtilities.getMyLibraryFromSerialFile(fileName);
        assertEquals("Test", endMyLibrary.getName());
        assertEquals(2, endMyLibrary.getBooks().size());
        assertEquals(2, endMyLibrary.getPeople().size());
        assertEquals("Fred", endMyLibrary.getBooks().
                get(0).getPerson().getName());
    }
```

```
}
```

Lesson 11 – MyUtilities (with saveMyLibraryToSerialFile() method)

```
package org.persistence.tutorial;

import java.io.*;

import com.thoughtworks.xstream.XStream;
import com.thoughtworks.xstream.io.xml.DomDriver;

public class MyUtilities {

	public static boolean saveStringToFile(String fileName,
			String saveString) {
		boolean saved = false;
		BufferedWriter bw = null;

		try {
			bw = new BufferedWriter(
					new FileWriter(fileName));

			try {
				bw.write(saveString);
				saved = true;
			}
			finally {
				bw.close();
			}
		}
		catch (IOException ex) {
			ex.printStackTrace();
		}
		return saved;
	}

	public static String getStringFromFile(String fileName) {
		BufferedReader br = null;
		StringBuilder sb = new StringBuilder();

		try {
			br = new BufferedReader(
					new FileReader(fileName));
			try {
				String s;
				while ((s = br.readLine()) != null) {
					// add linefeed back since stripped by readline()
					sb.append(s);
					sb.append("\n");
				}
			}
			finally {
				br.close();
			}
		}
		catch (IOException ex) {
			ex.printStackTrace();
		}
		return sb.toString();
	}
	public static String convertToXML(MyLibrary ml) {
		XStream xstream = new XStream(new DomDriver());
		xstream.setMode(XStream.ID_REFERENCES);
		xstream.alias("person", Person.class);
		xstream.alias("book", Book.class);
		xstream.alias("mylibrary", MyLibrary.class);
		return xstream.toXML(ml);
	}

	public static MyLibrary convertFromXML(String XMLString) {
		MyLibrary ml = null;
		XStream xstream = new XStream(new DomDriver());
		xstream.setMode(XStream.ID_REFERENCES);
		xstream.alias("person", Person.class);
		xstream.alias("book", Book.class);
		xstream.alias("mylibrary", MyLibrary.class);
		Object obj = xstream.fromXML(XMLString);
		if (obj instanceof MyLibrary) {
			ml = (MyLibrary) obj;
		}
		return ml;
	}

	public static boolean saveMyLibraryToXMLFile(String fileName,
			MyLibrary ml) {
		return saveStringToFile(fileName, convertToXML(ml));
	}

	public static MyLibrary getMyLibraryFromXMLFile(String fileName) {
		return convertFromXML(getStringFromFile(fileName));
	}

	public static boolean saveMyLibraryToSerialFile(String fileName,
			MyLibrary ml) {
		boolean saved = false;
		try {
			ObjectOutputStream oos =
				new ObjectOutputStream(
						new BufferedOutputStream(
								new FileOutputStream(fileName)));
			// inner try block
			try {
				oos.writeObject(ml);
				saved = true;
			}
			finally {
				oos.close();
			}

		}
		catch (Exception ex) {
			ex.printStackTrace();
		}
		return saved;
	}

	public static MyLibrary getMyLibraryFromSerialFile(String fileName) {
		// TODO Auto-generated method stub
		return null;
	}
}
```

Lesson 12 – Final Book Class

```java
package org.persistence.tutorial;

import java.io.Serializable;

public class Book implements Serializable{

	/**
	 * 
	 */
	private static final long serialVersionUID = -4946021242876591956L;
	public String title;
	public String author;
	private Person person;

	public Book(String string) {
		this.title = string;
		this.author = "unknown author";
	}

	public String getAuthor() {
		return author;
	}

	public void setAuthor(String author) {
		this.author = author;
	}

	public String getTitle() {
		return title;
	}

	public void setPerson(Person p2) {
		this.person = p2;
	}

	public Person getPerson() {
		return this.person;
	}

	@Override
	public String toString() {
		String available;
		if (this.getPerson() == null) {
			available = "Available";
		}
		else {
			available = "Checked out to " +
			this.getPerson().getName();
		}
		return this.getTitle() +
		" by " + this.getAuthor() +
		"; " + available;
	}
}
```

Lesson 12 – Final MyLibrary Class

```
package org.persistence.tutorial;

import java.io.Serializable;
import java.util.ArrayList;


public class MyLibrary implements Serializable {

	/**
	 * 
	 */
	private static final long serialVersionUID = 1695201413859231186L;
	String name;
	ArrayList<Book> books;
	ArrayList<Person> people;

	public MyLibrary(String name) {
		this.name = name;
		books = new ArrayList<Book>();
		people = new ArrayList<Person>();

	}

	public String getName() {
		return name;
	}

	public ArrayList<Book> getBooks() {
		return books;
	}

	public ArrayList<Person> getPeople() {
		return people;
	}

	public void addBook(Book b1) {
		this.books.add(b1);

	}

	public void removeBook(Book b1) {
		this.books.remove(b1);

	}

	public void addPerson(Person p1) {
		this.people.add(p1);
	}

	public void removePerson(Person p1) {
		this.people.remove(p1);
	}

	public boolean checkOut(Book b1, Person p1) {
		int booksOut = this.getBooksForPerson(p1).size();
		if ((b1.getPerson() == null) &&
				(booksOut < p1.getMaximumBooks()))
		{
			b1.setPerson(p1);
```

```
                        return true;
                }
                else {
                        return false;
                }
        }

        public boolean checkIn(Book b1) {
                if (b1.getPerson() != null) {
                        b1.setPerson(null);
                        return true;
                }
                else {
                        return false;
                }
        }

        public ArrayList<Book> getBooksForPerson(Person p1) {
                ArrayList<Book> result = new ArrayList<Book>();
                for (Book aBook : this.getBooks()) {
                        if ((aBook.getPerson() != null) &&
                                        (aBook.getPerson().getName() == p1.getName()))
                        {
                                result.add(aBook);
                        }
//                      if (aBook.getPerson().getName() ==
//                              p1.getName()) {
//                              result.add(aBook);
//                      }

                }
                return result;
        }

        public ArrayList<Book> getAvailableBooks() {
                ArrayList<Book> result = new ArrayList<Book>();
                for (Book book : this.getBooks()) {
                        if (book.getPerson() == null) {
                                result.add(book);
                        }
                }
                return result;
        }

        public ArrayList<Book> getUnavailableBooks() {
                ArrayList<Book> result = new ArrayList<Book>();
                for (Book book : this.getBooks()) {
                        if (book.getPerson() != null) {
                                result.add(book);
                        }
                }

                return result;
        }

        public static void main(String[] args) {
                // create a new mylibrary
                MyLibrary testLibrary = new MyLibrary("Test Drive Library");
                Book b1 = new Book("War and Peace");
                b1.setAuthor("Tolstoy");
                Book b2 = new Book("Great Expectations");
                b2.setAuthor("Charles Dickens");
                Person jim = new Person();
                jim.setName("Jim");
                Person sue = new Person();
                sue.setName("Sue");

                testLibrary.addBook(b1);
                testLibrary.addBook(b2);
                testLibrary.addPerson(jim);
                testLibrary.addPerson(sue);

                System.out.println("Just Created New Library");
                testLibrary.printStatus();

                testLibrary.checkOut(b1, sue);
                System.out.println("Checked out War and Peace to Sue");
                testLibrary.printStatus();

                testLibrary.checkIn(b1);
                testLibrary.checkOut(b2, jim);

                testLibrary.printStatus();

                MyUtilities.
                        saveMyLibraryToXMLFile("testmain.xml", testLibrary);
                MyLibrary newMyLibrary = MyUtilities.
                        getMyLibraryFromXMLFile("testmain.xml");
                System.out.println("Printing information from saved xml file");
                newMyLibrary.printStatus();

        }

        private void printStatus() {
                System.out.println("Status Report of MyLibrary: \n" +
                                this.toString());

                for (Book thisBook : this.getBooks()) {
                        System.out.println(thisBook);
                }

                for (Person thisPerson : this.getPeople()) {
                        int count = this.getBooksForPerson(thisPerson).size();
                        System.out.println(thisPerson + " (has " + count +
                                    " of my books)");
                }

                System.out.println("Books Available: "
                                + this.getAvailableBooks().size());
                System.out.println("--- End of Status Report---\n");


        }

        @Override
        public String toString() {
                return this.getName() +
                ": " + this.getBooks().size() + " books; "
                + this.getPeople().size() + " people.";
        }
}
```

Lesson 12 – Final MyUtilities Class

```
package org.persistence.tutorial;

import java.io.*;

import com.thoughtworks.xstream.XStream;
import com.thoughtworks.xstream.io.xml.DomDriver;

public class MyUtilities {

	public static boolean saveStringToFile(String fileName,
			String saveString) {
		boolean saved = false;
		BufferedWriter bw = null;

		try {
			bw = new BufferedWriter(
					new FileWriter(fileName));

			try {
				bw.write(saveString);
				saved = true;
			}
			finally {
				bw.close();
			}
		}
		catch (IOException ex) {
			ex.printStackTrace();
		}
		return saved;
	}

	public static String getStringFromFile(String fileName) {
		BufferedReader br = null;
		StringBuilder sb = new StringBuilder();

		try {
			br = new BufferedReader(
					new FileReader(fileName));
			try {
				String s;
				while ((s = br.readLine()) != null) {
					// add linefeed back since stripped by readline()
					sb.append(s);
					sb.append("\n");
				}
			}
			finally {
				br.close();
			}
		}
		catch (IOException ex) {
			ex.printStackTrace();
		}
		return sb.toString();
	}

	public static String convertToXML(MyLibrary ml) {
		XStream xstream = new XStream(new DomDriver());
		xstream.setMode(XStream.ID_REFERENCES);
		xstream.alias("person", Person.class);
		xstream.alias("book", Book.class);
		xstream.alias("mylibrary", MyLibrary.class);
		return xstream.toXML(ml);
	}

	public static MyLibrary convertFromXML(String XMLString) {
		MyLibrary ml = null;
		XStream xstream = new XStream(new DomDriver());
		xstream.setMode(XStream.ID_REFERENCES);
		xstream.alias("person", Person.class);
		xstream.alias("book", Book.class);
		xstream.alias("mylibrary", MyLibrary.class);
		Object obj = xstream.fromXML(XMLString);
		if (obj instanceof MyLibrary) {
			ml = (MyLibrary) obj;
		}
		return ml;
	}

	public static boolean saveMyLibraryToXMLFile(String fileName,
			MyLibrary ml) {
		return saveStringToFile(fileName, convertToXML(ml));
	}

	public static MyLibrary getMyLibraryFromXMLFile(String fileName) {
		return convertFromXML(getStringFromFile(fileName));
	}

	public static boolean saveMyLibraryToSerialFile(String fileName,
			MyLibrary ml) {
		boolean saved = false;
		try {
			ObjectOutputStream oos =
				new ObjectOutputStream(
						new BufferedOutputStream(
								new FileOutputStream(fileName)));
			// inner try block
			try {
				oos.writeObject(ml);
				saved = true;
			}
			finally {
				oos.close();
			}

		}
		catch (Exception ex) {
			ex.printStackTrace();
		}
		return saved;
	}

	public static MyLibrary getMyLibraryFromSerialFile(String fileName) {
		MyLibrary ml = null;
		try {
			ObjectInputStream ois =
				new ObjectInputStream(
						new BufferedInputStream(
								new FileInputStream(fileName)));
			try {
```

```
                    Object obj = ois.readObject();
                    if (obj instanceof MyLibrary) {
                        ml = (MyLibrary) obj;
                    }
                }
                finally {
                    ois.close();
                }
            }
            catch (Exception ex) {
                ex.printStackTrace();
            }
            return ml;
        }
}
```

Lesson 12 – Final Person Class

```
package org.persistence.tutorial;

import java.io.Serializable;

/**
 * @author Mark Dexter
 * @version 1.0
 * The Person class represents people who
 * check out books from a MyLibrary.
 *
 */
public class Person implements Serializable{
    /**
     *
     */
    private static final long serialVersionUID = -5498322204635329714L;
    // fields
    private String name; // person's name
    private int maximumBooks; // # books can check out

    // constructors
    public Person() {
        name = "unknown name";
        maximumBooks = 3;
    }

    public Person(String name, int maximumBooks) {
        super();
        this.name = name;
        this.maximumBooks = maximumBooks;
    }

    public int getMaximumBooks() {
        return maximumBooks;
    }

    // methods
    public String getName() {
        return name;
    }
	public void setMaximumBooks(int maximumBooks) {
		this.maximumBooks = maximumBooks;
	}

	public void setName(String newName) {
		this.name = newName;
	}

	public String toString() {
		return this.getName() + " (" + this.getMaximumBooks()
		+ " books)";
	}
}
```

Lesson 12 – Final AllTests Class

```
package org.persistence.tutorial;

import org.junit.runner.*;
import org.junit.runners.*;

@RunWith(Suite.class)
@Suite.SuiteClasses(value={
		PersonTest.class,
		BookTest.class,
		MyLibraryTest.class,
		MyUtilitiesTest.class
})

public class AllTests {

}
```