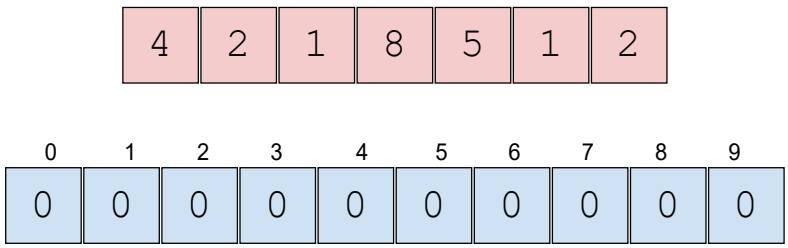
Introduction to Counting Sort

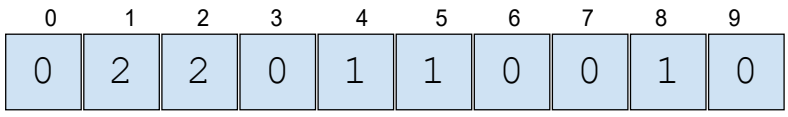
Counting sort is a sorting algorithm that works by calculating the positions of each element in the output sequence. (Reading time: 4 minutes)

This algorithm first calculates how many times the same item occurs, and then adds all the values. We start off with the array we want to sort and initialize an index array. In this index array, we first store the number of times a particular value occurs in the array we want to sort.



Let's say that we know that all values will be between 0 and 9. We initialize the index array that is 10 elements long. In here, we will store the occurences of the elements.

1 of 8



After looping over the array, we fill the index array with the occurrences of the elements. In the array we want to sort, we have two 1, two 2, one 4, one 5, and one 8!

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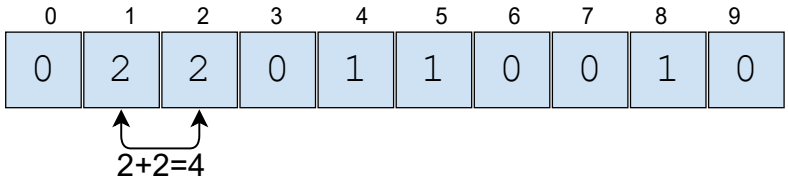
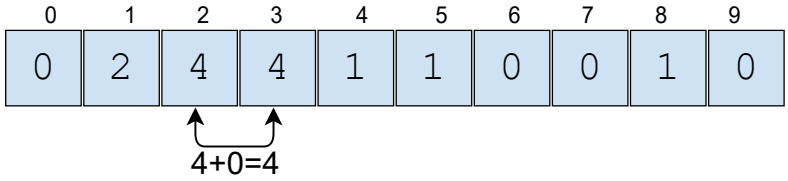
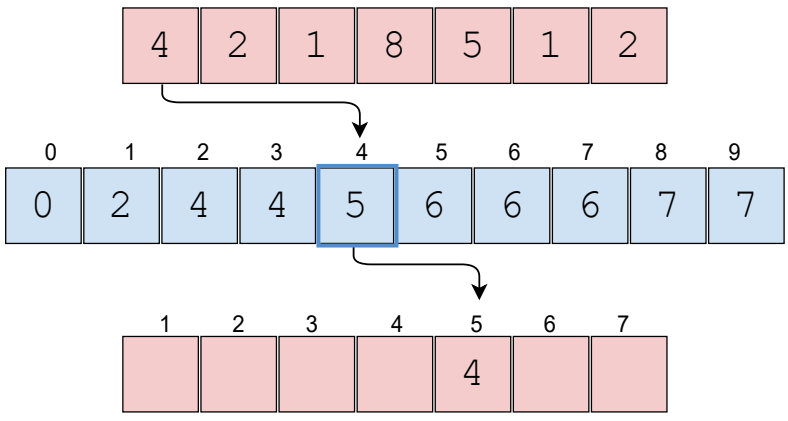


When we have the entire array with all the occurrences, we now add all values with their previous values. The element on index 1 stays the same, because 0+2 is still 2. However, the element in the second index becomes 4, as 2+2 is 4.

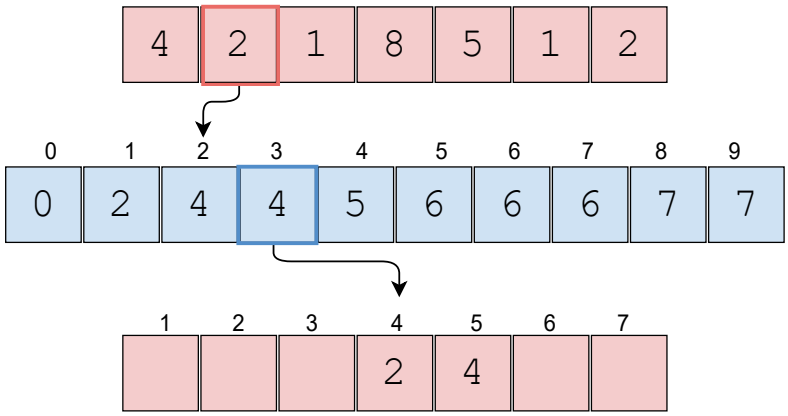


We move on to the next element, the element on index 3, which is 0. 4+0 is 4, so this becomes 4, and so on. The reason you do this, is to figure out how big the length of our sorted array will be.

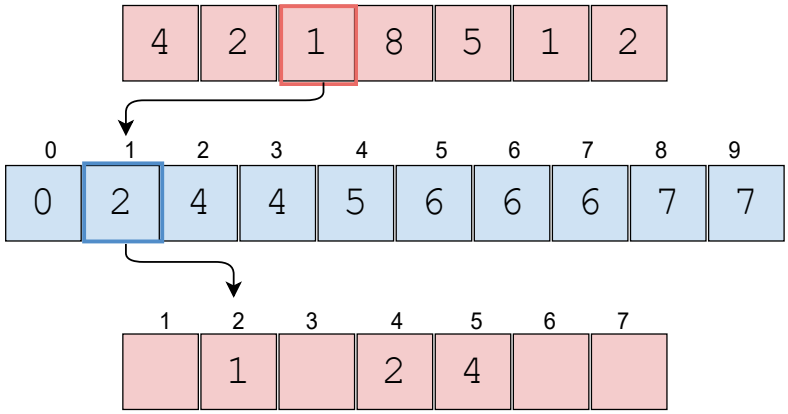


It's time to place the items in the right order. We do this by looping over the original array. The value of the element in the original array, is the index in the index array. The value in the index array is the new index in the sorted array. We have our element with the value 4, so we check the index array at index 4. Here, the value is 5. 5 is the new index of the element 4 in the index array, so we put the element with value 4 on index 5. After doing this, we decrement the value of the

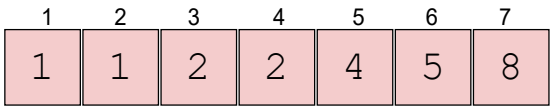
element on index 4 in the index array. In the next example, the elements value on index 4 is decremented by one.



We move to the next element in the array. We place the value of the element on the index with the value of the index array, which is 4 in this case.



We decrement the value again, and move on to the next element. We keep on doing this, until we have the sorted array.



We move to the next element in the array. We place the value of the element on the index with the value of the index array, which is 4 in this case.

In the next lesson, I will talk about the implementation of this algorithm.