CMSC 221: Data Structures
Quiz #1

Name: __________________________ Key: __________________________

1. True or False (Circle one): The amount of work done by an algorithm usually depends on the speed of the computer.

2. Stack ADT. (circle all that apply):
   (a) The functions of the stack ADT include \texttt{pop()}, \texttt{push()}, \texttt{top()}, and \texttt{size()}.
   (b) The functions of the stack ADT include \texttt{insertFirst()}, \texttt{insertLast()}, \texttt{removeTop()}, \texttt{removeLast()}, and \texttt{first()}.
   (c) The functions of the stack ADT all run in $O(1)$ time.
   (d) The functions of a fixed-size array-based implementation of the stack ADT, can all be implemented to run in $O(1)$ time.
   (e) The functions of a growable array-based implementation of the stack ADT, can all be implemented to run in amortized $O(1)$ time.
   (f) The functions of a singly-linked-list-based implementation of the stack ADT can all be implemented to run in $O(1)$ time.

3. Queue ADT. Which of the following statements apply to the Queue ADT (circle all that apply):
   (a) The functions of the queue ADT include \texttt{enqueue()}, \texttt{dequeue()}, \texttt{top()}, and \texttt{isEmpty()}.
   (b) The functions of the queue ADT include \texttt{insertFirst()}, \texttt{insertLast()}, \texttt{removeTop()}, \texttt{removeLast()}, and \texttt{first()}.
   (d) The functions of the queue ADT all run in $O(1)$ time.
   (e) The functions of a fixed-size array-based implementation of the queue ADT can all be implemented to run in $O(1)$ time.
   (f) The functions of a growable array-based implementation of the queue ADT can all be implemented to run in amortized $O(1)$ time.
   (g) The functions of a singly-linked-list-based implementation of the queue ADT can all be implemented to run in $O(1)$ time.
4. **Double-Ended (Deque) ADT.** Which of the following statements apply to the Deque ADT (circle all that apply):

(a) The functions of the deque ADT include `enqueue()`, `dequeue()`, `top()`, and `isEmpty()`.  
(b) The functions of the deque ADT include `insertFirst()`, `insertLast()`, `removeTop()`, `removeLast()`, and `first()`.  
(c) The functions of the deque ADT all run in $O(1)$ time.  
(d) The functions of a singly-linked-list-based implementation of the deque ADT can all be implemented to run in $O(1)$ time.  
(e) The functions of a doubly-linked-list-based implementation of the deque ADT can all be implemented to run in $O(1)$ time.

5. **Bonus.** Express the function $f(n) = 1439 + 12 \log_4 n + 923n + 23n \log_3 n$ as concisely as possible in terms of Big-Oh ($O()$) notation. $O(n \log^3 n)$.