PROBLEM INTRODUCTION:

Counting Sort is a sorting algorithm that is performed on numbers within the given range. It performs sorting in a linear time as it has no comparisons.

ALGORITHM STEPS:

REQUIRED INPUTS: An unsorted array of integers within a certain range. A temporary counting array to hold the cumulative counts of elements of the input array.

OUTPUT: The sorted array of given elements

CORE STRATEGY:

The Counting sort reduces the logarithmic time complexity to linear time by removing the comparisons between elements. It always performs counting of the number of occurrences of each element within a specified range. The order of occurrences of duplicate elements is always maintained in counting sort.

STEPS:

1. Take the unsorted array as input.
2. Compute the maximum of given elements.
3. Declare a counting array of size equal to the maximum of the given input.
4. Assign all the elements of the counting array to zero
5. Repeat step 6 for all elements of the input array.
6. Take the element of the counting array at index equal to the element of the input array and increment it by one.
7. Out of the counting array, compute the cumulative counting array.
8. Repeat step 9 for all elements of the input array.
9. Take the element of the cumulative counting array at an index equal to the element of the input array and at the obtained index, in the output array, insert the input element and decrement the element count inside the cumulative counting array by 1.
10. The resultant output array will give the sorted order of elements.

TIME AND SPACE COMPLEXITY: The counting sort takes the linear time i.e, For sorting n elements with the maximum element as k, it takes the time of O(n+k).