

For Friday

- No reading
- Rough drafts due (electronically on Blackboard and two hard copies to class)
- **BE ON TIME!**

For Monday after Thanksgiving

- Read chapter 10, section 4
- Ethics exercise
- Homework TBA – check website

Program 5

- Any questions?

Research Paper

- Need topics approved . . .
- Rough draft of COMPLETE paper due Friday
- Any questions?

Divide and Conquer

- Basic Concept
 - Break a problem into pieces
 - Solve the problem for each piece
 - Combine the solutions to create the solution for the entire problem
- Recursion
 - The divide and conquer concept is recursive
 - Implementations of divide and conquer algorithms may or may not be recursive

Finding a Counterfeit Coin

Familiar Divide and Conquer Algorithms

- What algorithms have we looked at that fit this type?

Familiar Divide and Conquer Algorithms

- Quicksort
- Mergesort
- Binary Search
- Permutations
- Towers of Hanoi Solution

Divide and Conquer Examples

- Finding max-min
- Closest two points
- Selection

Dynamic Programming

- Related to divide and conquer
- We want to build solutions from partial solutions
- However, our partial solutions may overlap
- Rather than re-computing the partial solutions, we want to compute them once
- Bottom-up

Fibonacci Numbers

- Recursive solution
- Better to use iterative solution and record partial solutions

Making Change

- With standard denominations, we can use a greedy algorithm to make change in the fewest number of coins
- What if denominations are 1, 4, and 6
- Greedy algorithm doesn't work
- But we can use partial solutions

Basic Dynamic Programming

- Find and record optimal solutions to the smallest subproblems
- From those solutions, compute optimal solutions to the next-smallest subproblems
- Continue until solution is computed to the complete problem

Principal of Optimality

- Optimal solution must be based on optimal partial solutions

All Shortest Paths

- Floyd's algorithm is a dynamic programming algorithm
- We keep track of best path known thus far.

Matrix Multiplication

Optimal Binary Tree