Solution to Section #8

Parts of this handout by Brandon Burr and Patrick Young

```java
/*
 * FlightPlanner.java
 * ------------------
 * Reads in a file of cities and their corresponding flights,
 * and allows the user to plan a flight route.
 */

import acm.program.*;
import acm.util.*;
import java.io.*;
import java.util.*;

public class FlightPlanner extends ConsoleProgram {

   /** Runs the program. */
   public void run() {
      println("Welcome to Flight Planner!");
      readFlightData("flights.txt");

      println("Here's a list of all the cities in our database:");
      printCityList(cities);

      println("Let's plan a round-trip route!");
      String startCity = readLine("Enter the starting city: ");
      ArrayList<String> route = new ArrayList<String>();
      route.add(startCity);
      String currentCity = startCity;

      while (true) {
         String nextCity = getNextCity(currentCity);
         route.add(nextCity);
         if (nextCity.equals(startCity)) break;
         currentCity = nextCity;
      }

      printRoute(route);
   }

   /** Ask user for the name of the next city in the route */
   private String getNextCity(String city) {
      ArrayList<String> destinations = getDestinations(city);
      String nextCity = null;
      while (true) {
         println("From " + city + " you can fly directly to:");
         printCityList(destinations);
         String prompt = "Where do you want to go from " + city + "? ";
         nextCity = readLine(prompt);
         if (destinations.contains(nextCity)) break;
         println("You can't get to that city by a direct flight.");
      }
      return nextCity;
   }
```

```java
/**
 * Given a starting city, looks up the destinations from that
 * city in the HashMap of flights, and return an array list of
 * the destinations that are available.
 */
private ArrayList<String> getDestinations(String fromCity) {
    return flights.get(fromCity);
}


/**
 * Prints a list of cities from the array list. Each city name is
 * indented by a space.
 */
private void printCityList(ArrayList<String> cityList) {
    for(int i = 0; i < cityList.size(); i++) {
        String city = cityList.get(i);
        println(" " + city);
    }
}


/**
 * Given a list of city names, prints out the flight
 * route, with a " -> " between each pair of cities
 */
private void printRoute(ArrayList<String> route) {
    println("The route you've chosen is: ");
    for (int i = 0; i < route.size(); i++) {
        if (i > 0) print(" -> ");
        print(route.get(i));
    }
    println();
}


/**
 * Reads in the city information from the given file storing the
 * information in both the ArrayList of cities and the HashMap of
 * flights.
 */
private void readFlightData(String filename) {
    flights = new HashMap<String,ArrayList<String>>();
    cities = new ArrayList<String>();
    try {
        BufferedReader
        rd = new BufferedReader(new FileReader(filename));
        while (true) {
            String line = rd.readLine();
            if (line == null) break;
            if (line.length() != 0) {
                readFlightEntry(line);
            }
        }
        rd.close();
    } catch (IOException ex) {
        throw new ErrorException(ex);
    }
}
```

```java
    /**
     * Reads a single flight entry from the line passed as an argument,
     * which should be in the form
     *
     * fromCity -> toCity
     *
     * Each new city is added to the ArrayList cities, and each new
     * flight is recorded by adding a new destination city to the
     * ArrayList stored in the HashMap flights under the key for the
     * starting city.
     */
    private void readFlightEntry(String line) {
        int arrow = line.indexOf("->");
        if (arrow == -1) {
            throw new ErrorException("Illegal flight entry " + line);
        }
        String fromCity = line.substring(0, arrow).trim();
        String toCity = line.substring(arrow + 2).trim();
        defineCity(fromCity);
        defineCity(toCity);
        getDestinations(fromCity).add(toCity);
    }


    /**
     * Defines a city if it has not already been defined. Defining
     * a city consists of entering it in the cities array and
     * entering an empty ArrayList in the flights table to show
     * that it has no destinations yet.
     */
    private void defineCity(String cityName) {
        if (!cities.contains(cityName)) {
            cities.add(cityName);
            flights.put(cityName, new ArrayList<String>());
        }
    }


    /* Private instance variables */
    private HashMap<String,ArrayList<String>> flights;
    private ArrayList<String> cities;
}
```