

CMPT-225 Jan Manuch

Recommended Labs – Monday, June 12, 2006

Consider the problem of choosing k out of n things (see pages 140-142 in the textbook). A recursive procedure calculating $c(n,k)$ is given on pages 141-142. For this assignment, we are concerned about efficiency of this recursive implementation.

- 1) Determine how many arithmetic operations are necessary to compute $c(5,2)$, $c(8,5)$ and $c(10,10)$. (Write a recursive formula calculating it, implement it and run it.)
- 2) Write an iterative version of the method computing $c(n,k)$. Unlike for $\text{Fib}()$ you have to store much more information than 2 values when implementing the method iteratively (without using recursion). Probably, you will need to store the data in an array. How many arithmetic operations are required to compute c for 3 pairs of values mentioned above?
- 3) Prove using mathematical induction that $c(n,k) = \frac{n!}{k!(n-k)!}$, where $m!$ is a factorial of m , that is $m! = m*(m-1)*...*2*1$.
- 4) Write another iterative version of the method computing $c(n,k)$ using the formula from 3). How many arithmetic operations it requires to compute c for 3 pairs of values mentioned above? Can you do it using only $4*k$ operations?