

CAS CS 131 - Combinatorial Structures
Spring 2012

PROBLEM SET #2 (LOGIC & PROOFS)

OUT: TUESDAY, FEBRUARY 2

DUE: TUESDAY, FEBRUARY 9 AT 2PM

NO LATE SUBMISSIONS WILL BE ACCEPTED

To be completed individually.

1. Write down the contrapositive of the following implication:

If $a > b$ and $b > c$, then $a > c$.

2. Use (strong) induction to prove that every integer $n \geq 2$ is divisible by a prime.
3. Use (weak) induction to prove that n cents of postage can be formed using 3 and 8 cent stamps for all $n \geq 15$.
4. The harmonic number H_n is the sum of the first n values of the harmonic series: $H_n = 1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{n}$. For example, $H_1 = 1$, $H_2 = 1 + \frac{1}{2}$, and $H_3 = 1 + \frac{1}{2} + \frac{1}{3}$. Use (weak) induction to prove that

$$\sum_{i=1}^n H_i = (n+1)H_n - n.$$