

PROG 20799

Quiz #5: Sorting & Searching

Prof. Georg Feil / Winter 2020

Working individually, complete the following programming question and hand in using SLATE when your professor indicates time is up (SLATE Assignments tab, Quiz 5). Attach your source files (.c and .h) individually. Do not use Zip or RAR.

This quiz is open book. You are allowed to use your notes and access these web sites:

- SLATE (slides and example programs)
- Our recommended and supplementary textbooks (Safari Online)

No other web sites are allowed. Please follow the C99 language standard, and use proper coding style and standards as you would for an assignment. Worth 2% of your grade. Marked out of 10 marks.

In this quiz you'll write a C program that searches for a specific value in a list of random numbers using binary search. Please follow these steps to write your program.

1. Declare an array size 1000 and fill it with random integers. Make the size a constant so you can change it easily. Important: At the start of the program you must initialize the random number generator like this to get a specific sequence of numbers:

```
srand(42); // Initialize random number generator, do this only once
```


Then to get each random number call the `rand()` function, which returns a random integer. Note you'll need to include **stdlib.h** to use these functions.
2. Sort the array in ascending order using `qsort()`. Remember you'll need a comparison function.
3. Incorporate the **binarySearch** function from my slides on searching into your program. This function returns the array index where the value was found, or -1 if it was not found.
4. **Change** the `binarySearch` function so that instead of the index it returns the number of steps needed to find the value (number of times around the loop), or -1 if it was not found.
5. Use binary search to find the number **18718** in your array. Print out how many steps were needed.
6. Do it for the following array sizes: 1000, 10000, and 100000. In the comments box when submitting your program write how many steps were needed for each of the array sizes (1000, 10000, 100000). Also show that the number of steps is less than \log_2 of the array size in each case. Recall: To calculate \log_2 take log of the number (using any base) and divide by the log of 2.

Please see the start of the page for submission instructions.