Programming assignment 1.

Due date: Saturday, February 22, 2020 at 11:59pm

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Implement *linearSearch(a,key)* and *binarySearch(a,key)* functions.

Part A. In this part we will calculate the **average-case running time** of each function.

1. Request the user to enter a positive integer, and call it **n**. (*n = 10⁵*)
2. Generate **n** random integers between *-1000* to *1000* and save them in array **a**.
3. Sort **a** (you can use any sorting algorithm you want.*)*
4. Pick a random number in **a** and save it in variable called **key**.
5. Call each function separately to search for the key in the given array.
6. To calculate the **average-running time**, you need to have a timer to save the total runtime when repeating step 4 and 5 for **100** times.

(***Note1***: Do not forget to divide the runtime by the number of the times you run step 4-5)

(***Note2***: Remember to choose a different random number each time you go back to step 4.)

Part B. In this part we will calculate the **worst-case running time** of each function.

1. Repeat steps **1 to 3** in part A.
2. Now to have the worst-case scenario, set the value of the key to **5000** to make sure it does not exist in the array.
3. Run each function **ONLY** *once* to calculate the **worst-case running time** when n = 10⁵.
4. Calculate how much time your machine takes to run **one** single line using only your <u>binary search</u> function. (***Hint***: look at HW4)
5. Now using the **previous** step, estimate the worst-case running time for each algorithm when **n=10¹⁵ (You do not need to run any of binary_search or linear_search functions. Just do a simple calculation in your code!** ***Hint***: **look at HW4).**