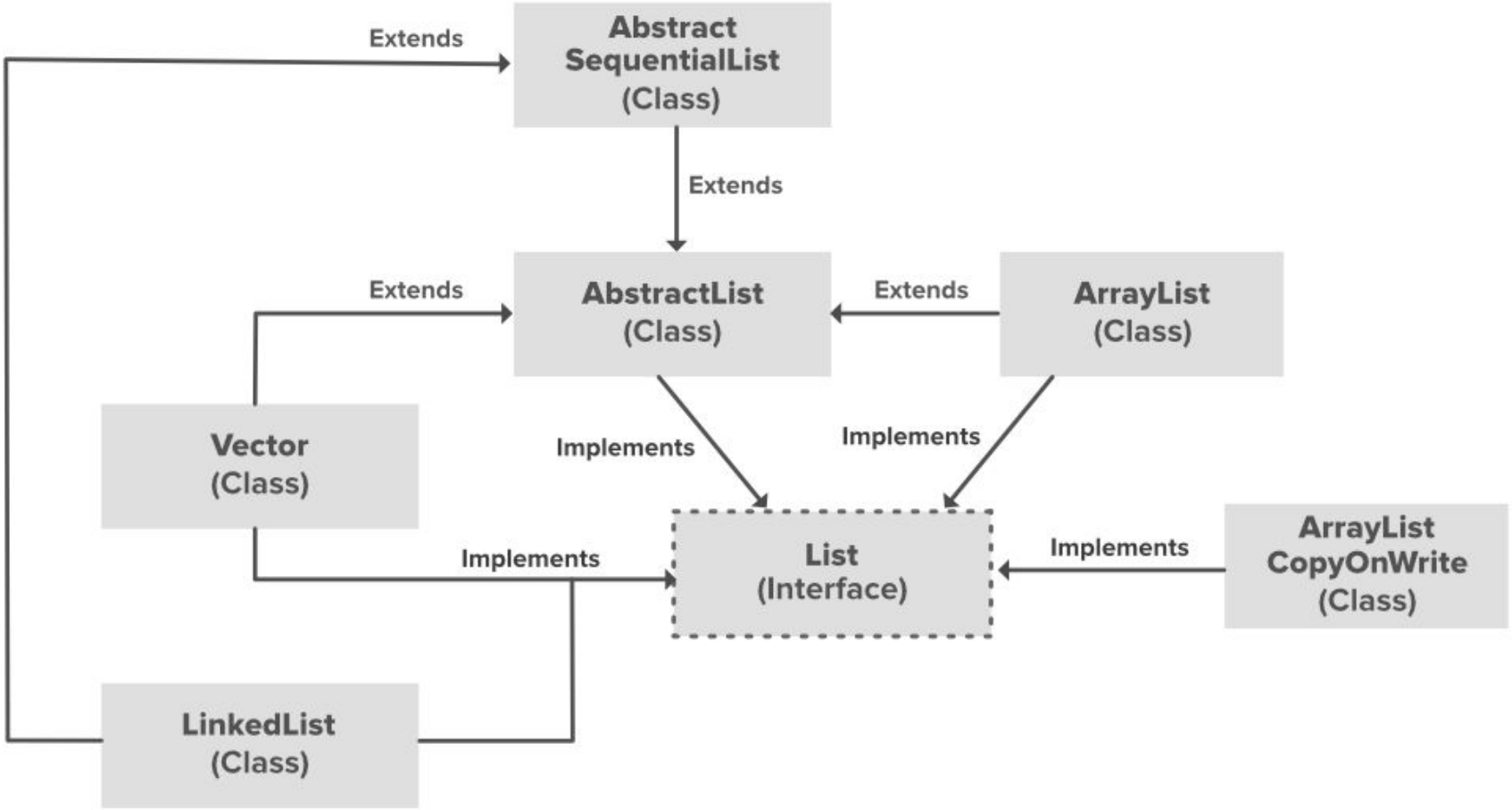
# Nodes, Lists, Stacks, Queues

Java
Mr. Poole

Collections are Generics
Lists are Interfaces
ArrayList is an example class


Extends
Abstract SequentialList (Class)
Extends
Extends
AbstractList (Class)
Extends
ArrayList (Class)
Vector (Class)
Implements
Implements
List (Interface)
Implements
ArrayList CopyOnWrite (Class)
Implements
LinkedList (Class)

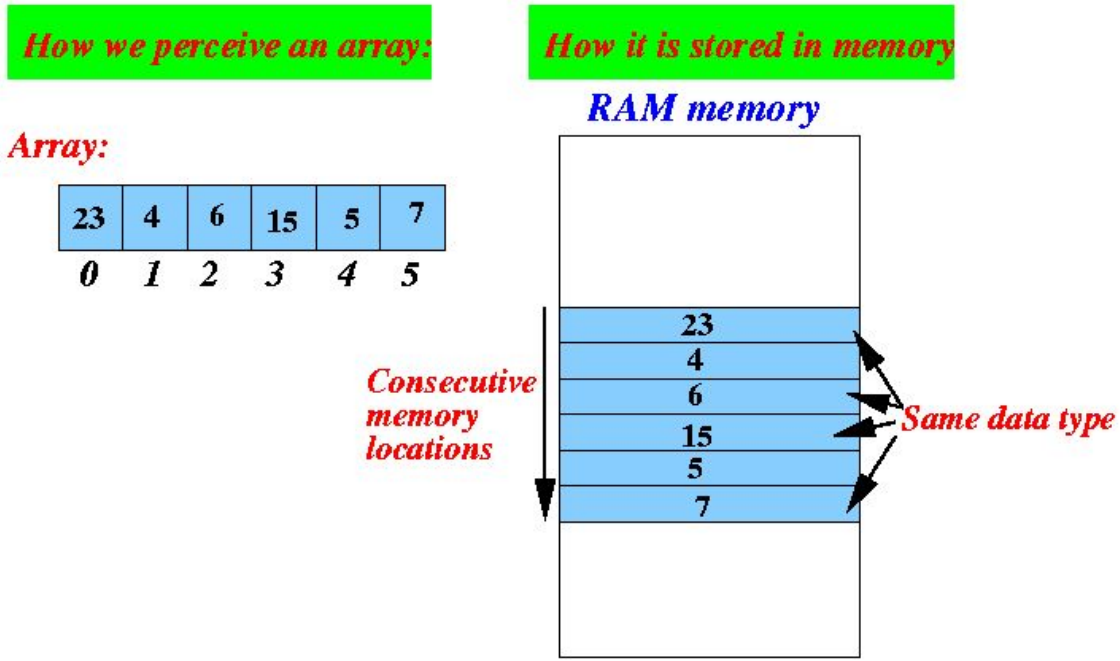
# What is an Array?

# What is an ArrayList?

# What is Static vs Dynamic?

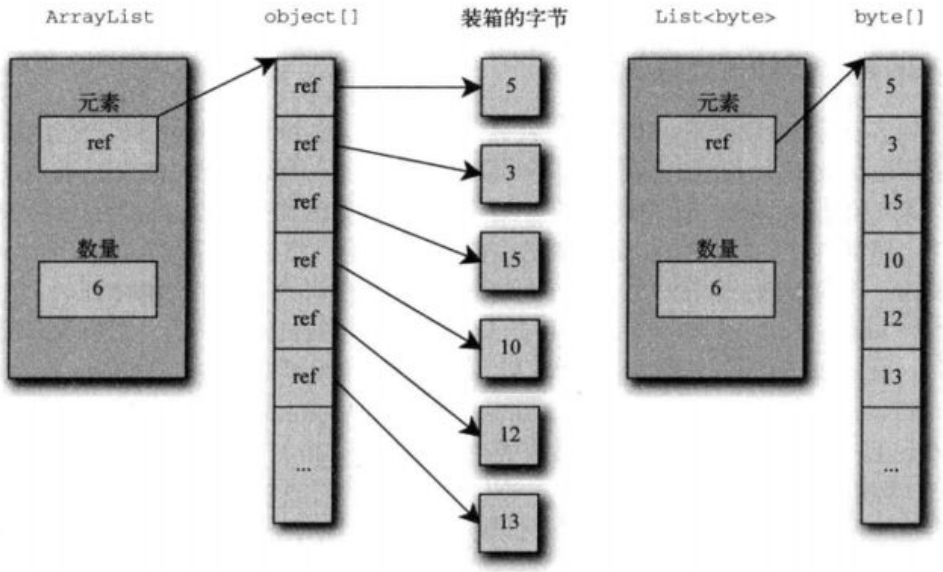
# Arrays are Static

Arrays are limited in how much data can be stored



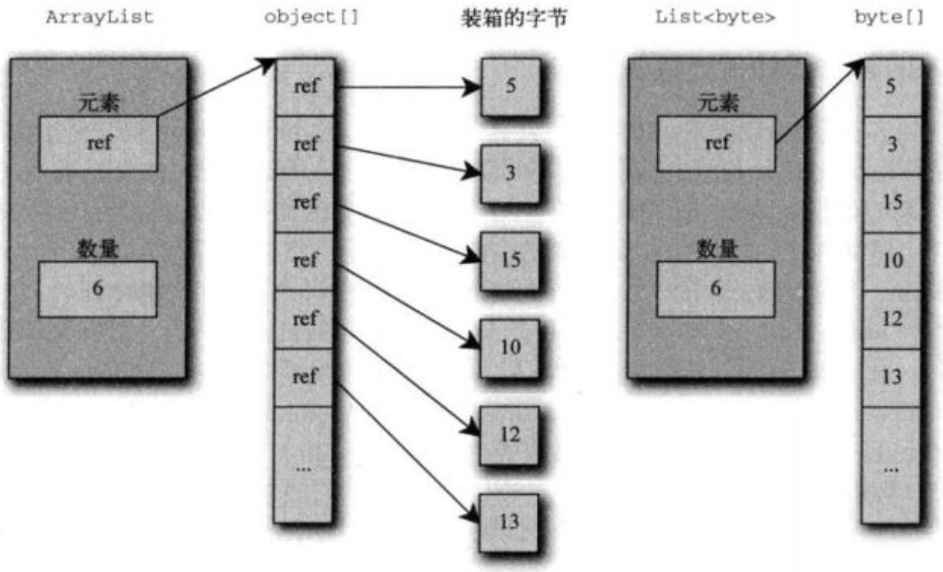
# ArrayLists are Dynamic

ArrayLists are able to create and remove data from the list which changes where it is stored in memory.



# ArrayLists use Addresses (pointers) to store data

Instead of storing actual “Data”, ArrayLists store “Addresses” that reference data in memory. This is how ArrayLists are dynamically allocated in memory.

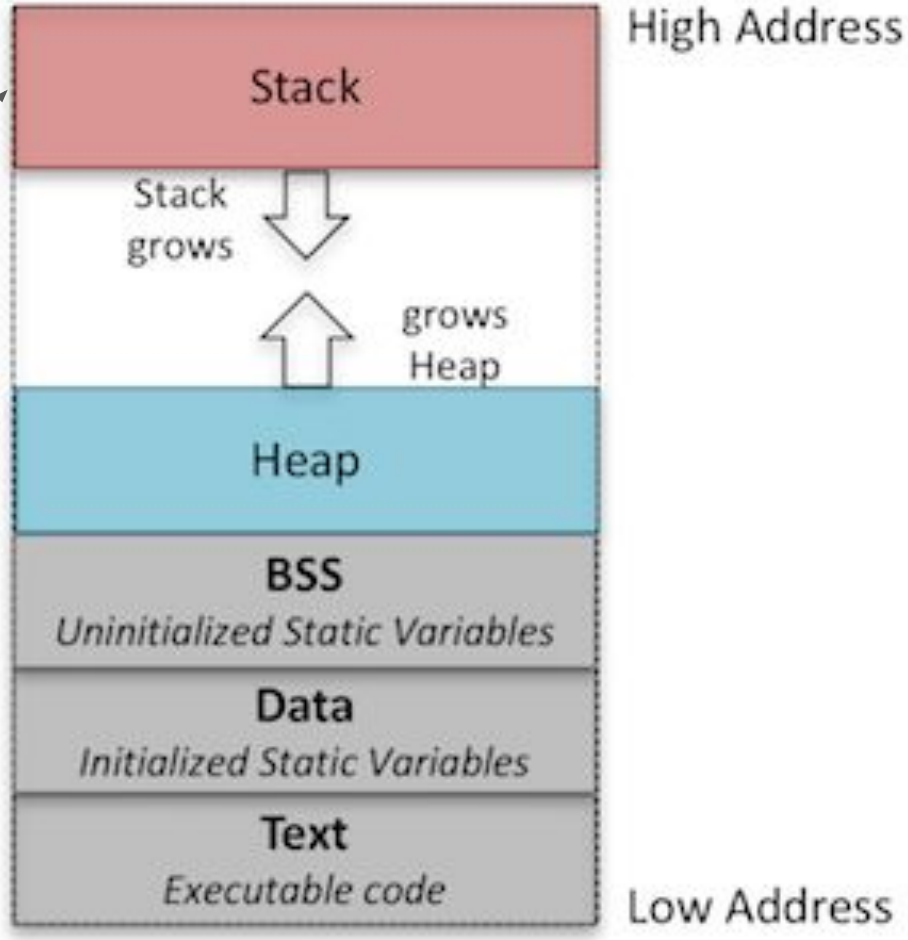


# How memory works

Static Memory (Arrays) is stored in the Stack

Dynamic memory (ArrayLists) is stored in the Heap

Unlike stack where memory is allocated or deallocated in a defined order, heap is area of memory where memory is allocated or deallocated without any order or randomly.



Introducing the:

**Node**

# What is a Stack?

# Stacks

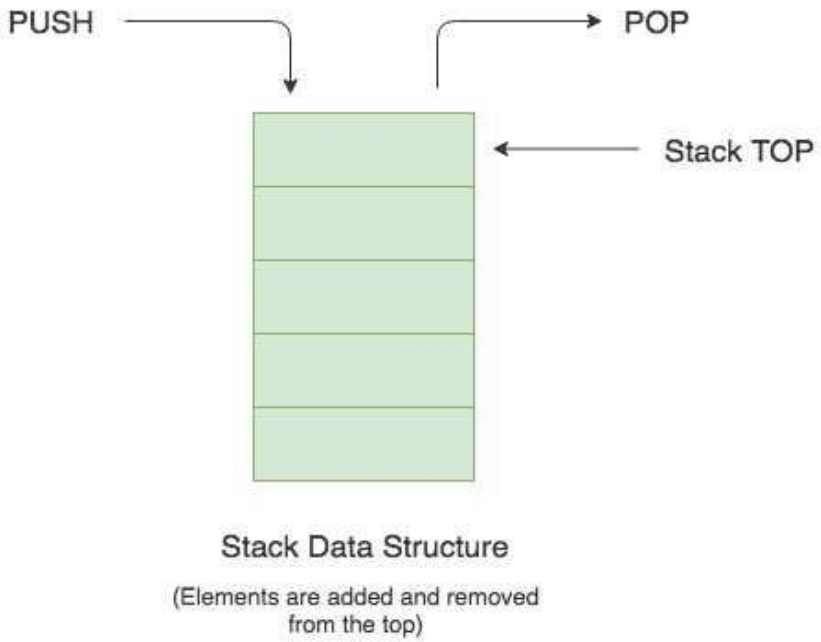
# Stacks

Stacks are data structures that follow the rule **Last In First Out (LIFO)**

With two major actions:

- Push (add data to the stack)
- Pop (remove the last piece of data)

- Peek (check out what's on top)



# What is a Queue?

# Queues

# Queues

Queues are data structures that follow the rule **First In First Out (FIFO)**

With two major actions:

- Add (add data to the queue)
- Remove (remove the first piece of data)

- Queues can use Iterators to iterate through
  - Similar to for-each loops

*Beyond normal queues, there are Priority queues that then give priority(weights) to different values.

# Why use Stacks and Queues?

# In short: Tree Searching

# Trees - Breadth First Search, Depth First Search

- Stacks and queues are used for searching through trees to store what nodes we've accessed!
- Stacks and Queues are much faster at doing this than any other data structure

We'll expand upon trees and searching algorithms later :)

# Cool things to look at

ArrayLists vs Vectors

- Synchronization (Editing the data structure through multiple threads)
  - This is so cool, used during operating systems of running multiple processes at a time
  - This also goes for PriorityQueues vs PriorityBlockingQueues

Memory

- There’s so much to memory and how data is stored, it’s really cool to understand it