

# CSC236 tutorial exercises, Week #2

(Best before 11 am, Monday October 1st)

Danny Heap

Here are your tutorial sections:

| Surname | Section             | Room   | TA     |
|---------|---------------------|--------|--------|
| A–F     | Day 1 (11:00 am)    | LM162  | Lila   |
| G–Li    | Day 2 (11:00 am)    | BA2139 | Yuval  |
| Lo–Si   | Day 3 (11:00 am)    | BA2145 | Oles   |
| So–Z    | Day 4 (11:00 am)    | BA2155 | Lalla  |
| A–H     | Evening 1 (8:00 pm) | BA1190 | Colin  |
| I–M     | Evening 2 (8:00 pm) | BA2135 | Norman |
| N–Z     | Evening 3 (8:00 pm) | BA2139 | Feyyaz |

These exercises are intended to give you practice with complete induction, proving inequalities, and dealing with cases where the base cases aren't obvious.

1. Recall the definition of a full binary tree from the [annotated lecture slides](#) or the [course notes, example 1.13, page 42](#). Use Complete Induction to prove that every non-empty full binary tree has exactly one more leaf than interior nodes.
2. Use Complete Induction, and emulate the [course notes, example 1.12, page 40](#) to show that postage of exactly  $n$  cents can be made using only 3-cent and 5-cent stamps, for every natural number  $n$  greater than  $k$  (you will have to discover the value of  $k$ ).
3. Use Mathematical Induction to prove that for all natural numbers  $n$ ,  $n^4 \leq 4^n + 17$ .