

Computer Science 62

Bruce/Mawhorter – Fall '16

Midterm Examination

October 5, 2016

Question	Points	Score
1	15	_____
2	10	_____
3	10	_____
4	8	_____
5	9	_____
TOTAL	52	_____

Your name (Please print)

1. Suppose you are given a singly-linked list class that holds strings and that maintains pointers to both the head and the tail of the list. Its fields and constructors are as follows:

```
public class SinglyLinkedList {
    protected ListNode head;
    protected ListNode tail;

    public SinglyLinkedList() {
        this.head = null;
        this.tail = null;
    }

    ...
}
```

The `ListNode` class looks like this:

```
public class ListNode {
    private String value;
    private ListNode next;

    public ListNode(String value, ListNode next) {
        this.value = value;
        this.next = next;
    }

    public String getValue() {
        return this.value;
    }

    public ListNode getNext() {
        return this.next;
    }

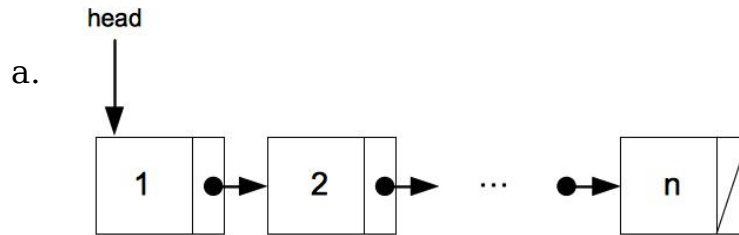
    public String setValue(String newValue) {
        this.value = newValue;
    }

    public ListNode setNext(ListNode newNext) {
        this.next = newNext;
    }
}
```



```
public void keep(int howMany) {
```

2. You have a singly linked list with only a `head` pointer (see the figure below). The `insert()` method for the list inserts new values into the list so that the elements remain in sorted order using the obvious algorithm. In other words, after each



insertion, the list is in sorted order. Assume you are given a sequence of n values to insert one at a time into

the list. What do you expect the total worst-case running time to be, using big-O notation, for inserting all of the values into the list? Give a brief (one to two sentence) **justification** for your answer.

- b. Suppose that the sequence of n values to be inserted just happen to be **in reverse sorted order**. E.g., you might be given the elements 47, 23, 19, 13, 7, 6, and finally 2. What do you expect the running time to be, using big-O notation, for inserting all of n values into the list? Give a brief (one to two sentence) **justification** for your answer.

4. An advantage of using stacks and queues is that their limited number of operations allows more efficient representation than more general data structures. Please answer the following questions about the complexity of operations on queues, expressing all answers in big-O notation.

A queue may be represented by a “circular” implementation on an array (or ArrayList) or by a singly linked list with a reference to both the front and rear. Please give the complexity of the following queue operations on a queue of size n for each representation, including one or two sentences justifying your answer.

i) Enqueuing an element at the rear of the queue with a

circular array:

linked list:

ii) Dequeuing an element from the front of the queue with a

circular array:

linked list: