# University of Waterloo
# CS240E, Winter 2021
# Assignment 3 Post Mortem

## Question 1 [3+3=6 marks]

- Well done in general.
- One issue was missing explanations. Another was not stating the answer in terms of $k$ and $n$.

## Question 2 [3 marks]

- Generally well done. The most common error was not justifying the optimal static order.

## Question 3 [9(+5)+4=13(+5) marks]

- The bonus part b) and part c) were well done. Most students got the bonus.
- For a), some errors were:
- Not considering both zig-zig and zig-zag
- Not remembering the single rotation for odd cases. This resulted in an incorrect constant.
- Not making a clear claim about what the height of the subtree rooted at $x$ after $i$ rotations is (this was generally handwaved).

## Question 4 [5+3=8 marks]

- In part a), a common error was not justifying that the number of nodes in a tower was independent.
- In part b), the most common error was plugging in an $t$ value for Chebyshev's inequality.

## Question 5 [6 marks]

- Some students forgot to handle when $k < A[0]$ or $k > A[n-1]$.
- Some students showed that one can find $k$ in $O(1)$ time, but didn't show that the algorithm terminates in $O(1)$ time.
- Some students stated the formula incorrectly (forgetting the floor function).

## Question 6 [6 marks]

- Generally well done.
- Some students didn't justify that extracting the sorted list from the trie takes $O(n \log n)$ time.

## Question 7 [2+5+4=12 marks]

- For b), some students stated the upper bound of $\lfloor (M+1)/2 \rfloor$, but did not justify.
- The biggest problem was missing / informal justification.