ICS211 Section 3, Dutch-Flag Exercise

You are given an integer n>1 and a one-dimensional array [0 . . .n-1] of integers with given values restricted to 3 distinct integers 1, 2, and 3 where 1 represents red, 2 represents white, and 3 represents blue. You are to write a method segment that rearranges the values in the array such that all the 1's that represent red values precede all the 2's that represent white values, which in turn precede all the 3's that represent blue values.

Your segment must carry out this task in a single loop or scan of the array. On entry of n >= 1, the array holds a mixture of the values 1, 2, and 3 that represent red, white and blue values. On exit the values in the array are rearranged so that all 1's (red values) precede all 2's (white values) that precede all 3's (blue values).

In your solution strategy, consider that no assumptions are made concerning the presence of any one of the numbers representing the 3 color values. In particular, your method segment must perform correctly if n = 1 or 2, when all 3 colors can't be represented.

Initial Situation
On entry

Mixture of integers 1, 2 and 3 representing the colors red, white, and blue

On exit

red	white	blue

If your solution does not examine every element of the array, there may be at least one element out of order. One simple way of ensuring this is to scan each element of the array from left to right and relocate it according to its color. This result can be achieved by switching 1 or 2 elements.

If the color value represents blue, it is already in the correct place. If the color value represents white or red, you need to make room in the correct place in the array for the element. If the value represents the color white interchange it with the first value that represents the color blue. If the value represents the color red interchange it with the first value that represents the color white. You will need to keep track of the positions for the First White and First Blue elements to do this.

	First White		First Blue		i	
red		white		blue		mixture

Consider these cases of the rearranged array and draw the before and after the switch diagrams if:

1. There is at least one white
2. There are no whites but at least one blue
3. There are no whites and no blues