ADSB Exercise 2

Tackle these topic exercises after today's lectures. All methods should be static, 2 JUnit tests are expected for each exercise.

Part 1: Recursion

You may not use loops in any of the following exercises. Please make sure, in your Javadoc comments, that you write pseudocode before you write the methods. Please write the base case and how you are splitting the problem into smaller pieces to get to that base case (in plain English).

reverseString

Here's a classic exercise that you'll often get at first-round interviews for software development jobs: Write a recursive method, `reverseString`, that takes a single `String` parameter and returns it reversed. For example, parameter `"ABCDE"` should yield a return value of `"EDCBA."`

sumDigits

Given a non-negative int n, return the sum of its digits recursively (no loops).

sumDigits(126) → 9
sumDigits(49) → 13
sumDigits(12) → 3

count7

Given a non-negative int n, return the count of the occurrences of 7 as a digit, so for example 717 yields 2. (no loops).

count7(717) → 2
count7(7) → 1
count7(123) → 0

powerN

Given base and n that are both 1 or more, compute recursively the value of base to the n power, so powerN(3, 2) is 9 (3 squared).

powerN(3, 1) → 3
powerN(3, 2) → 9
powerN(3, 3) → 27

array220

Given an array of ints, compute recursively if the array contains somewhere a value followed immediately in the array by that value times 10. We'll use the convention of considering only the part of the array that begins at the given index. In this way, a recursive call can pass index+1 to move down the array. The initial call will pass in index as 0.

array220({1, 2, 20}, 0) → true
array220({3, 30}, 0) → true
array220({3}, 0) → false

euclideanGCD

Implement Euclid's algorithm for finding the greatest common denominator of two positive integers (the largest integer that divides both without a remainder).

gcd (num1, num2) is num2 if num2<=num1 and num2 divides num1 evenly
gcd(num1,num2) is gcd(num2, num1) if num1<num2
gcd(num1, num2) is gcd(num2,num1%num2) otherwise

Thanks to Danny Navarro

countVowels

Write a method countVowels to return the number of vowels in its single String parameter. Y is not a vowel. Thanks to Danny Navarro

isPalindrome

A palindrome is a string that is spelled the same way forward and backward. Some examples of palindromes are: "radar," "able was i ere i saw elba," and (if blanks are ignored) "a man a plan a canal panama."

Write a recursive method isPalindrome that returns 1 if the string parameter is a palindrome and 0 otherwise. The method should ignore spaces and punctuation in the string. Again, do not use loops. You should not need a helper method.

Example palindromes:

Poop
Joon.*nooj
com!psci c*spm&oc

Commenting guidelines: Make sure you have javadoc comments for each method, but instead of descriptions, give me your pseudocode in plain English BEFORE you write the code for the method. Give me your base case and your recursive calls.