# CSC148 Lab#7, winter 2015

## learning goals

In this lab you will use iterative (looping) techniques and mutation (changing objects) to implement some functions and methods for a **LinkedList** class. You may want to review the related work from our lecture materials.

You should work on these on your own before Thursday, and you are encouraged to then go to your lab where you can get guidance and feedback from your TA . There will be a short quiz during the last 15 minutes of the lab, based on these exercises.

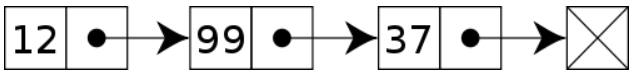
## set-up

Open file node.py in Wing, and save it under a new sub-directory called **lab07**. This file declares both class **LLNode**, to represent linked list nodes, and class **LinkedList**, to represent an entire linked list. There are also headers and docstrings for functions and methods that you will implement, as well as some functions and methods we have already implemented, to get you started.

We have commented-out function and method headers that you are to implement. You should uncomment these, one-by-one, as you work on them.

Once you have familiarized yourself with the **_init_** and **_str_** methods for class **LLNode** and **LinkedList**, you are **almost** ready to proceed to the implementation of the functions/methods below. But first, read the warnings below:

- **Draw lots of pictures!** You will need these to understand what your linked structures should look like before, during, and after operations where you change (mutate) those structures. If you skip the drawing, you are **much** more likely to mess up!




  These pictures are not just for beginners. Experienced programmers routinely draw pictures when they write code for linked structures.

- Be sure that you know exactly what attribute each part of your drawing represents. This will guide your code.

- Remember that functions/methods that make updates to values traditionally return **None**. This is the case with our function append, for example. It may lead to surprises if you try to use this return value...

## implement special method _setitem_

Read the docstring and examples for method **_setitem_**. They type for parameter **key** is **int—slice**. For now, assume that **key** is an **int**. You should adjust any negative **key** to an index in range by adding the size of the list (perhaps more than once). However, you should raise an **IndexError** if **key** is too large.

Before you write any code, decide what steps must occur and **draw careful pictures** of how your list should look before and after each step. Call over your TA to show her/him your drawings.

Once you've talked to your TA, you should implement the method. If it worked, you should be able to do something like:

```
>>> lnk = LinkedList()
>>> lnk.prepend(5)
>>> print(lnk)
5 ->|
>>> lnk[0] = 7
>>> print(lnk)
7 ->|
```

### implement method _add_

Read the docstring and examples for method **_add_**. The aim is to provide a way of "adding" (concatenating) linked lists to produce a new one (the original lists are unchanged).

As usual, **draw careful pictures** of each step you carry out. Show your TA your drawings:

Once you've shown your pictures to your TA, you're ready to implement this method. You are allowed to use method **append**, if it helps. Once you are finished, you should be able to do things like this:

```
>>> lnk1 = LinkedList()
>>> lnk1.prepend(5)
>>> lnk2 = LinkedList()
>>> lnk2.prepend(7)
>>> print(lnk1 + lnk2)
5 -> 7 ->|
>>> print(lnk1)
5 ->|
>>> print(lnk2)
7 ->|
```

### implement function insert_before

Read the docstring and examples for function **insert_before**. The aim is to be able to insert a new node with value **v1** before the first occurrence of **v2**, if possible.

You will want to keep track of **two** nodes, so walking the list something like this:

```
while <some condition here>:
    prev_node = cur_node
    cur_node = cur_node.nxt
```

It is really easy to lose track of a reference between **LLNode**s as you do this so. . . **draw pictures**.

Show your TA your diagrams and ideas, and then implement this function.

### implement function delete_after

Read the docstring and examples for function **delete_after**. The aim is to be able to delete the node after the first occurrence of **value**, is such a node exists.

Again, it's really easy to mess up the updating of references, so you'll need **pictures**.

Show your TA your ideas before you begin implementing this function, then go ahead and implement it.

## additional exercises

As usual, we have more exercises than we can fit into one lab. Work through as many unimplemented functions or methods in node.py as you can.