CS302 - Assignment 14
Due: Tuesday, April 16 at the beginning of class
Hand-in method: paper

http://xkcd.com/801/
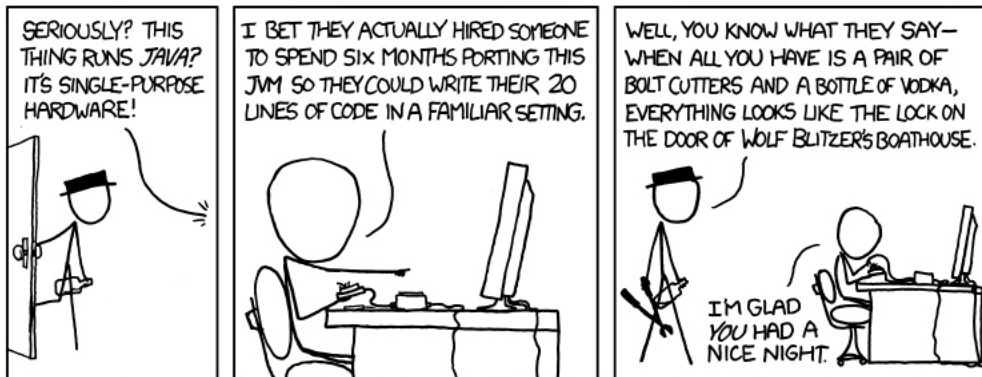
1. [**15 points**] You are given a string of characters $S = s_1, s_2, ..., s_n$ where all non-alphabetic characters have been removed (e.g. "thisisasentencewithoutanyspacesorpunctuation") and a function $\text{DICT}(w, i, j)$, which takes as input a string w and two indices i and j and returns *true* if the string $w_{i...j}$ is a dictionary word and *false* otherwise.

   (a) [**10 points**] Give a solution that determines whether the string S consists of a sequence of valid dictionary words. State the running time of your algorithm assuming calls to DICT are $O(1)$.

   (b) [**5 points**] If the string is valid, describe how to modify your algorithm to output the sequence of words. Be clear!

Greedy or DP

One of the problems below can be solved more efficiently using a greedy approach and the other cannot (i.e. you must use dynamic programming). For each problem clearly describe your algorithm and state the run-time. For the greedy problem, prove that your solution is optimal.

2. (10 points) You're going on a road trip with friends. Unfortunately, your headlights are broken, so you can only drive in the daytime. Therefore, on any given day you can drive no more than d miles. You have a map with n different hotels and the distances from your start point to each hotel $x_1 < x_2 < ... < x_n$. Your final destination is the last hotel. Describe an algorithm that determines which hotels you should stay in if you want to minimize the number of days it takes you to get to your destination.

3. (10 points) Same setup as above, however, you also want to do some sightseeing along the way. To make sure you don't spend too little or too much time in any one place, you decide to add a penalty for having too much free time. If you travel x miles in a day, then the penalty for that day is $(d - x)^2$. Describe an algorithm that determines the hotel sequence that mimizes the total pentalty, that is the sum of the daily penalties over all travel days.