The Sequence Abstraction

- red, orange, yellow, green, blue, indigo, violet.
- 0, 1, 2, 3, 4, 5, 6.

There isn't just one sequence class or data abstraction (in Python or in general). The sequence abstraction is a collection of behaviors:

- **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.

There is built-in syntax associated with this behavior, or we can use functions.

A list is a kind of built-in sequence.

**Linked List Structure**

A linked list is either empty or a first value and the rest of the linked list:

- `Link(3, Link(4, Link(5, Link.empty)))`

**Linked List Class**

A linked list class: attributes are passed to `__init__`

```python
class Link:
    empty = ()
    def __init__(self, first, rest=empty):
        assert rest is Link.empty or isinstance(rest, Link)
        self.first = first
        self.rest = rest

    def __repr__(self):
        return 'Link({!r}, {!r})'.format(self.first, self.rest)

    def __str__(self):
        return self.__repr__()

def is_instance(obj, klass):
    return isinstance(obj, Link) or any(isinstance(x, klass) for x in obj)
```

(Demo)
Sequence Operations

Linked List Class

Linked lists are sequences

class Link:
    empty = ()
def __init__(self, first, rest=empty):
    self.first = first
    self.rest = rest
def __getitem__(self, i):
    if i == 0:
        return self.first
    else:
        return self.rest[i-1]
def __len__(self):
    return 1 + len(self.rest)

Methods can be recursive too!

More special method names:

__getitem__ Element selection []
__len__ Built-in len function

Property Methods

Often, we want the value of instance attributes to stay in sync:

For example, what if we wanted a Ratio to keep its proportion when its numerator changes?

>>> r = 4/5
>>> r
0.8
>>> r.second = 8
>>> r
8/10
>>> r.first
4

The @property decorator on a method designates that it will be called whenever it is looked up on an instance.

A @<attribute>.setter decorator on a method designates that it will be called whenever that attribute is assigned. <attribute> must be an existing property method.

Linked List Processing

[map exp for name in iter exp if filter exp]