* Rotate array :-

→ We have to rotate the input array to the right by k steps.

→ k is always +ve.

→ Do it in-place without any extra space.

Eg:- nums = [1, 2, 3, 4, 5, 6, 7]   k = 3 $1 \le n \le 10^5$

o/p = [5, 6, 7, 1, 2, 3, 4]

* Generic approach towards rotating an array

arr = [1, 2, 3, 4]   -ve k indicates left rotation

k = 0	[1, 2, 3, 4]	k = 0	[1, 2, 3, 4]
k = 1	[4, 1, 2, 3]	k = -1	[2, 3, 4, 1]
k = 2	[3, 4, 1, 2]	k = -2	[3, 4, 1, 2]
k = 3	[2, 3, 4, 1]	k = -3	[4, 1, 2, 3]
k = 4	[1, 2, 3, 4]	k = -4	[1, 2, 3, 4]
k = 5	[4, 1, 2, 3]	k = -5	[2, 3, 4, 1]
k = 6	[3, 4, 1, 2]	k = -6	[3, 4, 1, 2]

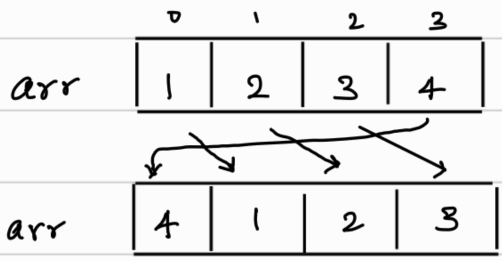
→ We see that k = 0, k = 4 & k = -4 produce the same result, irrespective of the rotation direction.

→ Similarly, k = -2, k = -6, k = 2 & k = 6 produce same results.

∴ For large values of k,

k = k % arr.length

* Rotate right :-



We need to store the last element somewhere in order to prevent it from getting overwritten.

→ After storing the last element, shift all elements to right once.

→ Doing this k times will eventually rotate array right by k times.

```
k = k % n;
for (int i=1; i<=k; i++) {
    int lastElement = arr[arr.length-1];
    for (int j= arr.length-1; j>=1; j--) {
        arr[j] = arr[j-1];
    }
    arr[0] = lastElement;
}
```

* Rotate left :-

	0	1	2	3
arr	1	2	3	4

arr	4	1	2	3

We need to store the first element somewhere in order to prevent it from getting overwritten.

→ Approach will be similar as previous, just do left shifting.

Time complexity :- $O(k \times n)$

Space complexity :- $O(1)$

* Optimal approach :-

→ Reuse the reverse array logic.

- Rotate right :-

arr = [1, 2, 3, 4]   k = 3

reverse arr = [4, 3, 2, 1]

reverse 0 to k-1 = [2, 3, 4, 1]

reverse k to n-1 = [2, 3, 4, 1]

arr = [1, 2, 3, 4, 5]   k = 6 ($k \% n = 1$)

reverse arr = [5, 4, 3, 2, 1]

reverse 0 to k-1 = [5, 4, 3, 2, 1]

reverse k to n-1 = [5, 1, 2, 3, 4]

- Rotate left :-

arr = [1, 2, 3, 4, 5] $k = 3$

reverse of arr = $\begin{array}{c} \begin{matrix} 0 & 1 & 2 & 3 & 4 \end{matrix} \\ [5, 4, 3, 2, 1] \end{array}$

reverse $n-k$ to $n-1$ = $\begin{array}{c} \begin{matrix} 0 & 1 & 2 & 3 & 4 \end{matrix} \\ [5, 4, 1, 2, 3] \end{array}$

reverse 0 to $n-k-1$ = [4, 5, 1, 2, 3]

arr = [1, 2, 3, 4] $k = 3$

$\begin{array}{c} \begin{matrix} 0 & 1 & 2 & 3 \end{matrix} \\ [4, 3, 2, 1] \end{array}$

[4, 1, 2, 3]

[4, 1, 2, 3] //