Review 7

1. Illustrate the operation of COUNTING-SORT on the array A={6,2,1,3,1,3,2}.

A	6	2	1	3	1	3	2

	1	2	3	4	5	6
C	2					1

	1	2	3	4	5	6
C	2					7

	1	2	3	4	5	6	7
B				2			

	1	2	3	4	5	6
C	2	3	6	6	6	7

	1	2	3	4	5	6	7
B							

	1	2	3	4	5	6
C						

	1	2	3	4	5	6	7
B							

	1	2	3	4	5	6
C						

	1	2	3	4	5	6	7
B							

	1	2	3	4	5	6
C						

⋮

2. Fill in the following RADIX-SORT example.

COW		SEA				
DOG		MOB				
SEA		TAB				
RUG		DOG				
ROW		RUG				
MOB		BAR				
BOX		EAR				
TAB	⇨	TAR	⇨		⇨	
BAR		COW				
EAR		ROW				
TAR		BOX				

3. Stack depth for quicksort

```
TAIL-RECURSIVE-QUICKSORT($A, p, r$)
    while $p < r$
        // Partition and sort left subarray
        $q$ = PARTITION($A, p, r$)
        TAIL-RECURSIVE-QUICKSORT($A, p, q - 1$)
        $p = q + 1$
```

a. Argue that TAIL-RECURSIVE-QUICKSORT(A, 1, $A.length$) correctly sorts the array A.

b. Describe a scenario in which TAIL-RECURSIVE-QUICKSORT′s stack depth is $\Theta(n)$ on n-element input array.

c. Modify the code for TAIL-RECURSIVE-QUICKSORT so that the worst-case stack depth is $\Theta(\lg n)$. Maintain the $O(n \lg n)$ expected running time of the algorithm.