CS 240: Data Structures and Data Management **Fall 2024**

Tutorial 03: Sep 27

1. **Heap Stacks**
   How would you implement a stack using a heap? Analyse the complexity of the push and pop operations.

2. **Average Runtime**
   Suppose A is an array containing n distinct elements. In addition, assume each element is in between 1 and n, inclusive. Analyze this pseudo-code to determine a tight bound on the average number of question mark (?) that are printed, rather than a runtime. You may assume n is divisible by 2.

```
mystery(A, n)
    count = 1
    for i = 1 to n-1
        if A[i] is divisible by A[0]
            count++
    for i = 1 to count
        print("?")
```

3. **Many Merges**
   Given a family k sorted arrays $A_1, \ldots, A_k$, where the combination of the k arrays has n elements, give an $O(n \log k)$ time algorithm that produces a single sorted array containing all n elements. Hint: use a priority queue.