

# CS1003/1004: Intro to CS, Spring 2004

Lecture #8: Algorithms IV

Janak J Parekh

[janak@cs.columbia.edu](mailto:janak@cs.columbia.edu)

---

---

---

---

---

---

---

---

## Administrivia

- HW#2 due now
  - Won't be returned before midterm, so I'll release solutions
- HW#3 out
  - All programming
- I'm teaching C lab this week
- Midterm next Tuesday
  - Topics list posted
  - Extra review session?

---

---

---

---

---

---

---

---

## Agenda

- One more recursive example
- Talk about one more class of algorithms: *sorting*
- Spend some more time on big-Oh notation
- Midterm review
  - More midterm review in labs...

---

---

---

---

---

---

---

---

## Recursion, redux

- Idea: instead of using explicit loops, cast problem in terms of itself
- *Base case(s)* and *recursive case*
- How can we compute  $n!$  recursively?
- I won't make you design a recursion on the exam, but you should be able to recognize one

---

---

---

---

---

---

---

---

## Sorting

- Common problem: given data, sort it in some fashion
- Most common-type is *comparison-based sort*
- Can you come up with way to sort information?
- Many different kinds; we'll look at two today
  - Bubble sort
  - Insertion sort
- Let's make this interesting...

---

---

---

---

---

---

---

---

## Big-Oh notation, redux

- Basic intuition:
  - Find the number of steps in terms of  $n$  or other variables
  - Drop any constants or additive lower-order terms
  - Put a  $O()$  around the result
  - Common:  $O(1)$ ,  $O(\log N)$ ,  $O(N)$ ,  $O(N^2)$ ,  $O(2^N)$
- What's the complexity of the algorithms we just talked about?

---

---

---

---

---

---

---

---

## Next time

- Midterm
- Then break! ☺
- Then HW3 is due... ☹

---

---

---

---

---

---

---

---