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CS 550
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A2 Questions

1. The difference between a search state and a problem state is that in a search state, we are given a set of actions to perform to try and reach the goal whereas a problem state just alerts us that we have a problem to solve
2. A constraint that we could add to an AI solving a crossword puzzle to make solving the puzzle faster would be to have a constraint that checks that wherever intersections occur between words, there are x amount of words that would fit x amount of intersections. For example, if there is a word that goes across in a row and encounters three column intersections, we would compare the strings and ensure that the characters of three words match wherever they would be intersected at, making sure that the word we place across in a row would be compatible with x amount of words that would intersect with their columns match with the character in the row. (It would be very hard to program this but for the purposes of answering this question, this is the constraint I came up with).
3. The effective branching factor is 1.746

```
import numpy as np

coeff = [1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, -10000]

print( np.roots(coeff) )
```

   If the actual branching factor is 4, then the percentage of nodes that would have needed to be expanded would have been 6.98491 * 10(-4)% (actual number after math is performed: 6.98491 * 10 ^(-6)).

4. So we prove h'(n) is consistent if ***h'(n)<=cost(n, action, n') + h'(n')***

   We will prove by contradiction, so we will assume h'(n) > cost(n, action, n') + h'(n')

   Well, h'(n) is the number of misplaced tiles, a number between 0 and 8, whereas h'(n') is either
   - h'(n): number of misplaced tiles stay the same
   -h'(n) +1: Number of misplaced tiles increases by 1
   -h'(n) -1: Number of misplaced tiles decreases by 1

   We know that the cost(n, action, n') is always 1, since only one move can be made

Let’s say there are 5 misplaced tiles, if a move is made and the number of misplaced tiles increases by 1, then we would have

$5 > 1 + 6$

This is not correct, thus contradicting the statement, hence proving that h’(n) is consistent.