



# Multidimensional Arrays

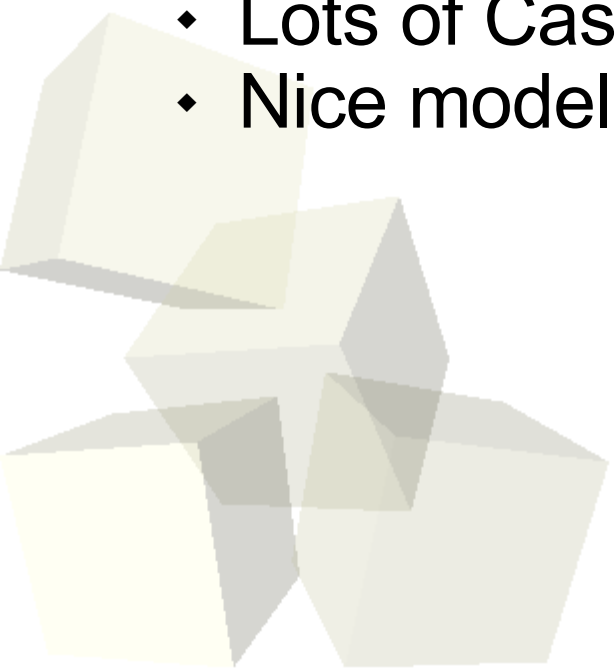
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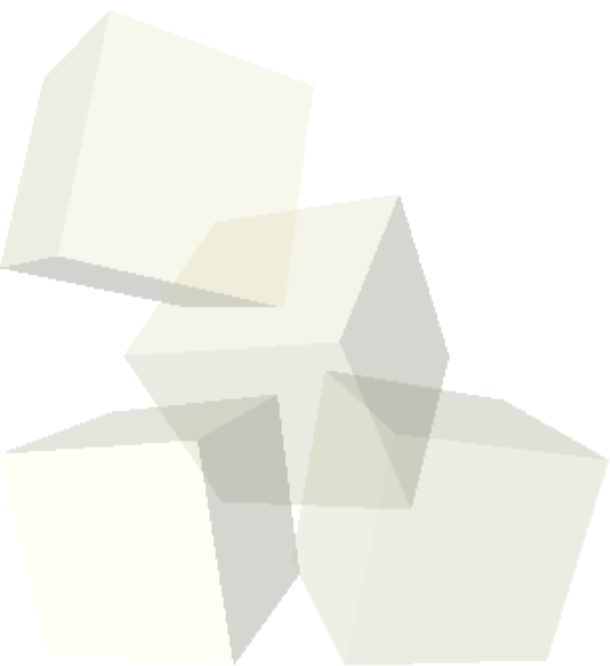
# Opening Discussion

- Let's look at some solutions to the interclass problem.
- Do you have any questions about the assignment?
- ACM's "Make the Most of Your Major" event is this evening.
- Fun things in planetary science.
  - ◆ Lots of Cassini data on rings and moons.
  - ◆ Nice model of planetary formation.





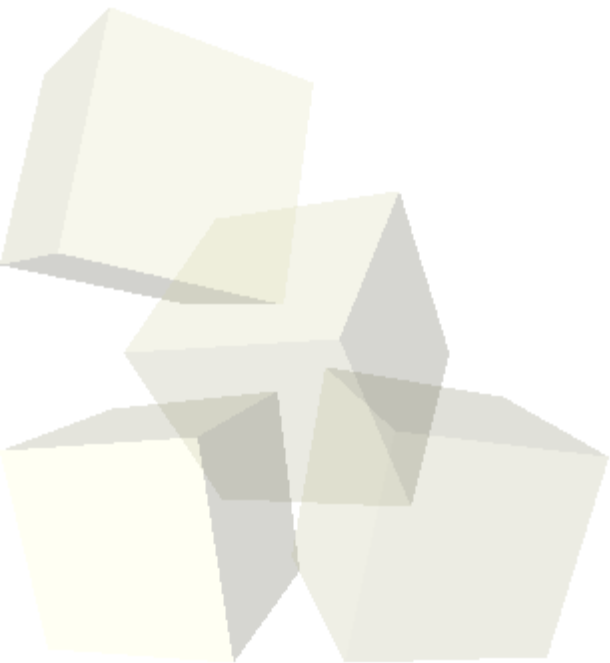
- Far more common than sorting is the act of searching.
- If I give you an array of ints and ask you to tell me where the number 33 is, what would you do?
- How fast is this procedure? How many checks do you need to do?





# Binary Search

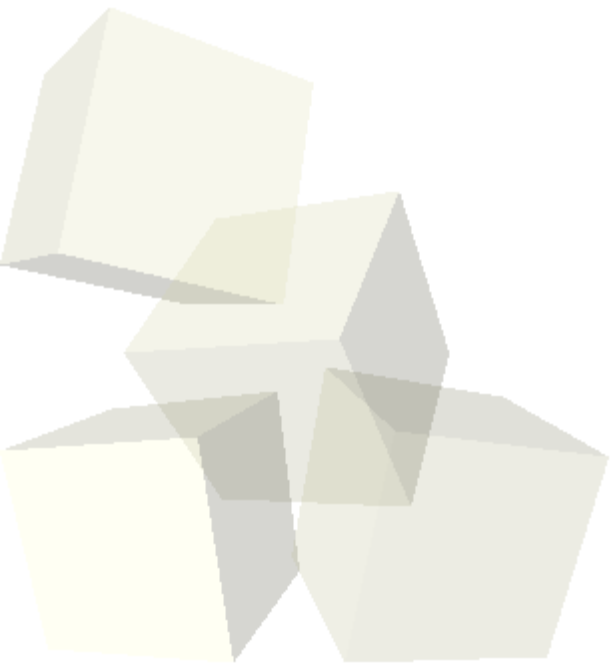
- The real benefit of sorting is that we can search faster. If data is sorted we can do a binary search.
- Start in the middle and determine if what you are looking for is on the right or the left.
- This only works for sorted data, but it is MUCH faster for big data sets. It is  $O(\log_2 n)$  instead of  $O(n)$ .





# Array Types

- When we declare `int a[]` you can think of it as a being of type `int[]`. (That is actually the accepted syntax in Java.)
- The array types are themselves types. By adding the brackets you basically create a new type that is an array of the base type. You can do this with any type.





# Multidimensional Arrays

- If array types are types and we can make arrays of any type then we can make arrays of arrays.
- This is what produces multidimensional arrays. To declare a multidimensional array simply put multiple sets of brackets with sizes after the variable name.
  - ◆ `int a[10][20];`
- When you pass a multidimensional array, you must specify the size of every dimension except the first one.
- You can put lots of dimensions on an array, but there are few applications needed more than three. Memory requirements grow quickly.



- There are lots of different uses for 2-D arrays, but one of my favorite is that of mazes.
- These also provide a great playground for recursion because maze functions are among the set that are hard to write with loops, but easy to do with recursion.





- Given that an int takes four bytes on these machines, how much memory would the following declaration consume?
  - `int a[10][5][20][100];`
- Remember that the assignment is due on Friday.
- ACM's "Make the Most of Your Major" event is this evening at 7pm in HAS 340.
- Interclass Problem – Write a function that tells you the length of the longest path from a given location to 0,0 on a maze made with a 2-D array of ints.