This week (Chapter 2):

- Abstract data types (**Today**)
- Data Structures (Wednesday and Friday)
- Programming practices (Friday)

Today:

- Definition *abstract data type*, especially in contrast with *data structure*
- The "canonical" ADTs
- Start data structures (time permitting)

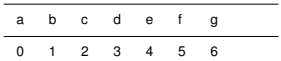
	Best case	Worst case	Expected case
Bounded linear search			
Binary search			
Quick sort			

An abstract data type (ADT) is a data type whose representation is hidden from the client. Implementing an ADT as a Java class is not very different from implementing a function library as a set of static methods. The primary difference is that we associate data with the function implementations and we hide the representation of the data from the client. When using an ADT, we focus on the operations specified in the API and pay no attention to the data representation; when implementing an ADT, we focus on the data, then implement operations on that data.

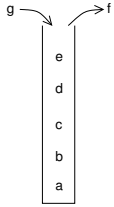
[Sedgewick and Wayne, *Algorithms*, Pg 64; also cf pg 84]

The "canonical ADTs":

- **List.** Linear collection with sequential and random access.
- **Stack.** Linear collection with LIFO access.
- **Queue.** Linear collection with FIFO access.
- **Set.** Unordered collection with binary membership.
- **Bag.** Unordered collection with enumerated membership.
- **Map.** Unordered collection of associations between keys and values.

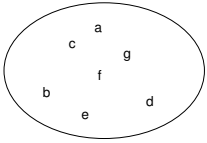


List

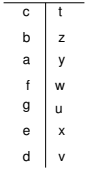


Stack

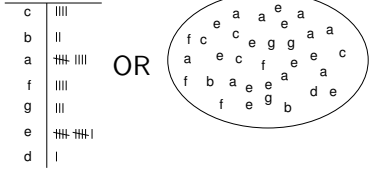
Queue



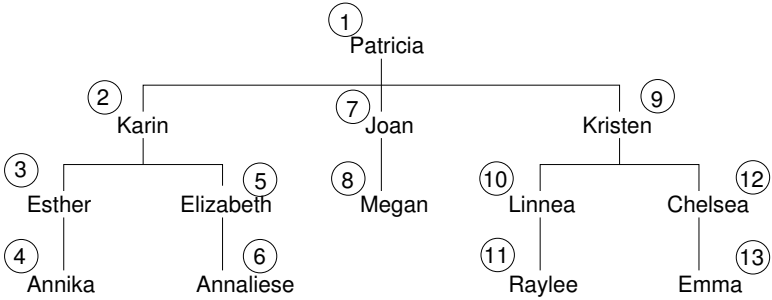
Set



Map



Bag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Karin
7
Joan
9
Kristen
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Esther
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Elizabeth
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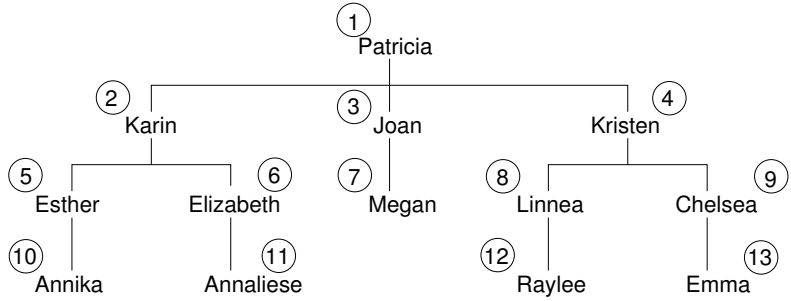
Megan
10
Linnea
12
Chelsea
4
Annika
6
Annaliese
11
Raylee
13
Emma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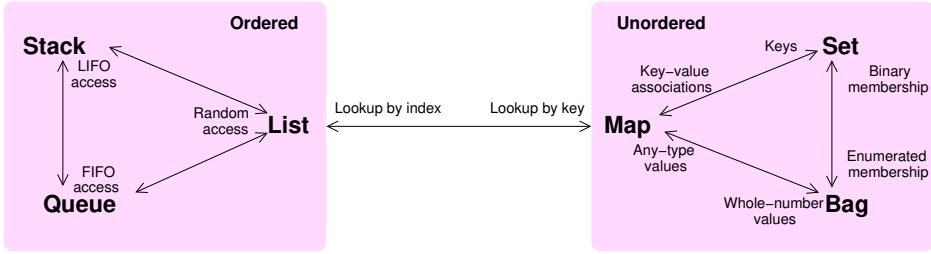
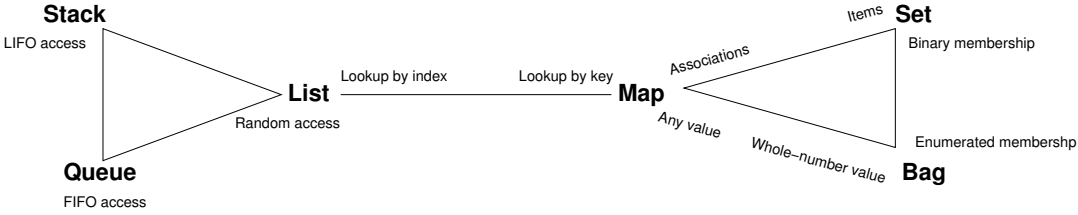

Ordered
Stack
LIFO
access
Random
access
List
FIFO
access
Queue
Lookup by index
Lookup by key
Unordered
Keys
Set
Key−value
associations
Binary
membership
Map
Any−type
values
Enumerated
membership
Whole−number
values
Bag


Stack
LIFO access
Queue
FIFO access
List
Random access
Lookup by index
Lookup by key
Map
Associations
Any value
Whole−number value
Items
Set
Binary membership
Bag
Enumerated membershp

The four basic ways to implement an ADT:

- Use an array
- Use a linked structure
- Use an "advanced" data structure, varying and/or hybridizing linked structures and arrays
- Adapt an existing implementation of another ADT.

Coming up:

Due **Mon, Jan 27***: (end of day)*
Finish reading Section 2.1
Do Ex 1.11
Take ADT quiz

Due **Fri, Jan 31***:*
Read Section 2.(2, 4, & 5)
Take data structures quiz

Also:
Do **"Implementing ADTs"** *project (Feb 3)*