CSSE 220 – Object-Oriented Software Development
Rose-Hulman Institute of Technology

Worksheet 19

Name (Print):_____ Section:_____

1. Express Cost in terms of BigO for ArrayList:

Operation	Cost
get(index) add(index, element) remove(index) size()	

2. A sorting algorithm is a systematic procedure for _____

3. _____ decides the new order of elements

4. Selection Sort has 2 parts: 1) _____ part at the beginning 2) _____ part is the rest of array

5. Suppose the selection sort algorithm from class is applied to the initial array:

9	5	7	10	18	1	12	8	16	4

In the boxes below, show the state of the array immediately following each of the first two iterations. Clearly mark the sorted part (with a vertical line) and the unsorted part of the array after each iteration for 1st, 2nd iterations. (Initially, the sorted part of the array is empty.)

0th iteration:

9	5	7	10	18	1	12	8	16	4

1st iteration:

2nd iteration:

6. Provide the definition for the profiling (empirical analysis): _____

7. Select which algorithm does Selection Sort follow (is similar/behaves like):
   1) O(N) 2) $O(N^2)$ 3) None

8. Review the code for Selection Sort:
   1). In selection sort, for an array of length n, how many times does the OUTER LOOP execute, in terms of n? _____

   2). In selection sort, for an array of length n, how many times is Comparison called during the FIRST iteration of the outer loop? _____

   3). ... during the SECOND iteration of the outer loop? _____

   4). ... during the SECOND-TO-LAST iteration of the outer loop? _____

   5). ... during the LAST iteration of the outer loop? _____

9. Formula for the number of times selectionSort() calls Comparison for an array size n:

   _____

10. Summary Table for Selection Sort:

Case	Number of Comparisons	BigO
Worst Average Best		

11. Suppose the insertion sort algorithm is applied to the initial array above. Show the state of the array immediately following each of the first three iterations of the outer loop. Clearly mark (as in 0th is alreday marked for you) the sorted part of the array after each iteration.

0^{st} iteration:

9	5	7	10	18	1	12	8	16	4

1^{st} iteration:

2^{nd} iteration:

3^{rd} iteration:

12. Summary Table for InsertionSort:

Case	BigO
Worst (reversed) Average Best (sorted)	

13. True/False Binary search must be sorted

14. Summary Table for Binary Search:

Case	BigO
Worst Best (ony one comparison is needed)	

15. What is run-time in terms of Big-O?

```
1  public static void function3(int[] array) {
2       for(int i = 1; i <= array.length; i++) {
3           for(int j = array.length; j >= 1; j = j / 2) {
4                if(array[i-1] <= array[j-1]) {
5                    array[j-1] = array[i-1];
6                }
7            }
8         }
9  }
10 //Runtime: _________________________
11
```

16. Summary Table for MergeSort:

Case	BigO
Worst Best	

17. Suppose the merge sort algorithm from class is applied to the initial array.

9	5	7	10	18	1	12	8	16	4

Show the state of the two sub-arrays immediately before the final merge.
