QuickCheck 04: Heaps of Fun with Trees
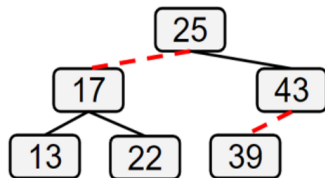
Due: 8:00 am on Thursday, Jan 30, 2020

QuickChecks must be scanned and submitted online via Gradescope. If you have a smartphone, you can follow these steps to scan using an app: https://www.gradescope.com/help#help-center-item-student-scanning. Otherwise, there are scanners located at various libraries on campus which can be found here: https://finance.uw.edu/c2/printing-copying/dawg-prints-copy-locations. Make sure that the gray border around the edge of this page is visible in your scanned document.

1. LLRB Trees

Suppose we have the LLRB below, where red links are given as thicker dashed lines. If we add 15, what single LLRB operation will we need to perform? Mark only one answer, where x is the node we rotate or color flip.
Reminder: colorFlip(17) would mean flipping all edges touching 17. Don't forget to fill in the value for x!

○ rotateLeft(X)   ○ rotateRight(x)   ○ colorFlip(x)   Where x = ☐

2. B-Trees

Insert the following values into a 2-3 B-Tree in order: 1,2,3,7,8,9,5

(a) What is the height of the tree?   ☐

(b) True or False: The leaves of a B tree must all be the same depth from the root   ○ True   ○ False

3. Heaps

Determine if the given binary tree is also a valid max heap: ○ Yes   ○ No