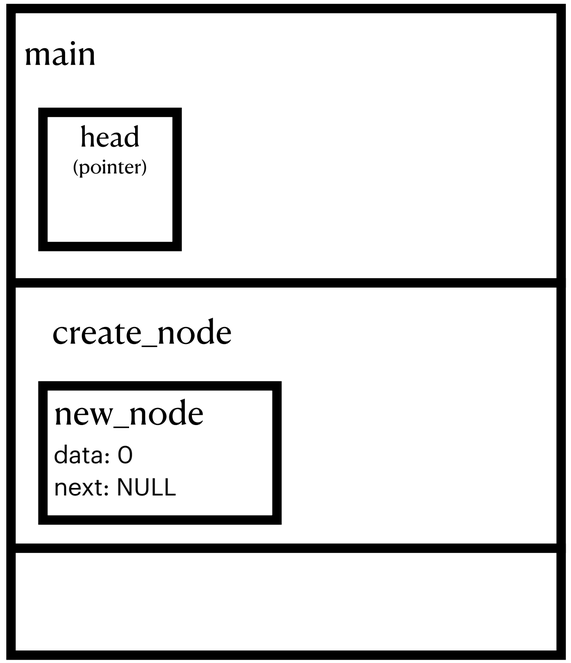
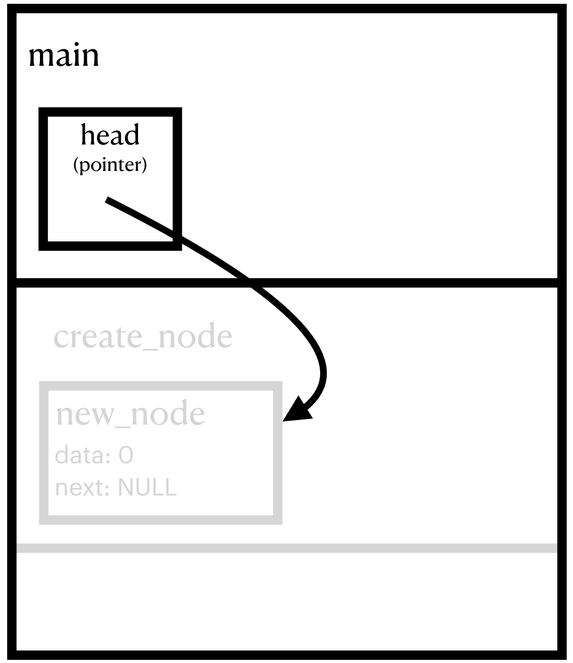
Returning an Address

Problem

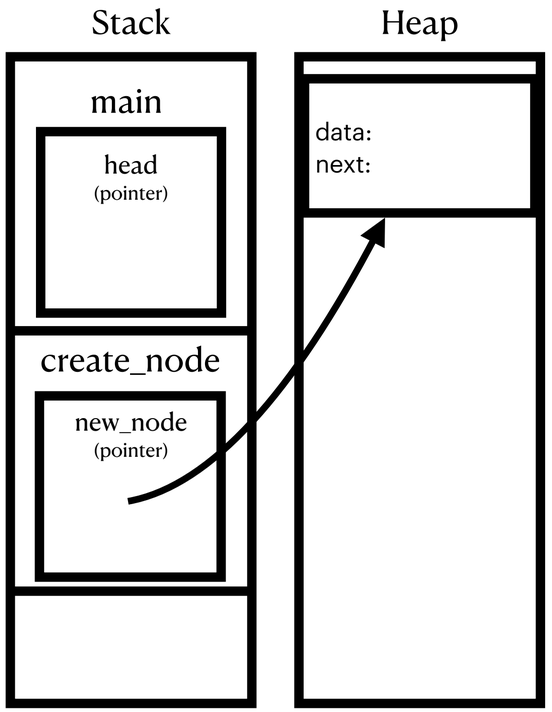


`create_node` creates a `struct node` called `new_node` and initialises its fields.

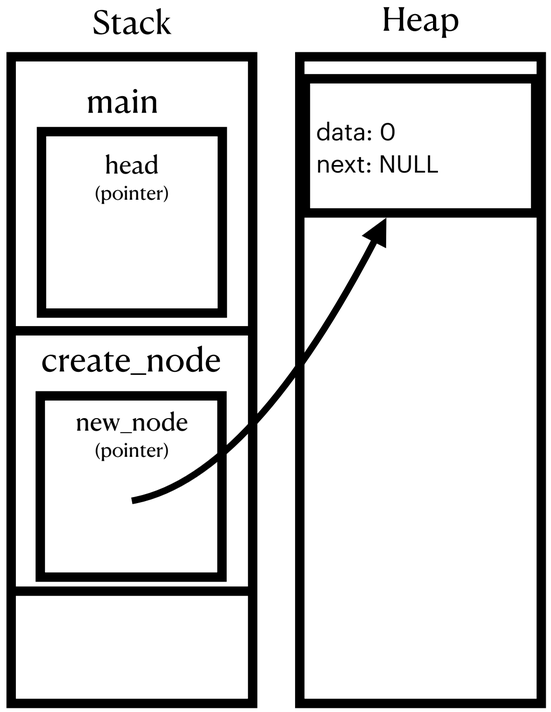


when we exit `create_node`, its memory is deallocated and the address of `new_node` is stored in `head`.
now `head` is left pointing at memory that is unsafe to access.

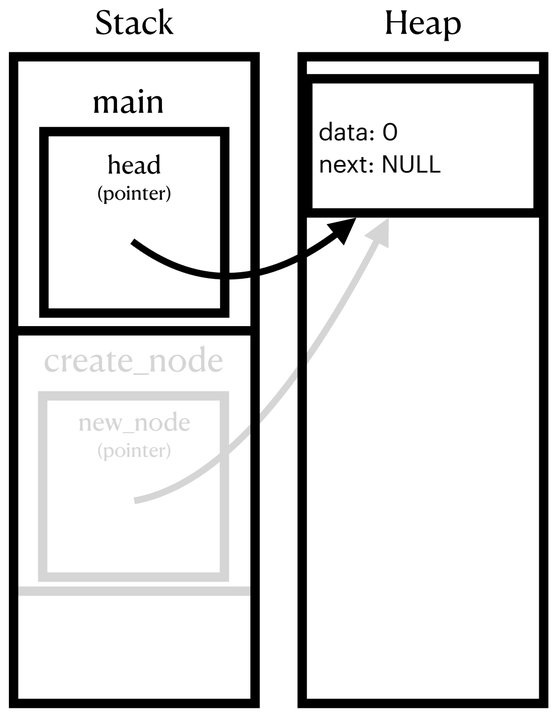
Memory Model



`malloc` allocates a block of memory on the heap for a **`struct node`**



The struct fields are initialised by dereferencing the **`new_node`** pointer

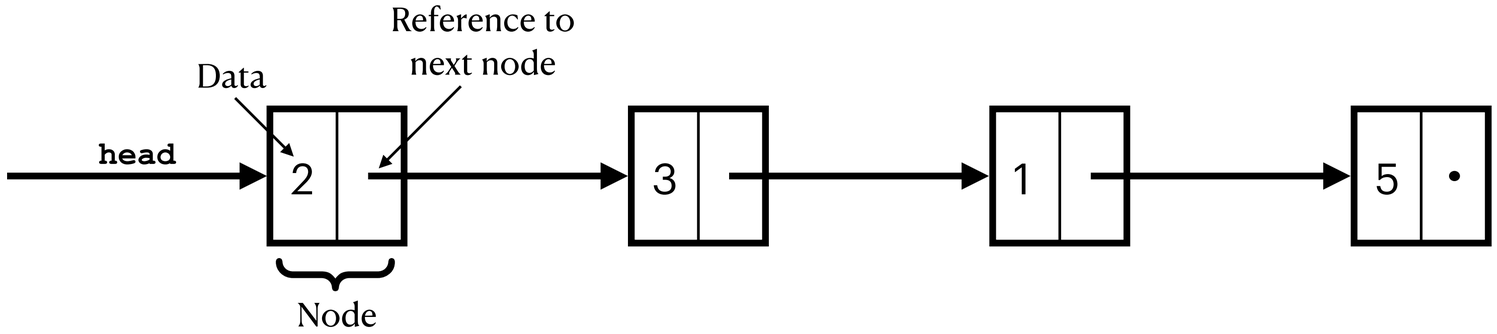


`create_node` returns the address to the heap-allocated struct, which is copied into the **`head`** variable. **`head`** points to the heap-allocated struct.

What is a Linked List

A Data Structure

- A linked list is an ordered collection of nodes. Every node contains a piece(s) of data, and (with the exception of the last node) a reference to the next element in the list.
- We can visualise it like so



- Here, we have a *list* of 4 nodes *linked* together by references.
- We are usually given where the first node of a list is through the **`head`** pointer.
  - This is our entry point into the list, giving us access to every node.

Linked Lists vs Arrays

Is one better than the other? It depends.

- We want to justify the need for inventing something new.
  - What's wrong with what we have?
  - Are there any limitations with linked lists that arrays don't have?

Array	Both	Linked Lists
• We are able to access any piece of data immediately using an index. • Memory efficient — we only need to store one thing at each index.	• We can store many variables that are associated with each other under one variable name. Through just one entity in our code, we can access multiple pieces of data.	• We don't need to know the size of the list upfront and can change the size of the list with ease. • Inserting at the start of the list is fast — we don't need to shift elements.