Announcements

• No Reading or RQ for next time
• APT 9 due today, APT 10 out
• Assignment 8 due Thursday
• Assignment 9 out (optional), due April 23
• Lab 11 this week
ACM Meeting

- Duke ACM is the student chapter of the professional organization for Computer Scientists
- Election and talking about Research
- Wednesday 6pm, Soc Sci 311
- See RSVP on Piazza site
Grace Hopper Conference

- Conference for women in computing
- 8000 women there last year!
- Apply for GHC scholarship by April 16
- Need a letter of reference
Dictionary Comprehension

• List comprehension - builds a new list
• Dictionary comprehension - builds a new dictionary

• Format
d = { key:value for key in somelist if ....}
Dictionary Comprehension Examples

```python
def dictPlayerToGamesPlayedIn(datalist):
    d = {item[1]:0 for item in datalist }

    for item in datalist:
        d[item[1]] += 1
    return d

def dictPlayersToOpponentsBeat(datalist):
    d = {line[1]:[] for line in datalist if line[3]=='won'}
    for line in datalist:
        if line[3] == 'won':
            d[line[1]].append(line[0])
    return d
```
Recursion

• Method calls a clone of itself
• Solves a problem by solving smaller subproblems
• “looping” by recursive calls
  – CAUTION – don’t add a loop, it is implicit
Examples: recursionMisc.py

• Calculates and prints the sum of integers from a list that are even
• Print the numbers one per line
• Mystery recursion
Recursion (more)

• Watch out for infinite recursion
  – No way out, what happens?
  – Segmentation fault, out of memory

• Rules
  – Base case (way out) – no recursive call
  – Recursive call(s) – solve a smaller problem
Recursion vs Iteration
Which method do you use?

• Iteration
  – Easier to define
  – Faster – recursion takes some overhead

• Recursion
  – Easier to define
  – Shorter code
Types of Recursion

• Tail recursion
  – One recursive call at the end of a method
  – Easy to replace with a loop

• Reverse something
  – One recursive call “before” process

• Multiple Recursion
  – More than one recursive call