Efficient Russian Multiplication
S19 CSCI332 Design and Analysis of Algorithms

Assigned: 2019-02-15

Reference: §4.4; 5.0 Due Date: 2019-03-09 (midnight)

Project Question Answers:

1. $Shifts(n) = 2 * \log_2 n$

2. $Accesses(n) = 2 * height + n$

3. One possible structure that could provide more a more Efficient result could be a heap. This is because as long as the Russian Peasant multiplication keeps n smaller than m and begins with the largest value in the tree, then the number of multiplications will be minimized. This fact allows us to use a binary heap which always keeps the largest value at the root the accesses for each node will be 1.

4. You would have to represent the numbers with two locations in memory sized at $(2^{64} - 1)$. When you multiply the numbers you would perform a bit shift on the smaller part of the number and keep track of any over flow and then add it to the larger half of the number, then bitshift the larger. For division it would be the same process but in reverse, bitshift the larger, add overflow to the smaller and then bitshift again.