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Declaration:
I understand the meaning of academic dishonesty, in particular plagiarism, copyright infringement and collusion. I am aware of the consequences if found to be involved in these misconducts. I hereby declare that the work submitted for the "ITP4510 Data Structures & Algorithms" is authentic record of my own work.

Lab 4.2 – Sorting

2. Show the steps for sorting the integers 79, 48, 35, 23, 19, 11, 7, 3 by using the above five methods.

   i. **Selection Sort**

        79 48 35 23 19 11 7 3
        3 [48 35 23 19 11 7 79]
        3 7 [35 23 19 11 48 79]
        3 7 11 [23 19 35 48 79]
        3 7 11 19 [23 35 48 79]
        3 7 11 19 23 [35 48 79]
        3 7 11 19 23 35 [48 79]
        3 7 11 19 23 35 48 [79]

   ii. **Bubble sort**

        79 48 35 23 19 11 7 3
        [48 35 23 19 11 7 3] 79
        [35 23 19 11 7 3] 48 79
        [23 19 11 7 3] 35 48 79
        [19 11 7 3] 23 35 48 79
        [11 7 3] 19 23 35 48 79
        [7 3] 11 19 23 35 48 79
        [3] 7 11 19 23 35 48 79
        3 7 11 19 23 35 48 79

   iii. **Insertion sort**

        79 48 35 23 19 11 7 3
        [48 79] 35 23 19 11 7 3
        [35 48 79] 23 19 11 7 3
        [23 35 48 79] 19 11 7 3
        [19 23 35 48 79] 11 7 3
        [11 19 23 35 48 79] 7 3
        [7 11 19 23 35 48 79] 3
        [3 7 11 19 23 35 48 79]

   iv. **Merge sort**

        {79 48 35 23 19 11 7 3}
        {79 48 35 23} {19 11 7 3}
        {79 48} {35 23} {19 11} {7 3}
        {79} {48} {35} {23} {19} {11} {7} {3}
        {48 79} {23 35} {11 19} {3 7}
        {23 35 48 79} {3 7 11 19}
        {3 7 11 19 23 35 48 79}

v. Quick sort (1 round only, with 1st element as pivot)

index	0	1	2	3	4	5	6	7		storeIndex
data	79	48	35	23	19	11	7	3		1
Step 1	79	48	35	23	19	11	7	3		2
Step 2	79	48	35	23	19	11	7	3		3
Step 3	79	48	35	23	19	11	7	3		4
Step 4	79	48	35	23	19	11	7	3		5
Step 5	79	48	35	23	19	11	7	3		6
Step 6	79	48	35	23	19	11	7	3		7
Step 7	79	48	35	23	19	11	7	3		8
Step 8 (swap pivot)	3	48	35	23	19	11	7	79		8

3. Fill in the following table:

Performance (# of comparisons)
with original data (in O-notation)

Sorting algorithms	Data is in random order	Data is in ascending order(Guess)	Data is in descending order	In place? (yes or no)
Selection	$O(n^2)$	$O(n^2)$	$O(n^2)$	yes
Bubble	$O(n^2)$	$O(n)$	$O(n^2)$	yes
Insertion	$O(n^2)$	$O(n)$	$O(n^2)$	yes
Merge	$O(n \lg n)$	$O(n \lg n)$	$O(n \lg n)$	no
Quick	$O(n \lg n)$	$O(n^2)$	$O(n^2)$	yes

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