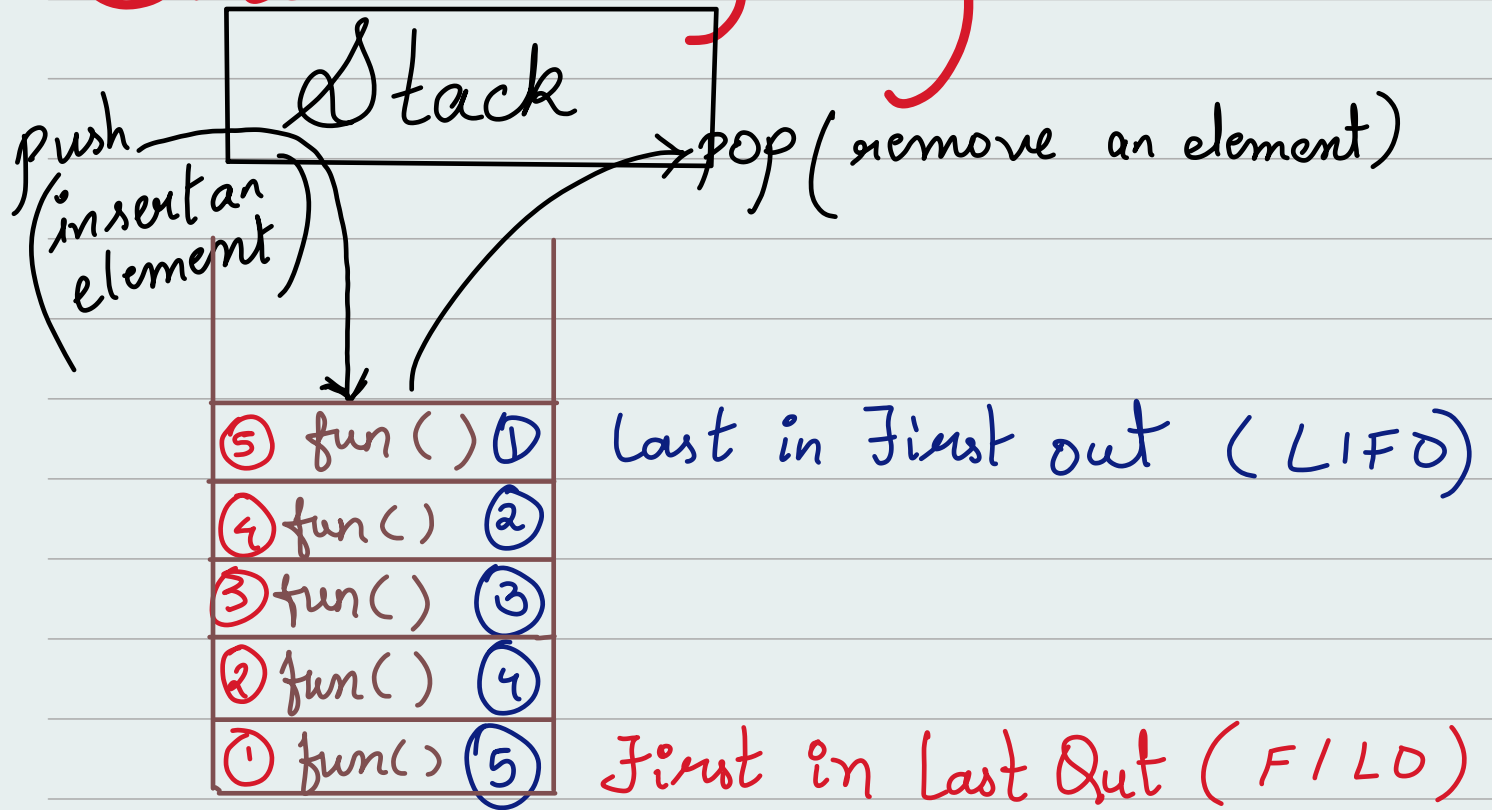
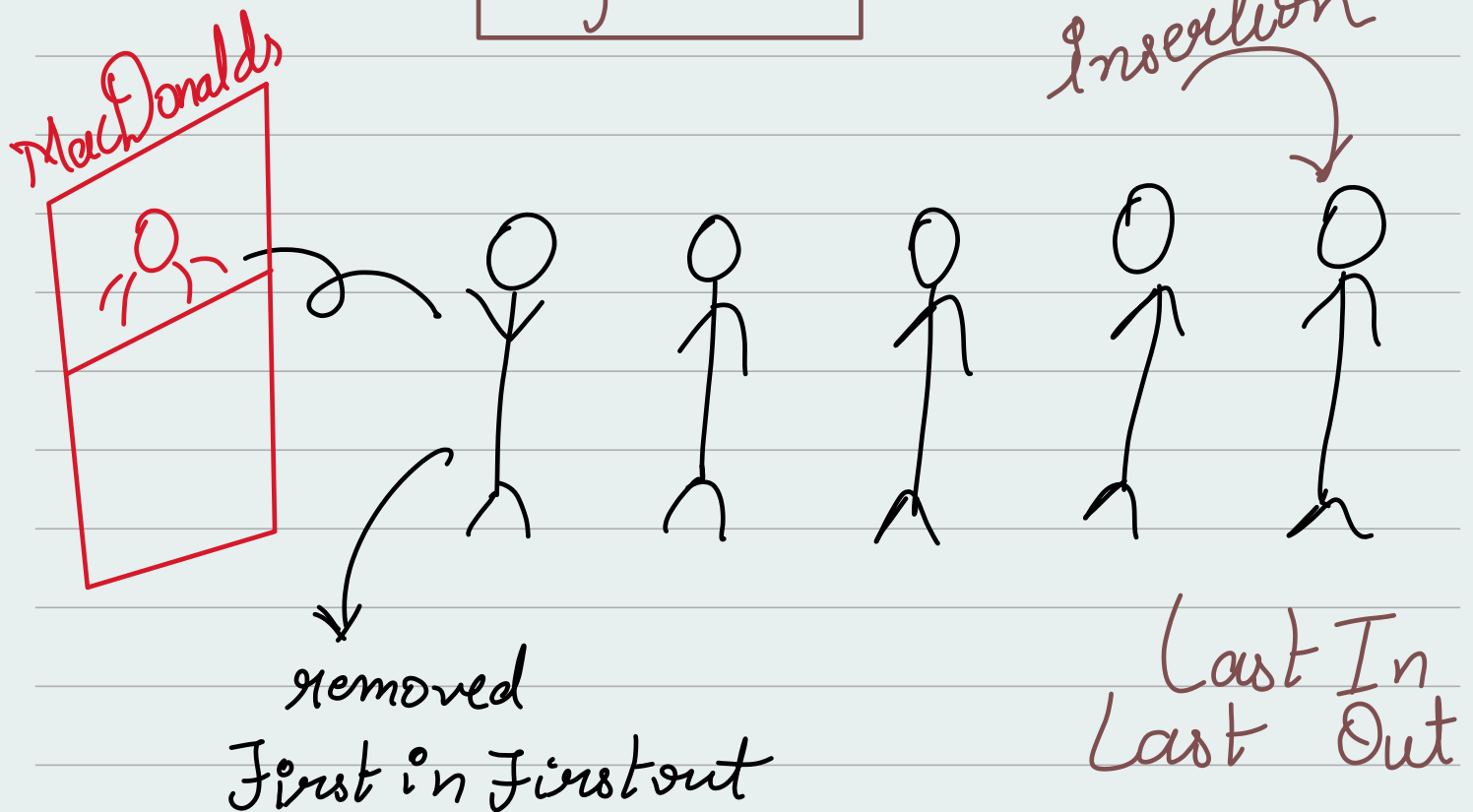


Stack & Queues :-



Queues

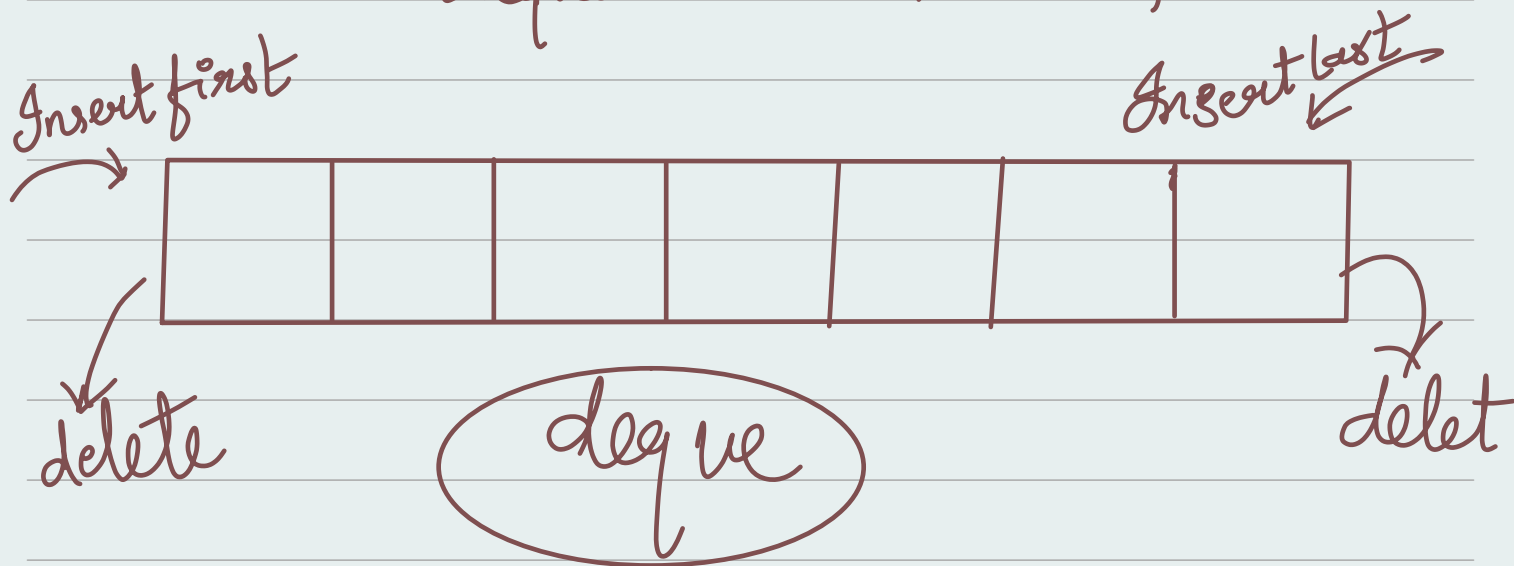


```
Queue<Integer> queue = new LinkedList<>();
```

Deque : Counter on both the sides we can insert & remove elements from both the sides.

```
Deque<Integer> deque = new ArrayDeque<>();
```

```
deque.add(10);  
deque.addLast(78);  
deque.removeFirst();
```



* Custom Stack.

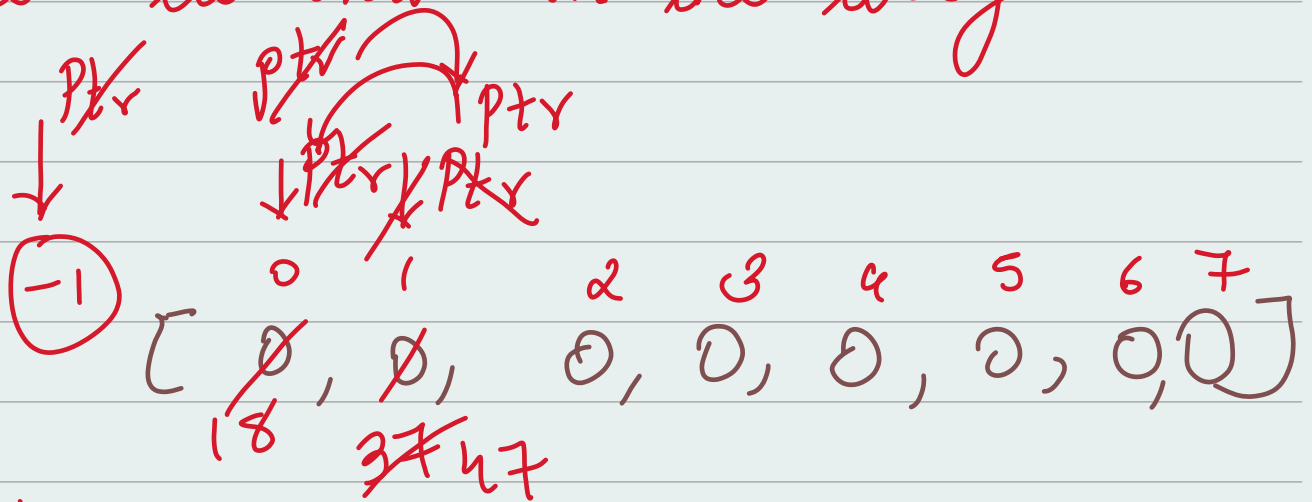
ptr \rightarrow $\textcircled{-1}$

0	1	2	3	4	5	6	7
0	0	0	0	0	0	0	0

ptr pointed to -1 index value.

So if we add or insert a item in this array we have to maintain

a pointer that would add or remove the elements in the array



ptr
 0 add an element ⁽¹⁾ increment $-1 + 1 = 0$
 1 add an element 37 $0 + 1 = 1$
 0 delete an element 37 $1 - 1 = 0$
 1 add an element 47 $0 + 1 = 1$

Using this pointer to go left and right to add or delete

When array is full $\{ ptr == data\ length - 1 \}$

Custom Queue:

data = $[34, 45, 0, 0, 0, 0]$

end
~~0~~
~~1~~

when data reach index 5 it's full.

2

data[i] data = [3, 9, 14, 18, 77]

0 1 2 3 4

remove

shift

data[i-1] [9, 14, 18, 77, 0]

0 1 2 3 4

→ Adding complexity is $O(1)$ because we are adding an element

→ But removing an element changes the complexity to $O(N)$ cause it's shifting left to $O(N-1)$ which is $O(N)$

```
public int remove() throws Exception {
```

```
    if (isEmpty()) {
```

```
        throw new Exception("Queue is Empty");
```

```
    }
```

```
    int removed = data[0]
```

```
    // shift the elements to left,
```

```

for (int i = 1; i < end; i++) {
    data[i-1] = data[i]
}
end--;
return removed;
}

```

```

public int front () throws Exception {
    if (isEmpty()) {

```

```

        throw new Exception("Queue is Empty");
    }

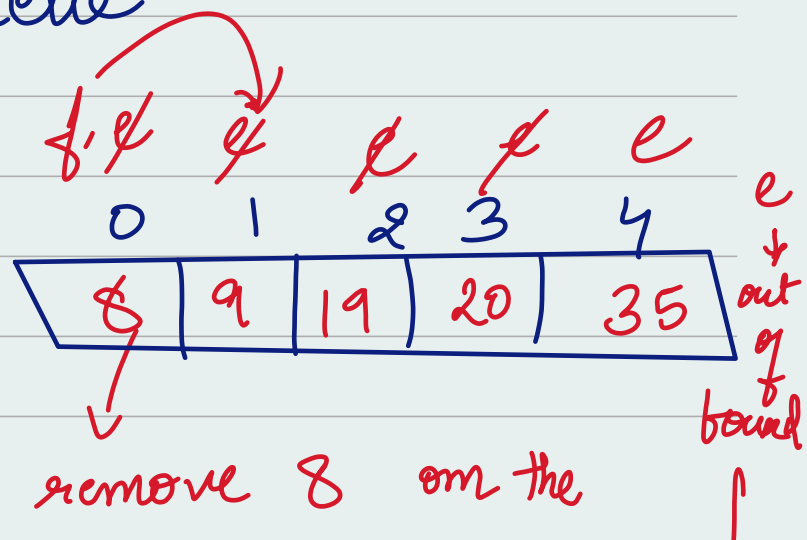
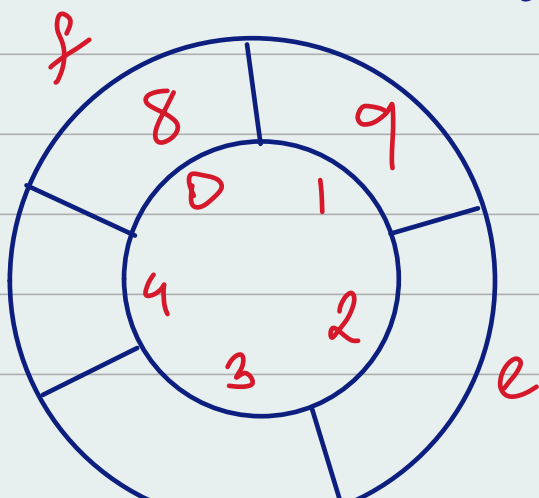
```

```

    return data[0];
}

```

* Circular Queue



remove 8 on the

index number zero.
front item is getting removed.

→ Use remainder theorem

$e \% \text{Size of the array}$

$$5 \% 5 = 0$$

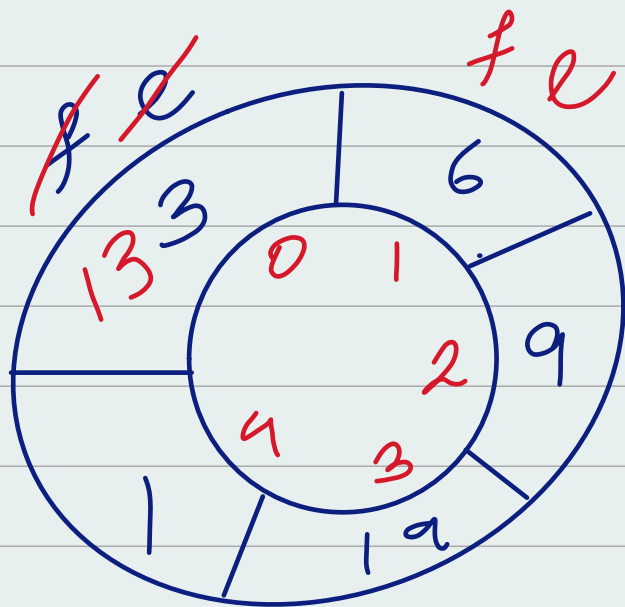
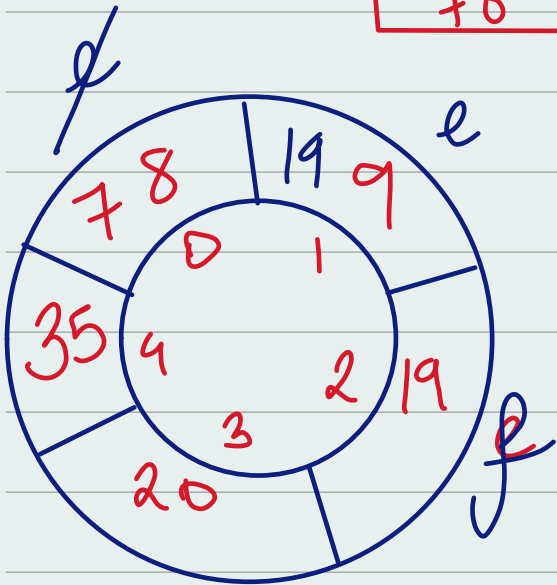
end is at 0th index
again.

$$6 \% 5 = 1$$

Now,

~~e~~ → e f

78	199	19	20	35
----	-----	----	----	----



(Remove an item)

(Insert an item)

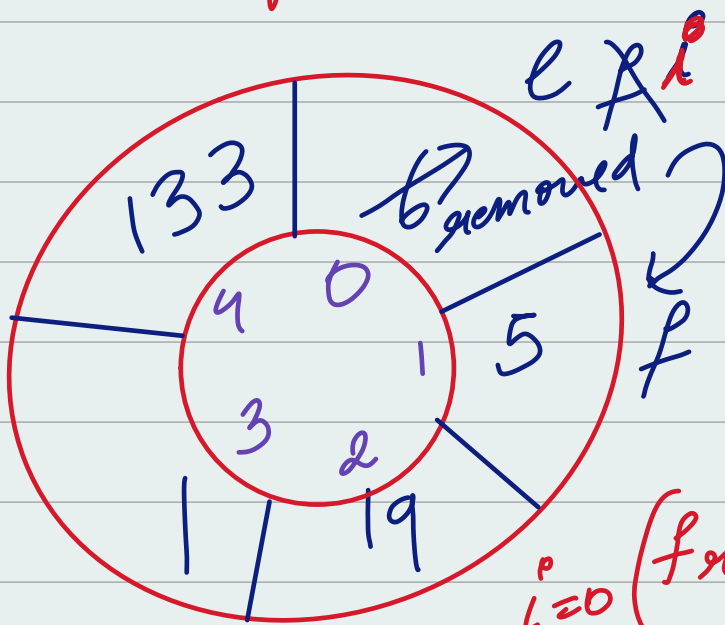
Remove 3 insert 133.

taking i pointer till its not equal to end using do while loop

from 1 to 5 index.

when elements are copied dynamically

After for loop cond
 $\text{temp}[i] = \text{data}[(\text{front} + i) \% \text{data.length}]$



front = 2
i = 0

$i = 0 \quad (\text{front} + i) \% \text{data.length}$

2nd index value
3rd index value
4th index value

i = 0	2 % 5 = 2
i = 1	3 % 5 = 3
i = 2	4 % 5 = 4
i = 3	5 % 5 = 0
i = 4	6 % 5 = 1

It will go data-length times

$f \downarrow$	\downarrow	\downarrow			$l \downarrow$				
0	1	2	3	4	5	6	7	8	9
5	19	1	133	6					

$i = 5$ $i \neq \text{data length}$
 terminate loop

so, front = 0

end = data length

