

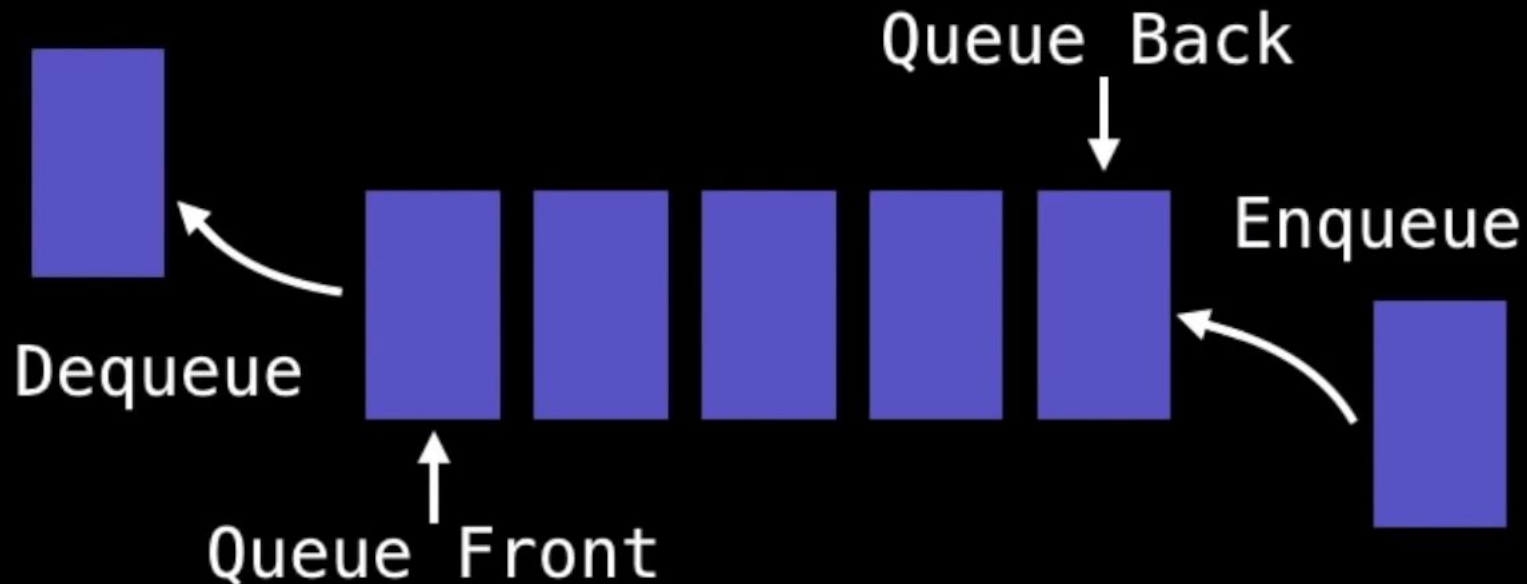
Queues

Outline

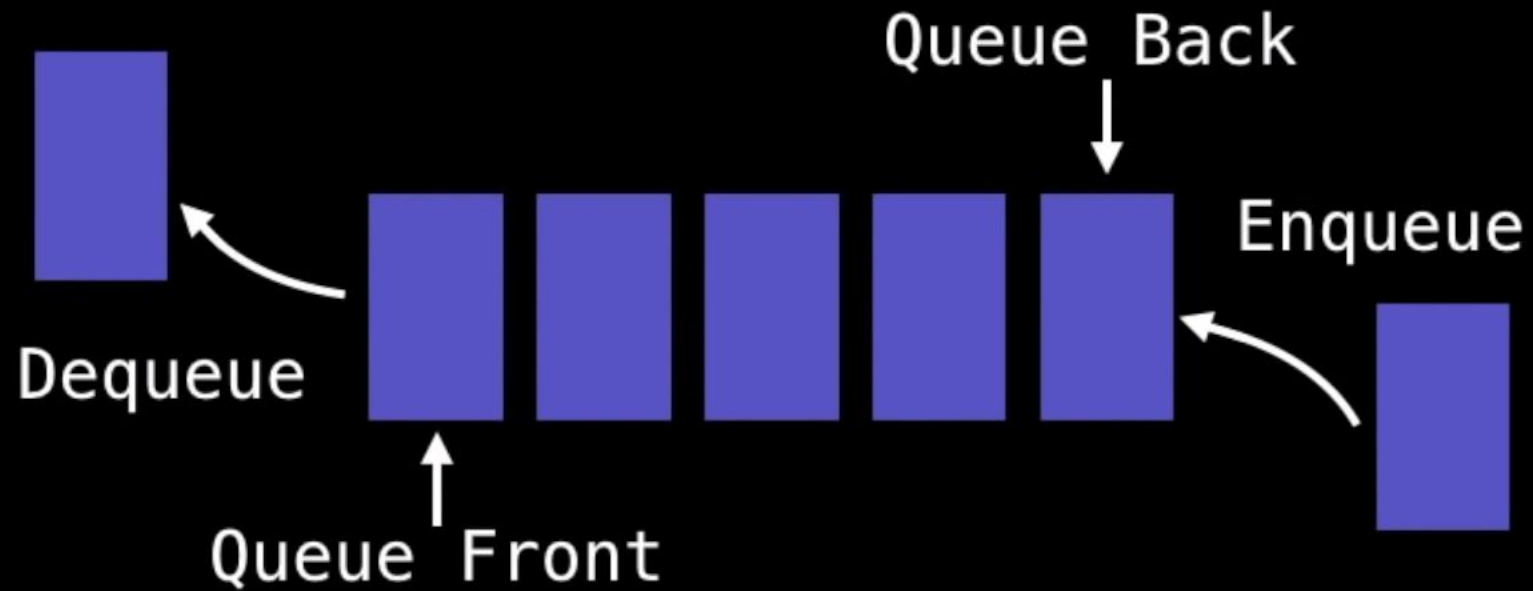
- Discussion About Queues
 - What is a queue?
 - Terminology
 - When and where is a queue used?
 - Complexity Analysis
 - Queue Breadth First Search (BFS) example
- Implementation Details
 - How to enqueue (add) elements to a queue
 - How to dequeue (remove) elements from a queue
- Code Implementation

What is a Queue?

A queue is a linear data structure which models real world queues by having two primary operations, namely **enqueue** and **dequeue**.



Queue Terminology



Queue Terminology

There does not seem to be consistent terminology for inserting and removing elements from queues.

Enqueue = Adding = Offering



Queue Terminology

There does not seem to be consistent terminology for inserting and removing elements from queues.

Dequeue = Polling

(These are also sometimes called *removing*, but I find this ambiguous)



Queue Example

Instructions:

Enqueue(12)

Dequeue()

Dequeue()

Enqueue(7)

Dequeue()

Enqueue(-6)



Queue Example

Instructions:

Enqueue(12)

Dequeue()

Dequeue()

Enqueue(7)

Dequeue()

Enqueue(-6)



Queue Example

Instructions:

Enqueue(12)

Dequeue()

Dequeue()

Enqueue(7)

Dequeue()

Enqueue(-6)

55

-1

33

17

11

12

Queue Example

Instructions:

Enqueue(12)

Dequeue()

Dequeue()

Enqueue(7)

Dequeue()

Enqueue(-6)



Queue Example

Instructions:

Enqueue(12)

Dequeue()

Dequeue()

Enqueue(7)

Dequeue()

Enqueue(-6)

-1

33

17

11

12

Queue Example

Instructions:

Enqueue(12)

Dequeue()

Dequeue()

Enqueue(7)

Dequeue()

Enqueue(-6)



Queue Example

Instructions:

Enqueue(12)

Dequeue()

Dequeue()

Enqueue(7)

Dequeue()

Enqueue(-6)

33

17

11

12

Queue Example

Instructions:

Enqueue(12)

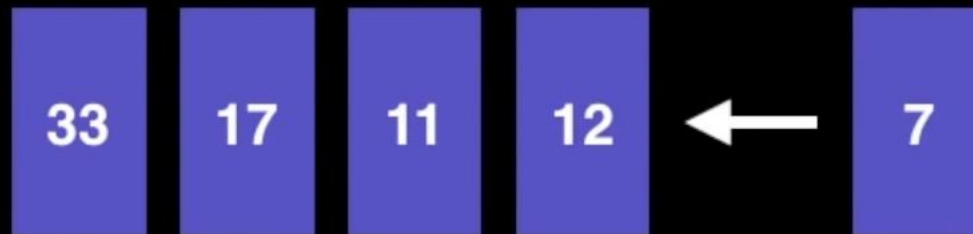
Dequeue()

Dequeue()

Enqueue(7)

Dequeue()

Enqueue(-6)



Queue Example

Instructions:

Enqueue(12)

Dequeue()

Dequeue()

Enqueue(7)

Dequeue()

Enqueue(-6)

33

17

11

12

7

Queue Example

Instructions:

Enqueue(12)

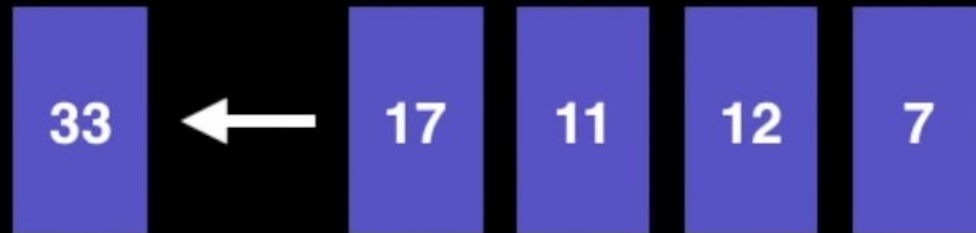
Dequeue()

Dequeue()

Enqueue(7)

Dequeue()

Enqueue(-6)



Queue Example

Instructions:

Enqueue(12)

Dequeue()

Dequeue()

Enqueue(7)

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7

Queue Example

Instructions:

Enqueue(12)

Dequeue()

Dequeue()

Enqueue(7)

Dequeue()

Enqueue(-6)



Queue Example

Instructions:

Enqueue(12)

Dequeue()

Dequeue()

Enqueue(7)

Dequeue()

Enqueue(-6)

17

11

12

7

-6

When and where is a Queue used?

- Any waiting line models a queue, for example a lineup at a movie theatre.
- Can be used to efficiently keep track of the x most recently added elements.
- Web server request management where you want first come first serve.
- Breadth first search (BFS) graph traversal.

Queue Implementation Details

Enqueuing

Instructions:

Enqueue(5)

Enqueue(1)

Enqueue(6)

Enqueue(17)

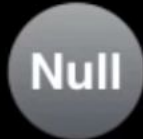
Enqueue(8)

Enqueuing

Instructions:

Enqueue(5)
Enqueue(1)
Enqueue(6)
Enqueue(17)
Enqueue(8)

Tail



Head

Enqueuing

Instructions:

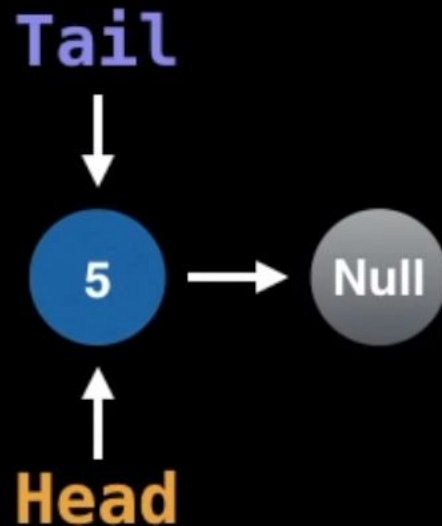
Enqueue(5)

Enqueue(1)

Enqueue(6)

Enqueue(17)

Enqueue(8)



Enqueuing

Instructions:

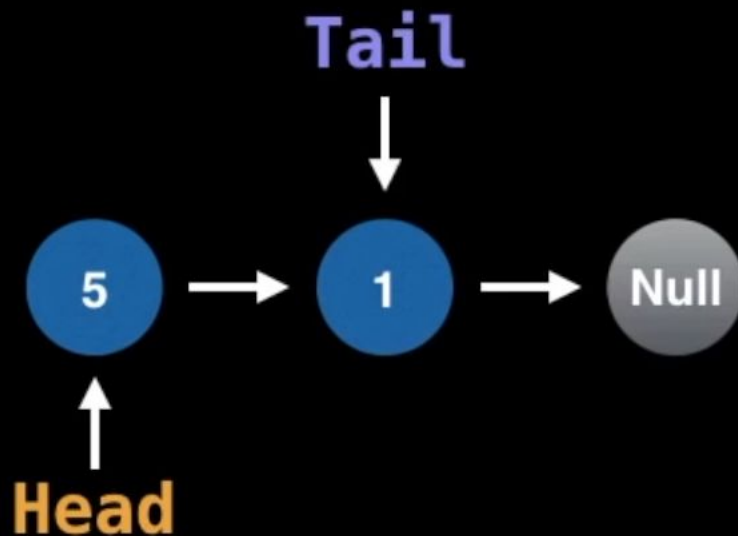
Enqueue(5)

Enqueue(1)

Enqueue(6)

Enqueue(17)

Enqueue(8)



Enqueuing

Instructions:

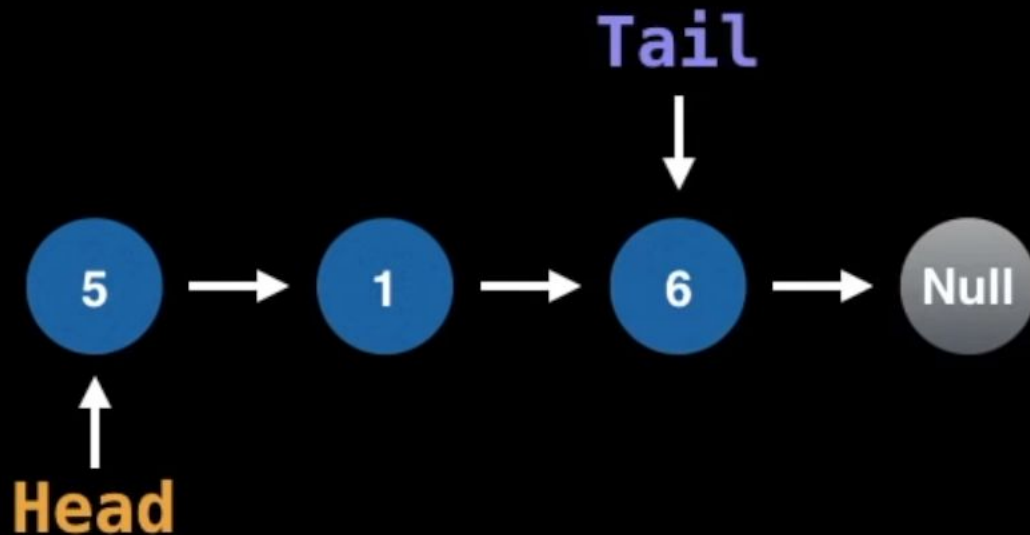
Enqueue(5)

Enqueue(1)

Enqueue(6)

Enqueue(17)

Enqueue(8)



Enqueuing

Instructions:

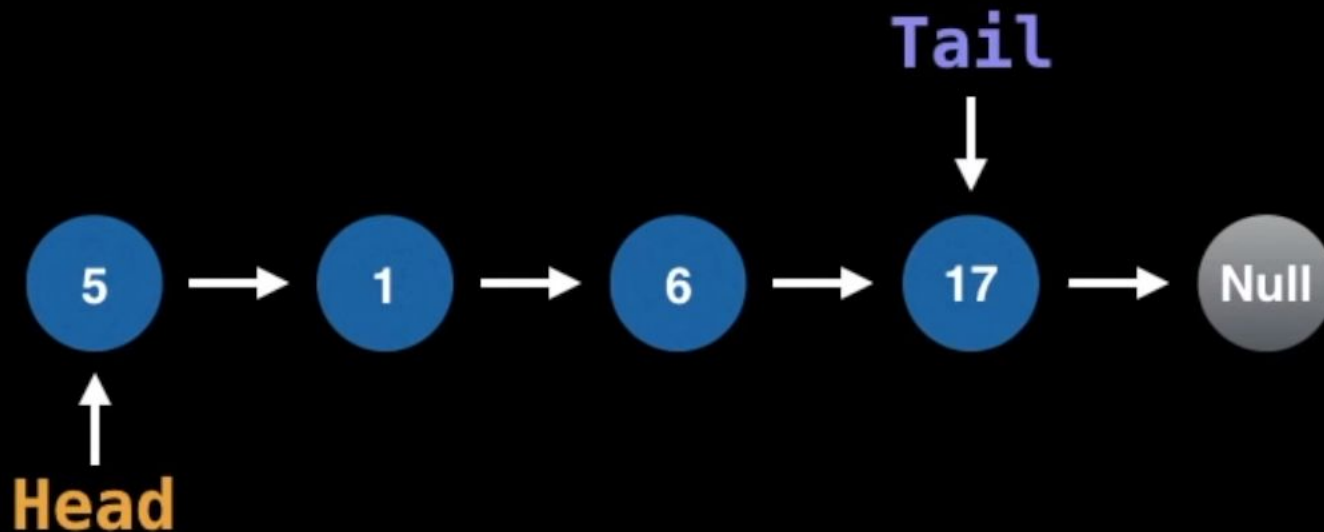
Enqueue(5)

Enqueue(1)

Enqueue(6)

Enqueue(17)

Enqueue(8)



Enqueuing

Instructions:

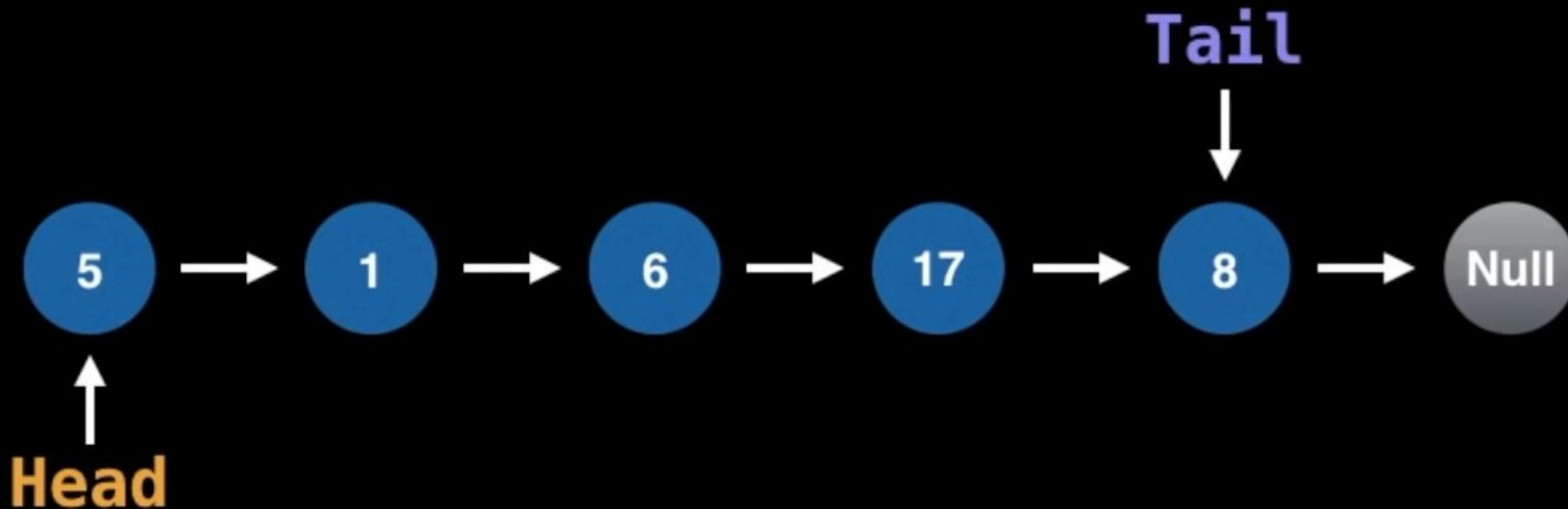
Enqueue(5)

Enqueue(1)

Enqueue(6)

Enqueue(17)

Enqueue(8)



Dequeuing

Instructions:

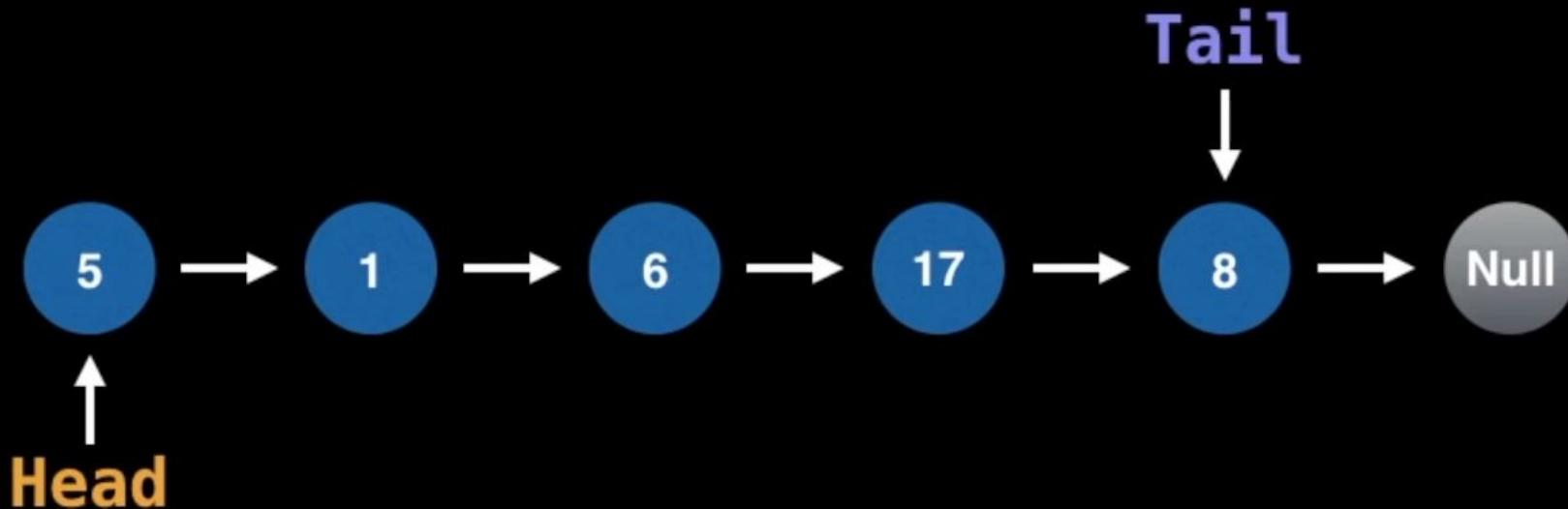
Dequeue()

Dequeue()

Dequeue()

Dequeue()

Dequeue()



Dequeuing

Instructions:

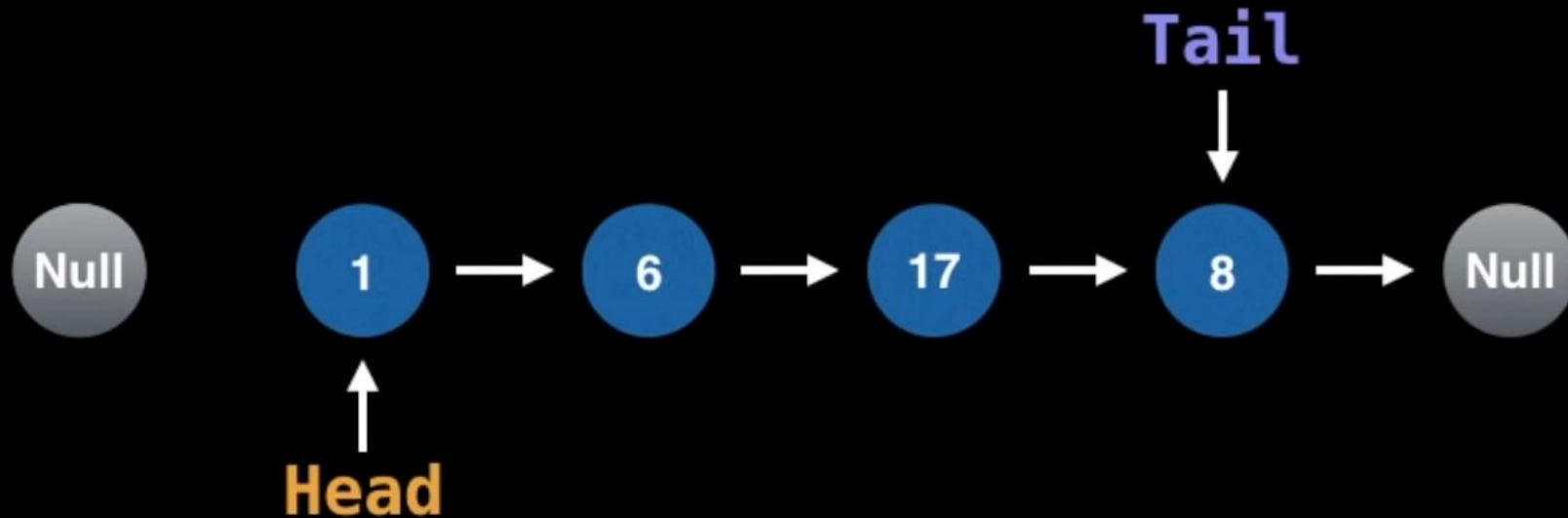
Dequeue()

Dequeue()

Dequeue()

Dequeue()

Dequeue()



Dequeuing

Instructions:

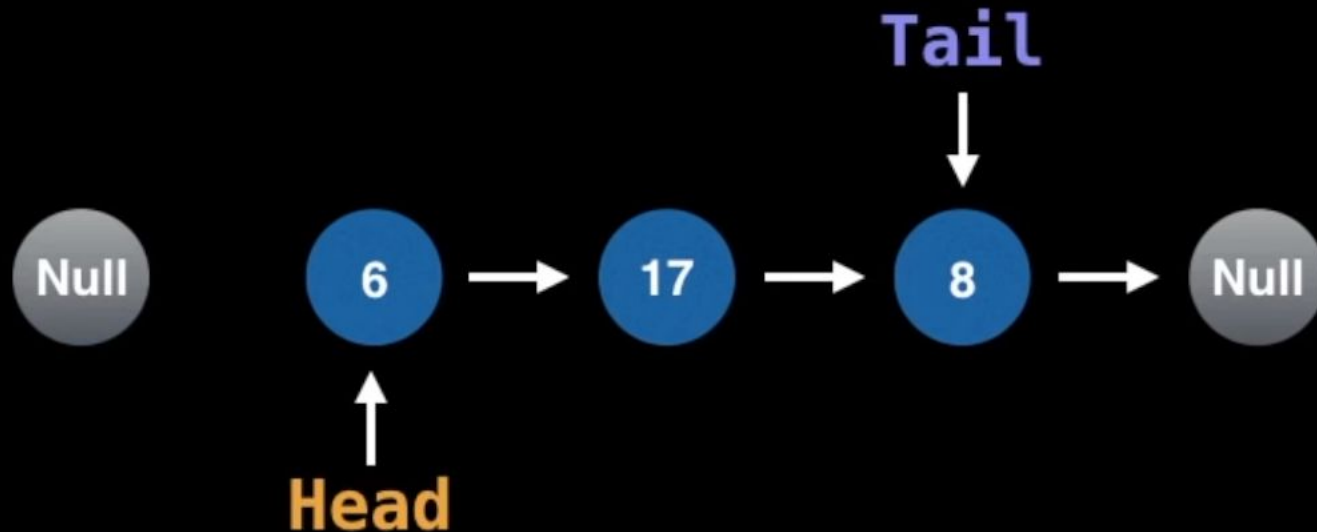
Dequeue()

Dequeue()

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Dequeue()



Dequeuing

Instructions:

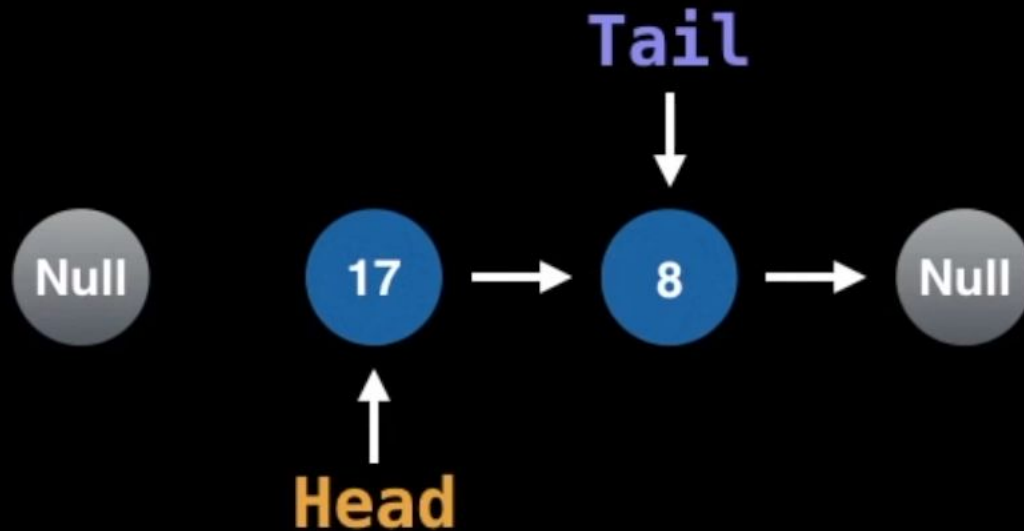
Dequeue()

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Dequeuing

Instructions:

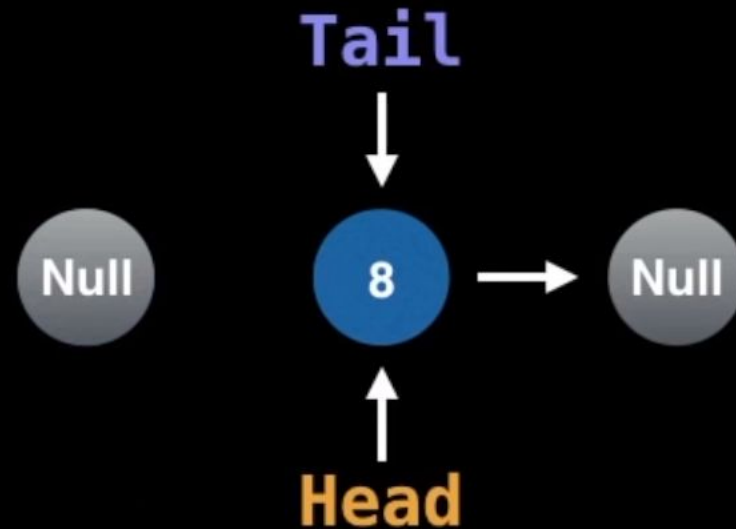
Dequeue()

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Dequeuing

Instructions:

Dequeue()

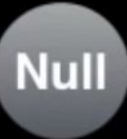
Dequeue()

Dequeue()

Dequeue()

Dequeue()

Tail



Head