CS 61A Lecture 9

Friday, September 14

The Sequence Abstraction

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Length. A sequence has a finite length.

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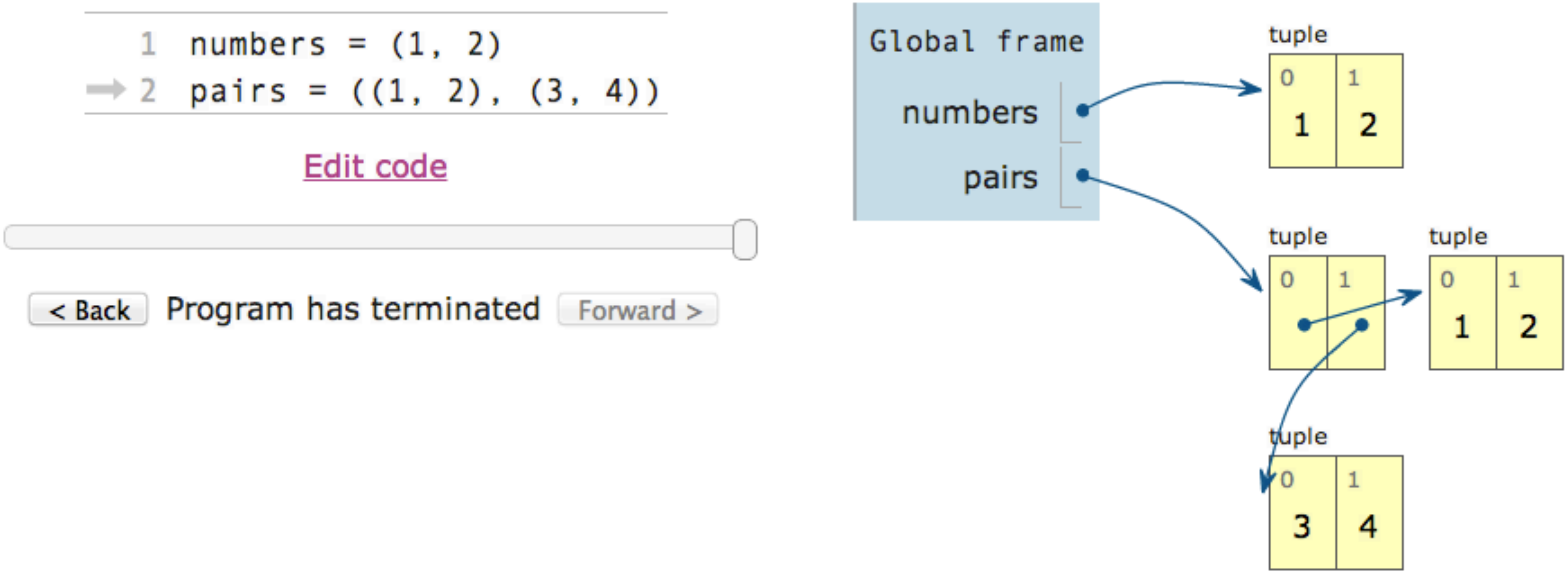
The sequence abstraction is shared among several types.

Tuples are Sequences

(Demo)

Box-and-Pointer Notation



```
numbers = (1, 2)
pairs = ((1, 2), (3, 4))
```

The Closure Property of Data Types

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Tuples can contain tuples as elements

Recursive Lists

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Behavior condition(s):

If a recursive list s is constructed from a first element f and a recursive list r, then

- first(s) returns f, and
- rest(s) returns r, which is a recursive list.

Implementing Recursive Lists with Pairs

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```
1 , 2 , 3 , 4
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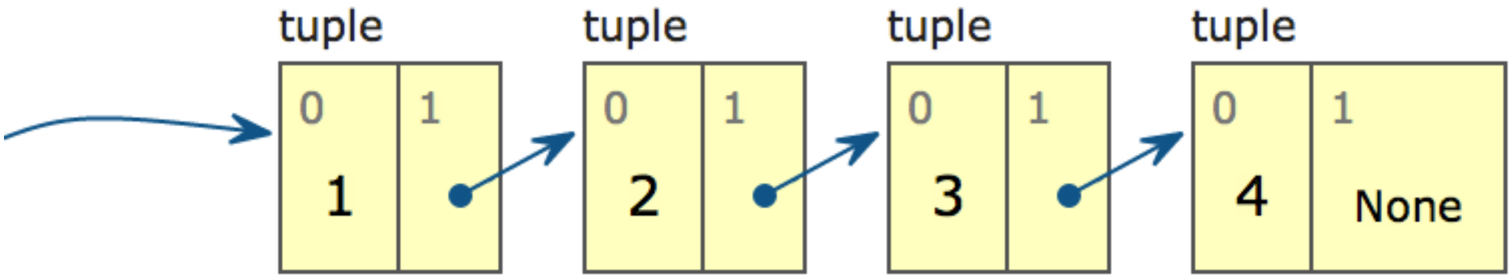

Implementing Recursive Lists with Pairs

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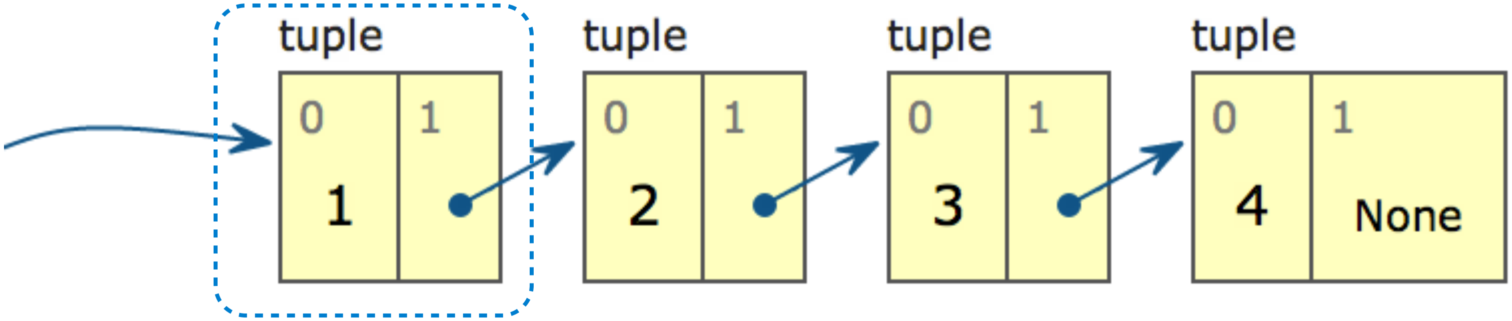
A recursive list is a pair



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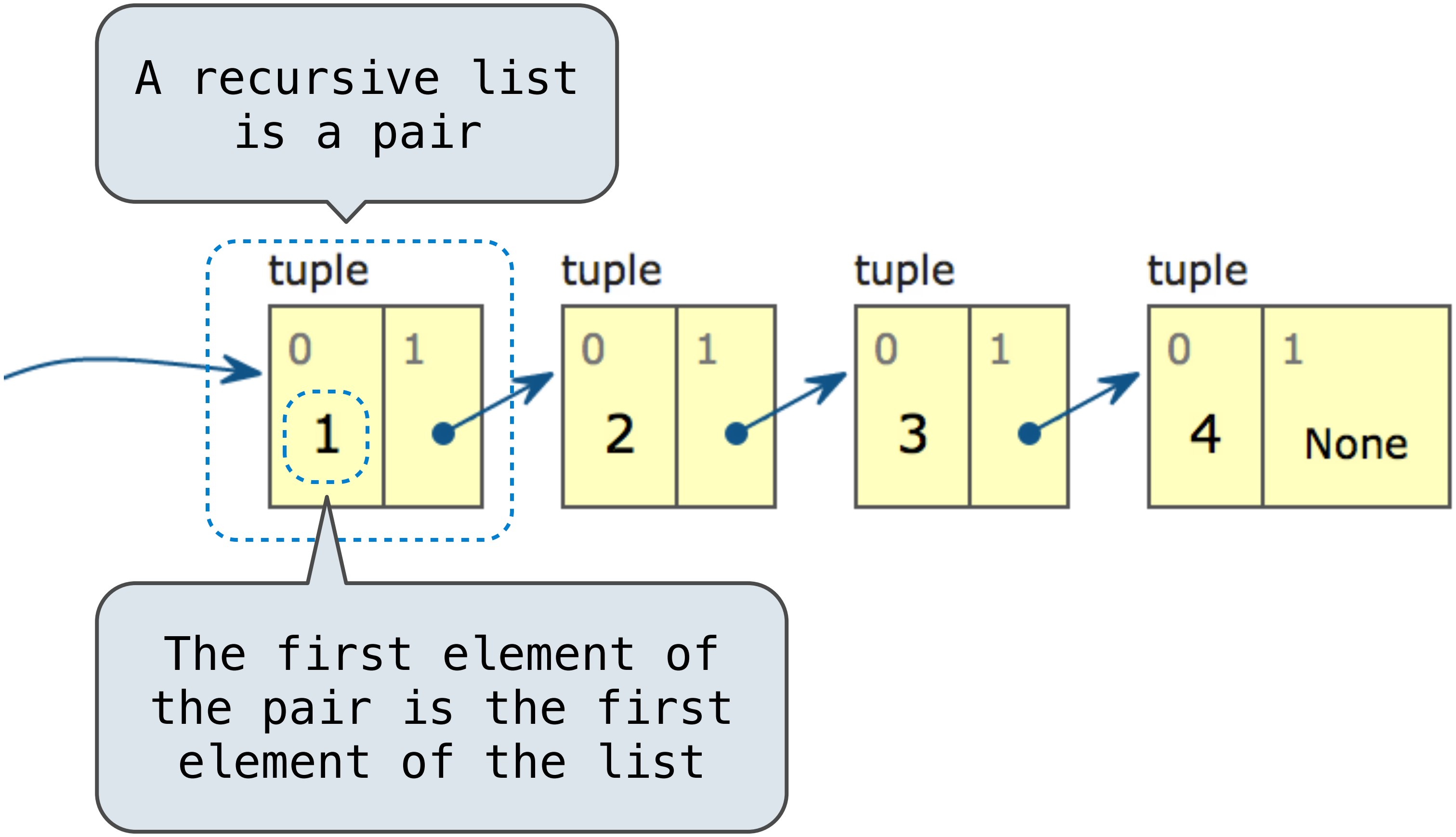
A recursive list is a pair
tuple
0
1
1
tuple
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None
The first element of the pair is the first element of the list

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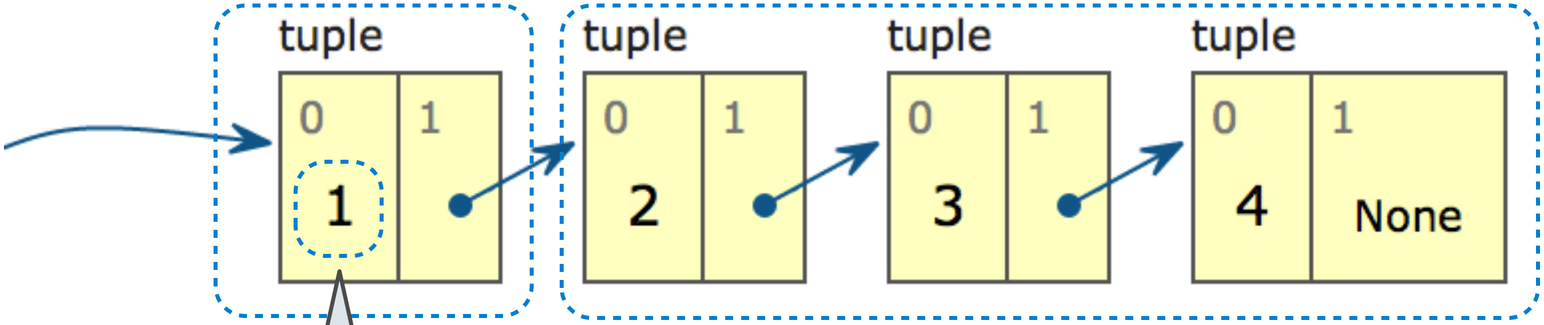

The first element of the pair is the first element of the list

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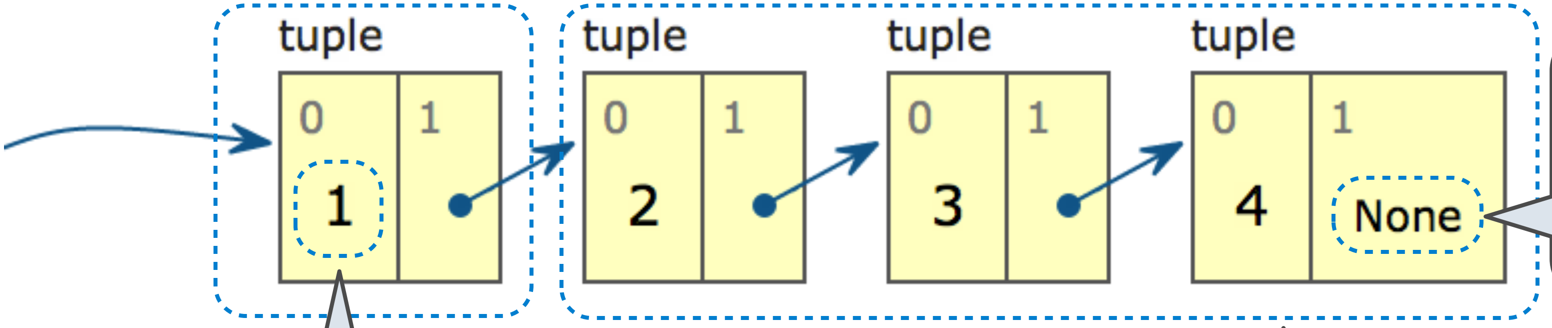

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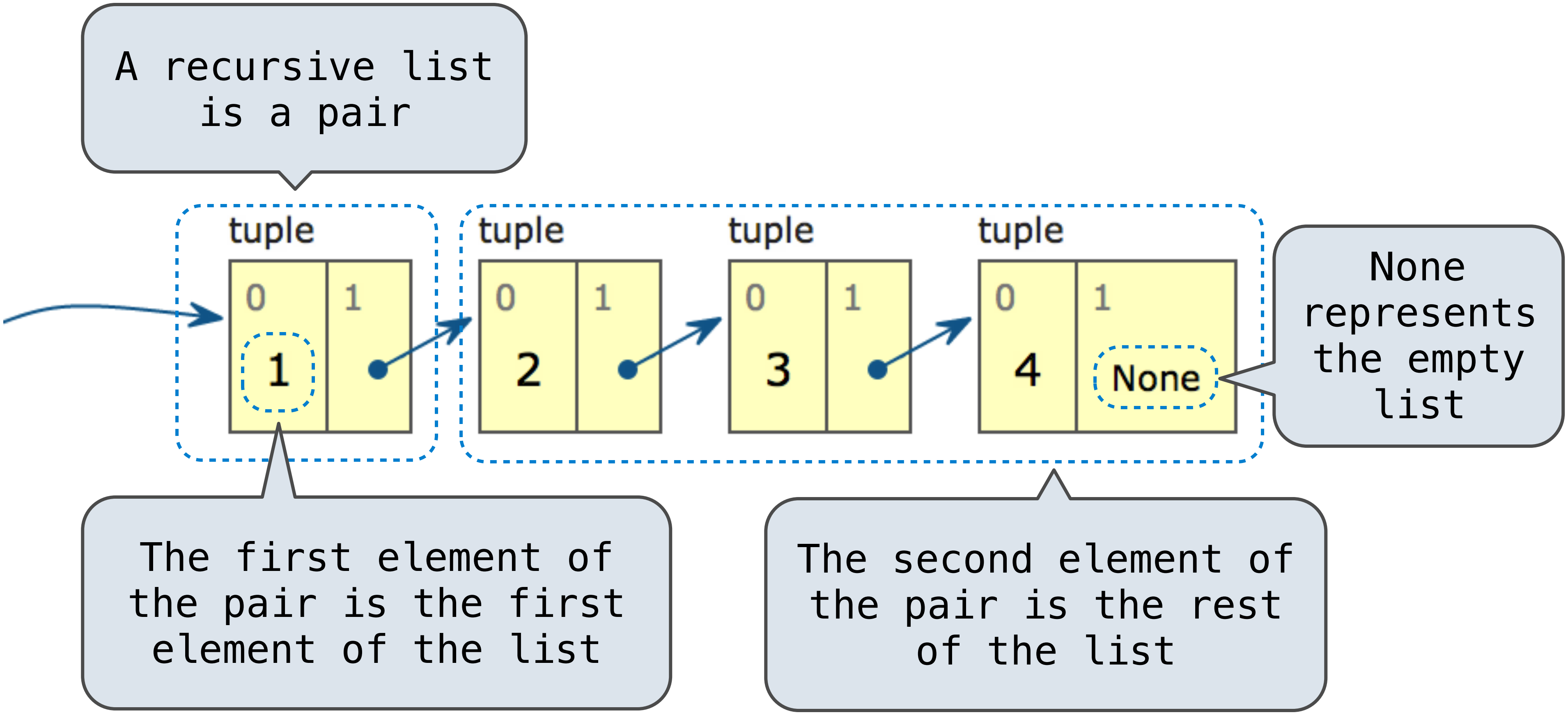

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Length. A sequence has a finite length.

Element selection. A sequence has an element corresponding to any non-negative integer index less than its length, starting at 0 for the first element.

Implementing the Sequence Abstraction

```
def len_rlist(s):
    """Return the length of recursive list s."""
    length = 0
    while s != empty_rlist:
        s, length = rest(s), length + 1
    return length
```

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def getitem_rlist(s, i):
    """Return the element at index i of recursive list s."""
    while i > 0:
        s, i = rest(s), i - 1
    return first(s)
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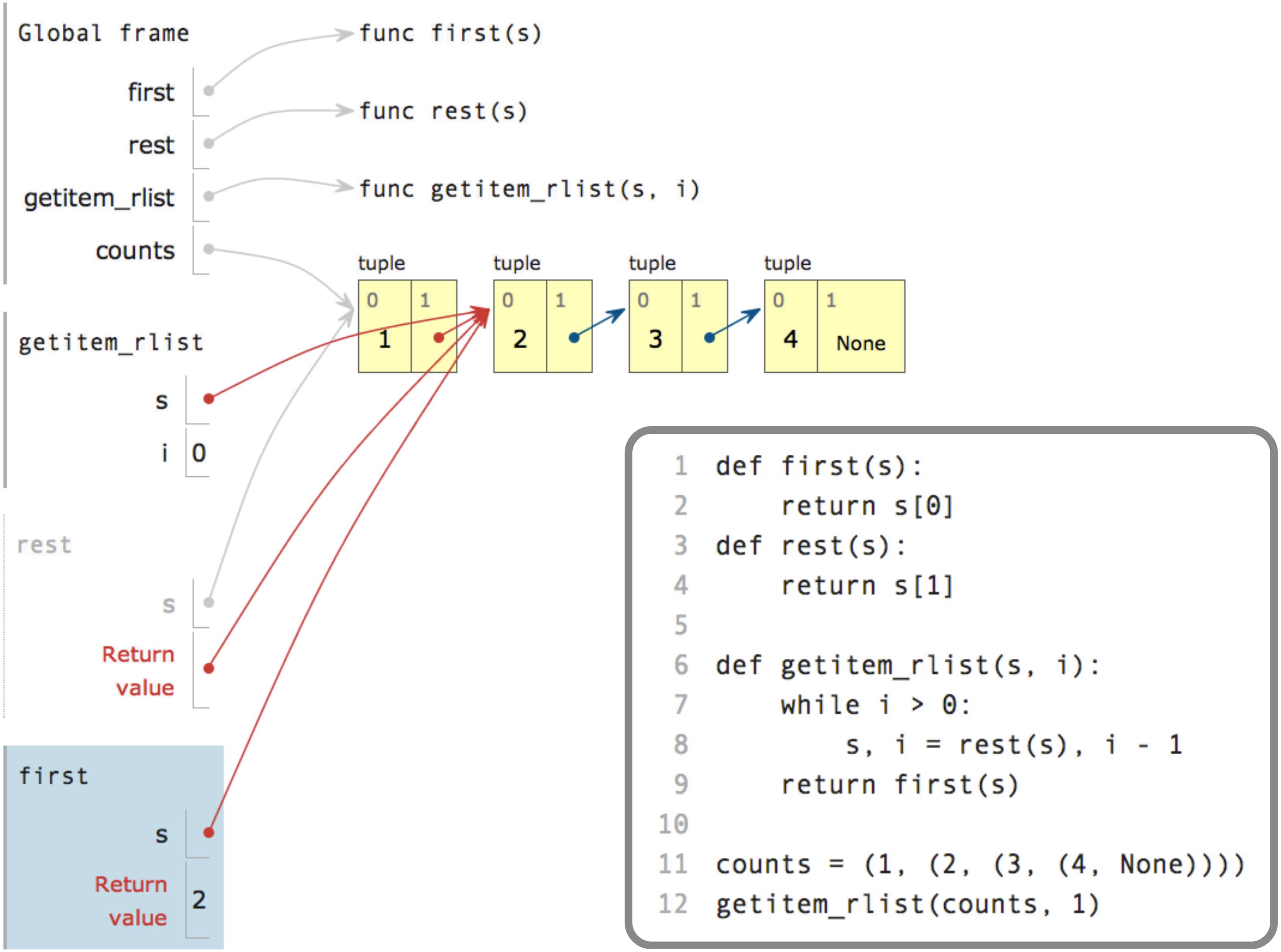
Environment Diagram for getitem_rlist



```
def first(s):
    return s[0]
def rest(s):
    return s[1]

def getitem_rlist(s, i):
    while i > 0:
        s, i = rest(s), i - 1
    return first(s)

counts = (1, (2, (3, (4, None))))
getitem_rlist(counts, 1)
```

Sequence Iteration

Not on
Midterm 1

(Demo)

Sequence Iteration

Not on Midterm 1

(Demo)

```
def count(s, value):
    total = 0
    for elem in s:
        if elem == value:
            total = total + 1
    return total
```

Name bound in the first frame of the current environment

For Statement Execution Procedure

Not on
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for <name> in <expression>:
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2. For each element in that sequence, in order:

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for <name> in <expression>:
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1. Evaluate the header <expression>, which must yield an iterable value.

2. For each element in that sequence, in order:

   A. Bind <name> to that element in the local environment.

   B. Execute the <suite>.

Sequence Unpacking in For Statements

Not on Midterm 1

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```
>>> pairs = ((1, 2), (2, 2), (2, 3), (4, 4))

>>> same_count = 0
```

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A sequence of fixed-length sequences

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>>> for x, y in pairs:
        if x == y:
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>>> same_count
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Not on Midterm 1

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A sequence of fixed-length sequences

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A name for each element in a fixed-length sequence

Each name is bound to a value, as in multiple assignment

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Not on Midterm 1

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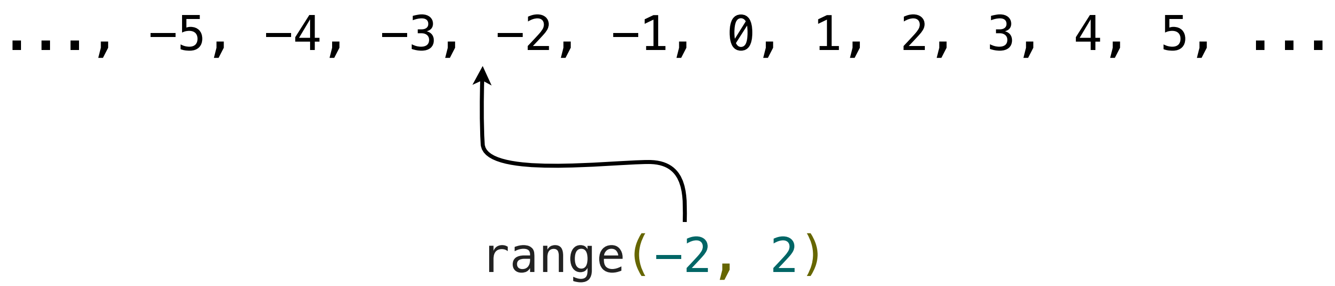

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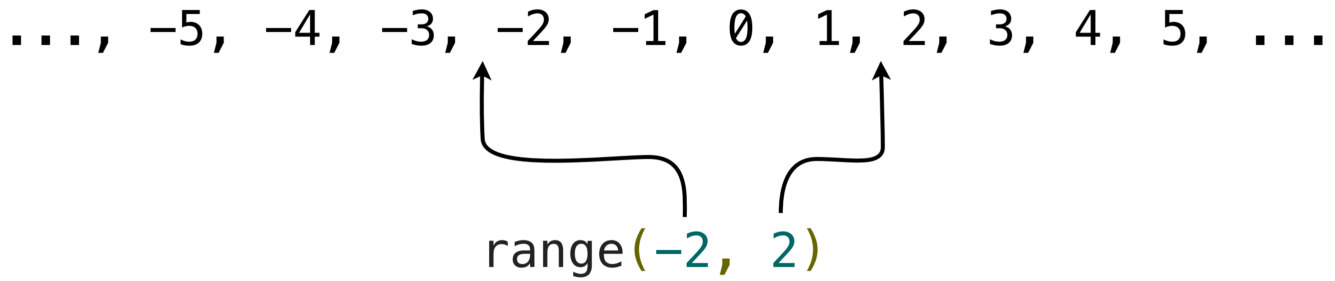

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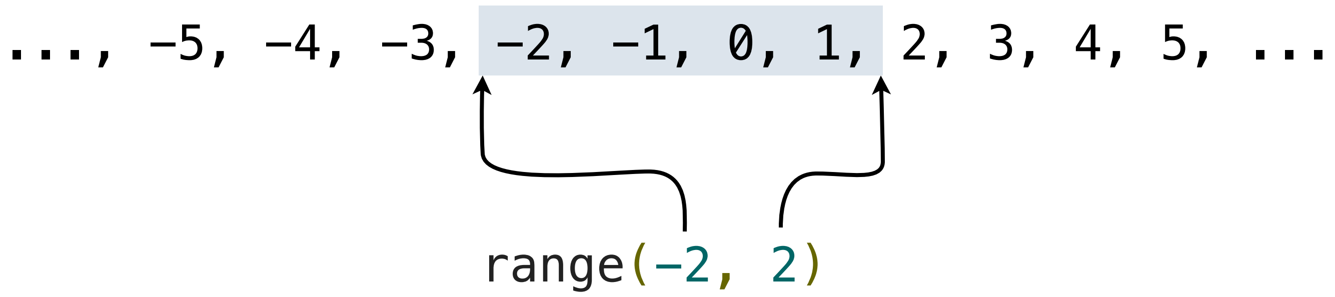

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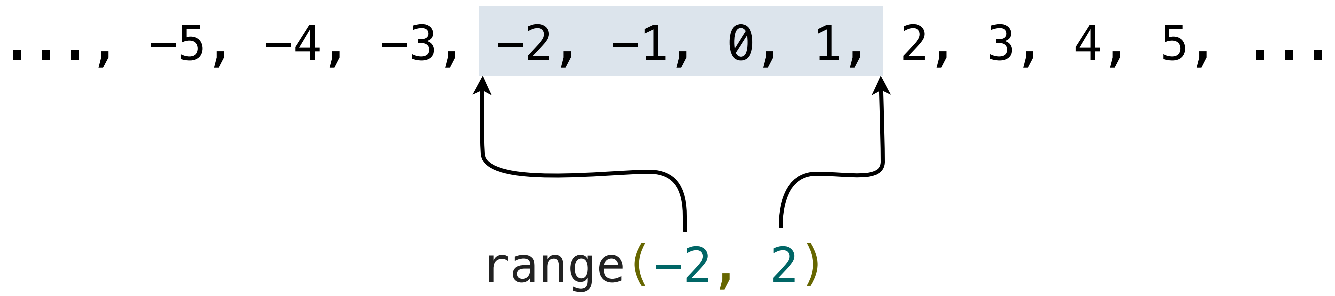

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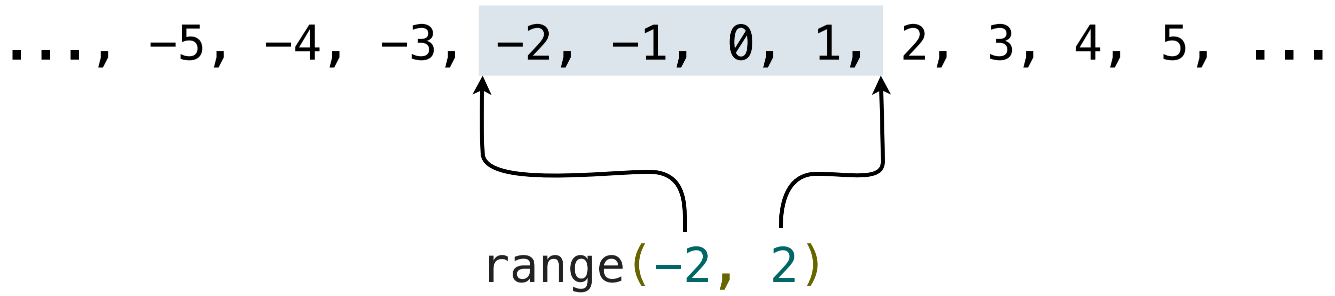

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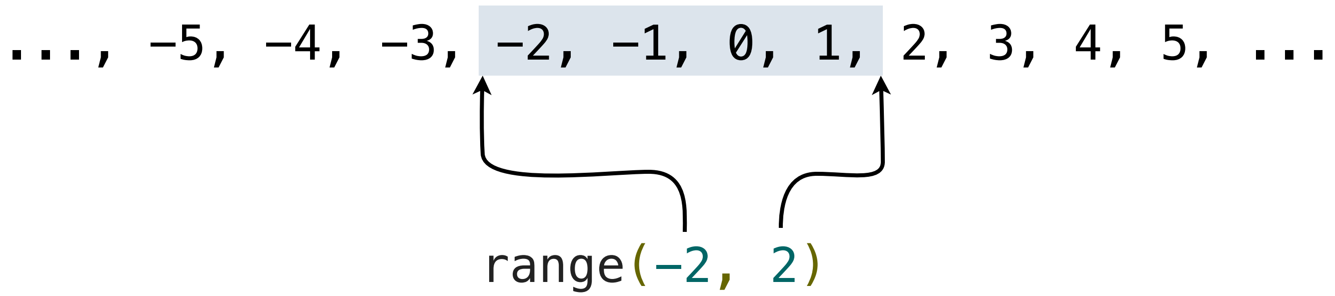

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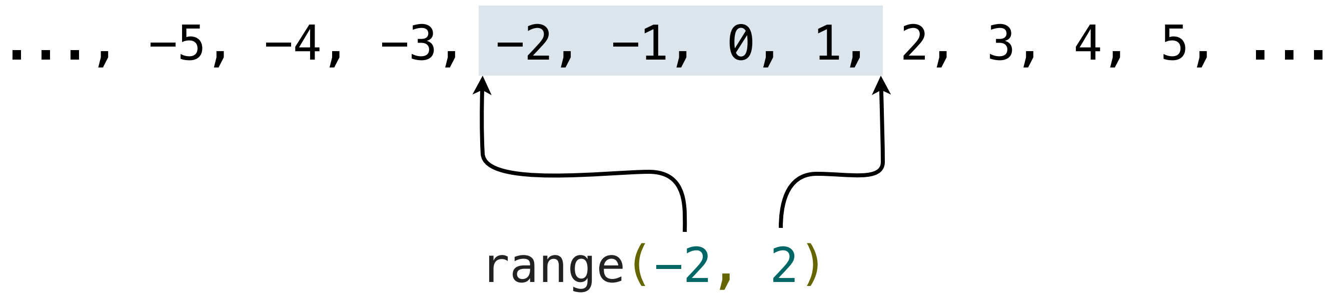

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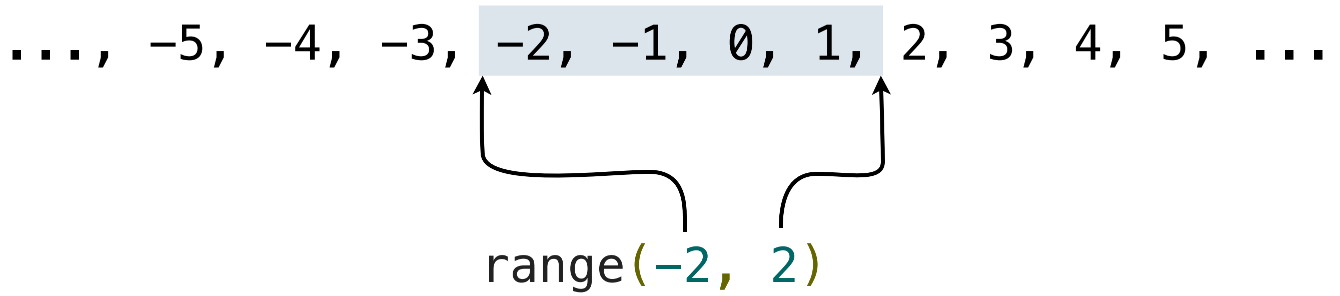

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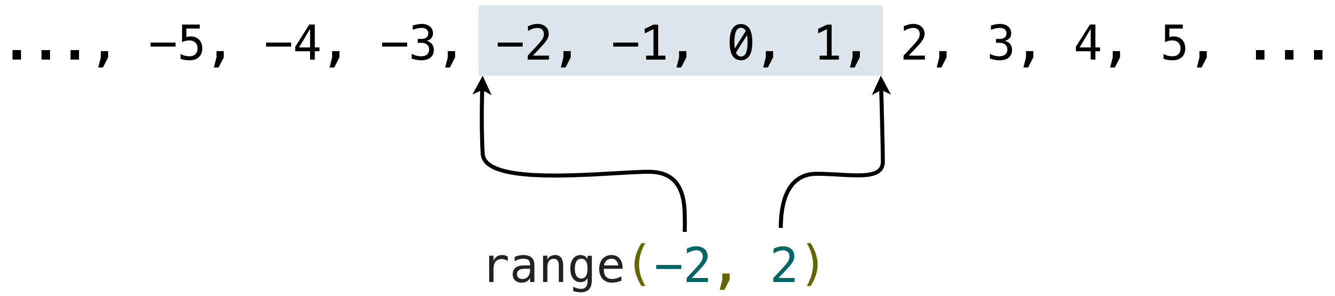

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>>> 1828 not in digits
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Membership.

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True
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True
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Slicing.

```
>>> digits[0:2]
(1, 8)
>>> digits[1:]
(8, 2, 8)
```