Binary Vs Linear

**Due: Thursday, 7/21 at 10:30AM EST**

**Description:**

This assignment will cover a very important step in almost any algorithm, searching. Searching may sound simple, but depending on the circumstances even a good computer scientists needs to think really hard about which variation of searching they can use and when it is most efficient

Topics that are covered in assignment are:

* Binary Search
* Linear Search
* Sorting
* Data Structures
* Pre-Processing

Today, we're going to work on a program that finds the appropriate data associated with our search criteria. In this lab, we’re looking at a state population dataset. This data set is a sorted of states and territories and their associated populations.

**Support Code:**

We’ve written a few functions for you. When you open up the file you will see that main() and getData() have already been written for you. To complete the assignment, most of your work will be done in getPopBinary(), getPopLinear, and getPopFaster(). However, for getPopFaster() you might have to change getData() a bit by adding a couple lines.

* Note that we have already created the functions for you, so all you have to do is implement them!
* The dataset states.txt contains a sorted set of states and territories along with their populations

**Your Task:**

Your goal is to implement the three functions getPopBinary(), getPopLinear, and getPopFaster(). There will be additional questions at the bottom of the file about these function that should be able to be answered in a few sentences each. Here is the recommended order of tasks, but feel free to mix it up if you would like!

1. Implement getPopLinear() using a linear search to find the correct population associated with the states. Be sure to keep a count of how many comparisons you do throughout this search.
2. Implement getPopBinary() using a binary search to find the correct population associated with the states. Be sure to keep a count of how many comparisons you do throughout this search.
3. Next, answer the questions at the bottom of the file for Linear Search and Binary Search. Feel free to include a doc/pdf of your answers, or write them as a comment. If you choose to include a doc or pdf just write a comment below the questions that says “See answers.pdf”
4. Once you are done with those implement getPopFaster() how ever you would like, but it needs to be faster than binary search (and faster than linear search by default).
5. Answer the questions about getPopFaster(). Again, Feel free to include a doc/pdf of your answers, or write them as a comment. If you choose to include a doc or pdf just write a comment below the questions that says “See answers.pdf”

**Files Given:**

states.txt – The dataset for the assignment that includes sorted states and their populations

BinaryVsLinear.py- source code for the assignment that include the functions you must implement

**Helpful Resources:**

* Here is a helpful video on understanding the difference between Linear Search and Binary Search. The video has great animations and gives a solidunderstanding of the two algorithms. https://youtube.com/watch?v=FBJKwjTwNTo
* For implementing getPopFaster() the solution I came up with uses very standard python data structures. This link explains some of the default data structures that python offers, and how to implement them  
  https://docs.python.org/3/tutorial/datastructures.html

**How to submit your lab:**

Submit through Replit