Practice with Recursive Structures & Processes

Warmup: Memory Diagram

```python
from __future__ import annotations

class Node:
    """Node in a singly-linked list recursive structure."""
    value: int
    next: Node | None

    def __init__(self, value: int, next: Node | None):
        self.value = value
        self.next = next

    def __str__(self) -> str:
        if self.next is None:
            return f"{self.value} -> None"
        else:
            return f"{self.value} -> {self.next}"

courses: Node = Node(110, Node(210, None))
print(courses)
```

and discuss with a neighbor:

1. What does the __str__ method do?
2. Is this method recursive? How do we know?

Memory Diagram

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Copy this into VS Code!

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A Recursive `last` Algorithm Demo

1. When you are asked,
   "What is the value of the last Node?"

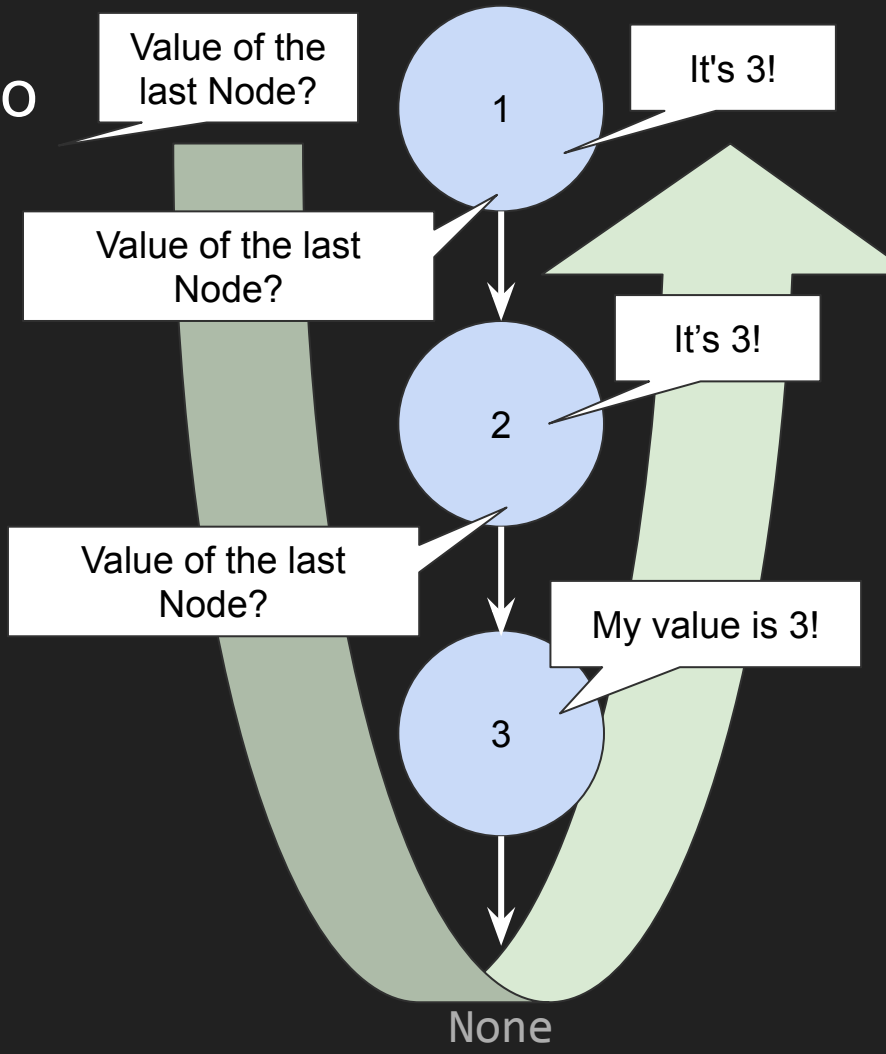
If you're ***not the last Node***:

2. Ask the ***next*** Node,
   "What is the value of the last Node?"
   Wait patiently for an answer!

3. Once the answer is returned back to you, turn to the person who asked you and give them this answer.

If you ***are the last Node***:

2. Tell them, "my value is ____!" and share your value.



Let’s write the `last` function in VS Code!

`recursive_range` Algorithm

Create a recursive function called `recursive_range` that will create a linked list of Nodes with values that increment from a start value up to an end value (exclusive). E.g.,

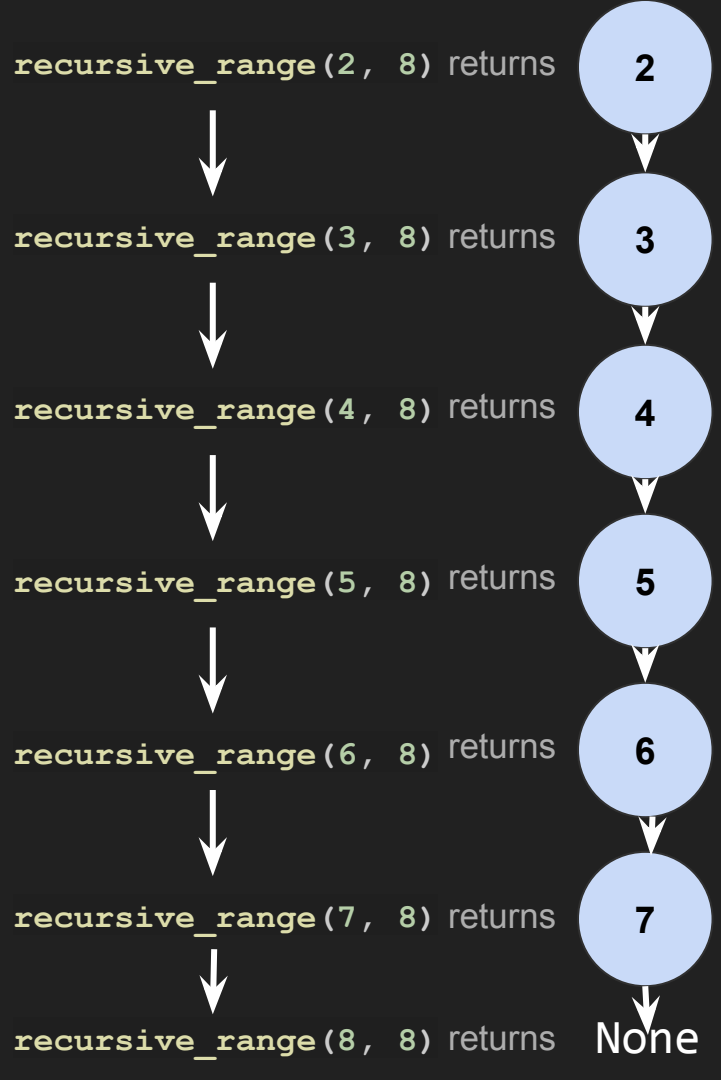
`recursive_range(start=2, end=8)` would return:

2 -> 3 -> 4 -> 5 -> 6 -> 7 -> None

Conceptually, what will our **base case** be?

What will our **recursive case** be?

What is an **edge case** for this function?
How could we account for it?



When "building" a new linked list in a recursive function:

Base case:

- ❏ Does the function have a clear base case?
  - ❏ Ensure the base case returns a result directly (without calling the function again).
- ❏ Will the base case *always* be reached?

Recursive case:

- ❏ Determine what the ***first*** value of the new list will be
- ❏ Then "build" the ***rest*** of the list by recursively calling the building function
- ❏ Finally, return a new ***Node(first, rest)***, representing the a new list

Let’s write the `recursive_range` function in VS Code!