Stacks and Queues

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Overview

Stacks

- Last-in, First-out data structure

Queues

- First-in, First-out data structure

Deque

- Double-ended queue

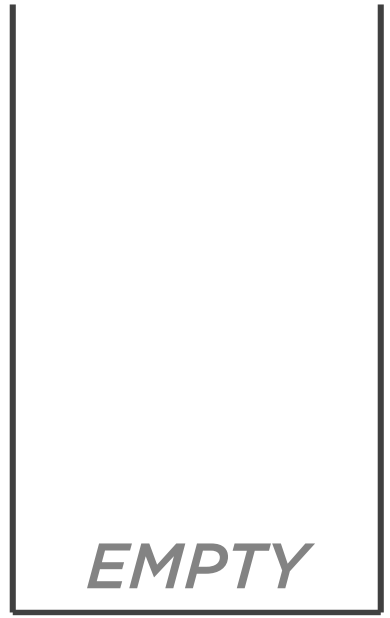
Demo: Contact Manager

- Undo
- Flight Recorder

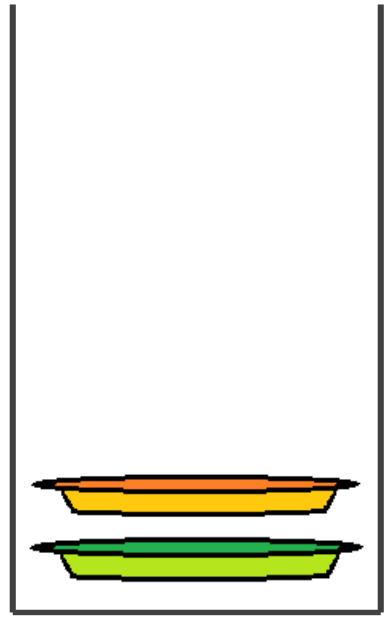
Stack

A Last-in, First-out (LIFO) data container.

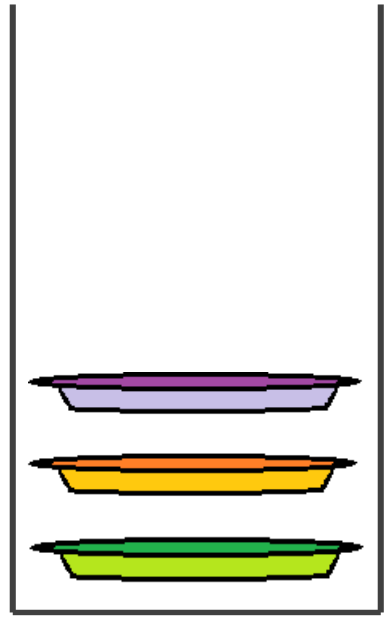
The stack of plates is initially empty



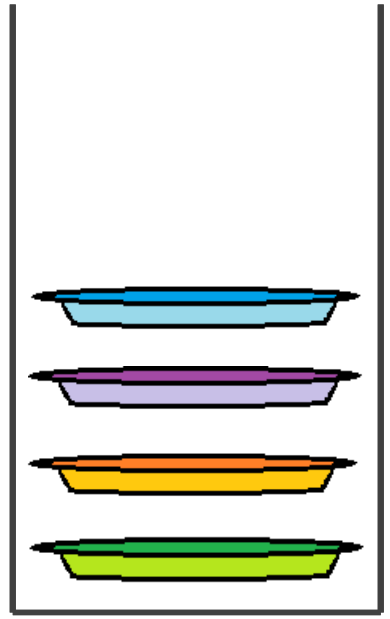
Additional plates can be added to the stack



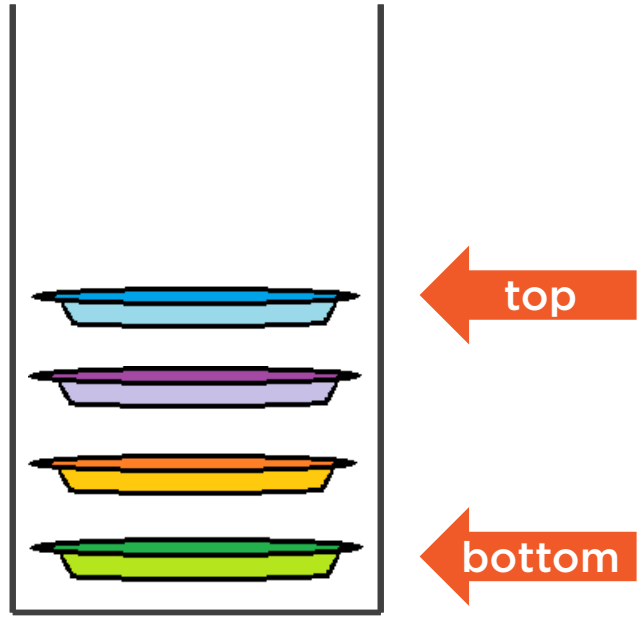
We can only access the plate at the top of the stack



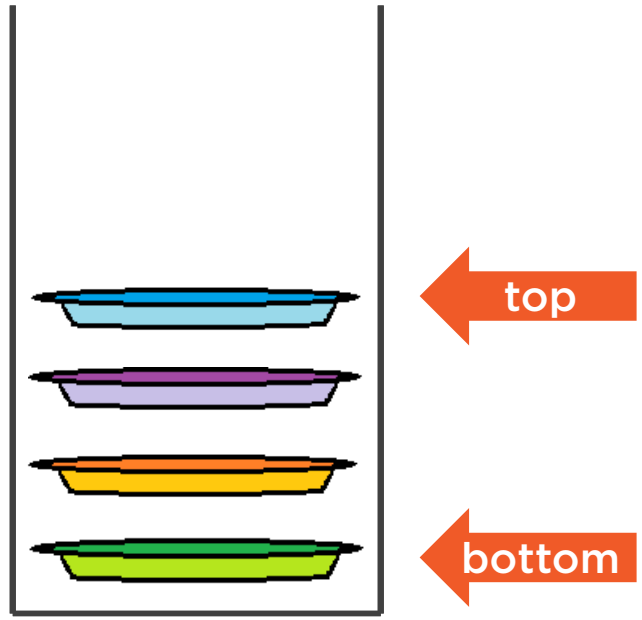
The stack of plates is now 4 deep



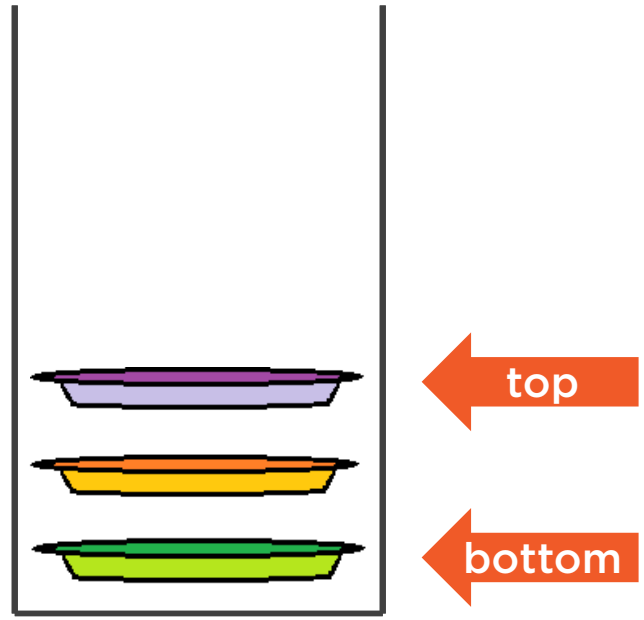
There is a top plate
and a bottom plate



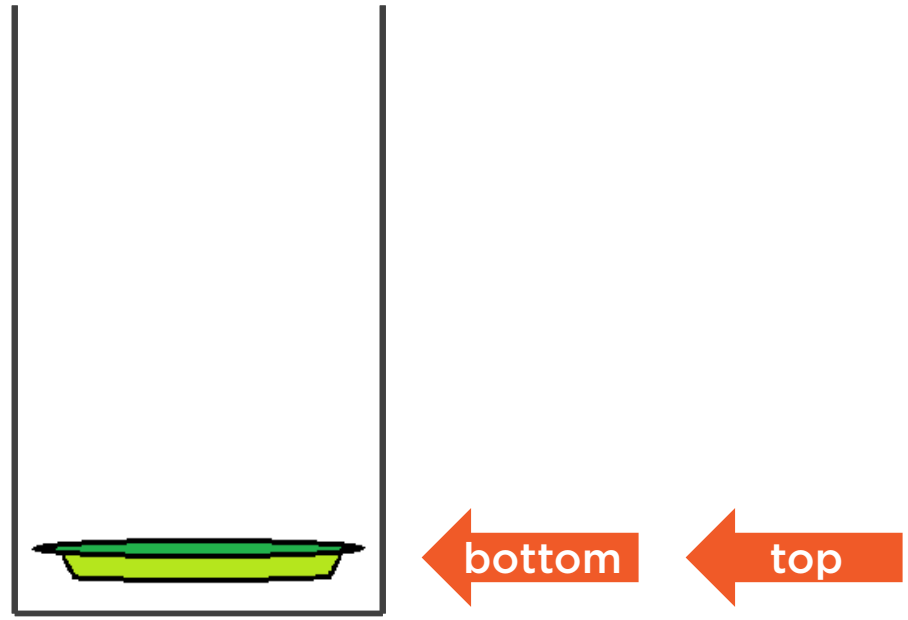
Plates come off the top of the stack



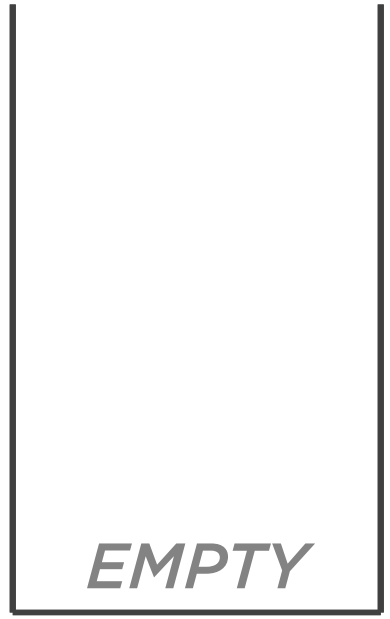
We “pop” items off the stack



A single item is the top and bottom



Popping the last item empties the stack



Queue

A First-in, First-out (FIFO) container.

”Queuing” in a line

Enqueue at end of line

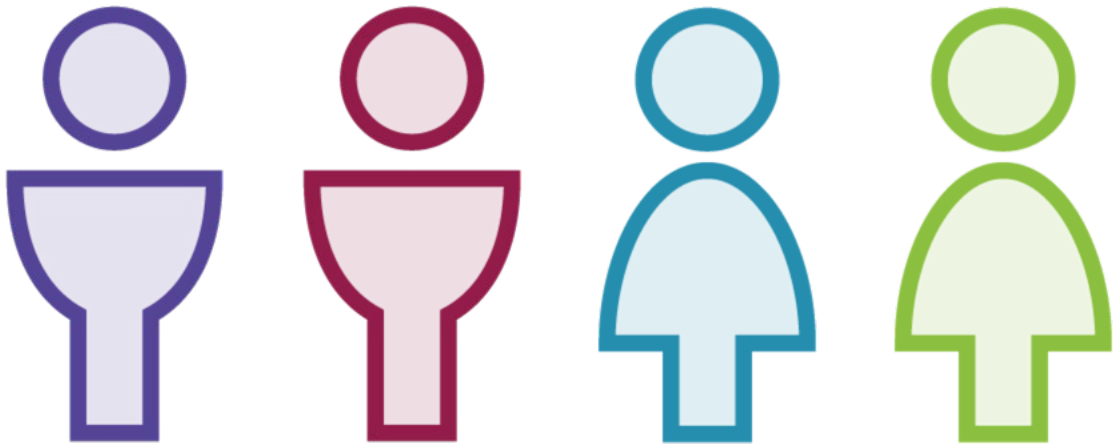
First is “head”

Last is “tail”

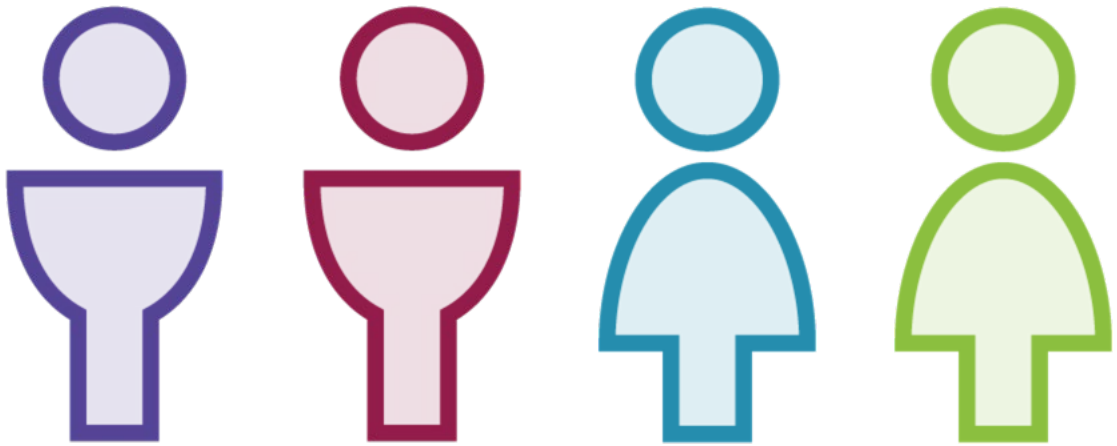
The head of the line is “dequeued”

Next is now “head”

A new person waits at the end of the line

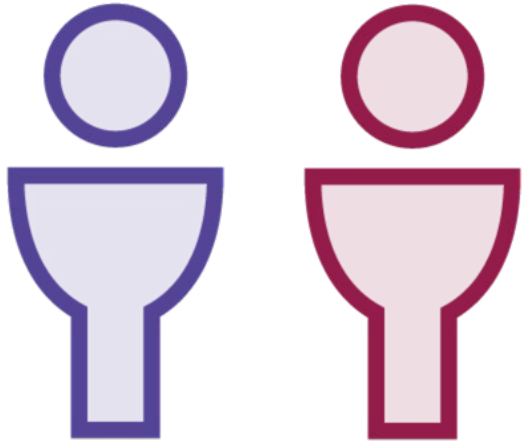


The queue gets shorter



The queue gets shorter

The queue gets shorter



The queue gets shorter

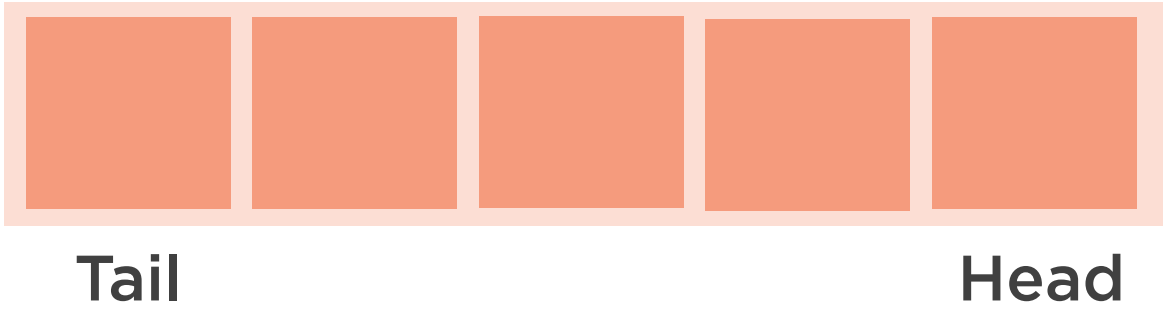
Until it is empty

Doubly Ended Queue (deque)

A queue-like container which is both First-in, First-out and Last-in, Last-out.

Doubly Ended Queue

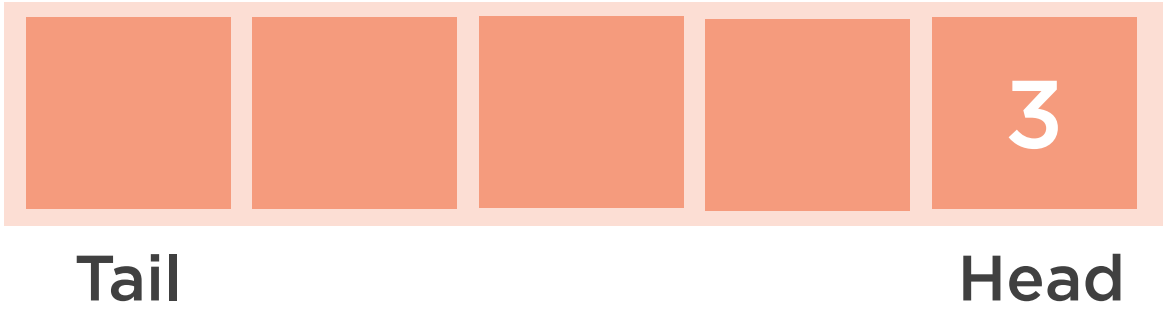
Start with an empty queue



Doubly Ended Queue

Start with an empty queue

Add ”3” to the head

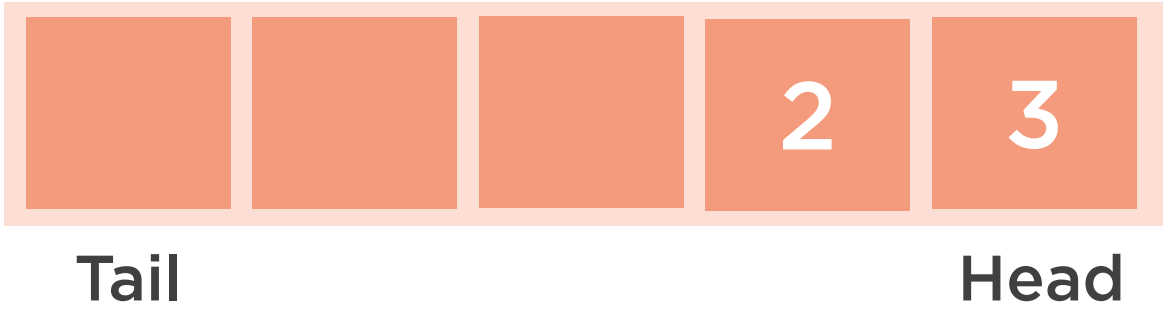


Doubly Ended Queue

Start with an empty queue

Add ”3” to the head

Add “2” to the tail



Doubly Ended Queue

Start with an empty queue

Add ”3” to the head

Add “2” to the tail

Add ”4” to the head

Doubly Ended Queue

Start with an empty queue

Add ”3” to the head

Add “2” to the tail

Add ”4” to the head

Add “1” to the tail

Doubly Ended Queue

Start with an empty queue

Add ”3” to the head

Add “2” to the tail

Add ”4” to the head

Add “1” to the tail

Add “5” to the head

Doubly Ended Queue

Remove “5” from the head

Doubly Ended Queue

Remove “5” from the head

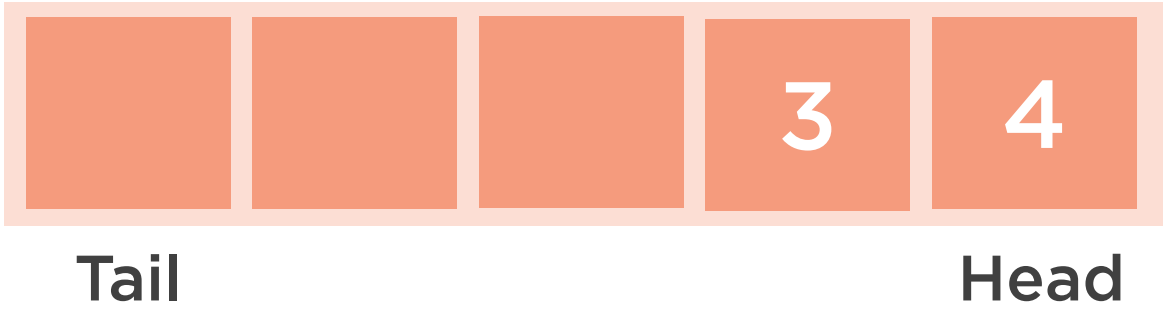
Remove “1” from the tail

Doubly Ended Queue

Remove “5” from the head

Remove “1” from the tail

Remove “2” from the tail



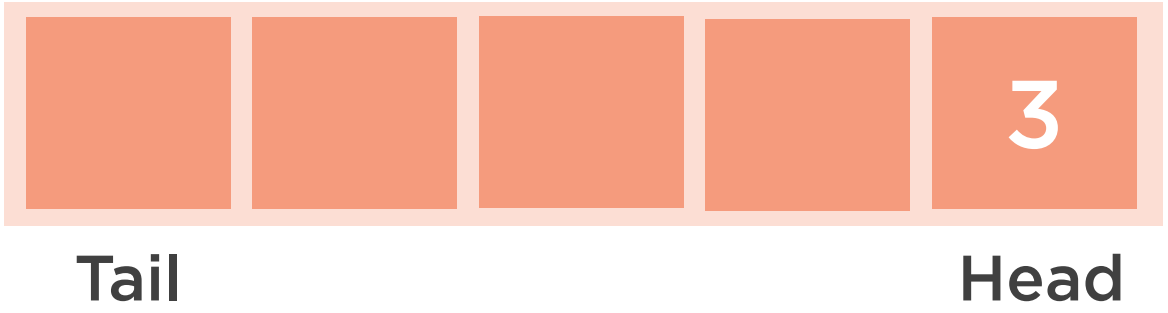
Doubly Ended Queue

Remove “5” from the head

Remove “1” from the tail

Remove “2” from the tail

Remove “4” from the head



Doubly Ended Queue

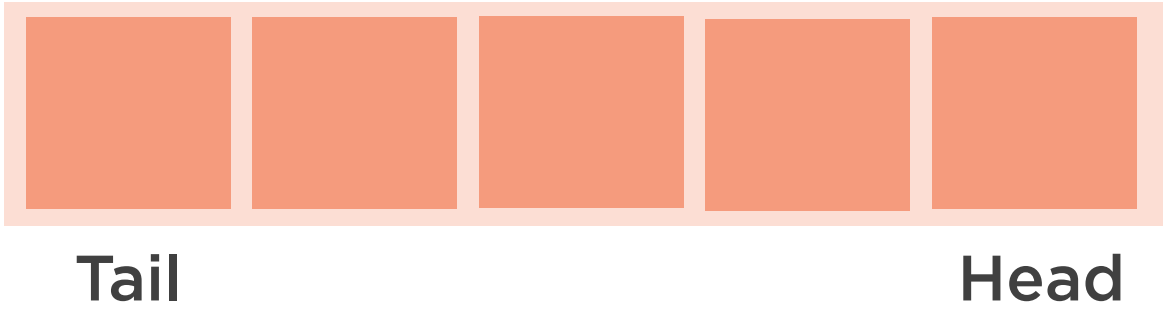
Remove “5” from the head

Remove “1” from the tail

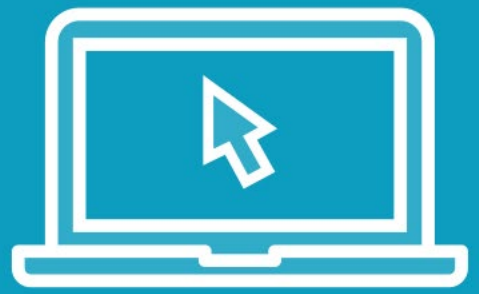
Remove “2” from the tail

Remove “4” from the head

Remove the “3” from the tail or head



Demo



Use a Stack to add an “Undo” operation

Use a Queue to add a flight recorder log