

# Finishing Linked Lists

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# Opening Discussion

- Minute essay comments.
  - Do I expect HUDs to be popular?
  - Turning your programs into executable files.
  - How does “in-class code” update in real-time?
  - Required methods for a list.
- ICP Solutions

# Sentinels

- A sentinel is an extra node in the list that represents the “end” of the list and doesn't store data.
- The purpose of the sentinel is to remove special cases. The next of the sentinel is what we have called head.
- They are most useful in a doubly linked list where the previous of the sentinel is tail.

# Implementing a Doubly Linked List

- Now let's implement `java.util.List` with a doubly linked list with a sentinel. The list will also be circular.
- You should notice that this implementation never has to check for null because no references in the list should ever be null. This simplifies the code significantly. We also implicitly get a head and a tail with no extra work. If you don't have a sentinel you will write a lot of extra checks for nulls and even more to include a tail.

# Stacks/Queues with Linked Lists

- The last time we talked about stacks and queues we implemented the ADTs using arrays. Part of the idea of an ADT though is that the implementation can vary as long as it has the right behavior.
- Since you now know how to write linked lists, we want to look at how we would write stacks and queues using linked lists.

# Code

- I want to write a ListStack and a ListQueue. These should implement MyStack and MyQueue, but instead of using arrays (like ArrayStack and ArrayQueue), they should have a linked list inside of them.
- Remember that it is essential that the implementation be  $O(1)$  for all operations.

# Priority Queue ADT

- A priority queue has the same methods as a normal queue, only the contents are ordered not only by arrival time, but also by a priority. So dequeue gets the highest priority object and if several have that priority, it gets the one that has been there the longest.
- One way to implement a priority queue is with a sorted linked list. To make this flexible, you could have it take a comparison function that tells you the ordering. That would be provided when the priority queue is constructed. Or require Ordered.
- What order are the various operations for this

# Code on Project

- I'd like to take whatever time is left and push forward to add some functionality to our drawing program.



# Minute Essay

- What do you see as the relative advantages and disadvantages of the array and list based implementations of stacks and queues?