Programming assignment 1.

Suggested due date: Friday, October 5 2018 at 11:59pm

Remember:

You can remove all the variables from the workspace by writing "clear"

Look up the description of all the functions in MATLAB by typing doc in the command window.

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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**. ($n = 10^5$)
2. Generate **n** random integers between _-1000_ to _1000_ and save them in array **a**. _(You can use randi function in MATLAB)_
3. Sort **a** (you can use any sorting algorithm you want. If you are using MATLAB, you can call the _sort_ function to sort your numbers_)_
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. _(tic toc in MATLAB)_

(**_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 = 10^5**.
4. Calculate how much time your machine takes to run **one** single step using your binary search function. (**_Hint_**: look at HW3)
5. Now using the previous step, **write a code** to estimate the worst-case running time for each algorithm when **n=10^7** (**You are not allowed to use a timer in this step**). (**_Hint_**: look at HW3)