More linked lists

Announcements

- Lab 12 is optional, but doing it will be a good way to practice linked lists for the final exam
    - Labs will meet this week, but are also optional
- The final exam is on Saturday, May 6
    - 7-10pm in SCI 101

Today's plan

- Review linked lists
- More linked list methods:
  - `removeHead()`
  - `__str__`
  - `getAtIndex(index)`

Review

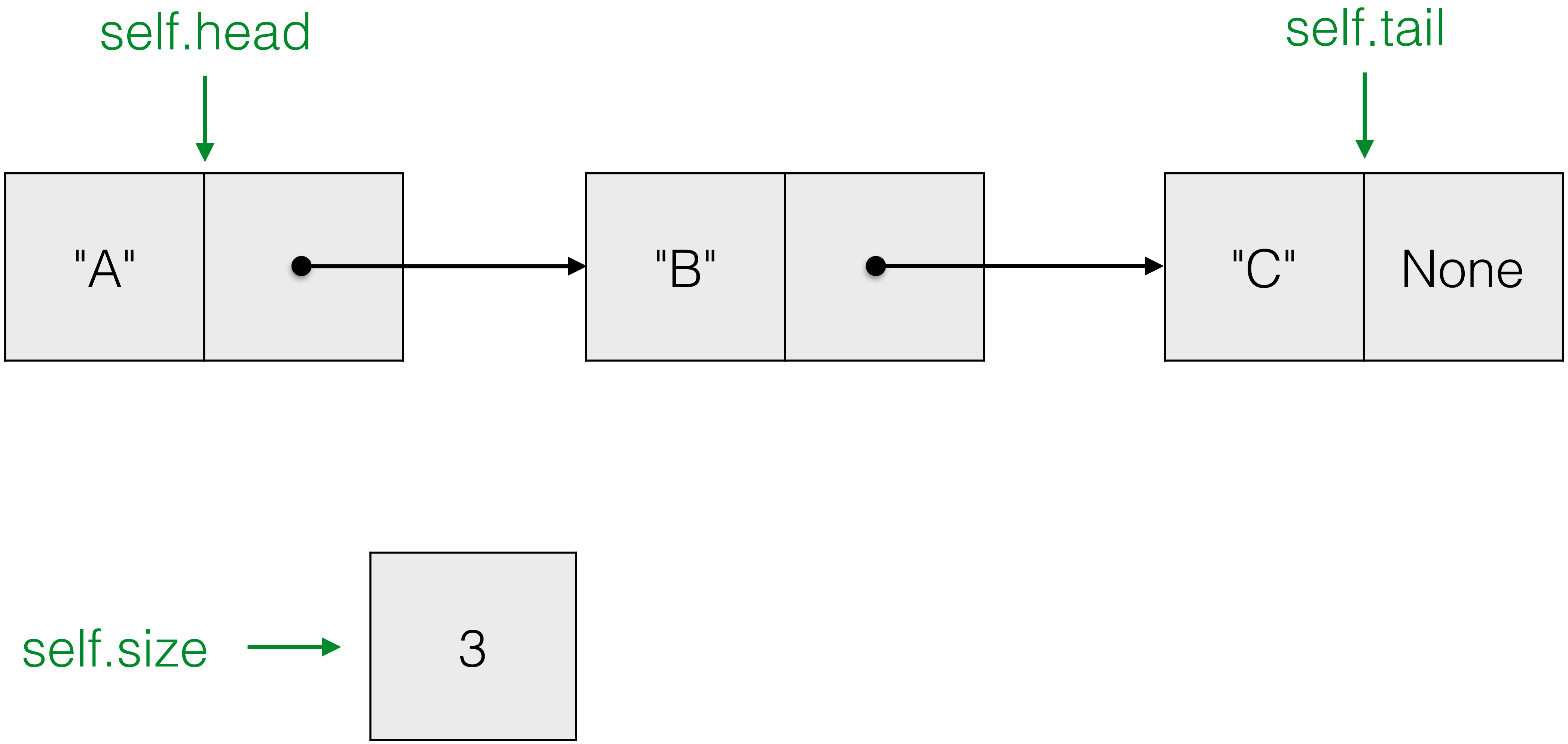
- A **linked list** is a **data structure** that's an alternative to a Python list.

- It has a similar **interface**, but a different **implementation**.

- The run times of the operations in this shared interface will vary based on the implementation.

Linked list structure

- Linked list of strings “A”, “B”, “C”



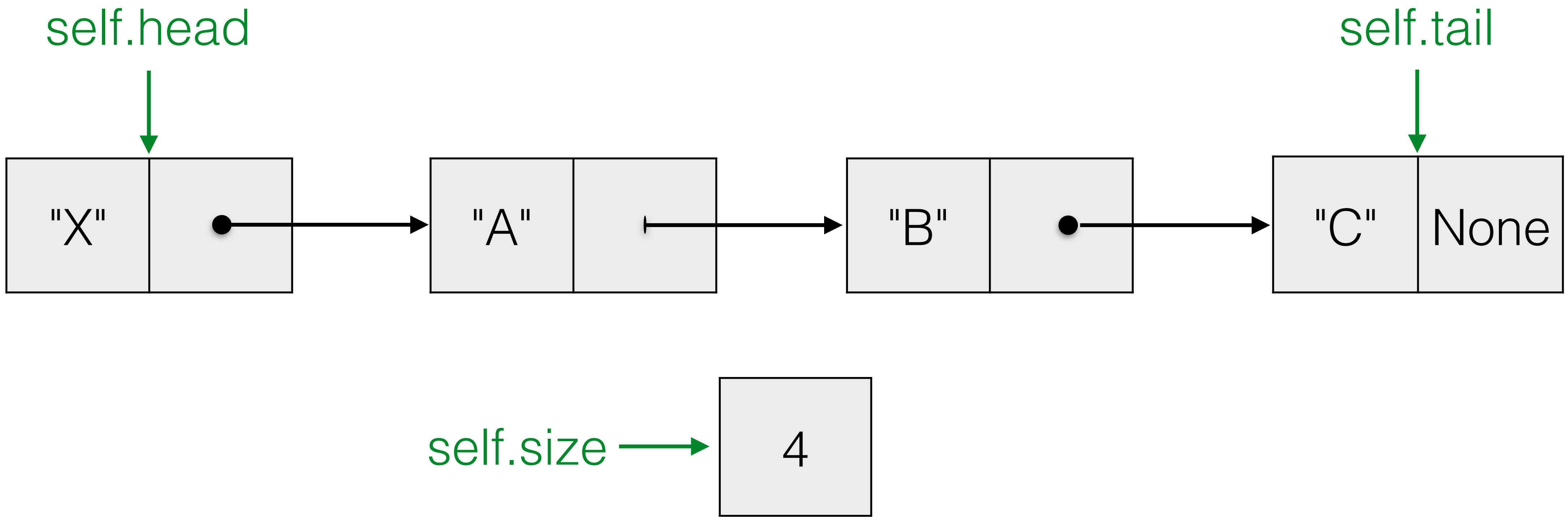
Review

- Each item in a linked list corresponds to a node. We represent this with a `Node` class that has two instance variables:
  - `self.data` (sometimes called `self.item`)
  - `self.next` (defaults to `None`)

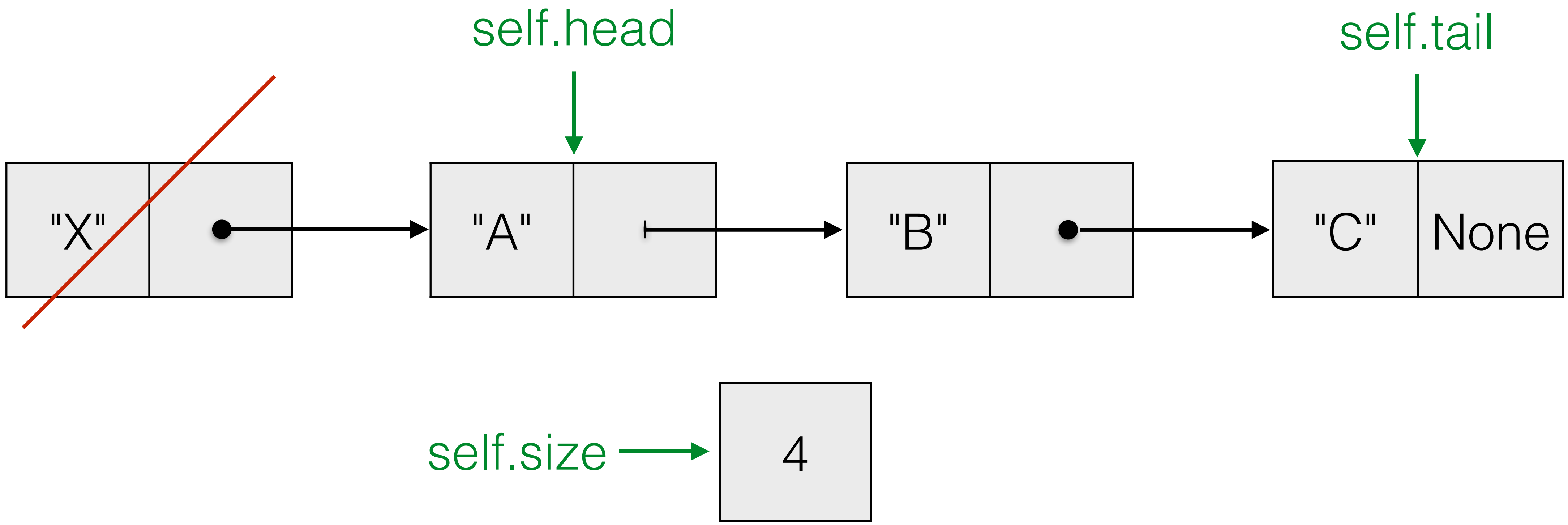
Review

- A linked list is a chain of nodes that connect to each other through their `self.next` fields. We represent linked lists with the `LinkedList` class. It has three instance variables:
    - `self.head`
    - `self.tail`
    - `self.size`

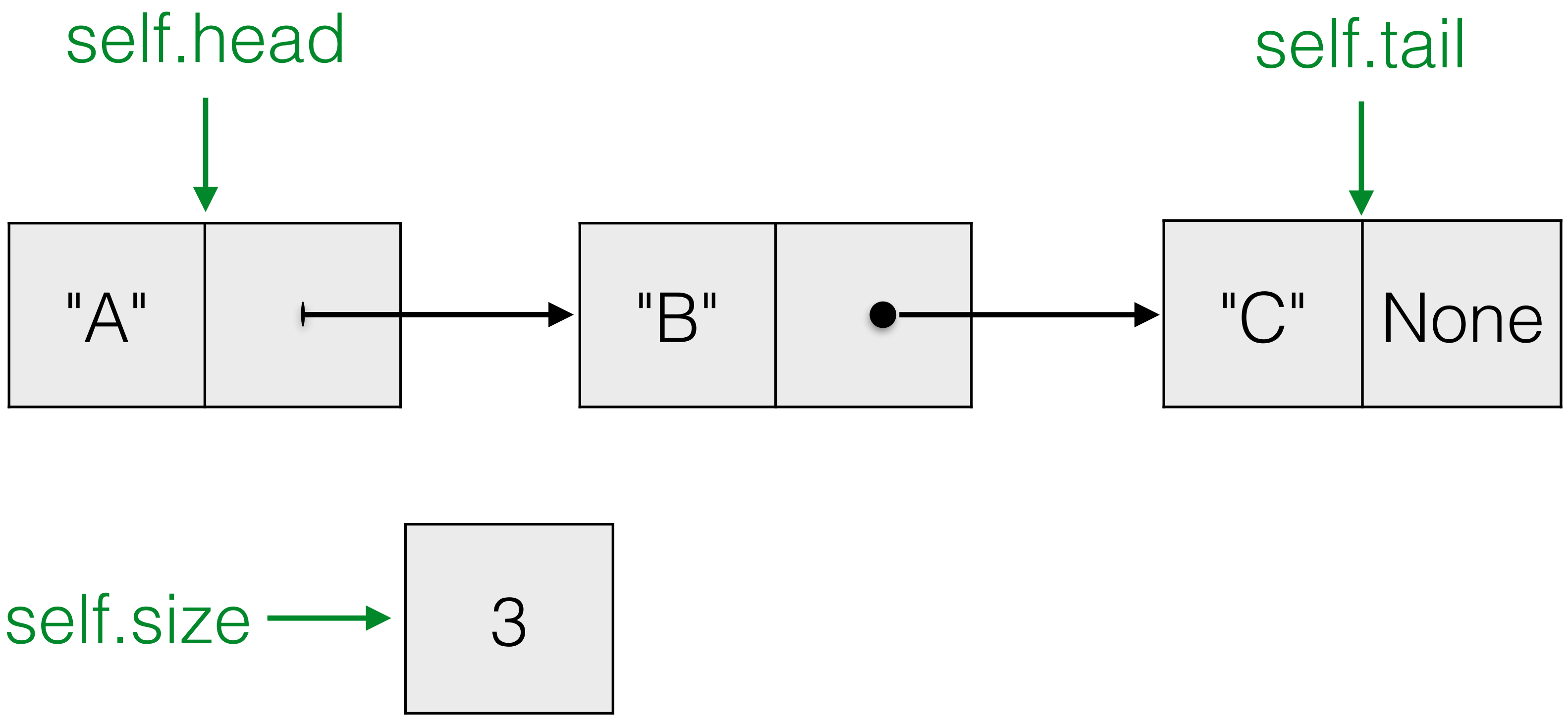
Removing from the front



Removing from the front



Removing from the front



removeHead() method

- Watch out for the case where self.size == 1

Back to linked list motivation

- Now we can insert at the front or back and remove from the front, all in constant time.

- There are applications where we don’t need to access the middle of a list, and these constant-time operations are enough:

    - Orders to be filled by a restaurant, customer service requests (or any other queue)

    - The function stack!

- For such applications, linked lists will outperform Python lists.

Traversing a linked list

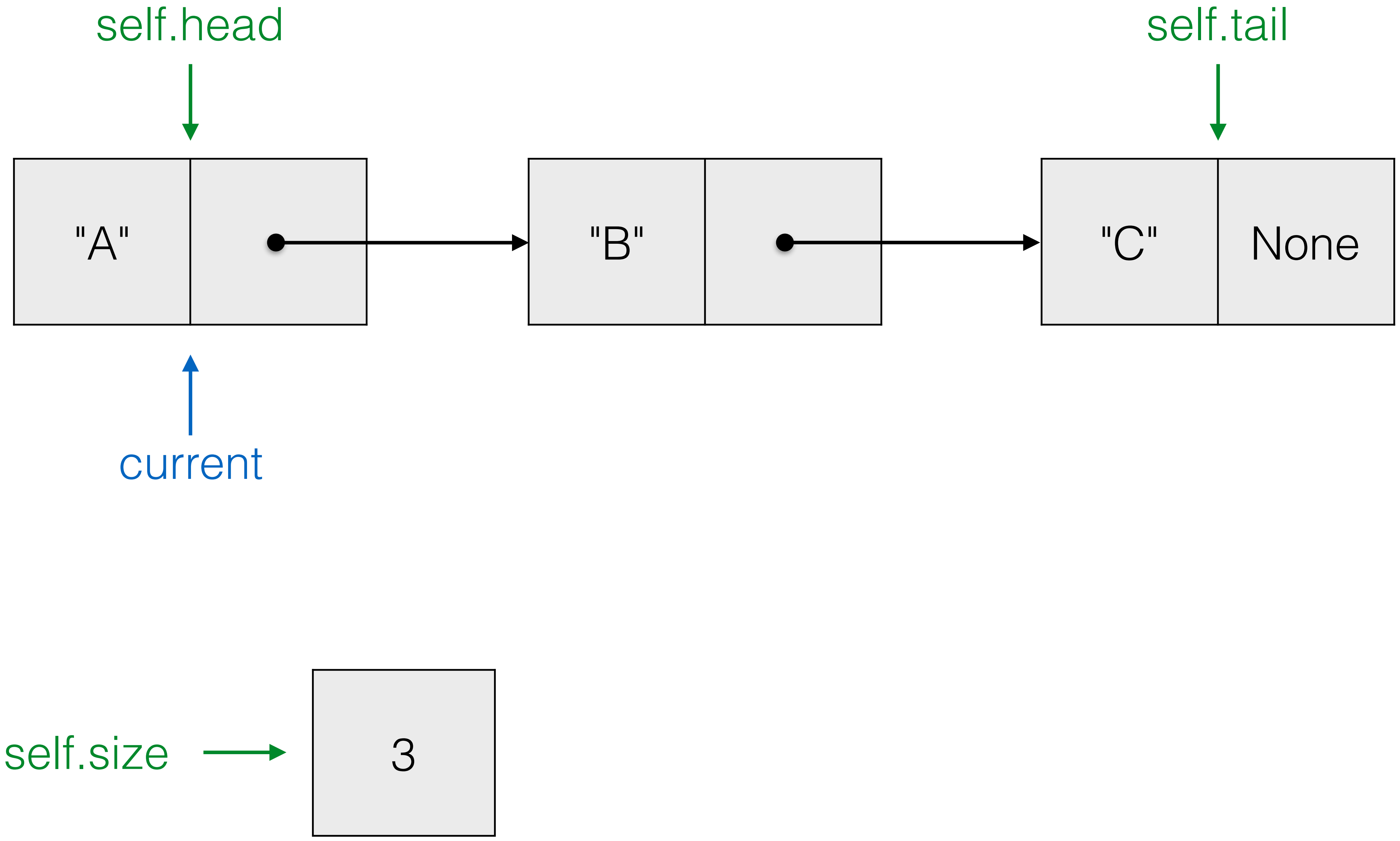
- Use a while loop that continues until the current `Node` is equal to `None`

- (Can also use a for loop since we know the number of nodes)

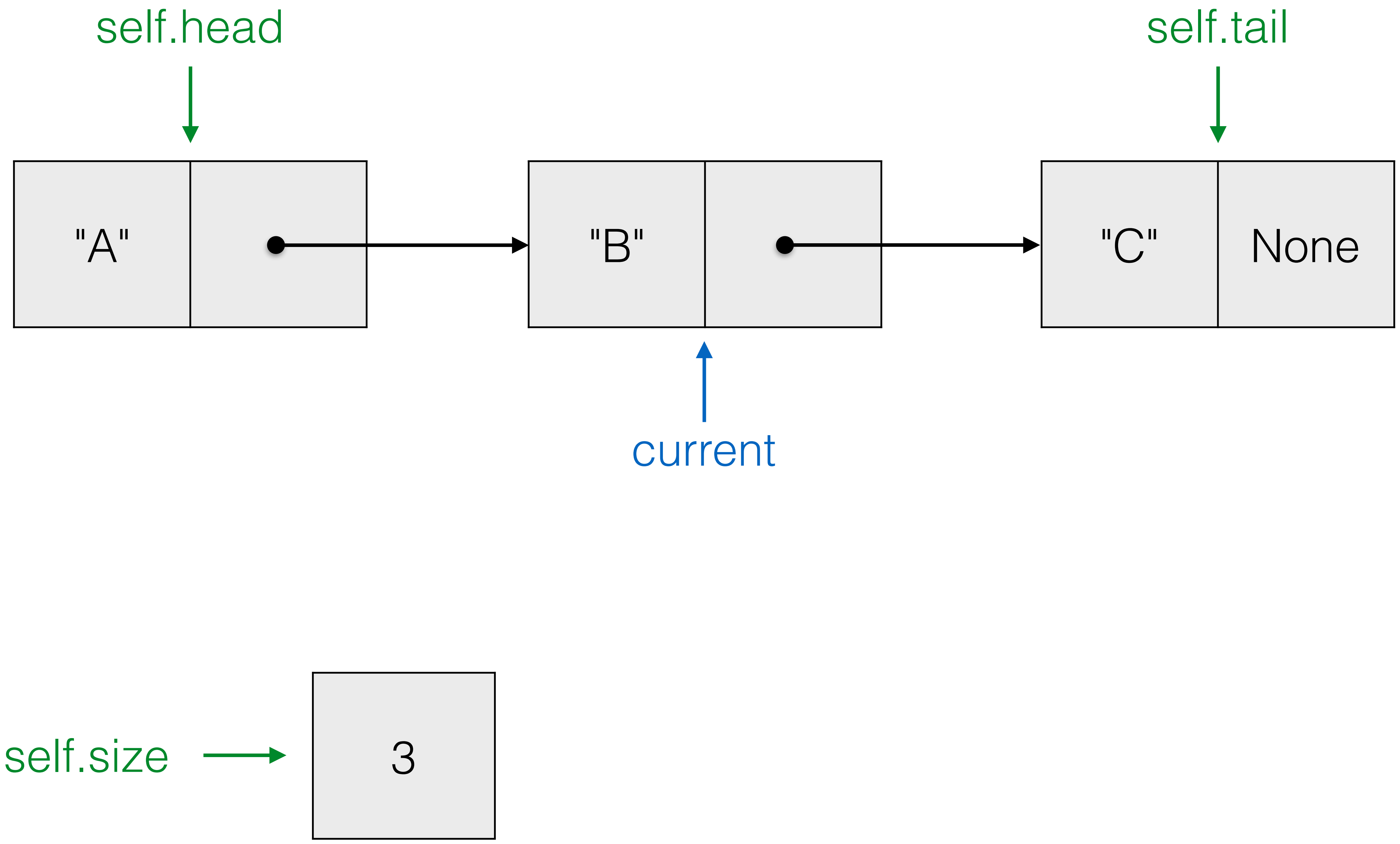
- Traversal will be used in a number of methods:

  - `__str__`, searching, indexing, etc.

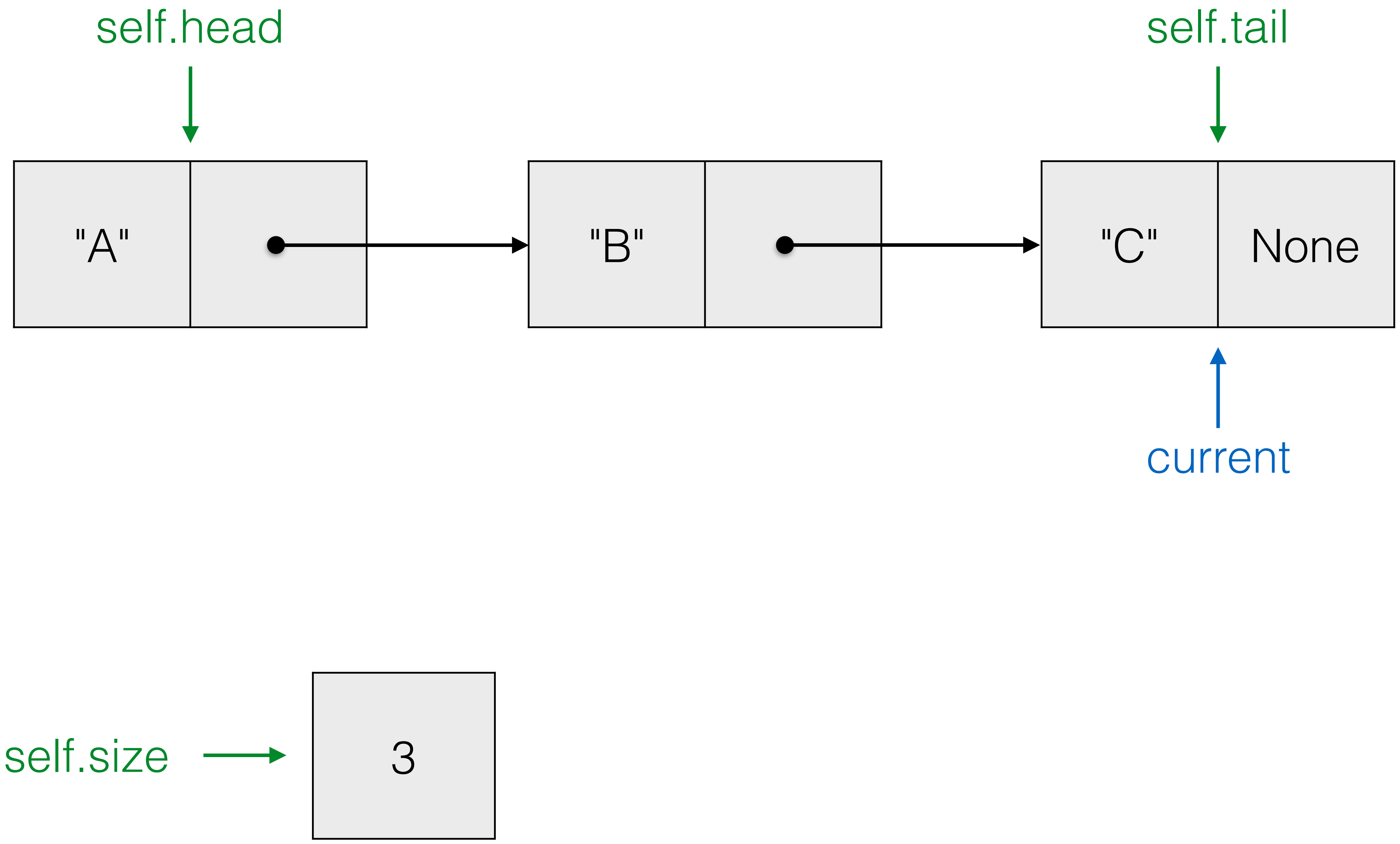
Traversing a linked list



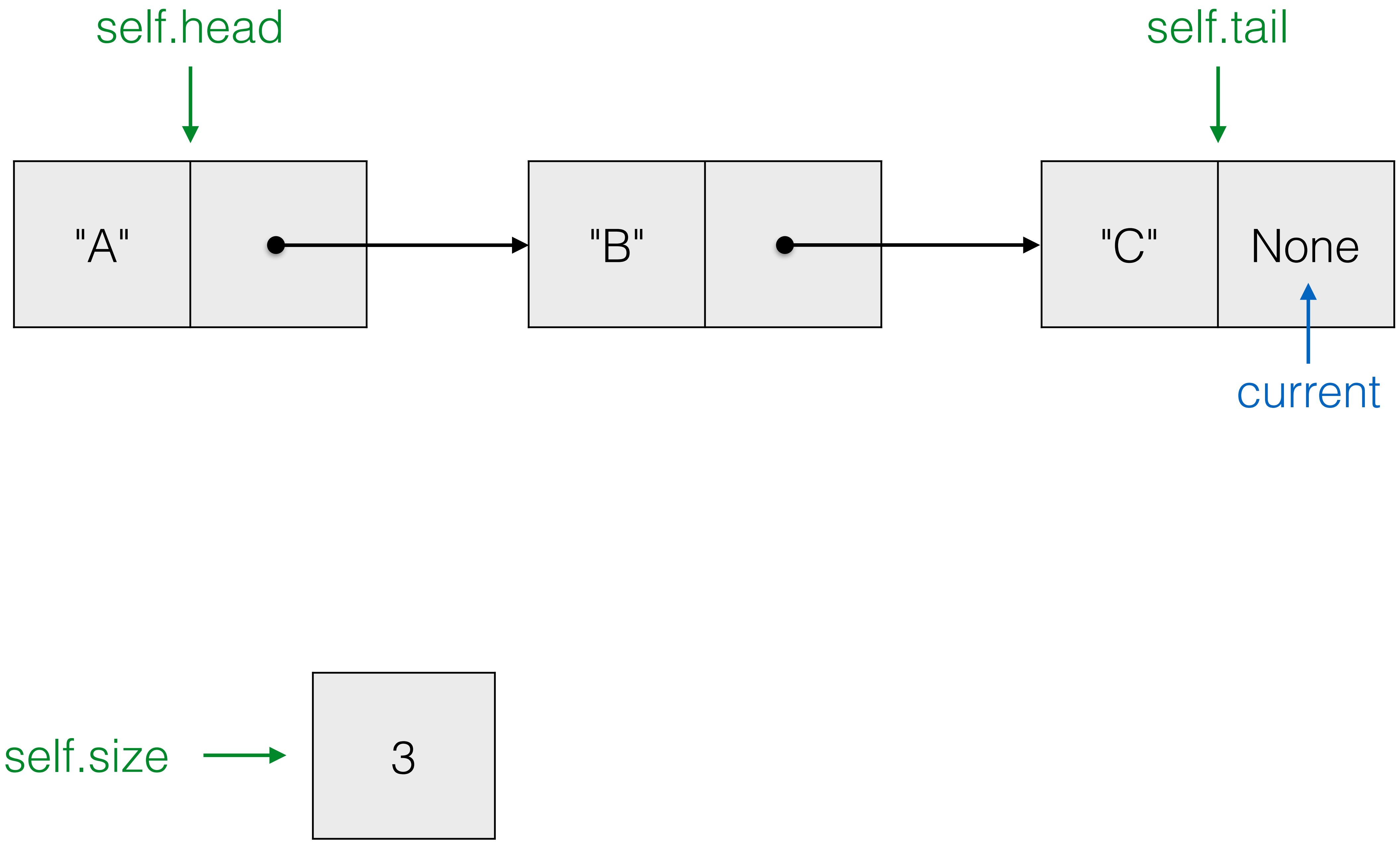
Traversing a linked list



Traversing a linked list



Traversing a linked list


self.head
self.tail
"A"
"B"
"C"
None
current
self.size
3