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# 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(n2)** | **O(n2)** | **O(n2)** | yes |
| **Bubble** | O(n2) | O(n) | O(n2) | yes |
| **Insertion** | O(n2) | O(n) | O(n2) | yes |
| **Merge** | O(n lg n) | O(n lg n) | O(n lg n) | no |
| **Quick** | O(n lg n) | O(n2) | O(n2) | yes |

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