

COMP 312
Assignment 4
Due at 9:00 am, Tuesday, October 9, 2007
All problems are of equal value.

Reading

Brassard & Bratley, Chapter 8.

Practice

Brassard & Bratley, 8.1, 8.2, 8.4, 8.5, 8.7, 8.15, 8.19, 8.20, 8.21, 8.22, 8.23, 8.26, 8.29, 8.30, 8.33, 8.34.

To Be Handed In

1. Brassard & Bratley 8.18.
2. Brassard & Bratley 8.28.
3. Brassard & Bratley 8.32.
4. We wish to compute the laziest way to dial an n -digit number on a standard push-button telephone using two fingers. We assume that the two fingers start on the * and # keys, and that the effort required to move a finger from one button to another is proportional to the Euclidean distance between them. Design an algorithm that computes the method of dialing that involves moving your fingers the smallest amount of total distance. Express the running time of your algorithm in Θ -notation.
5. Given a sequence of integers $X = x_1, x_2, \dots, x_n$ an *increasing subsequence* of X of length k is a sequence $Y = x_{i_1}, x_{i_2}, \dots, x_{i_k}$ where $x_{i_1} < x_{i_2} < \dots < x_{i_k}$ and $i_1 < i_2 < \dots < i_k$. Design an efficient algorithm for finding the longest increasing subsequence of a given sequence. What is the running time of your algorithm?

Bonus

You have 10 stacks of coins, each containing 10 quarters. One entire stack of coins is counterfeit but you don't know which. You know that a quarter weighs 10 grams and that the counterfeit quarters weigh 9 grams. You have a scale which measures the weight of any number of coins to the exact gram. What is the smallest number of weighings necessary to determine which stack is counterfeit?