csce750 — Analysis of Algorithms
Fall 2019 — Homework 05

Assigned: October 22
Due: October 31

This assignment covers material from the lectures on Chapters 14, 15, and 17 preparation for Quiz 5.

Page 345: Exercises 14.1-1, 14.1-2, 14.1-3, 14.1-7. (Some of these questions mention the fact that Figure 14.1 is a red-black tree. That fact is not important.)

Page 370: Exercises 15.1-2, 15.1-3

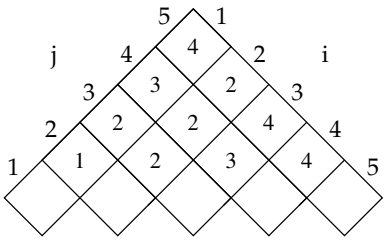
Page 378: Exercises 15.2-1 (construct the m and s tables, then use them to find the optimal parenthesization), 15.2-2

Page 389–390: Exercises 15.3-2, 15.3-3 (write pseudocode for a DP algorithm for this variant problem, or explain why DP won't work), 15.3-4

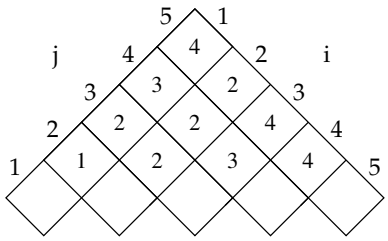
Page 405: Problem 15-2

(Note: There are several other interesting problems on pages 404–412.)

Not in textbook: The tables generated by a certain run of the matrix chain multiplication algorithm from class are shown below. Find the optimal parenthesization for this instance.



m table



s table

Page 456: Exercises 17.1-1, 17.1-2 (This refers to a k-bit counter data structure, which is analyzed in detail in Chapter 17, but was not one of the examples we reviewed in the lecture.)

Page 458–459: Exercises 17.2-1, 17.2-3

Page 462: Exercise 17.3-3. 17.3-6 (Write pseudocode for DEQUEUE and ENQUEUE operations, using the PUSH and POP operations of the two stacks, then use the potential method analyze the amortized run time)

Not in textbook: Consider the dynamic table data structure from the textbook and the lecture, but modified so that, when the table is reallocated, the size increases by 10, rather than doubling. (That is, replace the $\times 2$ with a $+10$.) Find the amortized run time of each operation, using the same $\Phi(T) = 2T.\text{num} - T.\text{size}$ potential function as we used in class. Explain why this variant is a terrible idea.

Not in textbook: Consider the dynamic table data structure from the textbook and the lecture. Find the amortized run time of each operation, using a potential function that evaluates to the number of elements in the table.