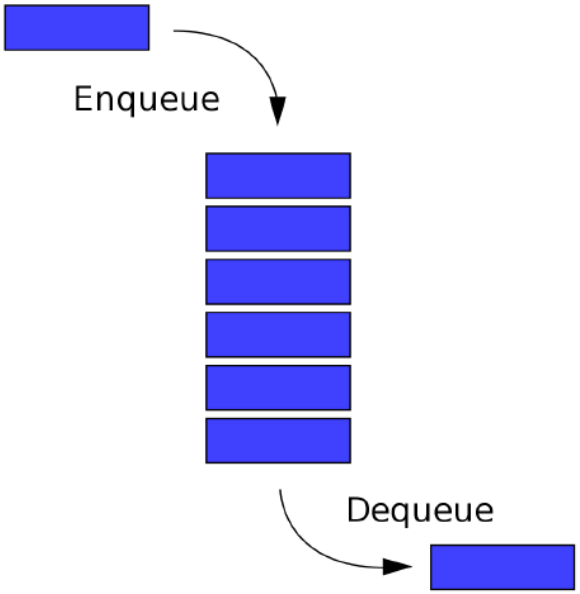
Queue ADT

Anoop S Babu
Faculty Associate
Dept. of Computer Science & Engineering
bsanoop@am.amrita.edu

Queue

- A queue is a data structure that a linear collection of items in which **access is restricted to a first-in first-out (FIFO)** basis.
- New items are **inserted at the back** and existing items are **removed from the front.**



Queue: Basic Operations

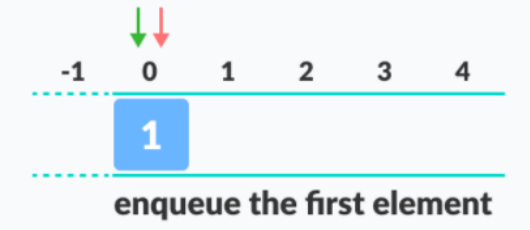
- **enqueue(*item*):** Adds the given **item to the back** of the queue.
- **dequeue():** Removes and returns the front item from the queue if the queue is not empty.
- **Queue():** Creates a new empty queue.
- **isEmpty():** Check if the queue is empty or not. Return a boolean value.
- **length():** Returns the number of items currently in the queue.
- **peek():** Get the value of the front of the queue without removing it.

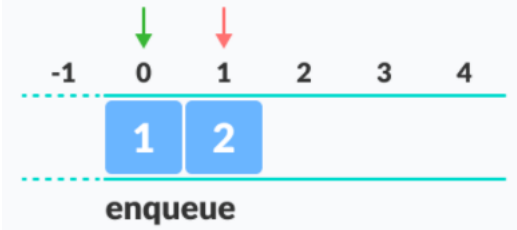
Working of Queue Data Structure

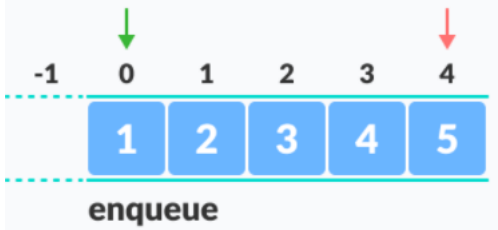
- Queue operations work as follows:
  - two pointers FRONT and REAR
  - FRONT track the first element of the queue
  - REAR track the last element of the queue
  - initially, set value of FRONT and REAR to -1

Working of Queue Data Structure

- **Enqueue Operation**
  - check if the queue is full
  - for the first element, set the value of FRONT to 0
  - increase the REAR index by 1
  - add the new element in the position pointed to by REAR

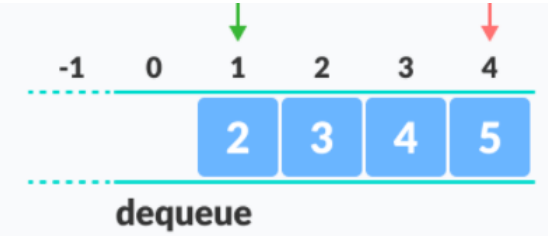


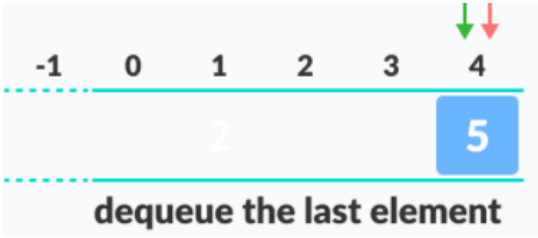




Working of Queue Data Structure

- **Dequeue Operation**
  - check if the queue is empty
  - return the value pointed by FRONT
  - increase the FRONT index by 1
  - for the last element, reset the values of FRONT and REAR to -1



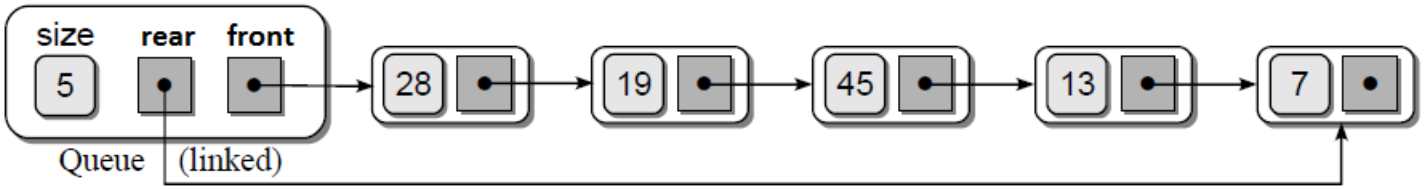


Implementing the Queue: Using Python List

```
# Queue using Array - Implementation using Python List

class Queue:
    # Constractor: Creating an empty queue
    def __init__(self):
        self.queue = []
    # Add an element
    def enqueue(self, item):
        self.queue.append(item)
    # Remove an element
    def dequeue(self):
        if len(self.queue) < 1:
            return None
        return self.queue.pop(0)
    def length(self):
        return len(self.queue)
```

Implementing the Queue: Using Single Linked List




```
class Queue:
# Creates an empty queue.
    def __init__( self ):
        self.FRONT = None
        self.REAR = None
        self.SIZE = 0
```