

# Queues

# Definitions


- A queue is a linear abstract data type such that *insertions are made at one end, called the rear*, and *removals are made at the other end, called the front*.
- Queues are sometimes called **FIFOs**: first-in first-out.

enqueue() → Queue → dequeue()

The two basic operations are:

- **enqueue**: adds an element to the *rear* of the queue.
- **dequeue**: removes and returns the element at the *front* of the queue.

→ Software queues are similar to physical ones: queuing at the **supermarket, at the bank, at cinemas**, etc.

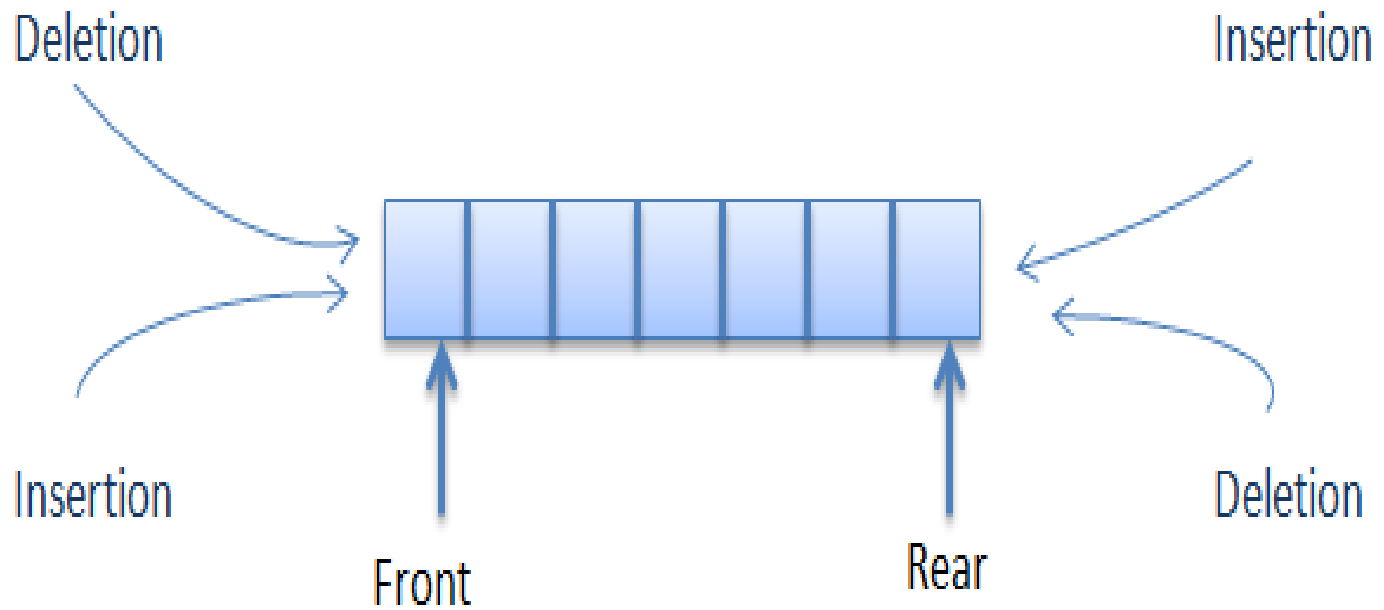


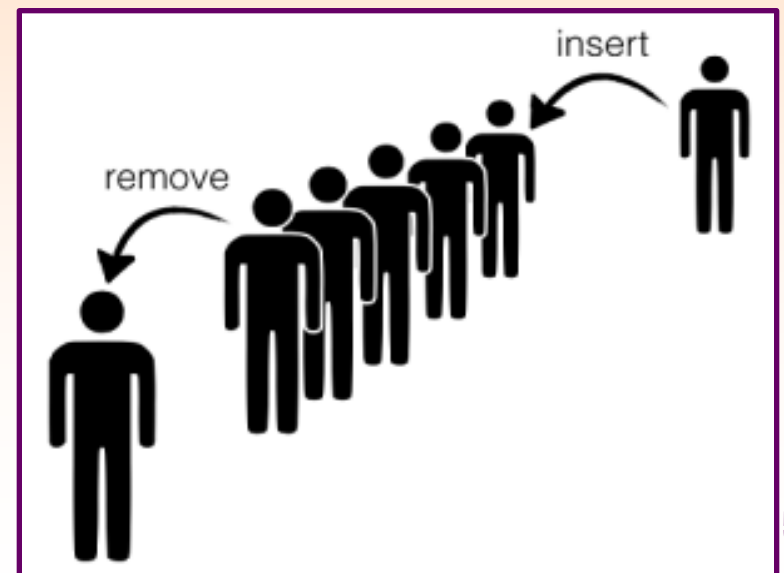
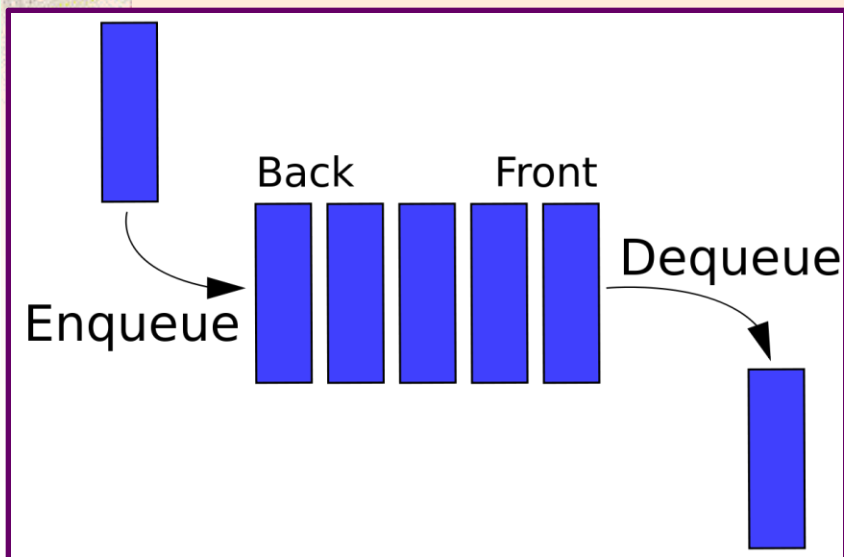
```
q = new QueueImpl()
q.enqueue(a)
q.enqueue(b)
q.enqueue(c)
q.enqueue(d)
q.dequeue() → a
q.dequeue() → b
q.enqueue(e)
q.dequeue() → c
q.dequeue() → d
```

```
q → []
q → [a]
q → [a,b]
q → [a,b,c]
q → [a,b,c,d]
q → [b,c,d]
q → [c,d]
q → [c,d,e]
q → [d,e]
q → [e]
```

→ Elements of a queue are processed in the same order as the they are inserted into the queue, here “***a***” ***was the first element to join the queue and it was the first to leave the queue: first-come first-serve.***”

Ex.

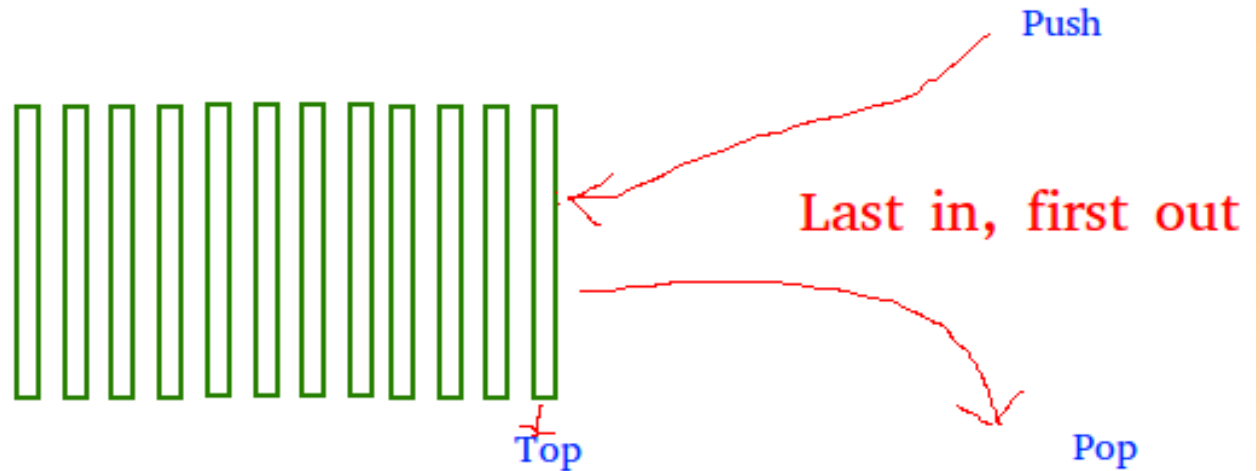




# Different: → **STACK / QUEUE**

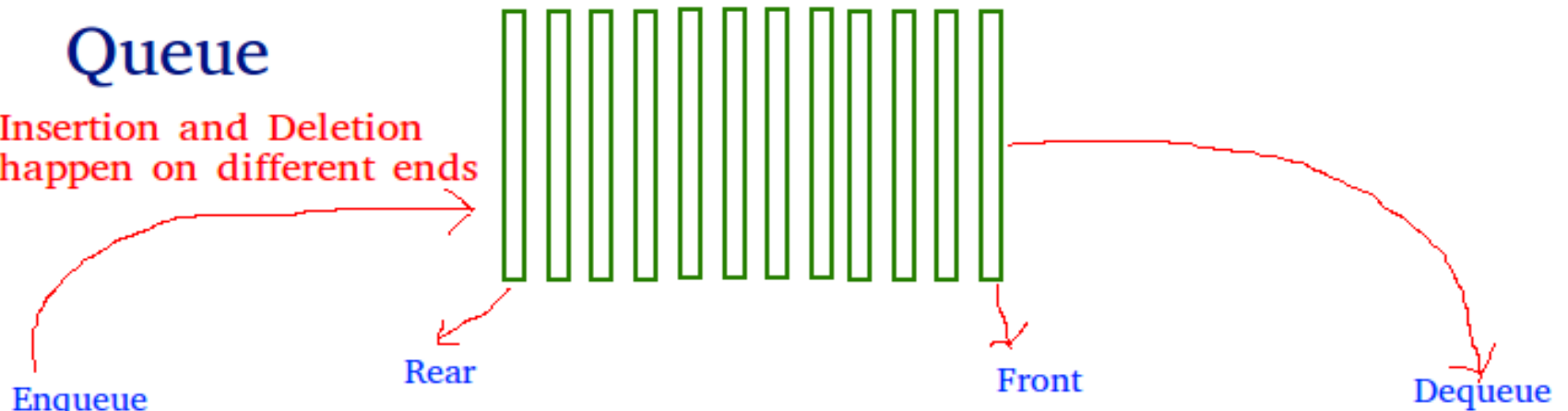
## Stack

Insertion and Deletion happen on same end



## Queue

Insertion and Deletion happen on different ends



First in, first out

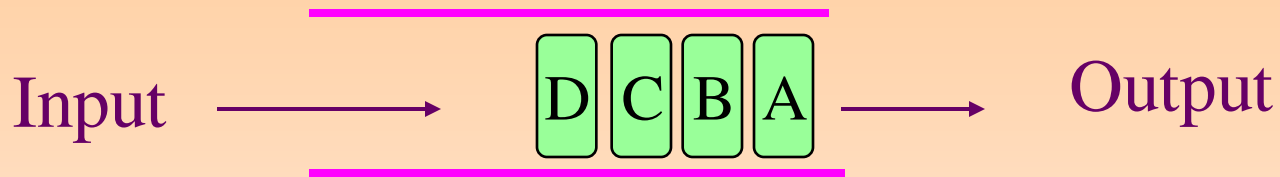
# Topics

- **Queue**
  - **Implementation of Queue**
  - **Usage of Queue**



# Queue

- **Queue:** *First In First Out (FIFO)*



- **Toll Station**
  - Car comes, pays, leaves
- **Check-out in Big Y market**
  - Customer comes, checks out and leaves
- **More examples: Printer, Office Hours, ...**

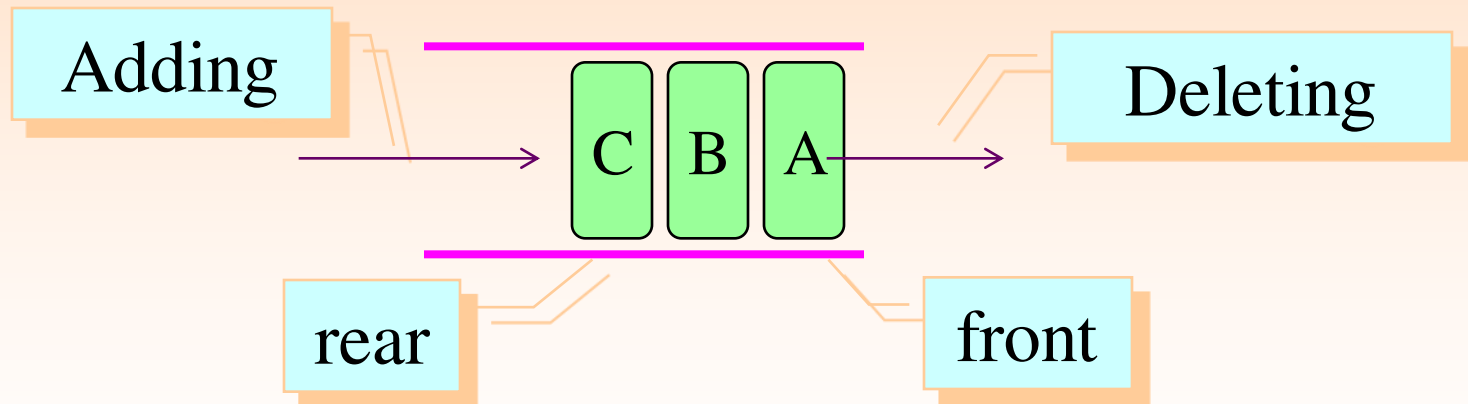


# More Examples of Queue

- **In our daily life**
  - **Airport Security Check**
  - **Cinema Ticket Office**
  - **Bank, ATM**
  - **Anything else ?**

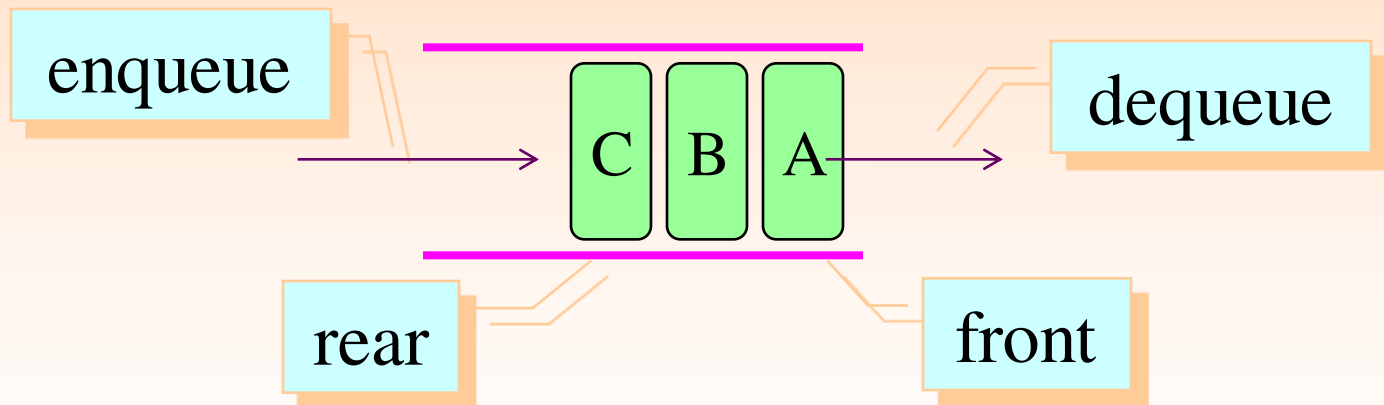
# What Is Queue

- Queue is an abstract data type
- Adding an entry at the rear
- Deleting an entry at the front



# Abstract Data Types

- **Queue**
  - Operating on both ends
  - Operations: *EnQueue(in), DeQueue(out)*



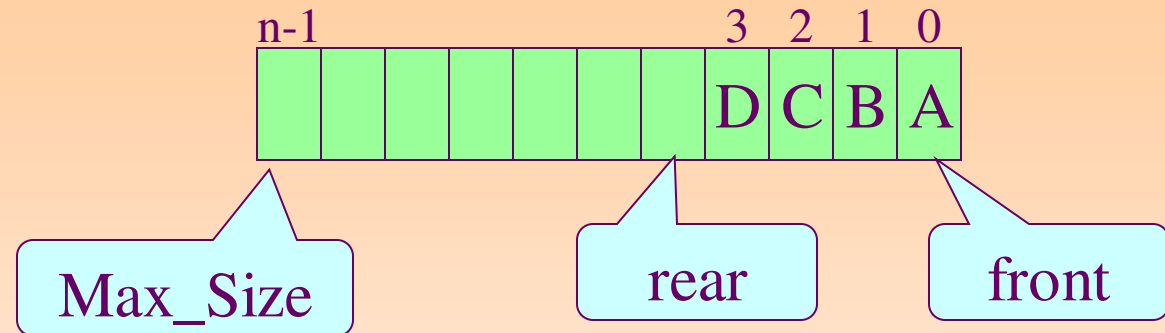
# Queue

**Queue is FIFO ( First-In First-Out)**

**A queue is open at two ends. You can only add entry (**enqueue**) at the **rear** , and delete entry (**dequeue**) at the **front**.**

**Note that you cannot add/extract entry in the **middle** of the queue.**

# Array Implementation of Queue



After A leaves,

