**CS 3410: Data Structures**

**Homework 2 (Fall 2017)**

**Due date: Monday, September 11, 2017 by 2:00 P.M.**

1. Write a recursive method (clearly indicate the base case) to reverse a string. [6 points]

String stringReverse(String inputString){

**if**( inputString==**null**) //Checks for the case inputString is undefined

**return** inputString;

**if**(inputString.length() <= 1) //Basecase

**return** inputString;

**else**

**return** stringReverse(inputString.substring(1)) + inputString.substring(0,1);

}

1. Write a recursive method (clearly indicate the base case) that returns number of 1s in the binary representation of a non-negative integer n. [6 points]

**int** NumberOfOnes(**int** n){

**if** (n == 0) //Basecase

**return** 0;

**if** (n % 2 == 1)

**return** *NumberOfOnes*(n/2)+1;

**else** **if** (n % 2 == 0)

**return** *NumberOfOnes*(n/2);

**else** //Was needed in compiler so something is for sure returned

**return** 0;

}

1. Write a recursive method that works in O(log n) time to find the positive integer power of a number.

**static** **double** power(**double** x, **int** n) {

//Base Case

**if** ( n < 1 ) {

**return** 1;

}

**double** halfN = *power*( x, (n / 2) );

//System.out.println(halfN); //Shows steps

//Even Numbers

**if** ( n % 2 == 0 ) {

**return** halfN \* halfN;

}

//Odd Numbers

**else**{

**return** x \* halfN \* halfN;

}

}

Here *n* is a non-negative integer. Explain why your method’s complexity is O(log n).

My solution is O(logN) because instead of running at n-1 I am dividing n/2 each time I call power and multiplying it on the way back up. This saves having to multiply each result by n and allows me to skip unnecessary calculations. Even and odd numbers had to be separated for this to work properly.

[6 + 2 = 8 points]

**Submission guideline:** You have the following options to submit your assignment. Choose only one option that suits you best.

1. Submit a handwritten copy in class. Writing should be clear (readable). Include **Course number** (CS3410), **Semester** (Fall 2017), **Assignment number** (Homework 1) and **your name** at the top. Failure to include these will not be accepted.
2. Scan your handwritten copy (including information mentioned in (i)) and submit it through BlazeVIEW dropbox. Scan resolution should be good (readable).
3. Type your answers on a document file using MS-Word. Include all information (mentioned in (i)) and submit through BlazeVIEW dropbox. Make sure symbols are appearing appropriately.