Computer Science 501
Data Structures & Algorithms
The College of Saint Rose
Fall 2014

Lab 1: Conway's Day of the Week Calculator

Due: 6:00 PM, Tuesday, September 2, 2014

This week's lab exercise is intended to bring you up-to-speed or back up-to-speed, as the case may be, with Java programming.

There are some questions to answer, practice programs to write, and one more substantial programming assignment to complete.

You may work alone or with a partner on this lab. Only one submission per group is needed.

Getting Set Up

To get your BlueJ environment set up for this week's lab assignment, start BlueJ and choose "New Project" from the "Project" menu. Navigate to your folder for this course and choose the name "Lab1" (no spaces) for the project.

Create a document where you will record your answers to the lecture assignment and lab questions. If you use plain text, call it "`lab1.txt`". If it's a Word document, you can call it whatever you'd like, but when you submit, be sure you convert it to a PDF document "`lab1.pdf`" before you submit it.

Lecture Assignment Questions

We will usually discuss these questions at the start of class on the lab due date, so no credit can be earned for late submissions of lecture assignment questions.

LA Question 1:

I would like to get a better sense of everyone's backgrounds coming in. Please answer each of the following. (4 points)

- Which degree program are you in, if any?
- What other computer sciences have you taken, either before or at Saint Rose?
- Briefly describe your programming experience. Which programming languages have you used and how complex were the programs you developed?
- What is your favorite restaurant in your home town and what should I order there?
- What types of computers (e.g., PC running Windows, Mac) have you used?
- If you plan to use computers other than those in Saint Rose labs for course work, what type of computer do you plan to use?

LA Question 2:

Bailey Problem 1.2, p. 26. (2 points)

LA Question 3:

a. Show the steps needed to compute the GCD of 31415 and 14142 using Euclid's algorithm.
b. How much faster is this than the more naive algorithm that checks consecutive integers starting at 14142 (the smaller of the two numbers whose GCD we are computing) until the GCD is found. (5 points)

LA Question 4:

Once upon a time a farmer went to market and purchased a fox, a goose, and a bag of beans. On his way home, the farmer came to the bank of a river and rented a boat. But in crossing the river by boat, the farmer could carry only himself and a single one of his purchases - the fox, the goose, or the bag of the beans. If left together, the fox would eat the goose, or the goose would eat the beans. The farmer's challenge was to carry himself and his purchases to the far bank of the river, leaving each purchase intact. Find the shortest sequence of crossings you can (where the farmer can carry 0 or 1 of his purchases in the board on each crossing) that solve the problem. (See if you can work it out – don't just look it up!) (5 points)

Practice Programs

Practice Program:

Write the class described by Bailey Problem 1.8, p. 27, in a file `PhoneNumber.java`. In addition to fields and constructors as required, include an appropriate `toString` method, and write a `main` method that thoroughly tests your implementation. (7 points)

Practice Program:
Write the class described by Bailey Problem 1.12, p. 27, in a file `ComboLock.java`. Again, include a `main` method that thoroughly tests your implementation. (10 points)

Programming Assignment

Write the program for the lab exercise at the end of Chapter 1 of Bailey.

- Write your entire program in a single Java source file `Date.java`. The `main` method required by step 4 of the procedure might normally be more appropriate in a separate class, but keep it in the `Date` class here for simplicity.
- Avoid large `switch` statements by using arrays from which you can look up information such as the day-of-week adjustment table and the number of days in each month.
- Don't forget to answer the thought questions as well. Please put the answers to these in your `lab1.txt` or `lab1.pdf` file.

Submitting

Before 6:00 PM, Tuesday, September 2, 2014, submit your lab for grading. There are two things you need to do to complete the submission: (i) Copy your file with the answers to the lecture assignment and lab questions into your project directory. Be sure to use the correct file name. If you prepared your answers in Word, export to a PDF file and submit that. (ii) Upload a copy of your lab (a `.7z` or `.zip` file containing your project directory) using Submission Box at `http://sb.teresco.org` under assignment "Lab1".

Grading

This assignment is worth 75 points, which are distributed as follows:

Feature	Value	Score
Lecture assignment questions	16	
`PhoneNumber.java` instance variables	1	
`PhoneNumber.java` constructors	2	
`PhoneNumber.java` `toString` method	1	
`PhoneNumber.java` complete `main` method	3	
`ComboLock.java` instance variables	2	
`ComboLock.java` general constructor	1	
`ComboLock.java` default constructor	1	
`ComboLock.java` `press`/`reset`/`lock`/`isLocked`	4	
`ComboLock.java` complete `main` method	3	
Basic `Date` class	5	
`Date` constructor to generate an arbirtrary date	3	
`Date` constructor to generate valid random dates	5	
Method in `Date` to compute day of week	5	
`main` method to play Conway's game	8	
`Date.java` comments	5	
`Date.java` naming conventions	3	
`Date.java` formatting	2	
Thought questions	5	
Total	75	