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Arrays and Linked Lists

Check In

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In your groups discuss

- What are excited to learn? 😄
- What are your nervous about? 😅
- What can Jess do to help you be successful? ⭐
- What can you do to be successful? 💪🏽

What we're going to learn

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- Static vs. Dynamic Arrays
- Linked Lists (shout out to Joi for the awesome linked list slides!)
  - Big idea
  - Methods
  - Applications

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Array Review

billboard

1	**Rockstar** DaBaby Featuring Roddy Ricch -	
2	**Whats Poppin** Jack Harlow Featuring DaBaby, Tory Lanez & Lil Wayne +6	
3	**Blinding Lights** The Weeknd -	

Top Songs Example

Declare an array of size 3.

Top Songs Example

Add elements as string values to array.

Top Songs Example

What should we do if we want to add the song "**Intentions**" to the array?

Static Arrays

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Static arrays are a direct representation of how memory is organized in physical RAM

Can’t change size because their memory is allocated once as a single contiguous block

However, we often do not know or cannot predict how many items we need to store...

Dynamic Arrays

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Dynamic arrays can change size but still have to store their items in a static array of fixed size – indexes are marked as occupied or available

When the static array is out of space we need to allocate a larger one and copy all existing items into it before we can append a new item

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We've actually used dynamic arrays before, a Python list is a dynamic array under the hood!

Top Songs Example

Rockstar	What's Poppin	Blinding Lights

Top Songs Example

Rockstar	What's Poppin	Blinding Lights

Rockstar	What's Poppin	Blinding Lights			

Top Songs Example

Rockstar	What's Poppin	Blinding Lights

Rockstar	What's Poppin	Blinding Lights	Intentions		

Top Songs Example

Rockstar	**What's Poppin**	**Blinding Lights**	**Intentions**		

Add "**Do It**" to the beginning of the array?

Top Songs Example

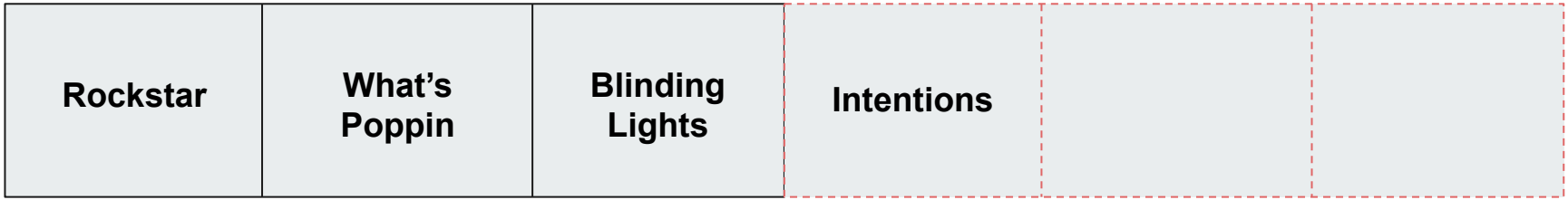
Rockstar	What's Poppin	Blinding Lights	Intentions		

	Rockstar	What's Poppin	Blinding Lights	Intentions	

Top Songs Example

Rockstar	What's Poppin	Blinding Lights	Intentions		

Do It	Rockstar	What's Poppin	Blinding Lights	Intentions	



Resizing is **expensive**.

Rockstar	What's Poppin	Blinding Lights	Intentions		

Do It	Rockstar	What's Poppin	Blinding Lights	Intentions	

Insertions are **inefficient**.

Rockstar	**What's Poppin**	**Blinding Lights**	**Intentions**		

Do It	**Rockstar**	**What's Poppin**	**Blinding Lights**	**Intentions**	

Empty array spaces means **memory waste**.

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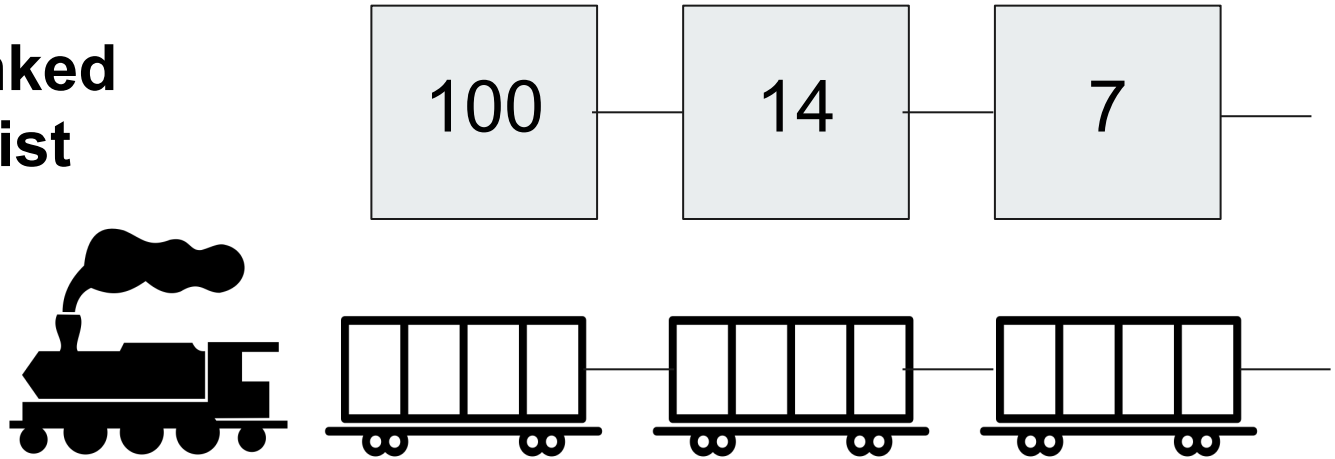
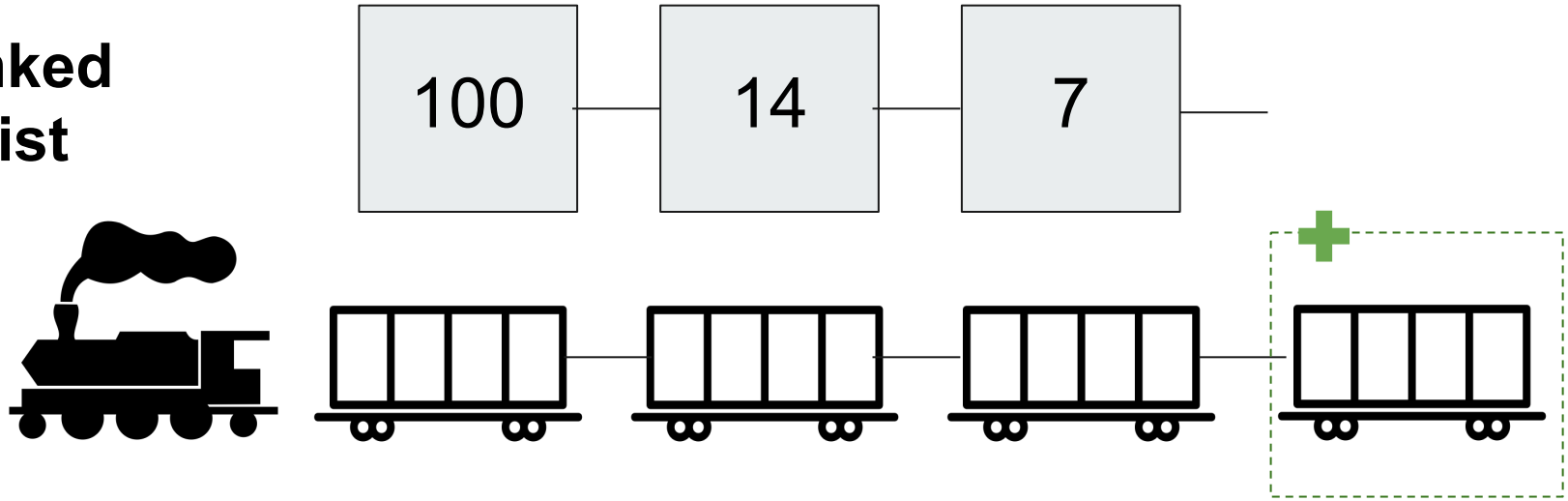
Introducing Linked Lists

Linked List



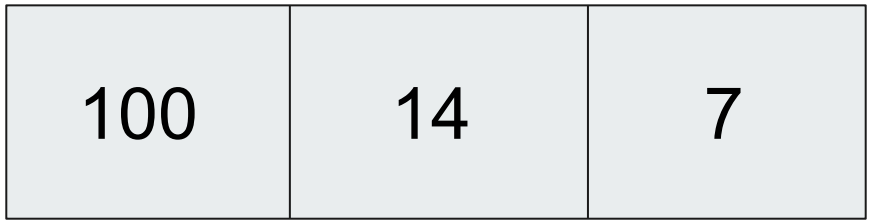
Analogy: A linked list is similar to a train.

Linked List

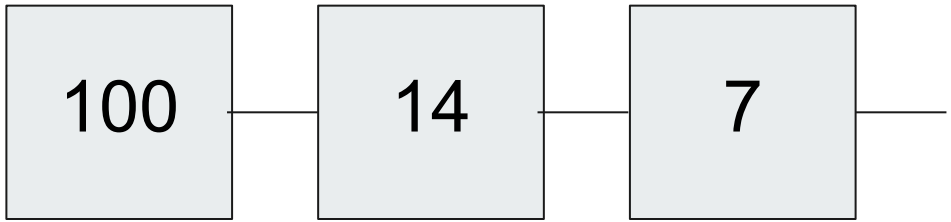


Analogy: To increase the train load, we do not need to switch bigger train. Just add train cars.

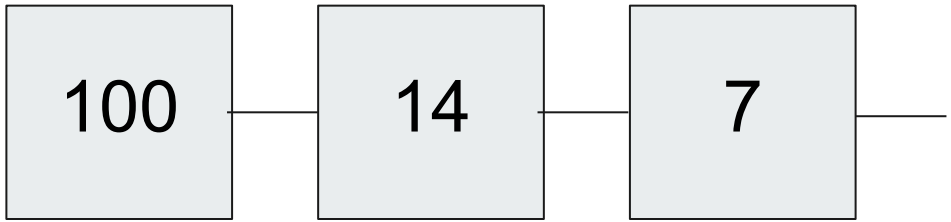
Array



Linked List



Linked List



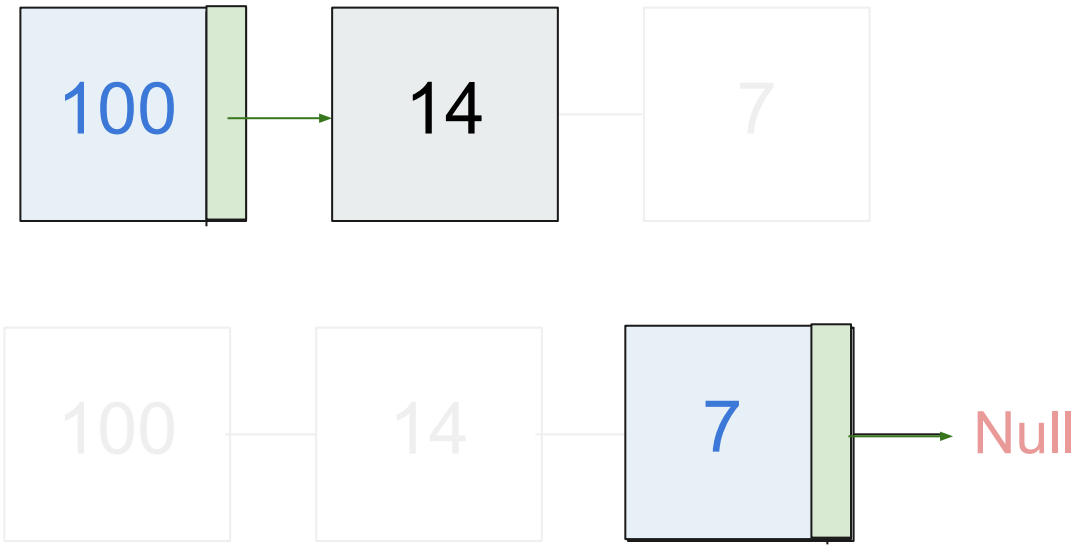
A linked list consists of nodes.

Linked List

Each **node** contains a two pieces of information:

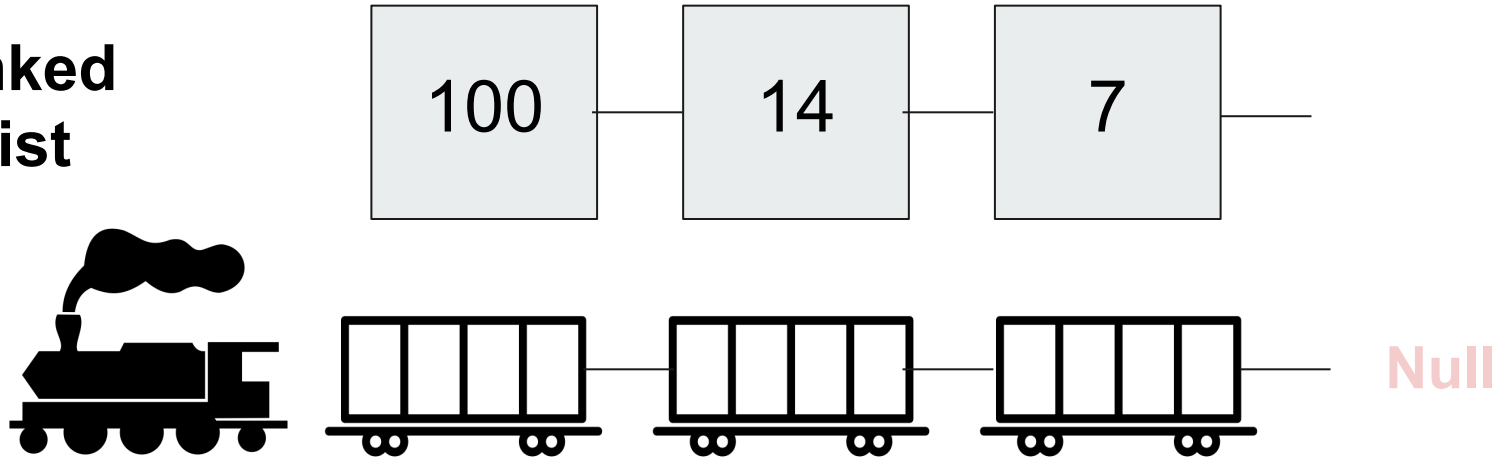
1. **Data**
2. **Next pointer**

Linked List



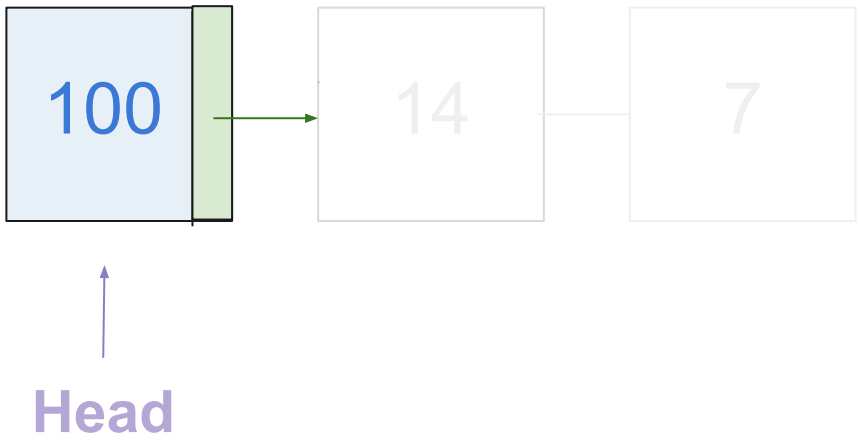
A **next pointer** either points to another node or Null, if it is at the end of the linked list.

Linked List



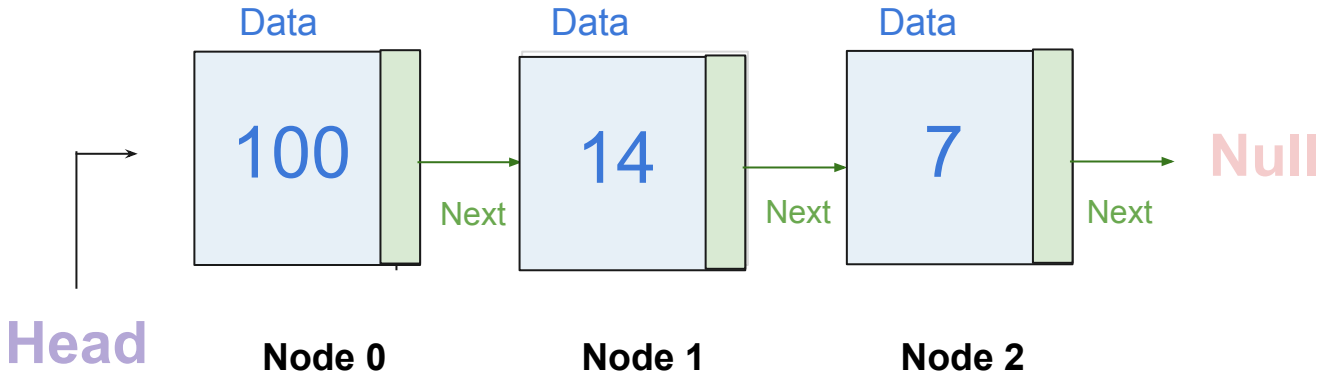
Analogy: After the last train car, there is not another train car. Thus, we are at the end of the train.

Linked List

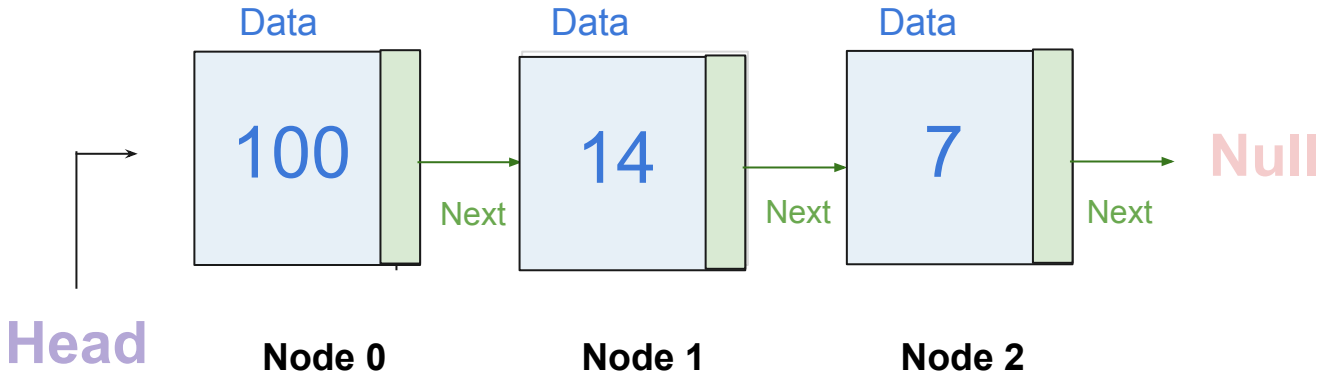


Linked List have a **head pointer** that keeps track of the head (beginning) of the list.

Linked List

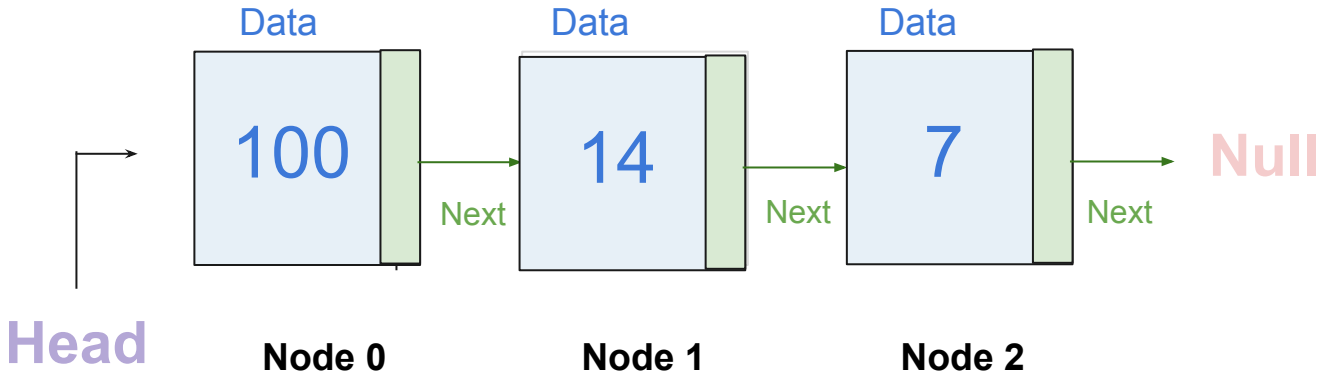

Data
Data
Data
100
14
7
Next
Next
Next
Null
Head
Node 0
Node 1
Node 2

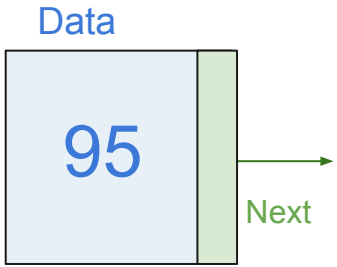
Linked List



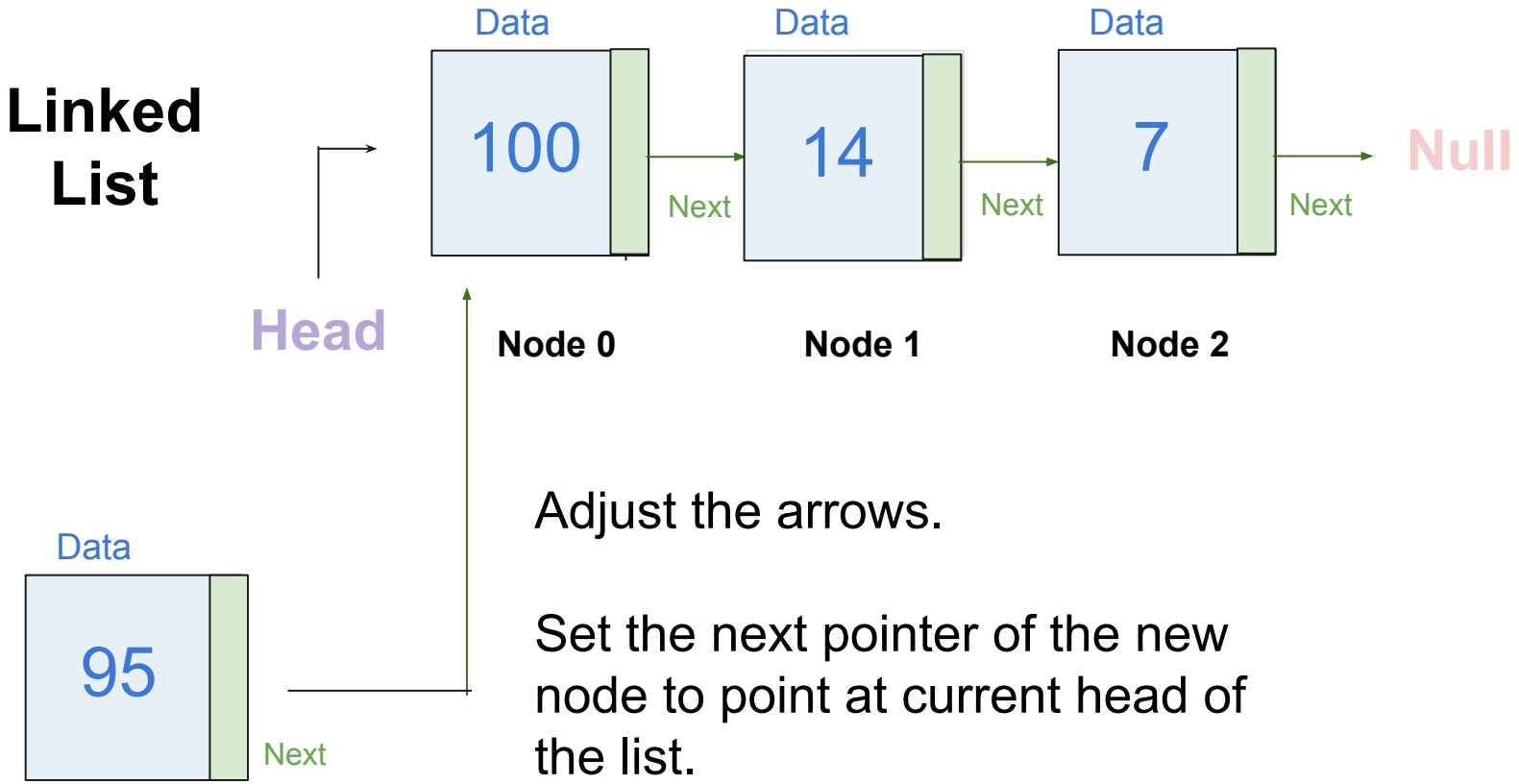
Given the above Linked List, insert **95** at the beginning of the list.

Linked List

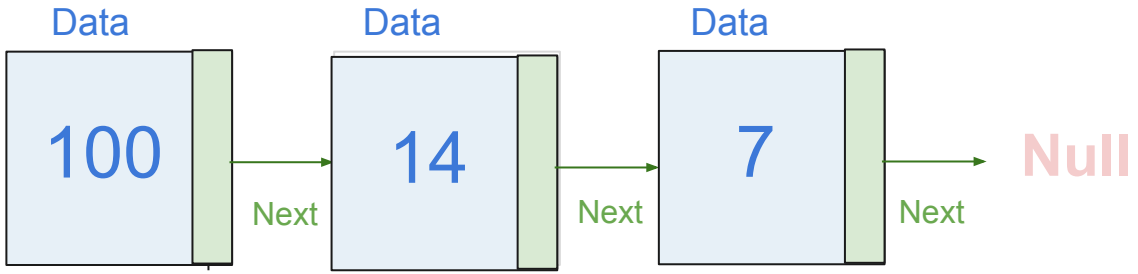


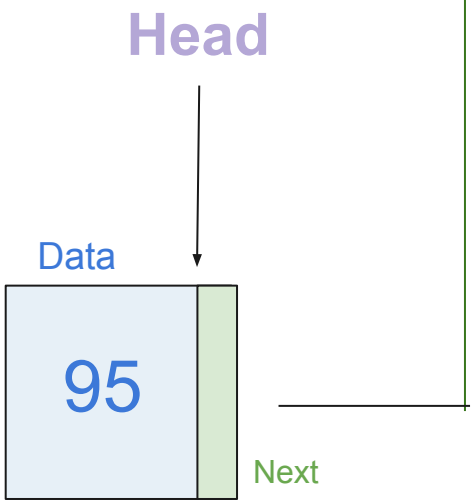


First, create a new node to store 95.


Linked List
Data
100
Next
Data
14
Next
Data
7
Next
Null
Head
Node 0
Node 1
Node 2
Data
95
Next
Adjust the arrows.
Set the next pointer of the new node to point at current head of the list.

Linked List





Adjust the arrows.

After, point the head pointer to point at the node storing 95.

Code Along

Students browse: repl.it/@MakeSchool/linkedlistcodealong?lite=true

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Shout Outs

Students, write your response!