1) Constructing Solver Tree O(4^n). The time complexity of searching the hashset for a word is O(1). The time complexity of searching the hashset for all possible words of N digits is O(4^n). The time complexity of searching the Prefix Tree for a single word is O(N). The time complexity of searching the Prefix Tree for all possible words of N digits is O(4^n * n)
2) Exhaustive search is also known as brute-force search or “generate and test”. This project uses exhaustive search because we generate all possible words with a tree, and then test each of them against the dictionary to see if it is an actual word.
3) The branch and bound method is where you put bounds on what it is trying to find and use those bounds to prune the search space eliminating branches that will not contain an optimal solution.
4) If you use a prefix tree in combination with the tree from the keypad, you could start at the root of the keypad tree and via breadth first search evaluate each node checking if the prefix is contained as a prefix in the prefix tree dictionary. If it is not, then that branch will contain no solutions, and we can prune that entire branch, thereby shrinking the search space.
5) Type "exit" to exit

```
Enter keypad input:asdf
Invalid input
Enter keypad input:123d
Invalid input
Enter keypad input:123
Words returned from HashDictionary (ExhaustiveSearch):
Words returned from PrefixTree (ExhaustiveSearch):
Enter keypad input:6294686
Words returned from HashDictionary (ExhaustiveSearch):
maximum
Words returned from PrefixTree (ExhaustiveSearch):
maximum
Enter keypad input:266868
Words returned from HashDictionary (ExhaustiveSearch):
amount
Words returned from PrefixTree (ExhaustiveSearch):
amount
Enter keypad input:63
Words returned from HashDictionary (ExhaustiveSearch):
md
me
nd
ne
of
Words returned from PrefixTree (ExhaustiveSearch):
md
me
nd
ne
of
Enter keypad input:3926753
```

```
Words returned from HashDictionary (ExhaustiveSearch):
example
Words returned from PrefixTree (ExhaustiveSearch):
example
Enter keypad input:96737
Words returned from HashDictionary (ExhaustiveSearch):
words
Words returned from PrefixTree (ExhaustiveSearch):
words
Enter keypad input:22443833
Words returned from HashDictionary (ExhaustiveSearch):
achieved
Words returned from PrefixTree (ExhaustiveSearch):
achieved
Enter keypad input:exit
Exiting...
```