

# Linked Lists

## Recap from last week (memory and arrays)

- A (kind of) formal definition of an array: A contiguous block of memory with a pre-defined size.
- Arrays in JS:
  - The language spec never defines how to implement `Array`, so different browsers/engines may (or may not) implement them differently. As long as an implementation let's you perform Array functions (.length, push(), etc), it's an array as far as JS is concerned. As far as I know, most implementations use Objects under the hood.

## What are linked lists?

## How are they different from arrays?

## What are common operations on list/arrays?

- Read Operations:
  - return the first/last element (polling)
  - return the element at a specific index
  - return the first element that has a specific value
  - return all elements that have a specific value
  - return the length
- Write Operations:
  - Add a new element to the front/back
  - Remove an element from the front/back
  - Add an element at a specified index
  - Remove the element at a specified index
- **Why linked lists?**
  - It's not about learning about lists. It's about navigating the constraints that working with computer memory puts on developers.

- The attempt to solve problems that are present in arrays
- **Note:** Other implementations of arrays also try to solve these problems (pushing to the end of an array, rather than the beginning)
- Amortised Constant Appending
- **Types of Linked Lists:**
  - Stacks/Queues/Doubly Linked Lists
  - Wrapper Classes/Optimisations
- Practice:
  - Get length of a stack (very easy)
  - Reverse a stack (easy)
  - Insert element at index into a singly linked list (medium)
  - Build the linked list you feel most comfortable with (medium to hard)
  - Build an insert function for the doubly linked list (quite hard)

### Summary:

Name	Array	Stack	Queue	FrankenList
<u>push()</u> .	Slow	Fast	N/A	Fast
<u>pop()</u> .	Slow	Fast	Fast	Fast
<u>append()</u> .	Fast	N/A	Fast	Fast
<u>length()</u> .	Fast	Slow (depends)	Slow (depends)	Fast
<u>insert()</u> .	Slow	N/A	N/A	Slow (and hard to write)
<u>getElementAtIndex()</u> .	Fast	Slow	Slow	Slow
<u>removeElementAtIndex()</u> .	Slow	N/A	N/A	Slow (and hard to write)