

a)

Pseudocode for Counting Sort:

1. **Input:** Array A of size n, with integers in the range [0,k].
2. **Output:** Sorted array B.

Algorithm:

COUNTING-SORT(A, B, k):

1. Create an array C[0...k], initialized to 0.
2. for i = 1 to length[A]:
 $C[A[i]] = C[A[i]] + 1$
3. for i = 1 to k:
 $C[i] = C[i] + C[i-1]$
4. for j = length[A] downto 1:
 $B[C[A[j]]] = A[j]$
 $C[A[j]] = C[A[j]] - 1$

- A: Input array.
 - B: Output array.
 - C: Count array (auxiliary).
 - k: Maximum value in A.
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b)

Time Complexity

1. Initializing array C: $O(k)$.
2. Populating C: $O(n)$.
3. Computing cumulative sums in C: $O(k)$.
4. Constructing the output B: $O(n)$.

Overall Complexity: $O(n+k)$.

- n : Number of elements in A .
- k : Range of values in A .