

# More Recursion

3-24-2010

# Opening Discussion

- Minute Essays
  - Counting not showing everything?
  - Conditionals in recursion (could be a loop)
  - Recursion vs. loops
  - Real life applications of recursion.
  - More life lessons according to Lewis?

# Why Did It Count Up?

- Let's go back over the last code we wrote previously that did a count up and figure out how it worked.
- The power of recursion comes from the “call stack”. This is the memory that each method is given when it is called.
- A loop doesn't implicitly remember anything it did before. Recursion does.

# Towers of Hanoi

- This is a classic game. You are given disks of different sizes that can go on three pegs.
  - You can only stack a disk on a larger one.
  - You can only move one disk at a time.
  - The goal is to move the whole pile.
- <http://www.dynamicdrive.com/dynamicindex12/tov>
- We want to write code that solves this problem.

# Recursive Solution

- This is a problem that looks very ugly when considered with normal iteration.
- However, it has a simple expression recursively.
  - To move a stack of 1 from peg A to peg B, simply move the piece to the other peg.
  - To move a stack of N disks from A to B, move N-1 disks from A to C, then move the Nth disk to B and move the N-1 from C to B.

# Analyzing the Solution

- This has the main hallmarks of a recursive solution.
  - There is a base case that is solved directly. (The condition that doesn't recurse.)
  - The solution for a large problem is made by solving a smaller problem.
- That definition in terms of itself is recursion.

# Code

- Now that we have explained how we do this in normal words, let's do it in code.

# The Power of Recursion

- The Towers of Hanoi is fairly easy to solve with recursion, but very hard to solve with a loop.
- The reason is that the solution uses the extra memory of recursion. This is seen in the code when it calls itself twice.
- A loop goes from one state to the next. Recursion can go from one state to multiple others.



# Minute Essay

- What questions do you have about today's topic?
- Mail me your projects by tonight.