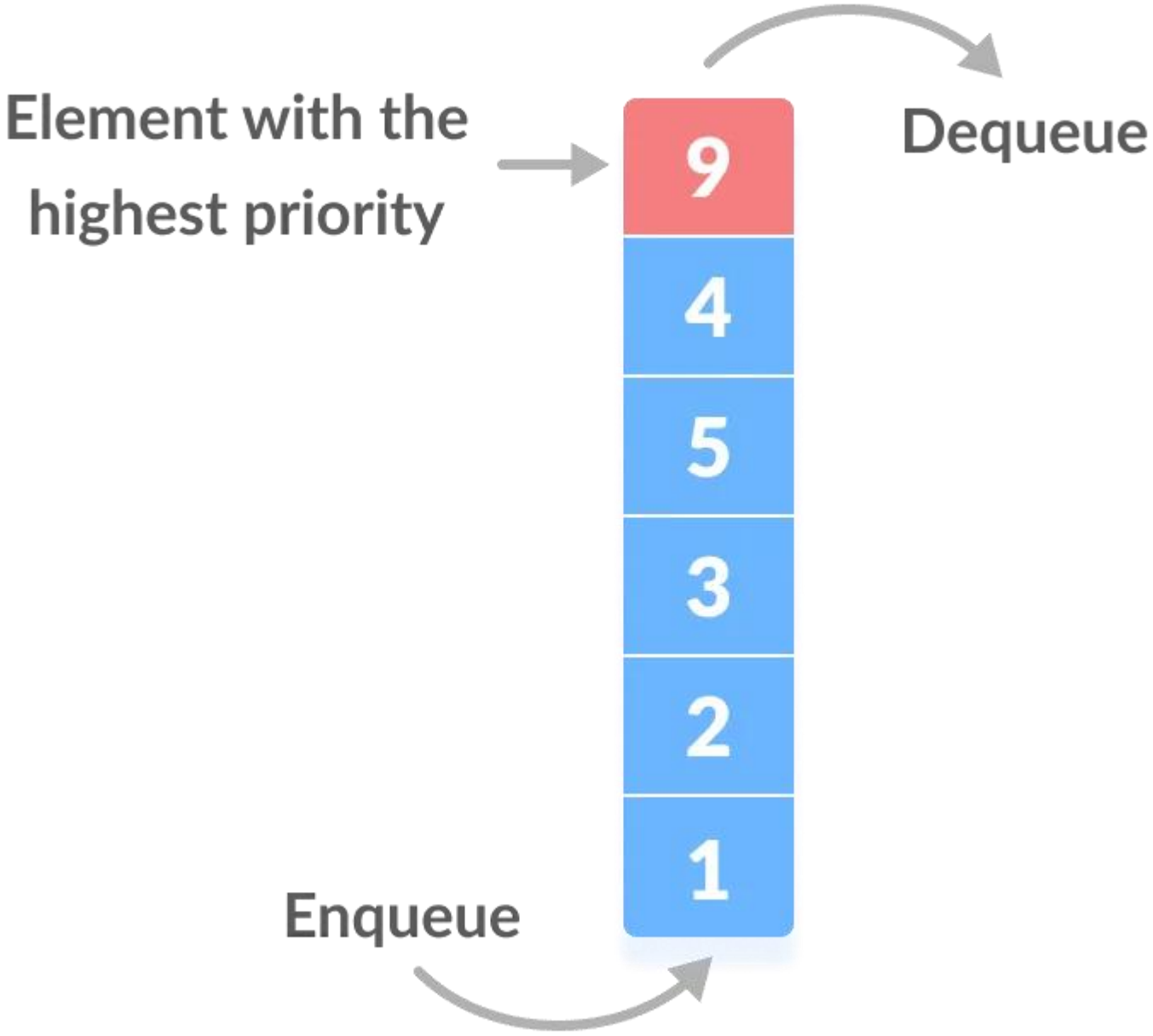
Priority Queue

Priority Queue

- A priority queue is a data structure in which each element is assigned a priority.
- The priority of the element will be used to determine the order in which the elements will be processed.
- The general rules of processing the elements of a priority queue are
  - An element with higher priority is processed before an element with a lower priority.
  - Two elements with the same priority are processed on a first-come-first-served (FCFS) basis.

Hospital Emergency Queue

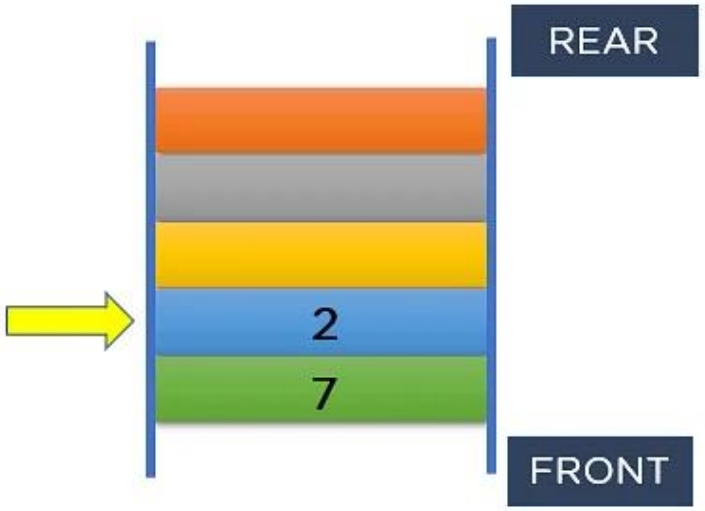

Element with the highest priority
9
4
5
3
2
1
Dequeue
Enqueue

PRIORITY QUEUE

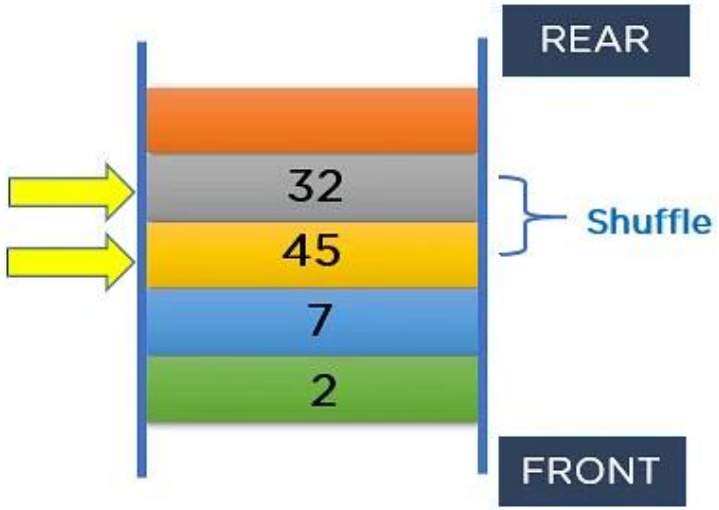
Consider you have to insert 7, 2, 45, 32, and 12 in a priority queue.

The element with the least value has the highest property.

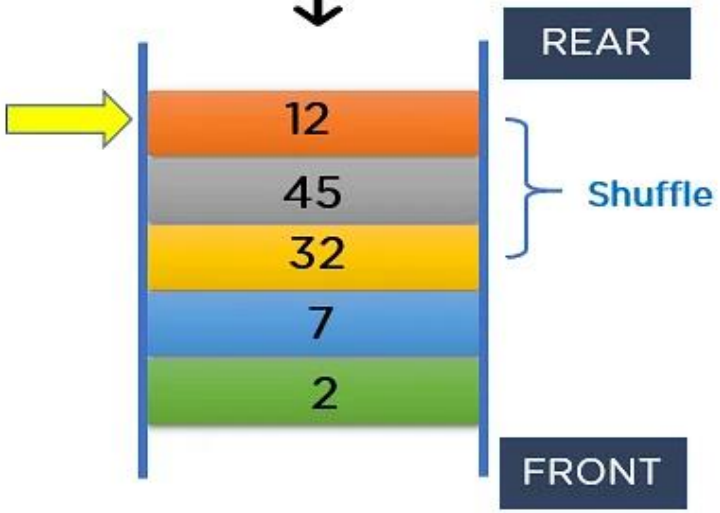
Thus, you should maintain the lowest element at the front node.

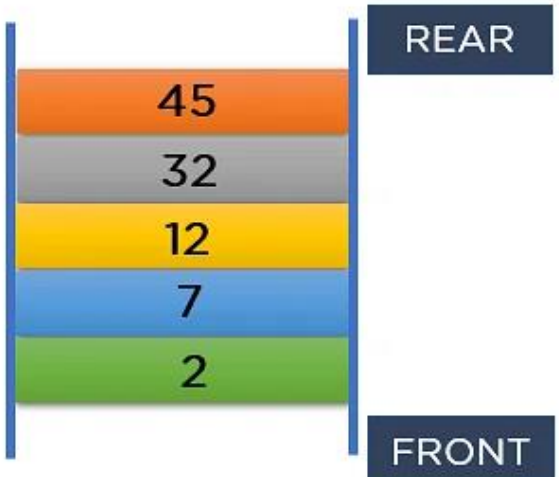


2 has higher priority so, shuffling will happen!



7 and 2 shuffled to maintain element with highest priority at front.





PRIORITY QUEUE

The priority of the elements is set based on several factors.

This is basically used in the **operating system** to execute the most priority process first.

If this is set on the **CPU tim**e, then the element with the lowest execution time is executed first.

Suppose there are two processes in a queue, one has 5ns execution time and the other has 10ns execution time, then the process having 5ns executes first.

PRIORITY QUEUE

The basic examples of Priority Queue

- **Routing**
- **Operating System Scheduler**
- **Dijkstra's Shortest Path Algorithm**
- **Huffman Coding**

Types of Priority Queue

There are two types of priority queues based on the priority of elements.

- If the element with the smallest value has the highest priority, then that priority queue is called the min priority queue.
- If the element with a higher value has the highest priority, then that priority queue is known as the max priority queue.

Implementation of Priority Queue

LINKED LIST

ARRAYS

HEAP DATA STRUCTURE

BINARY TREE

Applications of Priority Queue

The following are the applications of the priority queue:

- It is used in the Dijkstra's shortest path algorithm.
- It is used in prim's algorithm
- It is used in data compression techniques like Huffman code.
- It is used in heap sort.
- It is also used in operating system like priority scheduling, load balancing and interrupt handling.