CSC 2720 Data Structures

Homework assignment 2

Instructions: Please complete the following questions on a separate sheet of paper. After you have finished, scan your work and upload it to **Homework Assignment 2** in our **Gradescope** for the **CSC 2720 DATA STRUCTURES XLS Group ACS11 Spring Semester 2025** course.

1. Describe a method for performing a card shuffle of a list of 2n elements, by converting it into two lists. A card shuffle is a permutation where a list L is cut into two lists, L1 and L2, where L1 is the first half of L and L2 is the second half of L, and then these two lists are merged into one by taking the first element in L1, then the first element in L2, followed by the second element in L1, the second element in L2, and so on.

2. Suppose you have a stack S containing n elements and a queue Q that is initially empty. Describe how you can use Q to scan S to see if it contains a certain element x, with the additional constraint that your algorithm must return the elements back to S in their original order. You may only use S, Q, and a constant number of other variables.

3. Suppose Bob has four cows that he wants to take across a bridge, but only one yoke, which can hold up to two cows, side by side, tied to the yoke. The yoke is too heavy for him to carry across the bridge, but he can tie (and untie) cows to it in no time at all. Of his four cows, Mazie can cross the bridge in 2 minutes, Daisy can cross it in 4 minutes, Crazy can cross it in 10 minutes, and Lazy can cross it in 20 minutes. Of course, when two cows are tied to the yoke, they must go at the speed of the slower cow. Describe how Bob can get all his cows across the bridge in 34 minutes.
   Hint: Use either stack or queue to solve the problem.

Due Date: March 10, 2025