Sorting and Searching

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Opening Discussion

- Let's look at some solutions to the interclass problem.
- What are arrays? How do they help us? What are the limitations they have?

Sorting

- It is very common on computers to want to put things in order. This is known as sorting.
- Information can be sorted by many different things.
- Can you describe how you would sort things? If I give you a big stack of folders with names, how would you go about putting them in the right order? What if you were supposed to sort dumbbells on a weight rack?

“Slow” Sorts

- There are three standard “slow” sorts that we will discuss. These are all O(n^2) and involve two loops.
- Bubble Sort
  - Go through the whole array comparing adjacent elements. Swap them if needed. Repeat until done.
- Selection Sort (Min/Max Sort)
  - Run through and find the smallest/largest element. Swap it to where it belongs. Repeat this until done.
  - SWAP DON'T SHIFT!!!
- Insertion Sort
  - Starting at the beginning of the array take the next element and move it forward to where it belongs. Do this for each element in order.

Searching

- 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 $O(n)$.

Minute Essay

- How does the fact that arrays are passed by reference help us in sorting?
- Remember that there is an assignment due on Friday.
- Interclass Problem – Write a sort and a binary search for doubles. You can pick the sort algorithm you like best.