

## Chapter 14 Laboratory Exercise

### Prelab Assignment

1. What is the difference between a recursive algorithm and a divide and conquer algorithm?
2. Write the Java code for a recursive method that implements the definition of the factorial function given below.

$$\text{factorial}(n) = \begin{cases} 1 & \text{if } n \leq 1 \\ n * \text{factorial}(n - 1) & \text{otherwise} \end{cases}$$

3. Write a new method for the class `IntList` that computes the sum of the values stored in the list elements.

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1. Write and test a recursive method that computes the greatest common divisor of two integers using the definition given below.

$\text{gcd}(m, n) = n$  if  $n \leq m$  and  $n$  divides  $m$   
 $\text{gcd}(n, \text{remainder of } m / n)$  otherwise

2. A palindrome is a word that is spelled the same when its letters are reversed (e.g. mom or madam). Write and test a recursive method that returns the Boolean value true if its String argument is a palindrome and false otherwise.

3. Rewrite and test insertionSort so that it sorts the contents of a linked list of integers rather than an array of real numbers.

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### Postlab Questions

1. What was the most difficult part of this lab?
2. Would it be possible to write a version of Quicksort that sorted linked lists numbers? Why or why not?
3. What are the advantages of using a linked list rather than an array as a means of storing a collection of values?
4. Try to find a recursive definition for the binary search algorithm. Is this an example of a divide and conquer algorithm? Why or why not?