

CSC148 Lab#4, winter 2018

learning goals

In this lab you will use iterative (looping) techniques and mutation (changing objects) to implement some methods for a `LinkedList` class. You may want to review the related work from our [lecture materials](#) for week 4.

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. During the second hour of your lab/tutorial you will submit some code related to these exercises online.

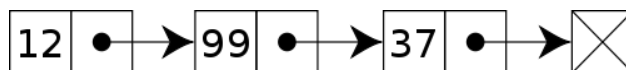
set-up

Open file `ex.py` in Pycharm, and save it under a sub-directory called `lab4`. This file declares both class `LinkedListNode`, to represent linked list nodes, and class `LinkedList`, to represent an entire linked list. There are also headers and docstrings for methods that you will implement, as well as some methods we have already implemented, to get you started.

We have commented-out 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 `LinkedListNode` and `LinkedList`, you are **almost** ready to proceed to the implementation of the 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 methods that make updates to values implicitly return `None`. This is the case with our method `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__`. The type for parameter `index` is `int`. You should adjust any negative `index` from $-n$ to -1 (if n is the length of the list) to an index in range by adding the size of the list. However, you should raise an `IndexError` if `index` is too large or too small. Notice that this is consistent with the behaviour of Python's built-in `list`.

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. 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.

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 method `insert_before`

Read the docstring and examples for method `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 as you walk the list, which should look something like this:

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

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

implement method `delete_after`

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

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

additional exercises

As usual, we have more exercises than we can fit into one lab. Work through unimplemented methods in `ex.py` While you are working on it, you will need `pylint.txt` to configure `python_ta` to ignore certain warnings.