Module 2

Q1:
A stack is a data structure that stores elements in LIFO (last in first out) order, which can be represented by a physical stack or pile. To use a stack, the data structure gives the user to access only the top of the pile.
Stack operations include push, pop and peek. Push is an insertion of a new element to the stack that allocates the new element to the top of the stack. Pop is to take an element from the top of the stack. Peek can get the top element without deletion

Q2:
Methods to push a new element, pop the top element, peek at the top element and check if the stack is empty or not are required for the stack data structure.

So the required methods are as below:
push(new element)
pop()
peek()
isEmpty()

Q3:
I think by using a helper stack and the combination of pop(), push(), we can build a method that calculates the size of the stack.
In addition, some implements can cause the limitation of the length of the stack, so in this case, the method checking if the stack is full or not is helpful.

Q4:
Stacks can be used as the list of operations done in a Word document, so that the user can undo the operation by LIFO manner.

Q5:
For some applications such as ordering system or database transactions, a stack would not be helpful because the item or operations have to be processed FIFO (first in first out) order.

Q6:
I have never used prefix or postfix in the past. But I think for a machine that parses the equations, it's pretty useful that the equations are in pre/post-fix notation. Because the machine can read it from the left to right and operate calculation, without considering operator precedence.

Q7:
The pros and cons of implementing a stack with an array versus a linked list are:

Pros: Compared to list implementation, it's easier to build a stack using an array and an integer that holds the index of the top element. Also, even though a stack doesn't require it, the array allows random access, and the counter integer can represent the size of the stack.

Cons: An array has a fixed length so the stack can be full after a number of push operations. Whereas, a linked list implementation has a dynamic size. So memory utilization is not efficient by using an array.