Linked node problem 3

- What set of statements turns this picture:

```
list1  data next  data next
  10-----------20
list2  data next  data next
  30-----------40
```

- Into this?

```
list1  data next  data next  data next
  10------30------20
list2  data next
  40
```

- Two possible solutions:

```
ListNode temp = list1.next;
list1.next = list2;
list2 = list2.next;
list1.next.next = temp;
```

```
ListNode temp = list2.next;
list2.next = list1.next;
list1.next = list2;
list2 = temp;
```

Basic Linked List Questions

- Suppose you have two variables of type ListNode named p and q. Consider the following situation:

```
p  data next  data next
  2-----4
```

```
q  data next  data next
  3-----9
```

- How many variables of type ListNode are there?
- How many ListNode objects are there?

- How many variables of type ListNode are there?
  - 6, circled in green

```
p  data next  data next
  2-----4
```

```
q  data next  data next
  3-----9
```
Basic Linked List Questions

- How many ListNode objects are there?
  - 4, circled in green

Linked node question

- Suppose we have a long chain of list nodes:

  - We don't know exactly how long the chain is.

- How would we print the data values in all the nodes?

Traversing a list correctly

- The correct way to print every value in the list:

  ```java
  ListNode current = list;
  while (current != null) {
    System.out.println(current.data);
    current = current.next; // move to next node
  }
  
  - Changing current does not damage the list.

Linked list vs. array

- Algorithm to print list values:

  ```java
  ListNode front = ...;
  int[] a = ...;
  
  ListNode current = front;
  while (current != null) {
    System.out.println(current.data);
    System.out.println(a[i]);
    i++;
  }
  ```

- Similar to array code:
### Relationship to Array Code

- A table explaining this relationship:

<table>
<thead>
<tr>
<th>Description</th>
<th>Array Code</th>
<th>Linked List Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>go to front of list</td>
<td>int i = 0;</td>
<td>ListNode current = front;</td>
</tr>
<tr>
<td>continue?</td>
<td>i &lt; size</td>
<td>current != null</td>
</tr>
<tr>
<td>get current value</td>
<td>elementData[i]</td>
<td>current.data</td>
</tr>
<tr>
<td>go to next element</td>
<td>i++</td>
<td>current = current.next;</td>
</tr>
</tbody>
</table>

- This may be helpful if you are comfortable with arrays.

### For Loops

- Of course, we usually write the array code in a for loop:
  ```java
  for (int i = 0; i < size; i++) {
      System.out.println(elementData[i]);
  }
  ```

- And we can still do this with the linked list code:
  ```java
  for (ListNode current = front; current != null; current = current.next) {
      System.out.println(current.data);
  }
  ```

- Whether you use a for loop or a while loop to traverse the linked list is up to you.