CSC148 *Intro. to Computer Science*

Lecture 5: *Linked Lists*

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Review

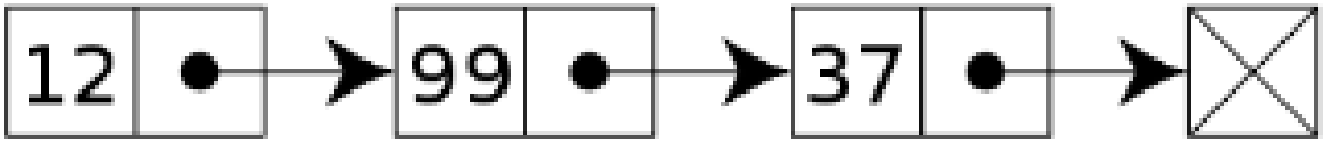
- So far
  - class design and implementation
  - composition and inheritance
  - inheriting, extending, and overriding
  - specific examples:
    - Shape: square, right angled triangle
    - Container: stack, sack, queue, etc.
- Today
  - linked lists
  - wrappers and helpers

Regular lists vs. linked lists

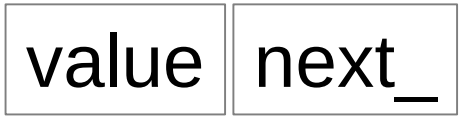
- Regular Python lists:
  - pro(s): it can efficiently be accessed
  - con(s): they allocate large blocks of contiguous memory, which becomes increasingly difficult as memory is in use.
- Linked list nodes reserve just enough memory for the object value they want to refer to, a reference to it, and a reference to the next node in the list
  - pro(s): it can efficiently grow and shrink, as needed
  - con(s): ?

Linked list

- For now, we implement a linked list as objects (nodes) with a value and a reference to other similar objects



Helper: Node



- Examples:

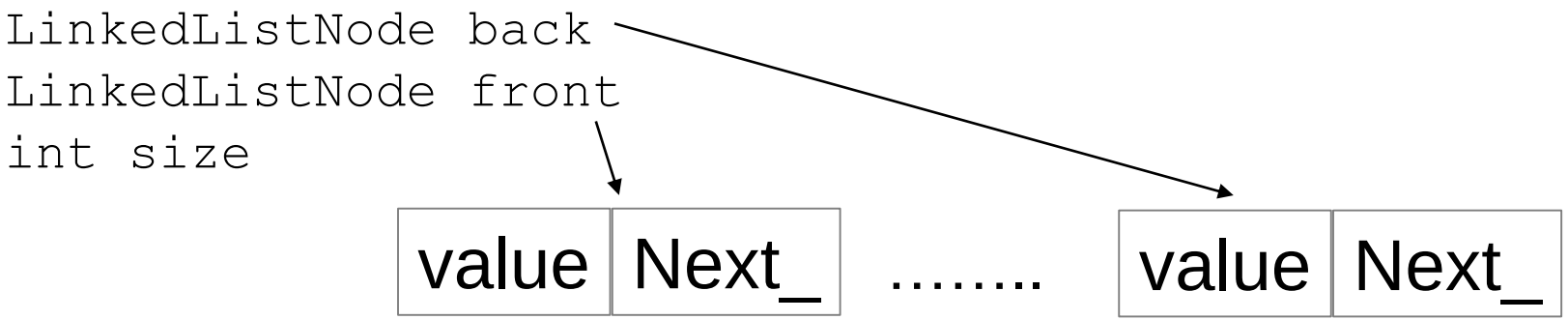
Helper: LinkedListNode class

```
class LinkedListNode:
    """
    Node to be used in linked list data structure

    === Public Attributes ===
    :type next_: LinkedListNode
        successor to this LinkedListNode
    :type value: object
        data this LinkedListNode represents
    """
    def __init__(self, value, next_=None):
        """
        Create LinkedListNode self with data value and successor next_.

        :param value: data of this linked list node
        :type value: object
        :param next_: successor to this LinkedListNode.
        :type next_: LinkedListNode|None
        """
        self.value= value
        self.next_= next_
```

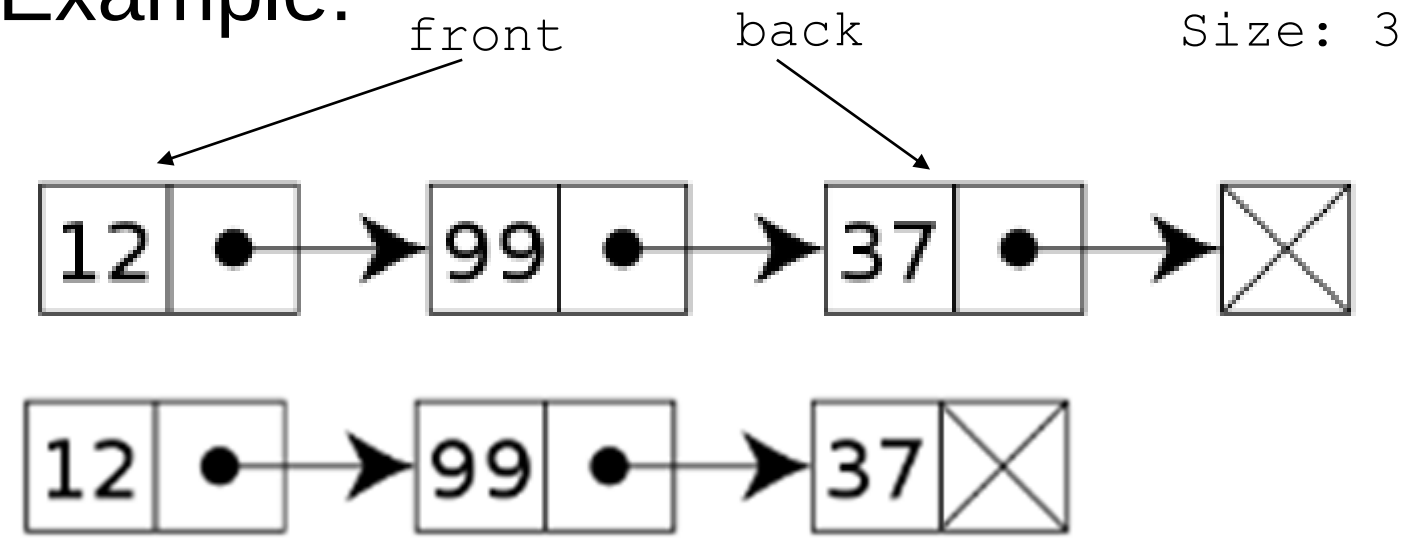
Helper: LinkedListNode class

What other methods does class node, i.e. LinkedListNode need?

Wrapper: LinkedList



- Example:



Wrapper: LinkedList class

```
class LinkedList:
    """
    Collection of LinkedListNodes
    === Public Attributes ==
    :type front: LinkedListNode
          first node of this LinkedList
    :type back: LinkedListNode
          last node of this LinkedList
    :param size: int
          number of nodes in this LinkedList
    """
    def __init__(self):
        """
        Create an empty linked list.

        :rtype: None
        """
        self.front, self.back = None, None
        self.size = 0
```

Wrapper: LinkedList class

What other methods does class LinkedList need?