



# INTRODUCTION TO COMPUTING

## Assignment 5

Instructor: Drakhshan Bokhat

Total Marks: 10

Marks Obtained: \_\_\_\_\_

Roll No: \_\_\_\_\_

Mapping CLOs: CLO 3

### Activity 08a Acting Out Stack Algorithms

A. In this activity we will physically implement a stack by having a person hold a stack of books. The person holding stack just holds the stack, with both hands. Practice having one person "be the stack" while another person pushes books onto the stack and pops them off.

B. In a group of 3 or 4 students, have 3 students represent stacks, called Stack A, Stack B, and Stack C. Have the 4th person be called the "director." The director should "push" 4 books on Stack A, one at a time. Then, the director needs to use only "push" and "pop" to move all the books to Stack C, in the order shown below. As a suggestion, place stick-it notes onto each book with its number.

Before

After

book4					
book3					
book2					
book1					
Stack A	Stack B	Stack C	Stack A	Stack B	Stack C

C. Change roles, to let someone else be the director. Using the same idea as above, solve this problem.

Before

After

book4			book1		
book3			book2		
book2			book3		
book1			book4		
Stack A	Stack B	Stack C	Stack A	Stack B	Stack C

D. Change roles, to let someone else be the director. Using the same idea as above, repeat problem B, but with 6 books in the stack.

E. Write down your algorithm for part D. As a challenge, write the algorithm that would work for  $N$  books, where  $N$  is any positive integer.

## Activity 08b Acting Out Queue Algorithms

A. In this activity we will physically implement a queue with a person using pieces of paper with numbers on them. A person represents a queue as they hold the pieces of paper in order they were received. This person can accept a piece of paper and place at the "tail" of their queue. They can take the piece of paper at the "head" of their queue and give it away. They can also tell someone what the thing at the "head" of their queue is.

B. In a group of 3 or 4 students, have 3 students represent queues, called Queue A, Queue B, and Queue C. Have the 4th person be called the "director." The director should "add" 5 numbers to Queue A, one at a time. Then, the director needs to use only "add at tail" and "remove at head" commands.

Start:	Queue A: 34, 12, 19, 22, 15	Queue B: empty	Queue C:
empty			
Finish:	Queue A: empty	Queue B: even numbers	Queue C: odd numbers

C. Change the role of director. Using the same system, try to solve this problem:

Start:	Queue A: 34, 12, 19, 22, 15	Queue B: empty	Queue C: empty
Finish:	Queue A: empty	Queue B: 15, 22, 19, 12, 34	Queue C: empty

D. Change the role of director. Using the same system, try to solve the problem of putting the numbers in the queue in order. For this problem, the director can hold one number in their hands.

Start:	Queue A: 34, 12, 19, 22, 15	Queue B: empty	Queue C: empty
Finish:	Queue A: empty	Queue B: 12, 15, 19, 22, 34	Queue C: empty

E. Select either problem C or D above, and write the algorithm in words.

Use the phrases "add \_\_\_\_ at the tail of Queue \_\_\_\_" and "remove from the head of Queue \_\_\_\_"

Write your algorithm so that it works for any integers in the Queue, and any size Queue