

## Lab 4

Q1. Consider the following sorted array:

`Double [ ] data = {1,4,6,7,9,10,14};`

- a) If using sequential search, how many comparisons (i.e. how many elements in the array do we need to examine) are needed to determine that 9 is in the array?
- b) If using sequential search, how many comparisons (i.e. how many elements in the array do we need to examine) are needed to determine that 11 is not in the array?

Q2. Fill in the blanks in the following code segment to implement sequential search of the given array. The method should return a boolean value indicating whether or not the parameter was found in the array.

```
public static boolean seqSearch(int s){  
  
    int[] a = {9, 12, 14, 3, 25};  
  
    for( int i = _____; _____; i++){  
  
        if ( _____ ){  
  
            return _____;  
        }  
    }  
    return _____ ;  
}
```

Q3. Use the quicksort algorithm to rearrange the following numbers into ascending order. Indicate clearly the pivots that you use. How many swap steps you need?

18 23 12 7 26 19 16 24

Q4.

A) A student is using a bubble sort to rearrange seven numbers into ascending order. Here correct solution is as follows:

Initial list: 18 17 13 26 10 14 24

After 1<sup>st</sup> pass: 17 13 18 10 14 24 26

After 2<sup>nd</sup> pass: 13 17 10 14 18 24 26

After 3<sup>rd</sup> pass: 13 10 14 17 18 24 26

After 4<sup>th</sup> pass: 10 13 14 17 18 24 26

After 5<sup>th</sup> pass: 10 13 14 17 18 24 26

Write down the number of comparisons and swaps on each of the five passes.

B) Find the maximum number of comparisons and the maximum number of swaps that might be needed in a bubble sort to rearrange seven numbers into ascending order.

Q5. Explain how Selection Sort works, give its average-case and worst-case efficiencies, and prove the worst-case efficiency.

Q6.

- a) Given that the average-case complexity for insertion sort is  $n^2 / 4$ , so on average, if input size is  $n=10^6$ , how many steps are required in order to complete the insertion process.

- b) Given that the average-case complexity for quicksort is  $2n \ln(n)$ , so on average, if input size is  $n=10^6$ , how many steps are required in order to complete the quicksort process.
- c) Compare two sorting method is a) and b) and state which one is faster and how many times?