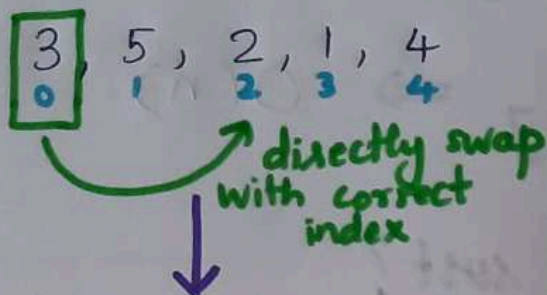


Cyclic Sort:

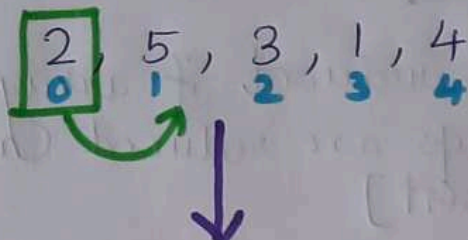
* When given numbers are from range 1 to N, use cyclic sort.

eg \Rightarrow

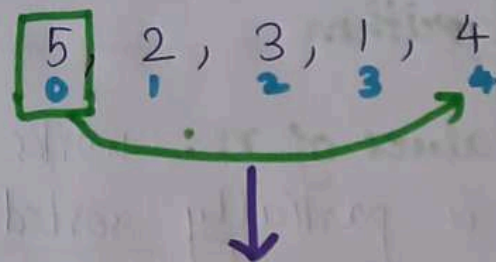
① swap with index 2
 $\Rightarrow 3 - 1 = 2$
value index



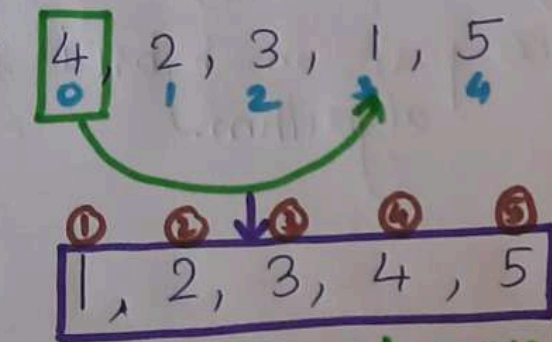
② swap with index 1
 $\Rightarrow 2 - 1 = 1$
value index



③ swap with index 4
 $\Rightarrow 5 - 1 = 4$
value index



④ swap with index 3
 $\Rightarrow 4 - 1 = 3$
value index



Here, all the elements are again compared and since, they are at correct position.

Array is sorted!!

Comparisons \Rightarrow 4 swaps made + 5 swaps (marked with brown)

$$\Rightarrow (n-1) + n$$

$$\Rightarrow (2n-1) \text{ swaps.}$$

Time Complexity $\Rightarrow O(2n-1)$

$$\Rightarrow \underline{O(n)}$$

We know,

$$1, 2, 3, 4, 5$$

$$\text{index} = \text{value} - 1$$

$$4 - 1$$

at 3 \rightarrow index
we have value 4
This is because index start from 0.