STACKS AND QUEUES

STACKS

- A stack is a one-dimensional data structure in which values are entered and removed one item at a time at one end, called the **top** of stack.
- A stack operates on a last-in, first-out basis, and is therefore sometimes called a **LIFO data structure**.
- Stacks have to be implemented using arrays or linked lists
- **Stack Structure**
  - Stack – a block of memory, either an array or linked list
  - Top – a pointer to the top of the stack. Depending on the implementation, it may point either to (a) the last element in the stack or (b) to the next available space in the stack
- **Stack Operations**
  - Push – (1) stores the datum at the top of the stack and (2) updates the stack pointer
  - Pop – (1) moves the stack pointer one position back and (2) removes the datum from the top of the stack

Visualizing Stacks
Check out the visualization at http://visualgo.net/list.html (click on the "Stacks" link/option).

Discuss:
Read Module 3 (page 35) in the CMSC 204 Manual. What are the differences in the array and linked list implementations of the stack?

To test your understanding of stacks, try to write C# functions which will perform push and pop operations on stacks implemented using (a) arrays and (b) linked lists.

QUEUES

- **FIFO (first-in, first-out)** the reverse of the LIFO data structure
- **Queue Structure**
  - Values are entered in one end called the **tail**
  - Values are removed from the other end called the **head**
  - **Two pointers** are needed, one pointing to the head, the other pointing to the tail
  - Queues can also be implemented using either arrays or linked lists
- **Queue Operations**
  - Insert (enqueue) – the insert operation stores the information at the tail of the queue
  - Remove (dequeue) – the remove operation removes the information found at the head of the queue

Visualizing Queues
*Check out the visualization at http://visualgo.net/list.html (click on the "Queue" **(singly linked list)** and "Dequeue" **(doubly linked list)** link/option).*

Discuss:
Read Module 4 (page 41) in the CMSC 204 Manual. What are the differences in the array and linked list implementations of the queue?

To test your understanding of stacks, try to write C# functions which will perform queue and dequeue operations implemented using (a) arrays and (b) linked lists.

Takeaway Thoughts and Questions:

1. *What new knowledge about stacks and queues is the most interesting for you?*
2. *Give an example of a computer program/problem which will make use of a stack.*
3. *Give an example of a computer program/problem which will make use of a queue.*