

Exercises: Sorting - solutions

Exercise 1

- a. Sort the sequence 3, 1, 4, 1, 5, 9, 2, 6, 5 using insertion sort. Note, you must be able to account for any state of the sorting algorithm.

For solutions, go to [this](#) website and insert the array.

- b. What is the running time of insertion sort if all elements are equal? Explain.

$O(N)$, because the while loop terminates immediately.

Exercise 2

Sort 3, 1, 4, 1, 5, 9, 2, 6, 5, 3, 5 using mergesort. Note, you must be able to account for any state of the sorting algorithm.

For solutions, go to [this](#) website and insert the array.

Exercise 3

Do exercises [1a](#) and [2](#) for Bubble Sort, i.e. do Bubble Sort using those arrays.

For solutions, go to [this](#) website and insert the array.

Exercise 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
28	6	12	16	15	27	13	5	21	25	1	19	2	17	10

State the result of using `Partition(A, 2, 12)` on the array above.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
28	6	12	16	15	13	5	1	19	27	21	25	2	17	10
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	2	5	6	10	12	13	15	16	17	19	21	25	27	28
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
28	6	12	16	15	13	5	1	19	25	27	21	2	17	10
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
28	1	5	6	12	13	15	16	19	21	25	27	2	17	10

☐ A

☐ B

☒ C

☐ D

Exercise 5

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
11	19	6	30	15	25	10	8	28	1	24	29	22	17	12

State the result of using `Partition(A, 4, 14)` on the array above.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
11	19	6	15	10	8	1	17	28	30	24	29	22	25	12	<input checked="" type="checkbox"/>
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
11	19	6	15	10	8	1	17	30	25	28	24	29	22	12	<input type="checkbox"/> B
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1	6	8	10	11	12	15	17	19	22	24	25	28	29	30	<input type="checkbox"/> C
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
11	19	6	1	8	10	15	17	22	24	25	28	29	30	12	<input type="checkbox"/> D

Exercise 6

Assume we are using MERGE-SORT to sort the following array:

1	2	3	4	5	6	7	8
3	7	1	2	8	9	4	6

For each of the pair of elements, determine whether MERGE-SORT applied to the above array will compare the two elements when executing.

		Yes	No
<input type="text" value="3"/>	<input type="text" value="6"/>	<input type="radio"/>	<input checked="" type="radio"/>
<input type="text" value="4"/>	<input type="text" value="7"/>	<input checked="" type="radio"/>	<input type="radio"/>
<input type="text" value="6"/>	<input type="text" value="9"/>	<input type="radio"/>	<input checked="" type="radio"/>
<input type="text" value="2"/>	<input type="text" value="3"/>	<input checked="" type="radio"/>	<input type="radio"/>

Exercise 7

Sort 3, 1, 4, 1, 5, 9, 2, 6, 5, 3, 5 using quicksort.

We only track changes here in the solution:

3	1	4	1	5	9	2	6	5	3	5
3	1	4	1	5	2	9	6	5	3	5
3	1	4	1	5	2	5	6	9	3	5
3	1	4	1	5	2	5	3	9	6	5
3	1	4	1	5	2	5	3	5	6	9
3	1	1	4	5	2	5	3			
3	1	1	2	5	4	5	3			
3	1	1	2	3	4	5	5			
1	3	1	2							
1	1	3	2							
1	1	2	3							
1	1	2	3	3	4	5	5	5	6	9