CS210: Intermediate Computing/Data Structures (Java)

Lab #3

Purpose

This lab gives you experience developing a class that extends a library class and a class with a main method that uses an ArraySet (a child of ArrayList) together with the classes for the Bingo game that we have been developing.

Pre-Lab Assignment

You must complete your code for the BingoCard class in Lab 2. If you have not been able to do that, see the TA.

Before the lab session, do the following to get started:

There is no project folder to download. Create a new folder for Lab3.

Copy your java source files from your Lab2 directory to this directory except for the BingoGame.java file. You will be writing a new one in this lab.

Open the Dr Java Application on your PC.

Create a new Dr Java project in the Lab3 directory by selecting the menu ***Project -> New…*** naming the project file ***Bingo*** and saving it in your new Lab3 directory. (Dr Java automatically opens an ***Untitled*** file in the editor window.)

Using the menu ***File-> Open***, open the files ***BingoBall.java, BingoCard.java, BingoNumber.java*** and ***BingoSquare.java***. Dr Java will automatically include these source files in the Bingo Project. Use the menu ***Project -> Save*** to save the updated project file.

Using the menu ***Project -> Compile Project***, compile the files. Dr Java invokes the Sun JDK javac compiler for you on each file in the project.

Does the project as initially set up compile? If so, can you run it? Record your observations for your lab report.

Note: The pre-lab assignment is due at the BEGINNING of the lab. You can only work on the lab once you complete the Lab 2 BingoCard class.

Lab Activities

Using the menu File->New, create and save a new java source file. Write the code for an ArraySet<T> class that is a subclass of the java.util.ArrayList<T> class. You need to add an attribute for a Random object, write a constructor, overload the add method, and write a new removeRandom method. The All other methods are inherited from the ArrayList class.

The constructor must call its super class constructor and instantiate a Random object to use in the new removeRandom method.

It would be bad if duplicates of any of the BingoBalls in the collection were present more than once. It would adversely affect the odds of winning and/or losing. The overloaded add method must check that the new type T element being added is not already present in the collection. If it is not, add it and return true. Otherwise, return false without adding what would be a duplicate. (You can use the super class contains method to help write this method.) Write a simple junit test case class that confirms the correct behavior of this method and test it before proceeding.

The removeRandom method, should calculate a random number from 0 through size-1 and remove/return that index value from the super class. (Use the super class's remove method to help do this.

Using the menu File->New, create and save a new java source file. Write the code for a BingoGame class. You need to write a main method for this class that does the following:

1. Instantiates an ArraySet object to hold the BingoBalls for a game of Bingo.
2. Fills the ArraySet with Bingo balls numbered 1 through 75

3. Creates a BingoCard object to play the game

4. Uses a loop to draw a BingoBall at random from the ArraySet object, calls the BingoCard cover method, and, if cover returns true, calls the BingoCard hasBingo method. It terminates the loop when the hasBingo method returns true.

5. Prints out the word “Bingo!” and displays the contents of the BingoCard object.

When your project compiles successfully, select the BingoGame.java file. Using the menu ***Tools -> Run Document's Main Method***, run the application.

You should get a printout that looks like this (with the numbers in each row/column that you chose to use):

```
> java BingoGame
Bingo!
****  ****  ****  ****  ****
B 06  ****  ****  ****  O 66
B 09  I 24  ****  G 54  O 69
****  ****  N 42  G 57  O 72
B 15  ****  ****  G 60  O 75
>
```

When you are through with the lab, close the Project using the menu ***Project -> Close***. Be sure to remove your media and take it with you.

Before you leave, have your TA check your code in progress for the ArraySet and BingoCard classes. If you have not completed them, finish them before the next lab session.

Lab Report

Write a document that answers the following questions. Your lab must be printed (not handwritten).

Update your UML diagram and provide it with your report.

Answer the following questions related to what you did in this week's lab.

> Explain why your project would compile successfully before you wrote the new BingoGame.java file. Even if it did compile, could you run it? Explain.
>
> Did you notice the incremental development model that we have followed in these three labs? We developed three versions of the program - each successively closer to the final goal. What has been good about this method? What has been bad about it?

Note: You should work alone on the lab report.

Note: The assignment is due at the BEGINNING of your next lab. No late assignments will be accepted. Emailed assignments will not be accepted. If you are not going to be in lab on the due date, you can turn the assignment ahead of time to the CS210 TA box in the CS department office.