

Data Structure and Algorithm Queue



A Data Structure where data are queued it follows the principle.

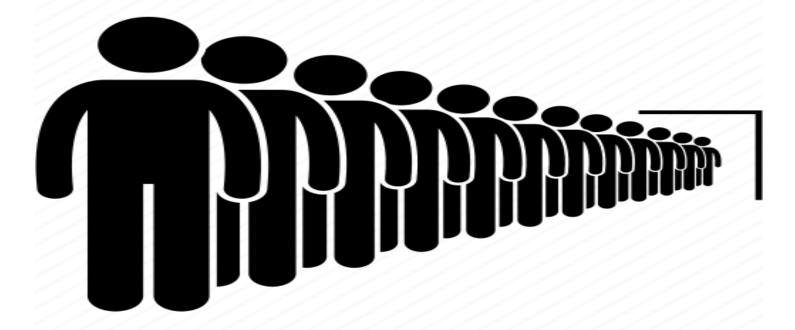
```
FI-FO (First in – First Out)
LI-LO (Last in – Last Out)
```



A Limitation to the Queue Data Structure is that Empty spaces will not be filled again until the queue is empty



Real Life Application





Once the queue is filled you cannot add to a queue until it is empty again.



Queue Data Structure Software Application













OMS Software The

Thermal Receipt Printer

QN100 5" Touch Screen

OD100

P901 (Calling Station)





Software Application



You are now in line

You are in line for the anticipated event. When it is your turn, you will have 10 minutes to enter the website.

What is this?

Your number in line: 8445

Number of users in line ahead of you: 1758 Expected arrival time on the website: 2:34 PM GMT

Your estimated wait time is: 5 minutes

Status last updated: 2:29:56 PM GMT

Message last updated: 2:29 PM GMT

This is a test message.

Please notify me when it is my turn:

Enter email address

Notify me by e-mail

Leave the line (You will lose your place)

Queue ID: 64da7b60-c59b-40ce-8293-b6ae18f4cfdf

DUEUE:IT











Queue Data Structure Empty Queue

front



| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| | | | | |

rear



Queue with Data

front



| C | | | | |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |

rear



Queue with Data

front



| С | A | | | |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |

rear



Queue with Data

front



 C
 A
 R

 0
 1
 2
 3
 4

rear



Queue with Data

front



| C | Α | R | L | |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |

rear



Queue Data Structure Full Queue

front



 C
 A
 R
 L
 O

 0
 1
 2
 3
 4

-1





front



| | A | R | L | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |

1 rear



front



| | | R | L | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |









front



| | | | | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |

rear



Queue Data Structure Empty Queue

front



| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|

rear



Queue Operations

enqueue(x)

Inserts data on the rear of the queue.

dequeue()

Removes data on front of the queue.



Queue Operations Example

Operations

front



dequeue()
enqueue(a)
enqueue(a)
dequeue()

-1

rear

| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|



Queue Data Structure Queue Operations Example

Operations

front



dequeue()

enqueue(C)

enqueue(a)

dequeue()

dequeue()

-1



| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|



Queue Operations Example

Operations

front



dequeue()

enqueue(C)

enqueue(a)

dequeue()

dequeue()

| | 1 |
|---|---|
| _ | |



| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|

Empty Queue



Queue Data Structure Queue Operations Example

Operations

front



dequeue()

enqueue(C)

enqueue(a)

dequeue()

dequeue()

-1



| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|



Queue Operations Example

Operations

dequeue()

enqueue(C)

enqueue(a)

dequeue()

dequeue()

front



 C

 0
 1
 2
 3
 4





Queue Operations Example

Operations

dequeue()

enqueue(C)

enqueue(a)

dequeue()

dequeue()

front







Queue Operations Example

Operations

dequeue()

enqueue(C)

enqueue(a)

dequeue()

dequeue()

front



| С | a | | | |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations

dequeue()

enqueue(C)

enqueue(a)

dequeue()

dequeue()

front



| С | a | | | |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations

dequeue()

enqueue(C)

enqueue(a)

dequeue()

dequeue()

front



| | а | | | |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations

dequeue()

enqueue(C)

enqueue(a)

dequeue()

dequeue()

front



| | а | | | |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations

front



dequeue()

enqueue(C)

enqueue(a)

dequeue()

dequeue()

-1



| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|



Queue Operations

isEmpty()
Checks if queue is empty.

isFull()
Checks if queue is full.



Queue Operations

peek()

Returns the data at the front of the queue.

size()

Returns the size of the queue.



Queue Operations Example

Operations enqueue(C)

enqueue(a)

size()

enqueue(r)

enqueue(I)

enqueue(o)

enqueue(C)

size()

front



-1



| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|



Queue Operations Example

Operations enqueue(C)

enqueue(a)

size()

enqueue(r)

enqueue(I)

enqueue(o)

enqueue(C)

size()

front





| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|



OF-POM-051 Rev 01 (03 05 2022



Queue Operations Example



enqueue(C)

enqueue(a)

size()

enqueue(r)

enqueue(I)

enqueue(o)

enqueue(C)

size()

front







Queue Operations Example

Operations enqueue(C)

enqueue(a)

size()

enqueue(r)

enqueue(I)

enqueue(o)

enqueue(C)

size()

front



C

4

3

4





Queue Operations Example

Operations enqueue(C)

enqueue(a)

size()

enqueue(r)

enqueue(I)

enqueue(o)

enqueue(C)

size()

front



| С | а | | | |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations enqueue(C) enqueue(a)

size()

enqueue(r)

enqueue(I)

enqueue(o)

enqueue(C)

size()

front



| С | а | | | |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations enqueue(C) enqueue(a)

size()

enqueue(r)

enqueue(I)

enqueue(o)

enqueue(C)

size()

front



| С | а | | | |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |



Size = 2



Queue Operations Example

Operations enqueue(C) enqueue(a)

size()

enqueue(r)

enqueue(I)

enqueue(o)

enqueue(C)

size()

front



| C | а | | | |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations enqueue(C) enqueue(a)

size()

enqueue(r)

enqueue(I)

enqueue(o)

enqueue(C)

size()

front



| С | а | r | | |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations enqueue(C)

enqueue(a)

size()

enqueue(r)

enqueue(I)

enqueue(o)

enqueue(C)

size()

front



| С | a | r | | |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations enqueue(C)

enqueue(a)

size()

enqueue(r)

enqueue(I)

enqueue(o)

enqueue(C)

size()

front



| С | a | r | | |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations enqueue(C)

enqueue(a)

size()

enqueue(r)

enqueue(I)

enqueue(o) enqueue(C) size() front



| С | a | r | | |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations enqueue(C)

enqueue(a)

size()

enqueue(r)

enqueue(I)

enqueue(o)
enqueue(C)

size()

front



| С | a | r | | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations enqueue(C)

enqueue(a)

size()

enqueue(r)

enqueue(I)

enqueue(o)

enqueue(C) size() front



| С | a | r | | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations enqueue(C)

enqueue(a)

size()

enqueue(r)

enqueue(I)

enqueue(o)

enqueue(C)

size()

front



| С | а | r | | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |

Full Queue





Queue Operations Example

Operations enqueue(C)

enqueue(a)

size()

enqueue(r)

enqueue(I)

enqueue(o)

enqueue(C)

size()

front



| С | a | r | | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations enqueue(C)

enqueue(a)

size()

enqueue(r)

enqueue(I)

enqueue(o)

enqueue(C)

size()

front



| С | а | r | | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |

Size = 5





Queue Operations Example

Operations



isFull()

dequeue()

peek()

dequeue()

dequeue()

dequeue()

dequeue()

isEmpty()

front



| С | a | r | | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations



isFull()

dequeue()

peek()

dequeue()

dequeue()

dequeue()

dequeue()

isEmpty()

front



| С | a | r | | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |

True





Queue Operations Example

Operations isFull()

dequeue()

peek()

dequeue()

dequeue()

dequeue()

dequeue()

isEmpty()

front



| С | a | r | | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations isFull()

dequeue()

peek()

dequeue()

dequeue()

dequeue()

dequeue()

isEmpty()

front



| | a | r | | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations isFull()

dequeue()

peek()

dequeue()

dequeue()

dequeue()

dequeue()

isEmpty()

front



| | a | r | | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations isFull()

dequeue()

peek()

dequeue()

dequeue()

dequeue()

dequeue()

isEmpty()

front



| | a | r | | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |

a





Queue Operations Example

Operations isFull()

dequeue()

peek()

dequeue()

dequeue()

dequeue()

dequeue()

isEmpty()

front



| | a | r | | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |

a





Queue Operations Example

Operations isFull()

dequeue()

peek()

dequeue()

dequeue()

dequeue()

dequeue()

isEmpty()

front



| | | r | I | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations is Euro

isFull()

dequeue()

peek()

dequeue()

dequeue()

dequeue()

dequeue()

isEmpty()

front



| | | r | | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations

isFull()

dequeue()

peek()

dequeue()

dequeue()

dequeue()

dequeue()

isEmpty()

front



| | | | | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations

isFull()

dequeue()

peek()

dequeue()

dequeue()

dequeue()

dequeue()

isEmpty()

front



| | | | | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations

isFull()

dequeue()

peek()

dequeue()

dequeue()

dequeue()

dequeue()

isEmpty()

front



| | | | | 0 |
|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 |





Queue Operations Example

Operations

isFull()

dequeue()

peek()

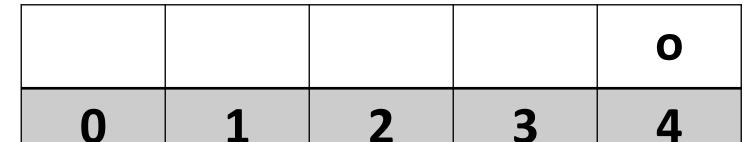
dequeue()

dequeue()

dequeue()

dequeue()

isEmpty()





front



Queue Operations Example

Operations isFull()

dequeue()

peek()

dequeue()

dequeue()

dequeue()

dequeue()

isEmpty()

front



| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|





Queue Operations Example

Operations isFull()

dequeue()

peek()

dequeue()

dequeue()

dequeue()

dequeue()

isEmpty()

front



| 0 | |
|---|--|



| 7 |
|---|
| Z |

4





Queue Operations Example

Operations isFull()

dequeue()

peek()

dequeue()

dequeue()

dequeue()

dequeue()

isEmpty()

front





| 0 | 1 | 2 |
|---|---|---|
| U | | Z |



True

QF-PQM-051 Rev.01 (03.05,202)