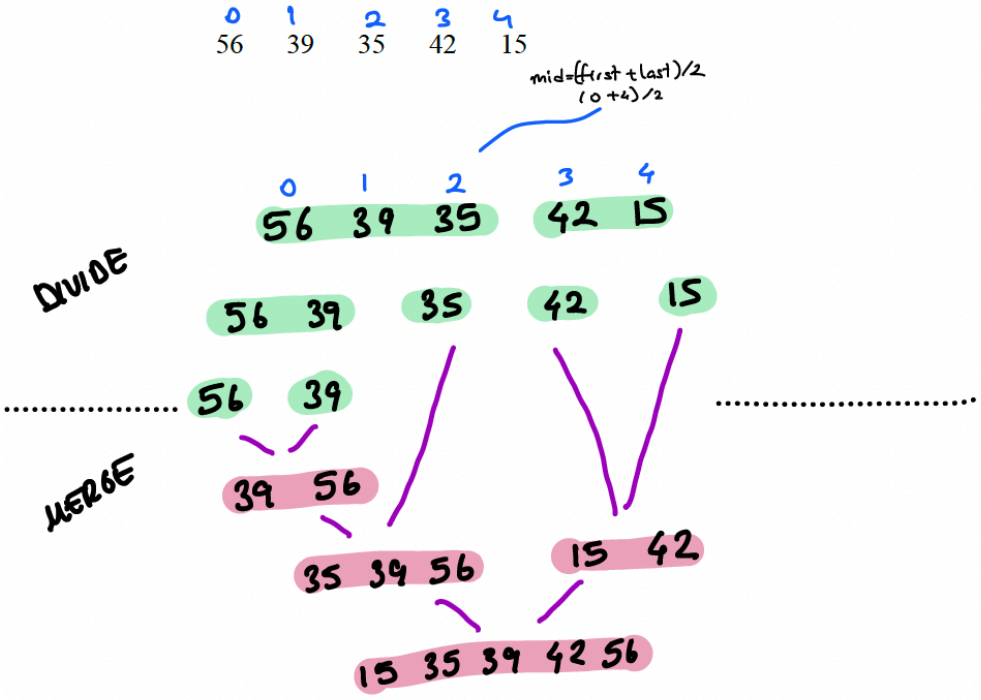
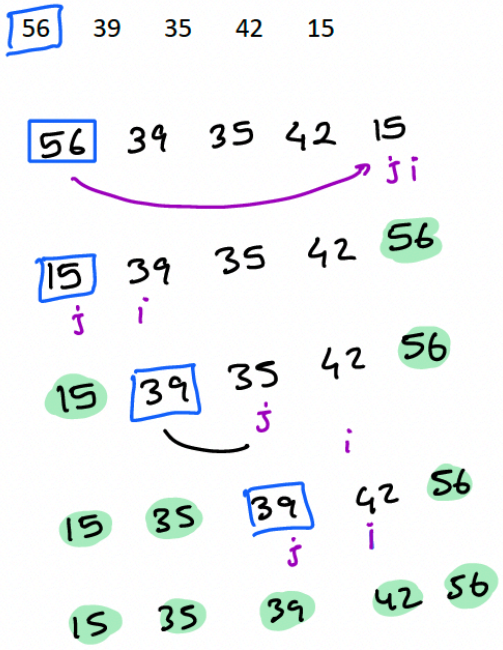
CS 300 Data Structures
Problem Set #12 – Faster Sorting Algorithms

1. What are the correct intermediate steps of the following data set when it is being sorted with the Merge sort?



2. What are the correct intermediate steps of the following data set when it is being sorted with the Quick sort?

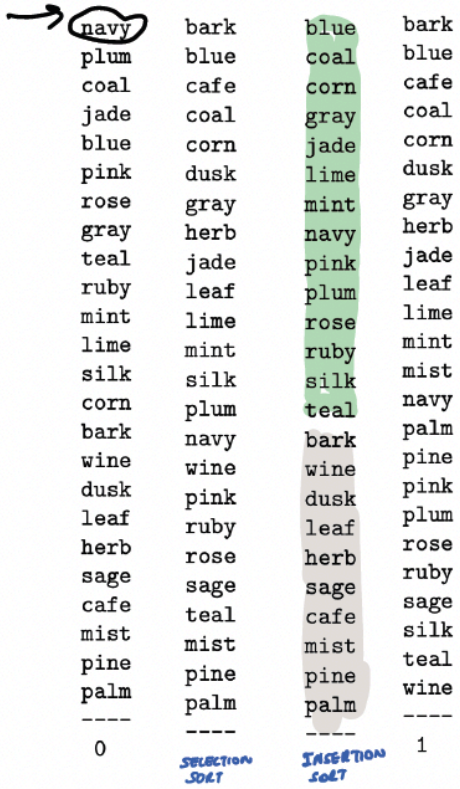


3. The column on the left is the original input of strings to be sorted; the column on the right is the content at some intermediate step during one of the sorting algorithms listed below. Which sorting algorithm would match with this content?

0	cyan	bole
1	cafe	bone
2	ruby	cafe
3	bole	cyan
4	flax	flax
5	bone	rose
6	rose	ruby
7	sage	sage
8	fawn	bark
9	leaf	buff
10	gold	fawn
11	jade	gold
12	lava	gray
13	bark	jade
14	gray	lava
15	buff	leaf
16	kobi	aqua
17	cyan	cyan
18	dust	dust
19	silk	kobi
20	palm	mint
21	sand	palm
22	aqua	sand
23	mint	silk
	Original array	**?**

MERGE-SORT

4. The column on the left is the original input of strings to be sorted or shuffled; the column on the right are the string in sorted order; the other columns are the contents at some intermediate step during one of the 8 algorithms listed below. Match up each algorithm by writing its number under the corresponding column. Use each number exactly once.



navy	bark	blue	bark
plum	blue	coal	blue
coal	cafe	corn	cafe
jade	coal	gray	coal
blue	corn	jade	corn
pink	dusk	lime	dusk
rose	gray	mint	gray
gray	herb	navy	herb
teal	jade	pink	jade
ruby	leaf	plum	leaf
mint	lime	rose	lime
lime	mint	ruby	mint
silk	silk	silk	mist
corn	plum	teal	navy
bark	navy	bark	palm
wine	wine	wine	pine
dusk	pink	dusk	pink
leaf	ruby	leaf	plum
herb	rose	herb	rose
sage	sage	sage	ruby
cafe	teal	cafe	sage
mist	mist	mist	silk
pine	pine	pine	teal
palm	palm	palm	wine
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0	SELECTION SORT	INSERTION SORT	1

2) Selection Sort 3)Insertion Sort 4)Merge Sort 5)Quick Sort

5. Which sorting algorithm will take least time when all elements of input array are identical? Consider typical implementations of sorting algorithms.

a. Insertion Sort $O(N)$
b. Quick Sort $O(N \log N)$
c. Merge Sort $O(N \log N)$
d. Selection Sort $O(N^2)$

6. Which of the following sorting algorithms has the lowest worst-case complexity?

a. Merge Sort $O(N \log N)$
b. Insertion Sort $O(N^2)$
c. Quick Sort $O(N^2)$
d. Selection Sort $O(N^2)$

7. Suppose we are sorting an array of eight integers using quicksort, and we have just finished the first partitioning with the array looking like this:

2 5 1 7 9 12 11 10

Which statement is correct?

a. The pivot value could be either the 7 or the 9
b. The pivot could be the 7, but it is not the 9
c. The pivot is not the 7, but it could be the 9
d. Neither the 7 not the 9 is the pivot