

# COMP610 WINTER 2016 ASSIGNMENT 1

Due at 8:30 AM on February 9th 2016

Consider the following problem:

## ***Heap Building with a head start:***

You are given an integer  $n=2^k$  for some  $k>3$ , and  $n$  elements grouped into  $n/8$  groups of size 8. You are told the maximum element of each group. You want to return a valid heap order on the elements.

- 1) Give as good an upper bound as you can on the number of comparisons needed to solve the problem.
- 2) Give as good an information theory lower bound as you can on the number of comparisons needed to solve the problem.
- 3) Give as good an adversarial bound as you can on the number of comparisons needed to solve the problem.
- 4) Show that there is an algorithm that finds the  $k^{\text{th}}$  smallest of a set of  $n$  elements using at most  $n+2(\log n)^{k-1}$  comparisons in the worst case.

Please email your solutions to [breed@cs.mcgill.ca](mailto:breed@cs.mcgill.ca)