Worksheet: Module 4

CS 315: Data Structures and Algorithms

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Problem #1:

Given the data: 3, 12, 44, 99, 72, 33, 11, 18, 65, 42

Sort the data and draw out a trace of the execution using *Merge Sort*.

Step Instruction (Swap values refer to the actual values themselves, not the index).

- 0 merge(arr, 0, 0, 1) Right Subarray: Swapping 12 12
- 1 merge(arr, 0, 1, 2) Right Subarray: Swapping 44 44
- 2 merge(arr, 3, 3, 4) Left Subarray: Swapping 99 72
- 3 merge(arr, 0, 2, 4) Right Subarray: Swapping 72 72, Right Subarray: Swapping 99 99
- 4 merge(arr, 5, 5, 6) Left Subarray: Swapping 33 11
- 5 merge(arr, 5, 6, 7) Left Subarray: Swapping 33 18
- 6 merge(arr, 8, 8, 9) Left Subarray: Swapping 65 42
- 7 merge(arr, 5, 7, 9) Right Subarray: Swapping 42 42, Right Subarray: Swapping 65 65
- 8 merge(arr, 0, 4, 9) Left Subarray: Swapping 72 42, Left Subarray: Swapping 99 65

Final: 3 11 12 18 33 42 44 65 72 99

Problem #2:

Given the data: 8, 6, 7, 5, 3, 0, 9, 99, 44, 100, 11

Sort the data and draw out a trace of the execution using *Merge Sort*.

Step Instruction (Swap values refer to the actual values themselves, not the index).

- 0 merge(arr, 0, 0, 1) Left Subarray: Swapping 8,6
- 1 merge(arr, 0, 1, 2) Left Subarray: Swapping 8,7
- 2 merge(arr, 3, 3, 4) Left Subarray: Swapping 5,3
- 3 merge(arr, 3, 4, 5) Left Subarray: Swapping 5,3
- 4 merge(arr, 0, 2, 5) Left Subarray: Swapping 5,0 & Swapping 7,3 & Swapping 8, 5
- 5 merge(arr, 6, 6, 7) Right Subarray: Swapping 99,99
- 6 merge(arr, 6, 7, 8) Left Subarray: Swapping 99, 44
- 7 merge(arr, 9, 9, 10) Left Subarray: Swapping 100, 11
- 8 merge(arr, 6, 8, 10) Right Subarray: Swapping 100, 100
- 9 merge(arr, 0, 5, 10) Right Subarray: Swapping 9,9 & Swapping 11,11 & Swapping
- 44,44 & Swapping 99, 99 Swapping 100

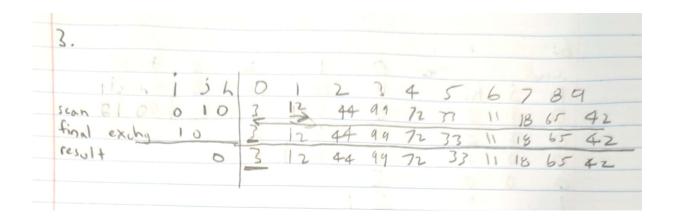
Final: 0 3 5 6 7 8 9 11 44 99 100

Problem #3:

Given the data: 3, 12, 44, 99, 72, 33, 11, 18, 65, 42

Partition the array using the first index as the pivot value v using the Partition algorithm.

- a. Trace your execution
- b. Label and show your final array with pivot location labeled
- c. Write out the index of j the pivot.



Problem #4:

Given the data: 8, 6, 7, 5, 3, 0, 9, 99, 44, 100, 11

Partition the array using the first index as the pivot value v using the Partition algorithm.

- a. Trace your execution
- b. Label and show your final array with pivot location labeled
- c. Write out the index of j the pivot.

4,	1	i	0	1	2	3	4	5	67	. 8	a	10
scan	0	11	8	6	7	5	3	D	9 99	44	100	111
final exchy	6	5	6	6	7	5	3	8	9 94	44	100	11
result 1		5	0	6	7	5	3	8	9 9 9	44	100	11

Problem #5:

Given the data: 11, 38, 42, 8, 6, 5

Partition the array using the first index as the pivot value v using the Partition algorithm.

a. Trace your execution

b. Label and show your final array with pivot location labeled

c. Write out the index of j the pivot.

	i	j	6		2	3	4	5		
	0	6	11	38	42	8	6	5		
Scan	1	5	11	38				5		
exchy		15	11	5				38		
Scan	2	4	11	5	42	8	6	38		
exchq	2	4	11	5	6		42	38		
can	4	3	11	5	6	8	42	38		
final excha	4	3	8	5	6	11	42	38		
result		3	3	-	6	11	4-7	38		-

Problem #6:

Given the data: 11, 38, 42, 8, 6, 5

Trace the execution of quicksort. You do not need to sort your array initially as shown in the book (this helps me grade).

10	<u>.</u> 3	hi 5	011	38	42	8	4 6	5 5 38
00	2	2	5	6	8			
0	0	0	5					
2		2		6	8		12	
4	+	5					38	38
5		5						4-2
resul	+		5	6	8	11	38	42