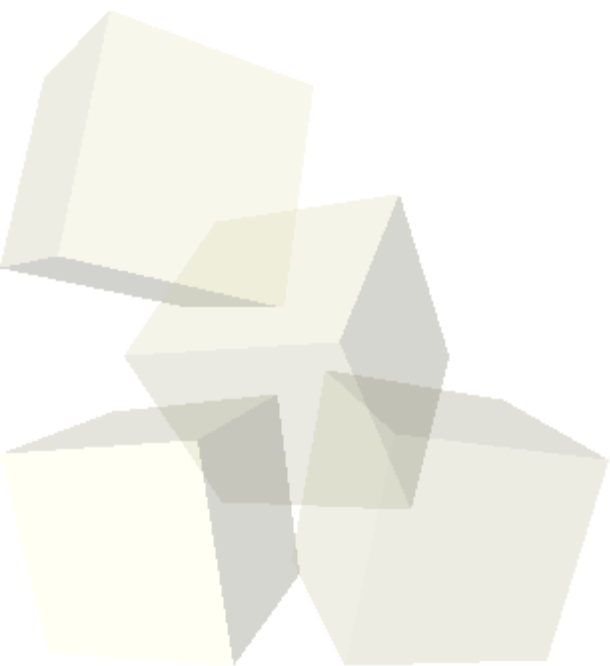




# Linked Lists

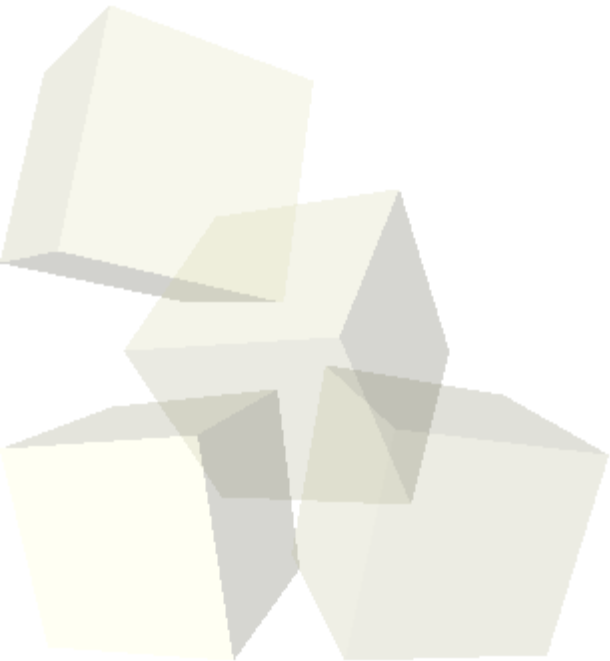
11-30-2006





# Opening Discussion

- What did we talk about last class?
- Do you have any questions about the assignment?





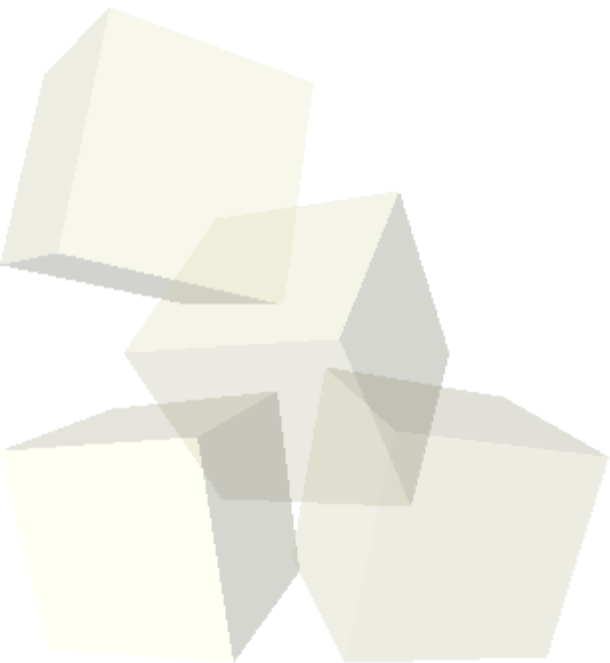
- The basic idea of the list ADT is we want to create code that gives us the ability to keep track of “things” with the following functions.
  - ♦ Data get(int)
  - ♦ void add(Data)
  - ♦ void insert(Data,int)
  - ♦ Data remove(int)
- We will likely also need some functions for setting things up and tearing them down to make sure that everything works properly.





# Our Array Based Implementation

- We started to write an array based implementation of this last time. Let's get back to that.
- I also want us to split our code into separate compilation units today.





# Inefficiencies of the Array List

- The insert and remove operations on the list had to do a lot of work moving stuff around with our array implementation. Basically, they had to do  $O(n)$  memory moves.
- This could be especially costly if our Data was a large structure.
- Array based lists are really good for random access, but they are very poor for inserting and removing items.





- If we have an application that is going to do a lot of adding and removing of data and not so much random access, the implementation we want is a linked list.
- Note that we are going to implement the exact same methods, we simply want to write them in a different way.
- In a linked list we don't have a single block of memory that we stick things in. Instead, we have many small blocks that are linked to one another.
- A node in a linked list will know about the next item and might know about the previous one. The list itself is just a pointer to the first node.



# Singly Linked Lists

- We will do a singly linked list for simplicity. Lets draw some pictures to try to understand what they are. The pictures can also help us figure out how we will do the various operations.
- The List itself will keep track of one or two nodes (keeping a tail is helpful for efficiency). We will also need a structure for the Node type that really stores the data.





- Why are linked lists better than array based lists for programs that do a lot of inserting and removing?
- Remember that assignment #9 is due today.

