Top-20 Training Program
(Stack & Queue)

Apply the problem solving techniques discussed in class to solve the following problems.

Problem1: Design SuperStack

Design a data structure, called SuperStack, that supports both push and pop operations and also third operation findmax, which returns the largest element in the data structure, all in O(1) worst case time.

Problem2: Queue with Stacks

Find an efficient implementation of Queue Interface using two stacks.

a) Implement Constructor, Enqueue and Dequeue operations.
b) What is the worst case possible number of push and pop operations required for any single Enqueue/Dequeue operation?
c) What is the average cost of an Enqueue or Dequeue operation in worst case(a.k.a. amortized cost)?

Problem3: Span of Array Data

Given an array A, the span of A[i] is the maximum number of consecutive elements A[j] immediately preceding A[i] and such that A[j] ≤ A[i]. Find an efficient algorithm to compute span of each element in the array A.

Example:
Input: a[ ] = { 6, 3, 4, 5, 2 }
Output: s[ ] = { 1, 1, 2, 3, 1 }

Problem4: Design SuperQueue

Design a data structure, called SuperQueue, that supports both enqueue and dequeue operations and also third operation findmin, which returns the minimum element in the Queue, all in O(1) worst case time.