

## Problem Set 1 — Invariants and Induction

**Due by 4:30pm Friday, Feb. 2, 2018 as a single pdf via Moodle (either generated via L<sup>A</sup>T<sub>E</sub>X, or concatenated photos of your work). Late assignments are not accepted.**

This is an *individual* assignment: collaboration (such as discussing problems and brainstorming ideas for solving them) on this assignment is highly encouraged, but the work you submit must be your own. Give information only as a tutor would: ask questions so that your classmate is able to figure out the answer for themselves. It is unacceptable to share any artifacts, such as code and/or write-ups for this assignment. If you work with someone in close collaboration, you must mention your collaborator on your assignment.

*Suggested practice problems (not to be turned in): 2.1-2, 2.1.4, 2.2-2, 2.2-4*

1. Problem 2.1-3 in CLRS, 3rd edition.
2. Problem 2-2 in CLRS, 3rd edition.
3. Prove by induction that for every non-negative integer  $n$

$$\sum_{k=0}^n k^2 = \frac{n(n+1)(2n+1)}{6}.$$

4. Prove that given an unlimited supply of 6-cent coins, 10-cent coins, and 15-cent coins, one can make any amount of change larger than 29 cents.<sup>1</sup>

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<sup>1</sup>This is problem 1 from Jeff Erickson's lecture notes on induction: <http://jeffe.cs.illinois.edu/teaching/algorithms/notes/98-induction.pdf>.