Problem 1 (3 marks) We are given n numbers stored in a queue. And you are given two stacks S_1 and S_2. You have to use the two stacks to sort the numbers. At the end all the numbers should be in S_1 with the largest number at the top of the stack and the smallest number at the bottom of the stack. You are **not** allowed to use the queue in any way except to dequeue the numbers. Write an algorithm for this **in words**. No pseudocode. If you use any pseudocode or code you will get a 0. Please compute and write out the time complexity of your algorithm.

Problem 2 In this problem we will implement integers base p for $p \geq 2$. We call the ADT IntBase(p). The ground set for this ADT is $\mathbb{Z}$ (the set of integers). Our implementation is based on two ADTs defined in the ADT note shared on the course page: Intmod(p) and AList. Specifically we will use Intmod(p) list. The idea is this: We will store the number as a list of Intmod(p) in "reverse" order.

eg. Consider the base 10 number 39, its IntBase(5) representation will be $\boxed{4} \to \boxed{2} \to \boxed{1} \to$ which is the reversal of 124 which is the base 5 representation of 39.

Assumptions: You can use the following operations from the ADT note without implementing them

- Int : all operations including those in Exer 1.
- Intmod(p): all operations given in Sec 2.2.
- Intmod(p)-List : all list operations of Definition 5.

Problem 2.1 (2 marks) Extend the Intmod(p) ADT by adding a function Intmod(p)-overflow (x, y) where x and y are Intmod(p). If we view x and y as integers and $x + y \geq p$ where $+$ is the usual summation on integers then this function returns 1 else it returns 0. Recall that Intmod(p) is implemented as an Int. Write an implementation of this operation using only the methods mentioned above.

Problem 2.2 (2 marks) Now write IntBase(p)-Create(a) This operation takes an Int a as argument and returns a list as defined above.

Problem 2.3 (3 marks) Finally we write IntBase(p)-Sum (x, y) which takes two arguments x and y of type IntBase(p) and returns an IntBase(p) which is the sum of x and y in Base p.