- Let's look at solutions to the interclass problem.
- Do you have any questions about the assignment?
One of the most powerful concepts in computer science is the abstract data type. This is something that holds information for us and defines a certain set of operations we can do on that data.

The ADT does not tell you how it will do those operations. This is critical as most operations can be done in different ways.

Some common ADTs include the following:
- List
- Map
- Set
Today we will concern ourselves with the list ADT. Conceptually this is quite simple. Think of the lists you write yourself to help organize.

You have certain operations.
- Get element from list
- Add element to list
- Insert into the list
- Remove from the list
- Get the size of the list

There might be others, but those are the basics.

Once again, the list ADT doesn't tell you how to store the elements or do these things. It just says that a list must do them.
You could write all of these functions using an array as the storage mechanism for your list.

Let's think about the different functions we have to implement.

- Getting an element is just looking up by index
- Adding an element at the end is storing it and then keeping track of the fact we have one more.
- Inserting into the list requires moving other elements down to make a hole in the list.
- Removing from the list requires moving elements down to fill up the hole.
- Return a stored value for the size.

Some of these are fast, but others aren't. The slow ones require a lot of memory movement.
The solution to this is to use a different implementation of the list: a linked list.

A linked list is made out of nodes that store data. Each node knows about one or two of it's neighbors.

If it knows about one it is called a singly linked list. If it knows about two it is a doubly linked list.

To build a linked list we need a structure for the nodes and most of the time we'll have a structure for the list to hide the nodes in.

The linked list is efficient for adding and removing, but random access is slow.
What do you have to do to return a random element from a linked list?

Quiz #6 is at the beginning of next class.

Interclass Problem – Write an implementation for an array based list with the five operations mentioned in this lecture.