CSE116 Problem Set #3

For each of the following problems you should start by writing several JUnit tests that will verify correct behavior. Once you have written at least four distinct tests for each of the problems, begin to implement solutions to each of the problems. Be sure to run your unit tests often. They are not necessarily in order of difficulty.

1. Define a method named encode that accepts a String as input and returns a new String which is the original String encoded using the ROT13 cipher. This simple substitution cipher is described here:

   http://en.wikipedia.org/wiki/Substitution_cipher#Simple_substitution

   For example, encode("firefly") must produce "sversyl". Notice that re-encoding the encoded String decodes it: encode("sversyl") must produce "firefly".
   For the purposes of this exercise, assume that lowercase letters are rotated within the lowercase letters, uppercase letters are rotated within the uppercase letters, and non-letters are not rotated. Thus, encode("338 Davis") must produce "338 Qnivf".

2. Define a method named encode that accepts two Strings as input and returns a new String which is the first of the two input Strings encoded using the second String as a keyword for creating a mixed alphabet, as described here:

   http://en.wikipedia.org/wiki/Substitution_cipher#Simple_substitution

   For the purposes of this exercise, assume that the ciphertext alphabet consists of only uppercase letters. See the 'zebras' example on the reference website.

3. Define a method named encode that accepts two Strings as input and returns a new String which is the first of the two inputs Strings encoded using the second String as a keyword using the Vigenère cipher, as described here (4th paragraph):

   http://en.wikipedia.org/wiki/Substitution_cipher#Polyalphabetic_substitution

4. Define a method named anagram that accepts two Strings as input and returns true if the two Strings are anagrams of each other (they contain the same letters, ignoring spaces and capitalization), and false otherwise. For example, "listen" and "silent" are anagrams, as are "Tom Marvolo Riddle" and "I am Lord Voldemort". HINT: problem set 2, question 7.

5. Define a void method named swap that accepts an array of int and two int values (call them and y) so that it interchanges the values in locations x and y of the array. For example, if an array is initially (5, 7, 9, 3) then swapping the values in positions 0 and 2 changes the array to (9, 7, 5, 3).

6. Define a method named zip accepts two equal-length arrays of ints, and produces a new array of ints. The resulting array must have alternate the values from the two input arrays. For example, if the two input arrays are (4,3,7,2,6) and (2,1,4,8,0) then the result must be (4,2,3,1,7,4,2,8,6,0).

7. Define a method named merge which accepts two possibly unequal-length arrays of ints, and produces a new array of ints. Assume that the two input arrays have their contents arranged from smallest to largest. The resulting array must have the values from the two input arrays arranged in order from smallest to largest. For example, if the two input arrays are (1,2,5,6,7) and (2,3,8,9) then the result must be (1,2,2,3,5,6,7,8,9).