RADIX SORT

Given Array (a) :

	237	146	259	348	152	163	235	48	36	62
index:	0	1	2	3	4	5	6	7	8	9

Process to Follow :

Step 1 : Find the max element from the array. Hence find the length of that element.

Step 2 : All the other elements less than the max element, put 0 in front of them to make them the same length of max element if needed.

Step 3 : Create a bin having size 10 (since in this eg. we are dealing with integers) and assign each bin[i] = NULL where $0 \leq i \leq 9$.

Step 4 : Start traversing the given array and check the last digits. Put them in respective bins, i.e. if 259 is the no. we check last digit i.e. 9. Put the value in bin[9].

Step 5 : Start popping the values from the bins starting from bin[0] to bin[9] and update our array.

Step 6 : Repeat Step 4 and Step 5, but with a little change in Step 4. In the 2nd iteration, all the second digits of the values will be checked. In 3rd iteration, all the third digits and so on. The iteration will be done to a maximum of length of the max element.

Time Complexity :

Time taken : we are copying all the elements from bin to the array in each iteration.
Suppose length of array = n. So each iteration 'n' copies are made.
Now, how many times this process is repeated is actually the length of max element, suppose 'd'.

$\therefore$ $T(n) = O(dn) = O(n)$ since we can treat 'd' as constant.

	237	146	259	348	152	163	235	48	36	62
index:	0	1	2	3	4	5	6	7	8	9

Max element = 348. Length (348) = 3.

Let's modify our array as per the rules written in prev. page.

	237	146	259	348	152	163	235	048	036	062
index:	0	1	2	3	4	5	6	7	8	9

Iteration - 1 (Check the last digit)

Bin :	0	1	2	3	4	5	6	7	8	9
			152	163		235	146	237	348	259
			062				036		048	

Array :	152	062	163	235	146	036	237	348	048	259
	0	1	2	3	4	5	6	7	8	9

Iteration - 2 (Check the second-last digit)

Bin :	0	1	2	3	4	5	6	7	8	9
				235	146	152	062			
				036	348	259	163			
				237	048					

Array :	235	036	237	146	348	048	152	259	062	163
	0	1	2	3	4	5	6	7	8	9

Iteration - 3 (Check the third last / first digit)

Bin :	0	1	2	3	4	5	6	7	8	9
	036	146	235	348						
	048	152	237							
	062	163	259							

Array :	036	048	062	146	152	163	235	237	259	348
	0	1	2	3	4	5	6	7	8	9

Sorted Array!