

CMPSC 138: Fall 2009

Assignment 1

Date Assigned: September 30, 2009

Date Due: October 9, 2009 by 4:30 PM (in the CS 138 homework box)

1. Show that $(1 + \dots + n)^2 = 1^3 + \dots + n^3$ for all $n \geq 1$.
2. Show that the number of subsets of a set of n elements is 2^n for $n \geq 1$.
3. Show that every positive integer can be written as a product of primes.
4. Show that there is an infinite number of primes.
5. For the alphabet $\Sigma = \{a, b\}$, construct DFA's that accept the languages consisting of
 - (a) All strings whose lengths are **even**.
 - (b) All strings whose lengths are **odd**.
 - (c) All strings with exactly **four** a 's.
 - (d) All strings with at least **four** a 's.
 - (e) All strings with at most **four** a 's.
 - (f) All strings with at least **two** a 's and exactly **two** b 's.
 - (g) All strings with at least **two** a 's or exactly **two** b 's.
 - (h) All strings where every bbb is immediately followed by aa .
 - (i) All strings where the leftmost symbol is identical to the rightmost symbol.