

## Midterm Solutions

1. a) [3, 10, 20, 10]  
b) [5, 3, 1, 8, 9, 7, 55]  
c) [7, 5, 3, 0, 16, 9, 64, 25, 0]
  
2. a) .  
b) ..  
c) .-  
d) .--.  
e) -.--.
  
3. a) 

```
s = r.next.next;
r.next.next = null;
```

  
b) 

```
s.next = r.next;
r.next = s;
s = null;
```

  
c) 

```
ListNode temp = s;
s = s.next;
temp.next = r.next;
temp.next.next = r;
r = temp;
r.next.next.next = null;
```

  
d) 

```
r.next.next.next = s.next;
ListNode temp = s;
s = r.next.next;
r.next.next = r;
r = r.next;
r.next.next = temp;
temp.next = null;
```

4.

```
public static int numUnique(Stack<Integer> s) {
    if (s.size() <= 1)
        return s.size();
    else {
        Queue<Integer> q = new LinkedList<Integer>();
        int prev = s.pop();
        q.add(prev);
        int count = 1;
        while (!s.isEmpty()) {
            int next = s.pop();
            if (prev != next)
                count += 1;
            q.add(next);
            prev = next;
        }
        while (!q.isEmpty())
            s.push(q.remove());
        while (!s.isEmpty())
            q.add(s.pop());
        while (!q.isEmpty())
            s.push(q.remove());
        return count;
    }
}
```

5.

```
public static String vowelsToEnd(String s) {
    if(s.length() == 0) {
        return s;
    }
    else {
        char first = s.charAt(0);
        if(first == 'a' || first == 'e' || first == 'i'
            || first == 'o' || first == 'u') {
            return vowelsToEnd(s.substring(1)) + first;
        } else {
            return first + vowelsToEnd(s.substring(1));
        }
    }
}
```

6.

```
public static String smallestSection(Map<String, String> m) {
    if(m.isEmpty()) {
        return null;
    }
    Map<String, Set<String>> sections =
        new TreeMap<String, Set<String>>();
    for(String student : m.keySet()) {
        String section = m.get(student);
        if(!sections.containsKey(section)) {
            sections.put(section, new TreeSet<String>());
        }
        sections.get(section).add(student);
    }

    String smallest = "";
    int count = m.size();
    for(String section : sections.keySet()) {
        if(sections.get(section).size() < count) {
            count = section.length();
            smallest = section;
        }
    }
    return smallest;
}
```