AI 2018-19 Lab2
Word Ladder
(P. Gabor, 10 Sep 2018)

Your Lab, with an anticipated due date of Friday, 14 Sep '18, is to do the following 10 tasks, displaying each item on a separate line such as:

Words: 2345
Neighbor pairs: 6543

1. Read in the word list at
   `https://academics.tjhsst.edu/compsci/ai/words.txt`

   You should save this word list to a local file so that you don't have subsequent internet connectivity issues and so that the speed of reading it in is faster. Each word in this particular file is 6 letters long and there is one word per line (and if there are any empty lines, your code should ignore (skip over) such lines). The file or link may be set as a string variable within your program file - you don't need to have it as a command line argument.

   Print out the total number of words.

2. Define two words as neighbors if they have the same number of letters, and at all the positions, save one, all of the letters match. So `tests` and `testy` are neighbors, but `eat` and `ate` are not.

   Your script should determine and print out the number of neighbor pairs.

3. Your script should print out the number of seconds it took to finish doing 2 from the start of the script. Always include the units (s for seconds). Include four significant figures (ie. round based on the 5^{th} digit). Your script should also have a second line of timing output as the final line that it prints, which is the number of seconds that the script takes to finish after the initial timing (ie. after part 2 finished).

4. If a command line argument is provided (ie. a word), print out the number of neighbors that word has followed by the list of the neighbors, if any.

5. Print out a word which has the most number of neighbors

6. Print out the number of words with no neighbors.

7. Print out the number of distinct pairs of words that have only each other as neighbors.

8. Define the degree of a word to be the number of neighbors it has. Print out the number of distinct degrees there are for your words, followed by a list of those numbers which are a degree for a word.

9. A connected component is a set of words such that it is possible to get from each word in the component to another word by moving from neighbor to neighbor.

   Print out the number of distinct connected component sizes.

10. Print out the number of connected components that are a K_3. A K_3 is a 3-clique, a set of three words where each word has the other two, and only the other two words, as neighbors.

Challenge question: What are two words that are a furthest distance apart?