CSC-361: Recursion

In each statement give an algorithm satisfying the constraints of the problem. Do so by stating a (1) base case(s) and (2) recursive processing. Your goal is to communicate your solution as a meaningful English description that avoids minute details unless they are required for clarity (i.e. do not write pseudocode or source code).

1. Reversing the contents of an array.
2. Converting a string to its integer representation. For example, ''13541'' results in 13541.
3. Computing the sum of all the elements in a $n \times n$ (two-dimensional) array of integers.
4. Identifying the element in a list that is repeated twice. Assume only one value in a given list is repeated twice (e.g. 2 is the repeated element in $[1, 4, 2, 5, 2, 7]$).
5. Computing the product of two positive integers using only addition and subtraction.

1. The algorithm would start from the outside of the array, the start and the end, and swap those two items and then move inwards. The base case would be when the first index is greater than or equal to the second index. The greater than is for arrays with even numbers of elements when the indices pass each other and the swapping would start reversing again. The equal to is for arrays with odd numbers of elements and the indices get to the same place, which does not need to swap. The recursive process would take the first index plus 1 and the last index minus one and swap those elements. This would repeat until the base case is reached.

2. The algorithm should start at the right side of the string. The recursive process would add the current position times the power of 10 to properly add the number to the integer. The base case would be when the algorithm reaches the left end of the string.

3. The algorithm should start at the end of both the x and y dimensions of the array. The recursive should add the current position and then call the method for the x-1 and then call the method for y-1. The base case should be whenever x or y is equal to 0, thus reaching the end of the array on that end.