

1 More Practice with Linked Lists

```
1 public class SLList {
2     private class IntNode {
3         public int item;
4         public IntNode next;
5         public IntNode(int item, IntNode next) {
6             this.item = item;
7             this.next = next;
8         }
9     }
10
11     private IntNode first;
12
13     public void addFirst(int x) {
14         first = new IntNode(x, first);
15     }
16 }
```

- 1.1 Implement `SLList.insert` which takes in an integer `x` and inserts it at the given position. If the position is after the end of the list, insert the new node at the end.

For example, if the `SLList` is $5 \rightarrow 6 \rightarrow 2$, `insert(10, 1)` results in $5 \rightarrow 10 \rightarrow 6 \rightarrow 2$.

```
1 public void insert(int item, int position) {
```

- 1.2 Add another method to the `SLList` class that reverses the elements. Do this using the existing `IntNodes` (you should not use `new`).

```
1 public void reverse() {
```

- 1.3 *Extra:* If you wrote `reverse` iteratively, write a second version that uses recursion (you may need a helper method). If you wrote it recursively, write it iteratively.

2 Arrays

- 2.1 Consider a method that inserts `item` into array `arr` at the given position. The method should return the resulting array. For example, if `x = [5, 9, 14, 15]`, `item = 6`, and `position = 2`, then the method should return `[5, 9, 6, 14, 15]`. If `position` is past the end of the array, insert `item` at the end of the array.

Is it possible to write a version of this method that returns `void` and changes `arr` in place (i.e., destructively)?

Extra: Write the described method:

```
1 public static int[] insert(int[] arr, int item, int position) {
```

- 2.2 Consider a method that destructively reverses the items in `arr`. For example calling `reverse` on an array `[1, 2, 3]` should change the array to be `[3, 2, 1]`.

What is the fewest number of iteration steps you need? What is the fewest number of additional variables you need?

Extra: Write the method:

```
1 public static void reverse(int[] arr) {
```

- 2.3 *Extra:* Write a non-destructive method `replicate(int[] arr)` that replaces the number at index `i` with `arr[i]` copies of itself. For example, `replicate([3, 2, 1])` would return `[3, 3, 3, 2, 2, 1]`.

```
1 public static int[] replicate(int[] arr) {
```