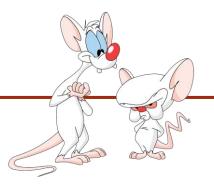
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/Week 5-2: Singly edu_assist_pro

Giulia Alberini, Fall 2020

WHAT ARE WE GOING TO DO IN THIS VIDEO?



Singly Linked Listsignment Project Exam Help

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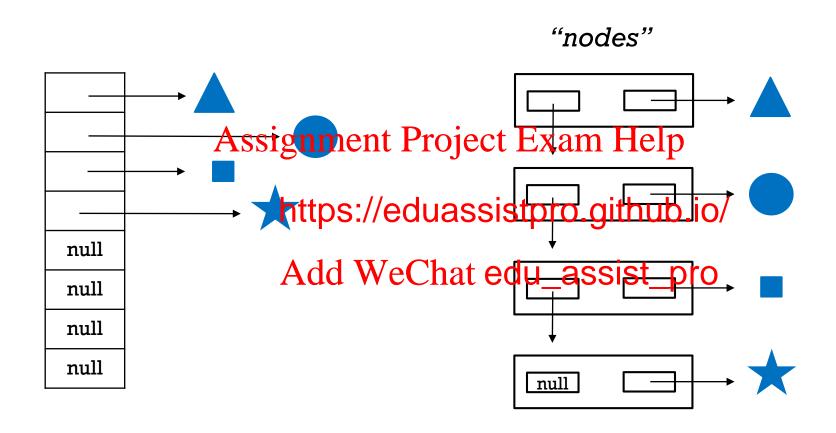
IMPLEMENTATIONS

There are different implementations of a list:

- Array list Assignment Project Exam Help
- Singly linked list https://eduassistpro.github.io/n the list are linked using poi
- Doubly linked list Add WeChat edu_assist_pro

Array list

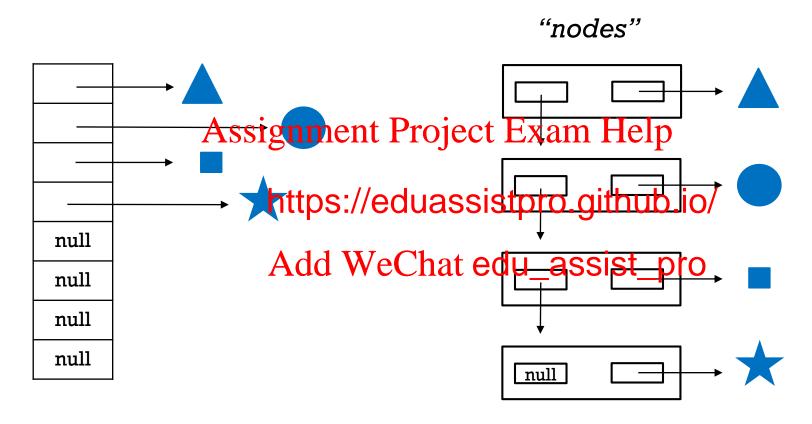
Linked list



size = 4

Array list

Linked list



Array slots are in consecutive locations (addresses) in memory, but objects (elements) can be anywhere.

Linked list "nodes" and objects (elements) can be anywhere in memory.

SINGLY LINKED LIST NODE

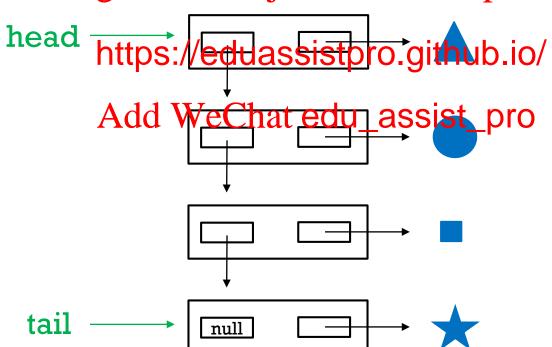
```
class SNode {
    Shape elementsisignment Project Exam Help
    SNode next;
} https://eduassistpro.github.phull
    Add WeChat edu_assist_pro
```

```
SNode myNode = new SNode();
n.element = new Shape( );
```

SINGLY LINKED LIST

We think of a linked list as a sequence of nodes, along with a reference to the first (head) and last (tail) node.

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SINGLY LINKED LIST

```
public class SLinkedList {
   private SNode head;
   private SNode tail; Assignment Project Exam Help
   private int size;
                          https://eduassistpro.github.io/
   private class SNode {
                          Add WeChat edu_assist_pro
      Shape element;
      SNode next;
                                                           null
```

```
SLinkedList list = new SLinkedList();
:
```

LINKED LIST OPERATIONS

```
addFirst(e)
```

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removeFirst()

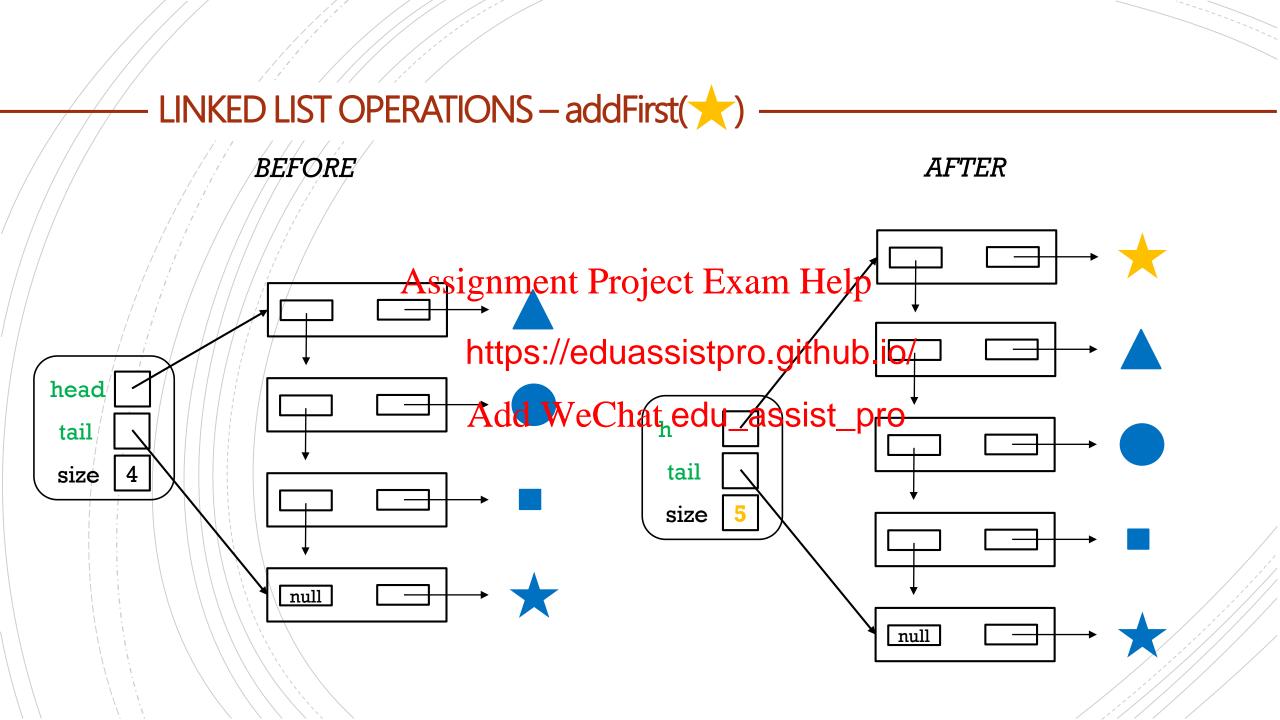
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addLast (e)

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removeLast()

many other list operations



addFirst(e) - PSEUDOCODE

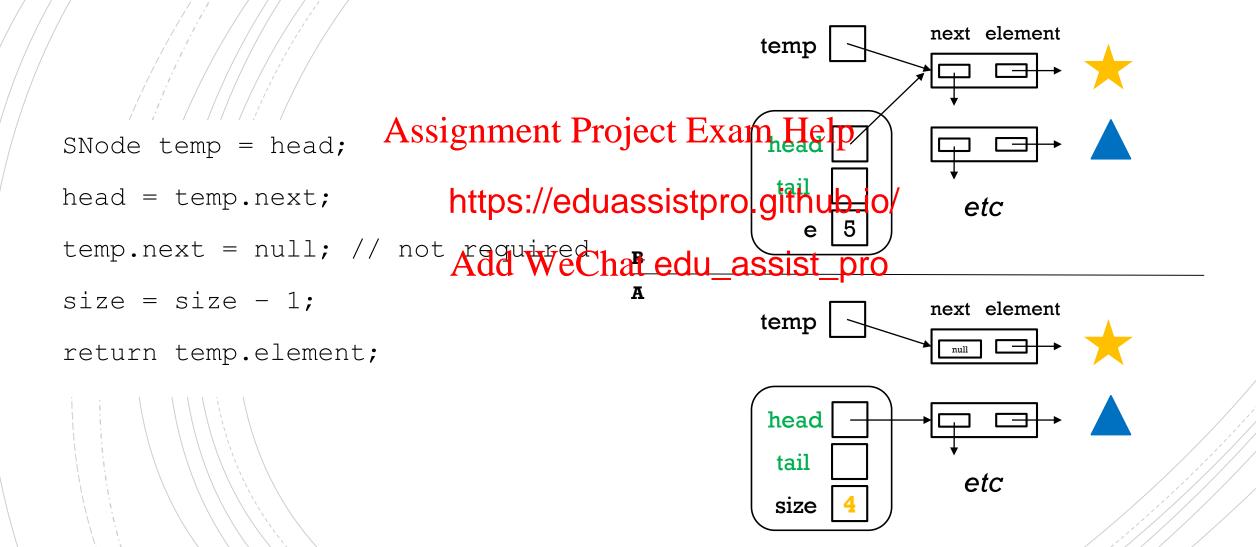
```
SNode newNode = new SNode();
newNode.element = eAssignment Project Exam Help
newNode.next = head;
                        https://eduassistpro.github.io/
                                               next element
                                newNo
// edge case
                        Add WeChat edu_assst_pro
if (head == null)
                                    head
      tail = newNode;
                                     tail
                                                 etc
head = newNode;
                                     size
size = size +1;
```

LINKED LIST OPERATIONS - removeFirst() BEFORE **AFTER** Assignment Project Exam Help https://eduassistpro.github.i<u>o/</u> Add WeChat edu assist_pro head size tail size

null

null

removeFirst() - PSEUDOCODE



removeFirst() - EDGE CASES (SIZE IS 0 OR 1)

```
temp | null
SNode temp = head;
if (size == 0)
                        Assignment Project Exam Help [null
       throw exception
                                                       tail
                                                            null
                             https://eduassistpro.glthub
head = temp.next;
                             Add WeChat edu assist pro
temp.next = null;
                               Size = 1
                                                       fore After
size = size - 1;
                                 temp
                                                             temp
if (size == 0)
                                            next element
                                                                        next element
       tail = null;
                                 head
                                                             head
                                                                  null
return temp.element;
                                  tail
                                                              tail
                                                                  null
                                 size
                                                             size
```

WORSE CASE TIME COMPLEXITY (N = LIST SIZE)

array list linked list

addFirst()

removeFirst()

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O(N) Add WeChat edu_assist_pro

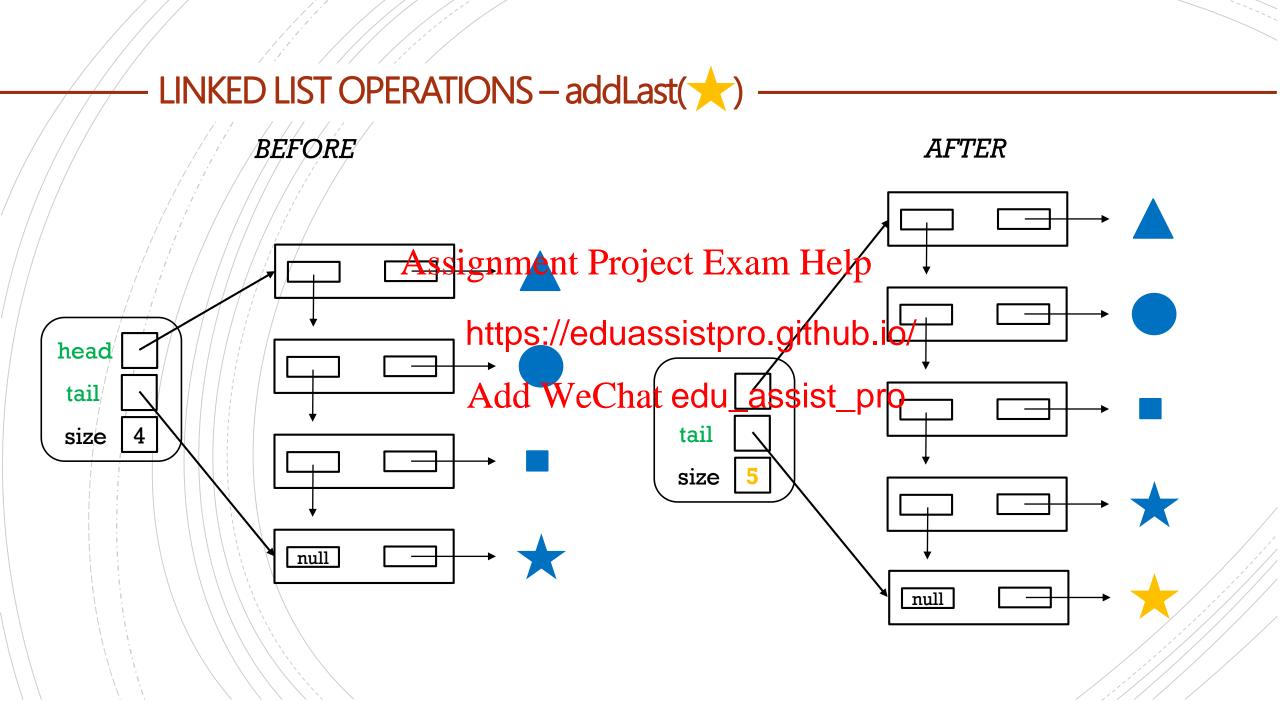
For arraylist with N elements, recall that add(0, e) and remove(0)required a loop with N iterations

For linked lists the implementation of addFirst() and removeFirst() does not depend on the number of elements in the list

WORSE CASE TIME COMPLEXITY (N = LIST SIZE)

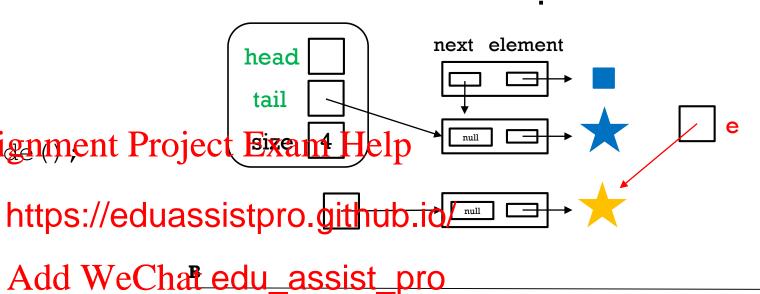
```
array list
                                     linked list
            Assignment Project Exam Help O(1)
addFirst()
                 https://eduassistpro.github.io/
                O(N O(1)
Add WeChat edu_assist_pro
removeFirst()
                         O(1)*
addLast()
                         O(1)
removeLast()
```

*if array is not full

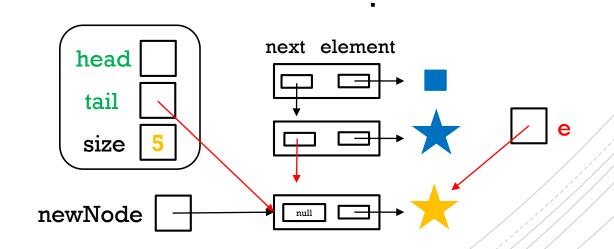


addLast(e) - PSEUDOCODE

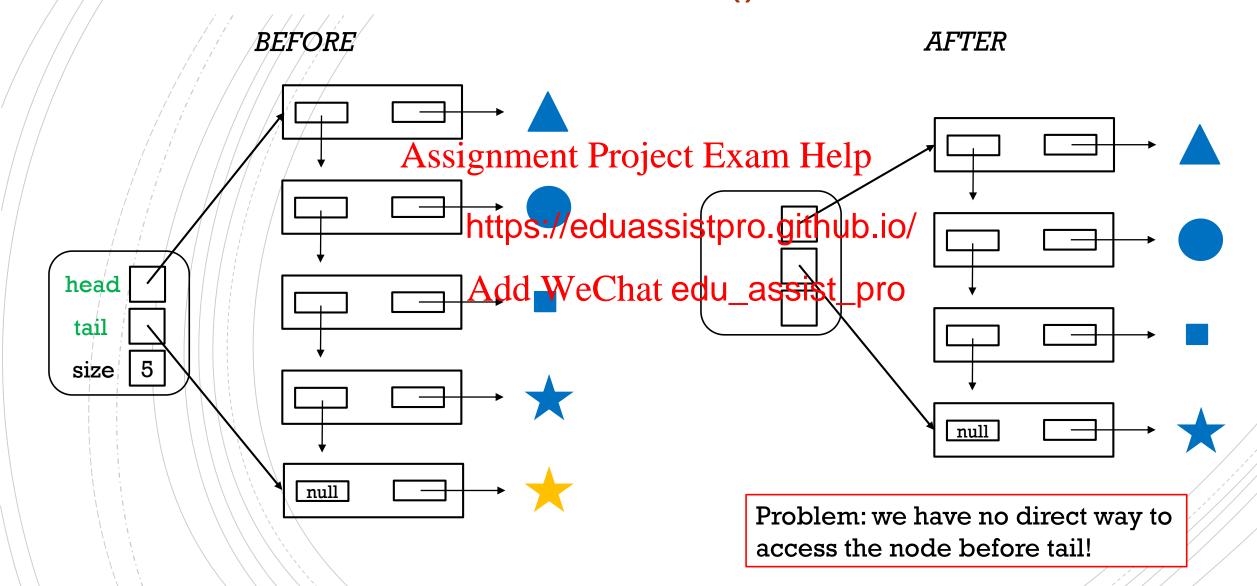
```
// create a new node
SNode newNode = new Assignment Project Eixent Help
newNode.element = e;
// add it at the end
tail.next = newNode;
tail = tail.next;
size = size + 1;
```



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LINKED LIST OPERATIONS – removeLast()



removeLast() - PSEUDOCODE

```
SNode tmp = head;
                                                       next element
while (tmp.next != tail)
                                        head
      tmp = tmp.next; Assignment Project Exam Help
                          https://eduassistpro.github.io//
                          Add WeChat edu_assist_pro-
```

removeLast() - PSEUDOCODE

// edge cases for size = 0 and 1 to be added

```
SNode tmp = head;
                                                        next element
while (tmp.next != tail)
                                         head
      tmp = tmp.next; Assignment Project Exam Help
                           https://eduassistprb.github.io//
                           Add WeChat edu_assist_pro-
tail = tmp;
tail.next = null;
size = size - 1;
// to return the element,
// you need to do a bit more work
```

removeLast() - EDGE CASES (SIZE IS 0 OR 1)

```
temp | null
if (size == 0)
       throw exception Assignment Project Exam [Help null
if (size == 1)
                                                        tail
                              https://eduassistpro.glthub
       head = null;
                              Add WeChat edu assist pro
       tail = null;
                                Size = 1
                                                         fore After
else {
                                             next element
                                                                          next element
                                                              head
                                  head
                                                                    null
                                  tail
                                                               tail
                                                                    null
size = size - 1;
                                  size
                                                               size
```

WORSE CASE TIME COMPLEXITY (N = LIST SIZE)

```
array list
                                     linked list
            Assignment Project Exam Help O(1)
addFirst()
                https://eduassistpro.github.io/
                O(N O(1)
Add WeChat edu_assist_pro
removeFirst()
                         O(1)*
addLast()
                                        O(1)
                         O(1)
removeLast()
                                        O(N)
```

*if array is not full



Assignment Project Exam Help In the next

Doubly

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