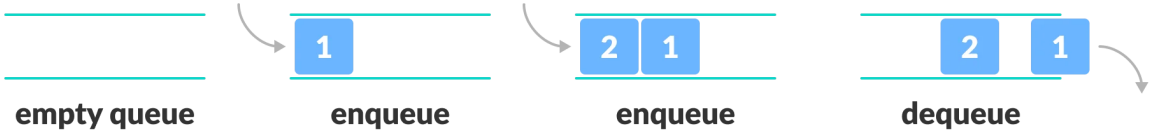
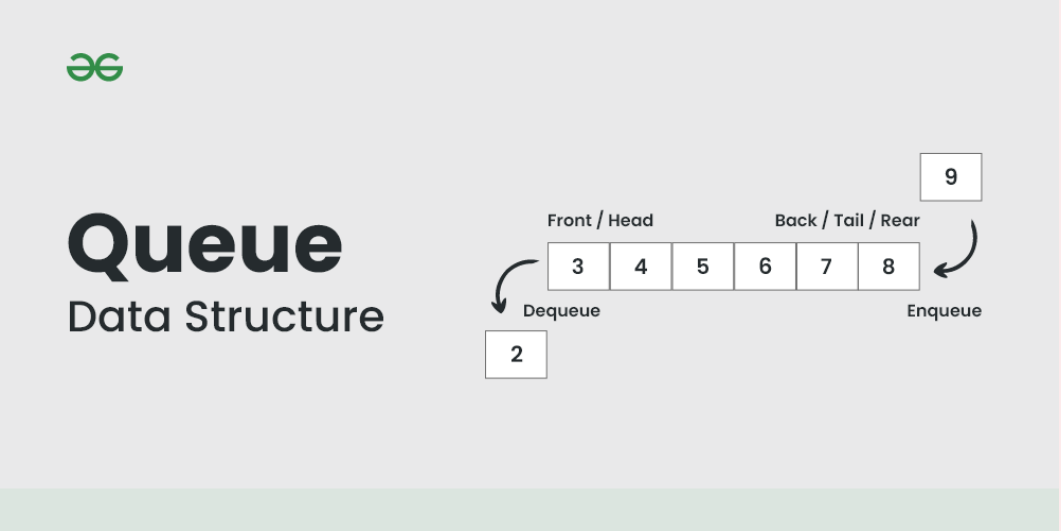
Queue

*A **Queue** is defined as a linear data structure that is open at both ends and the operations are performed in First In First Out (FIFO) order.*

In programming terms, putting items in the queue is called **enqueue**, and removing items from the queue is called **dequeue**.



📌 **SUMMARY:** *All additions to the list are made at one end, and all deletions from the list are made at the other end.*



Basic Operations of Queue

Enqueue : Add an element to the end of the queue

Dequeue : Remove an element from the front of the queue

IsEmpty : Check if the queue is full

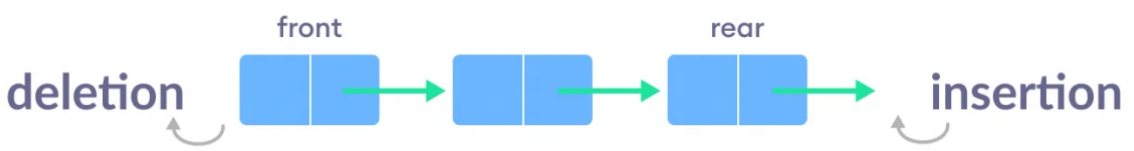
Is Full : Check if the queue is empty

Peek : Get the value of the front of the queue without removing it

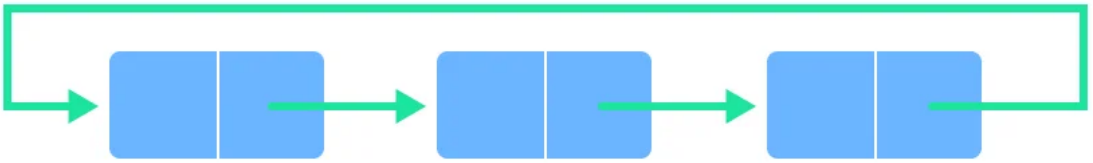
Rear : Get the value of the end of the queue without removing it

Types of Queue

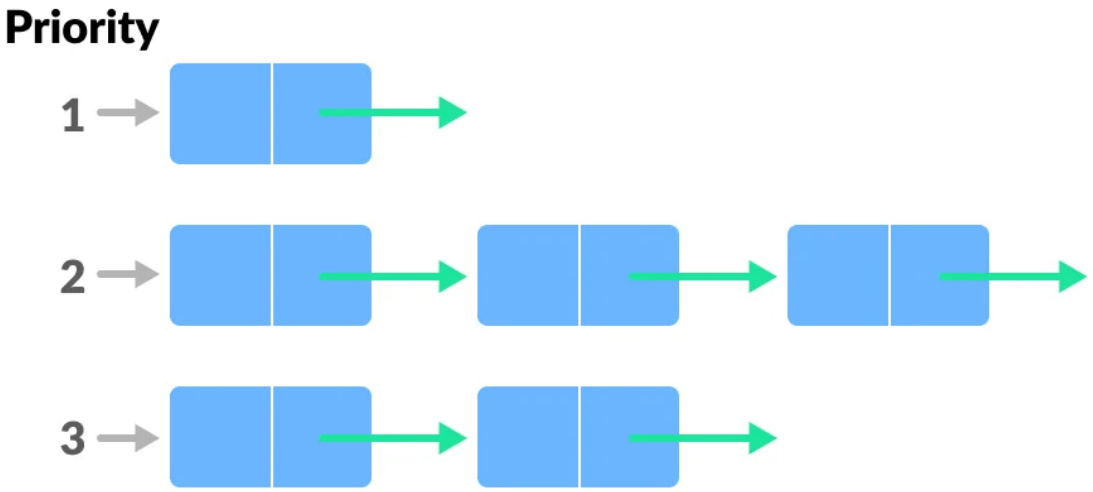
Simple Queue : In a simple queue, insertion takes place at the rear and removal occurs at the front. It strictly follows the FIFO (First in First out) rule.



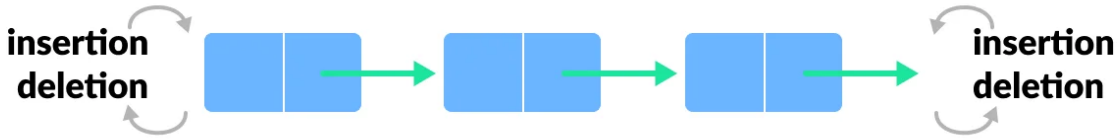
Circular Queue : In a circular queue, the last element points to the first element making a circular link.



Priority Queue : A priority queue is a special type of queue in which each element is associated with a priority and is served according to its priority. If elements with the same priority occur, they are served according to their order in the queue.



Deque (Double Ended Queue) : In a double ended queue, insertion and removal of elements can be performed from either from the front or rear. Thus, it does not follow the FIFO (First In First Out) rule.



Application of Queue

- **Multi programming:** Multi programming means when multiple programs are running in the main memory. It is essential to organize these multiple programs and these multiple programs are organized as queues.
- **Network:** In a network, a queue is used in devices such as a router or a switch. another application of a queue is a mail queue which is a directory that stores data and controls files for mail messages.
- **Job Scheduling:** The computer has a task to execute a particular number of jobs that are scheduled to be executed one after another. These jobs are assigned to the processor one by one which is organized using a queue.
- **Shared resources:** Queues are used as waiting lists for a single shared resource.

Real Time Application of Queue

- ATM Booth Line
- Ticket Counter Line
- Key press sequence on the keyboard
- CPU task scheduling
- Waiting time of each customer at call centers.

Advantages

- A large amount of data can be managed efficiently with ease.
- Operations such as insertion and deletion can be performed with ease as it follows the first in first out rule.
- Queues are useful when a particular service is used by multiple consumers.
- Queues are fast in speed for data inter-process communication.

Disadvantages

- The operations such as insertion and deletion of elements from the middle are time consuming.
- Limited Space.
- In a classical queue, a new element can only be inserted when the existing elements are deleted from the queue.
- Searching an element takes O(N) time.

- Queues can be used in the implementation of other data structures.
- Maximum size of a queue must be defined prior.

📚 References

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SerhatKumas - Overview

Computer engineering student who loves coding in different fields instead of focusing on a one spesific area. - SerhatKumas

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