CS 64 Homework Assignments

The beginning programming assignments of CS 64 have as their goal the creation of an application program that allows a user to maintain a simple file oriented database of birthday information. The "front end" of the database is the user interface. The "back end" of the database organizes the data and allows for manipulation of the data while the program is running. The first few assignments focus on the Java features that underpin the design of such an application program: inheritance used in extending class `JFrame` to write an application program, the Java Bean technology for writing class definitions, and the use of the array data structure to organize the data in memory and support desired application functionality such as searching for a data item or sorting the data items. Assignment 02 focuses on some fundamental algorithms and the resulting code for sorting and searching. The design of the GUI for the application begins in Assignment 03. Assignment 04 focuses on the work needed to implement an array data structure for the back end of the database. Assignment 05 implements the insert and display features of the database. Assignment 06 implements the search, sort, and delete features of the database. Assignment 07 will introduce the concept of type parameters in Java classes. Type parameters can be used to make data structures more generic with respect to the type of data items stored in the structure while maintaining functionality. Assignment 07 will specify the use of type parameters for the data structure. Your database application will be able to save data in a file and load data from a file. Assignment 09 will specify the use of files to maintain data between executions of the application. In Assignment 10, you will change the underlying data structure from an array to a linked list. In Assignment 11, you will change the underlying data structure from a linked list to two ordered linked lists. In Assignment 12, you will change the underlying data structure from two ordered linked lists to two binary trees. The final project for this course requires that the back end of the application be rewritten to employ data structures available in the Java API. With careful design, only minimal changes will be required for the front end as you implement different data structures in the back end.

Assignment 01: The following is due Thursday, 30 January 2014

1. Read page 275 through the middle of page 286 in Chapter 11.
2. Complete the following exercises:
    a. Exercise 11.1 on page 277 [4 points]
    b. Exercise 11.2 on page 280 [1 point]
    c. Exercise 11.3 on page 280 [1 point]
    d. Exercise 11.4 on page 281 [2 points]
    e. Exercise 11.12 parts 1 and 2 on pages 305 through 308 [20 points]
    f. Write a main class named `TestBirthInfo` that will test the constructors and methods of classes `Name`, `BirthDate`, and `BirthInfo`. Your main class should construct at least three `BirthInfo` objects. You do not need a GUI for this program. [20 points]

Assignment 02: The following is due Thursday, 6 February 2014

1. Read from the bottom of page 287 through page 300
2. Complete the following exercises:
    a. Exercise 11.6 on page 295 [8 points]
    b. Exercise 11.7 on page 297 [8 points]
    c. Exercise 11.8 on page 297 [3 points]
    d. Exercise 11.9 on page 300 [12 points]

Assignment 03: The following is due Thursday, 13 February 2014

Complete Exercise 11.13 part 1 on page 309 [10 points]

Assignment 04: The following is due Thursday, 20 February 2014

Complete Exercise 11.12 parts 3 and 4 on pages 305 through 308. You do not need a GUI for this program. [20 points]

Assignment 05: The following is due Thursday, 27 February 2014

Complete Exercise 11.13 part 2 on pages 309 and 310 [20 points]

Assignment 06 – The following is due Thursday, 6 March 2014

Complete Exercise 11.13 part 3 on pages 309 and 310 [20 points]

Assignment 07: The following is due Thursday, 13 March 2014

Before beginning this assignment, make sure that you make a copy of the folder containing your Database code package. **You should make sure you work on the copy, not the original.** In this assignment you will be making major changes to the back end of the Database application with only small modifications to the front end (i.e., the `Database` class).

Read Chapter 12

Complete Exercise 12.24 on page 351. [20 points]

Make sure the program incorporates all the comments you have received on previous assignments regarding the Database.

Assign 08 Due Thursday, March 20, 2014:

Complete the following exercises for **optional extra credit**:

1. Exercise 12.25 on pages 352 through 355. [10 points]
2. Exercise 12.26 on pages 355 through 358. [10 points]

Assignment 09: Due Thursday, April 3, 2014

Read Chapter 13

Complete Exercise 13.2 on page 382. [20 points]

Assignment 10: Due Thursday, April 10, 2014

1. Read Chapter 14
2. Complete the following Exercise:
    a. Exercise 14.24 on page 413 [20 points]
3. **For Optional Extra Credit**:
    a. Exercise 14.2, 14.3, and 14.4 on page 393 [2 points each]
    b. Exercise 14.5 on page 397 [2 points]
    c. Exercise 14.6 on page 399 [2 points]
    d. Exercises 14.7 on page 399 [1 point]
    e. Exercises 14.8 through 14.11 on page 402 [1 point each]
    f. Exercises 14.12 through 14.13 on page 404 [1 point each]
    g. Exercises 14.14 and 14.15 on page 408 [2 points each]
    h. Exercise 14.16 on page 410 [3 points]

Assignment 11: Due Thursday, April 17, 2014

1. Read Chapter 15
2. Complete the following Exercises:
    a. Exercise 15.16 on page 439 [20 points]
    b. Exercise 15.18 on page 440 [15 points] (Note: This is an extension of 15.16. It is a typo in the text that indicates it as an extension of itself.)
3. **For Optional Extra Credit**:
    a. Exercise 15.1 on page 419 [4 points]
    b. Exercise 15.2 on pages 419 and 420 [4 points]
    c. Exercises 15.3 and 15.4 on page 425 [1 point each]
    d. Exercises 15.5 and 15.6 on page 426 [2 points each]

e. Exercise 15.7 on page 426 [1 point]

f. Exercise 15.8 on page 427 [3 points]

g. Exercise 15.9 on page 432 [5 points]

h. Exercise 15.10 on page 433 [3 points]

i. Exercise 15.11 on page 436 [4 points]

j. Exercise 15.12 on page 437 [1 point]

k. Exercise 15.13 on page 437 [4 points]

Assignment 12: Due Thursday, April 24, 2014

1. Read Chapter 16
2. Complete the following Exercises:
    a. Exercise 16.23 on page 470 [20 points]
    b. Exercise 16.25 on page 472 [20 points] (Note that this is an extension of Exercise 15.18. It is a typo in the text indicating that this is an extension of Exercise 15.17.)
3. **For Optional Extra Credit**:
    a. Exercises 16.1 and 16.2 on page 447 [1 point each]
    b. Exercise 16.3 on pages 448 [1 point]
    c. Exercise 16.4 on page 454 [2 points for each tree diagram, 4 points each extra credit for tracing the tree building as done in the text]
    d. Exercise 16.5 on page 460 [2 points]
    e. Exercise 16.6 on page 461 [2 points]
    f. Exercise 16.7 on page 461 [1 point]
    g. Exercise 16.8 on page 461 [6 points]
    h. Exercise 16.9 on page 464 [5 points]

i. Exercise 16.10 on page 465 [6 points for a trace of the traversal as exhibited in the text]

j. Exercise 16.11 on page 465 [4 points each for traces of the traversals as exhibited in the text]

k. Exercise 16.12 on page 465 [1 point]

l. Exercise 16.13 on page 465 [4 points]

m. Exercise 16.14 on page 465 [6 points for a trace of the traversal as exhibited in the text]

n. Exercise 16.15 on page 465 [4 points each for traces of the traversals as exhibited in the text]

o. Exercise 16.16 on page 465 [1 point]

p. Exercise 16.17 on page 466 [4 points]

q. Exercise 16.18 on page 468 [10 points]

r. Exercise 16.19 on page 468 [10 points]

s. Exercise 16.21 on page 469 [3 points]