1.
    a. If we based the constructorHelper methods time complexity on our input, we would be creating the nodes that are exponential, where our base is 4, and our power is the length of the string, do to the fact that our method will create nodes based on level. This is due to our for loop, which is the most time complex piece of code we have. For example, level 0: 1, level 1: 4, level 2: 16, and so on. So our Big-Oh time complexity for our constructor is $O(4^n)$.
    b. O(n) for prefix tree search, and O(1) for our hashtable search
    c. For total time complexity of the algorithm for n string length, we break down its components. The time it takes to construct the solver tree is 4^n, the time it takes for the search algorithms to work is 1 and n for hashSearch, and prefixSearch respectively. The total number of leaf nodes(or paths) inside the solver tree is roughtly $4/5 * 4^n$ because 4^n is also the total number of nodes. Multiplied together gives us our time complexity of $O(4/5n * 4^n)$.
2. An exhaustive search, also known as a "Brute-force search" is a search that will check every single possible piece of data in a set against a singular piece of data. For example, in this context, we have a singular letter permutation that is then checked against our dictionary.
3. Branch and Bound is a concept that refers to an algorithm design used in solving problems with an exponential time complexity, by way of optimization. Usually used when the greedy method, and dynamic programming fail to optimize as a result.
4. During the constructor, while we are building the string, we can test the string against the prefix tree, and if the prefix doesn't exist, we don't continue building said pathway, and move to the next one.
5.

Please enter your keypad combination (Please use no spaces, or any other characters except 2-9) or enter 0 by itself to quit.

85647

Please enter your keypad combination (Please use no spaces, or any other characters except 2-9) or enter 0 by itself to quit.

258

alt

alu

Please enter your keypad combination (Please use no spaces, or any other characters except 2-9) or enter 0 by itself to quit.

4823

Please enter your keypad combination (Please use no spaces, or any other characters except 2-9) or enter 0 by itself to quit.

27753

apple

Please enter your keypad combination (Please use no spaces, or any other characters except 2-9) or enter 0 by itself to quit.

6667837

Please enter your keypad combination (Please use no spaces, or any other characters except 2-9) or enter 0 by itself to quit.

3463

Please enter your keypad combination (Please use no spaces, or any other characters except 2-9) or enter 0 by itself to quit.

0

Thank you! Have a good day!

Process finished with exit code 0

6. Damien Rodriguez, Ryan Bucherl