

## Sorting, Searching, Stacks, and Queues

10-1-2002

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### Opening Discussion

- What did we talk about last class?
- Do you have any questions about the quizzes?
- Do you have questions about the assignment?
- If you don't catch onto the syntax of a language by reading about it, then practice coding is what you need to do. Redo PAD1 assignments in Java.

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### Getting back to code

- Last time we started code to do the three sorts we talked about. Now we want to write some code to use those sorts and see if they work, then write a quick binary search to look for data in a sorted array.
- We can also show how we would use the Arrays class for these purposes.

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## Abstract Data Types

- The main topics for today are Stacks and Queues. These are the simplest forms of what we call "Abstract Data Types". An ADT is basically an entity that stores data in some unknown form, and provides us with a standard interface for dealing with it.
- Good data structures in general are ADTs. They demonstrate the separation of interface from implementation.

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## The Stack and Queue ADTs

- The stack and queue are the simplest ADT because they each have only 2 methods in their interface (or 3/4 depending on the details of your definition).
- Stack
  - Push: adds something new to the stack.
  - Pop: removes the "newest" thing.
- Queue
  - Enqueue: adds something to the queue
  - Dequeue: removes the "oldest" thing.

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## LIFO vs. FIFO

- A stack is a last in, first out data structure.
- A queue is a first in, first out data structure.
- You will commonly here these referred to with the acronyms LIFO and FIFO.
- This really is the only difference between the two as for as a mental model of them is concerned.

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## Array Implementation of a Stack

- Stacks can be implemented in many ways. There is even a simple implementation with an array.
- By just keeping an integer index to the "top" of the stack we can easily write the methods.
- The third method often added is a peek method to look at the top of the stack without popping and an isEmpty method.

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## Array Implementation of a Queue

- As with a stack, a queue can be fairly easily implemented with an array, but here there are a few more details to worry about.
- Now we need two indexed for a front and back of the queue. Array based queues also need to be "circular" or they run out of space quite quickly.
- Again, peek and isEmpty are helpful.

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## Minute Essay

- Draw a picture of what the array for a stack would look like after these operations:
  - push(5)
  - push(7)
  - pop()
  - push(2)
- Design for assignment #3 due today. The implementation on Thursday.

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