

University of Massachusetts Lowell

91.301: Organization of Programming Languages
Fall 2002

Problem Set 3 Data Abstraction and Lists

Issued: Thursday, 19 September 2002

Due: Thursday, 26 September 2002

Reading: Text (SICP 2nd Edition by Abelson & Sussman): Sections 2.1 and 2.2

Overview

This problem set deals with data abstractions and lists as data structures.

What to turn in

Keep one answers buffer for your problem set. Put the code for each problem sequentially in this buffer. Put the problem number in a comment before the code for that problem (use a semi-colon to make a line a comment).

Underneath the code for each problem, cut and paste the appropriate sample runs. You can put semi-colons before each line of the sample runs, which will comment them out and allow you to load the entire buffer in another session.

Print the answers buffer and turn it in during the class on the due date. You do not need to submit this assignment electronically.

Problems

Problem 1: Exercise 2.1 on p. 87.

Problem 2: Write a procedure called `simplify-rat`, which reduces a rational number (fraction). You should find the `gcd` procedure in Section 1.2.5 to be useful in this exercise.

Problem 3: Exercise 2.2 on p. 89–90.

Problem 4: Exercise 2.3 on p. 90.

Problem 5: Exercise 2.4 on p. 92.

Problem 6: Exercise 2.17 on p. 103.

Problem 7: Exercise 2.18 on p. 103.

Problem 8: Exercise 2.20 on p. 104.

Problem 9: Exercise 2.21 on p. 106.

Problem 10: Exercise 2.22 on p. 106–107.

Problem 11: Exercise 2.24 on p. 110.

Problem 12: Exercise 2.25 on p. 110. Draw the box and pointer diagrams for each list. Doing this first will help you figure out the sequence of `cars` and `cdrs`.

Problem 13: Exercise 2.26 on p. 110. Draw the box and pointer diagrams for `x`, `y`, and all results.

Problem 14: Exercise 2.27 on p. 110.

Problem 15: Exercise 2.28 on p. 111.