Activity: Card Sorting “Game”

Materials:

- Novelty-size (big) playing cards
- Magnetic clips
- Chalkboard (hopefully the kind to which magnets stick)

Setup:

Clip 8 cards (with numeric values) to magnetic clips and stick them on the chalkboard in a row (side-by-side vs. randomly distributed) so that one can’t see the faces of the cards.

Put students into groups of 2-4.

Objective:

Design a procedure for one (non-thinking) person to get the cards into ascending order. (The procedure should work for any number of cards and any set of face values that can be compared).

Rules:

- A person may detach a card from the board to look at it, but they may only hold one card in each hand.
- A person may compare two cards in any way s/he likes, and may replace the card back onto the board (face down) anywhere.
- Once a card has been stuck back on the board (face down) a person cannot remember what its value was. That is, a person can only be aware of at most two card values at once – the cards in his/her hands.

Comments and teaching strategy:

You can, of course, do this on a tabletop with plain old playing cards. I’ve found that using the novelty-size cards and magnets really drives home the idea that only two cards can be compared since it’s actually physically difficult for a person to hold more than two. If you just have one set for demonstration purposes, that usually gets the job done.

I usually ask the groups to write down their procedure. I’ll make my way around the room, checking in with each group, and usually I will attempt to follow their instructions as literally as possible. This usually gets across how specific they need to be.
Once each group is done, or close enough to done, I have the groups share their procedure. Someone from the group will describe the procedure and I’ll act it out on the board so that everyone can see how it works. Each time a procedure is explained, I ask if some other group did it any differently. Most of the time you’ll get all three of the $O(n^2)$ sorts. If one of them is left out I’ll demonstrate it.

Obviously, we won't program any of these algorithms until much later and I tell them so. But I also get an opportunity to explain what, for me, makes computer science fun and interesting: that it's about solving problems. And any problem can be solved many different ways - no one necessarily better than the other.

So, this little activity, and my associated "welcome to computer science" speech, seem to go a long way towards setting a good tone for the year. Students come away confident that they can solve problems algorithmically, and that they can do so using their own brains and creativity.

After several sorting algorithms have been demonstrated it’s very natural to ask, “So, which one is the best?” This naturally leads to a discussion of best-case and worst-case scenarios and we effectively describe the big-oh behavior of the various algorithms, obviously without any formal notation.

Time permitting, I demonstrate Merge-Sort on the board. It usually gets some oohs and ahs.