First Day: Fun with Algorithms!

CS 301

January 8, 2019

If we're going to think about algorithms and data structures to solve problems . . .

. . . we're going to need some problems!

Try to solve these problems by writing Python functions. Come up with as many different ways as possible to solve each problem. We have several goals in mind here: to start thinking about different kinds of algorithms and data structures and their pros and cons, and, more generally, to try to remember how Python works.

Some problems could be mathematical:

1. What is the sum of the first n positive integers?

Others could come from real life. Perhaps you like to play scrabble?

(Useful for these problems: from Canvas, you can download a file words.txt that contains most words in the English language.)

2. Given a proposed word that someone wants to play, can you check that it is a valid word?

3. Given a set of tiles and a word, can you check if the word can be made from the tiles?

4. Even more useful: given a set of tiles, can you find all the words you can make with them? For example, if you have the tiles in the word "retains", you could also rearrange them to spell "anestri," "nastier," "ratines," "retains," "retinas," "retsina," "stainer," and "stearin."

5. The *New York Times Sunday Magazine* publishes a related puzzle called the Spelling Bee each week. An example from the December 30, 2018 magazine is shown in Figure 1. Can you write a function to tell you all of the possible words for a given puzzle?

6. In Scrabble, a "bingo" is when you play all seven tiles in your rack, along with an eighth letter on the board, to form an eight letter word. What set(s) of eight letters forms the most possible bingos?

Remember that, in addition to being able to chose different algorithms to solve these problems, you could also chose different data structures to represent your data, and that these could also make a difference.

Ok, one last thing to think about: if we have several different ways to solve the same problem, how can we decide which ones are "better"??

SPELLING BEE

By Frank Longo

How many common words of 5 or more letters can you spell using the letters in the hive? Every answer must use the center letter at least once. Letters may be reused in a word. At least one word will use all 7 letters. Proper names and hyphenated words are not allowed. Score 1 point for each answer, and 3 points for a word that uses all 7 letters.
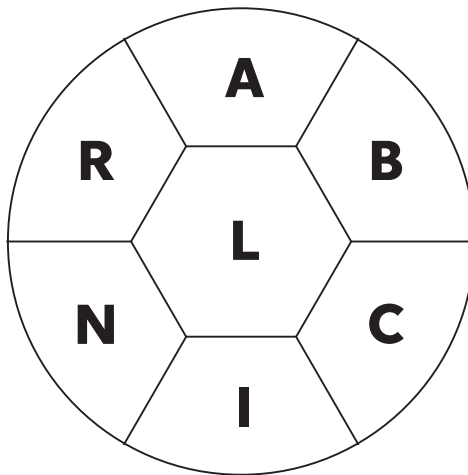
Rating: 7 = good; 15 = excellent; 23 = genius

Figure 1: A Spelling Bee Puzzle