

# For Monday

- Read chapter 10, section 4
- Chapter 10, exercise 10

# Research Paper

- Any questions?

# Program 5

# On-Line Strategies

- Next Fit
- First Fit
- Best Fit

# Off-Line Strategies

- First Fit Decreasing
- Best Fit Decreasing

# 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