

61A Lecture 21

Announcements

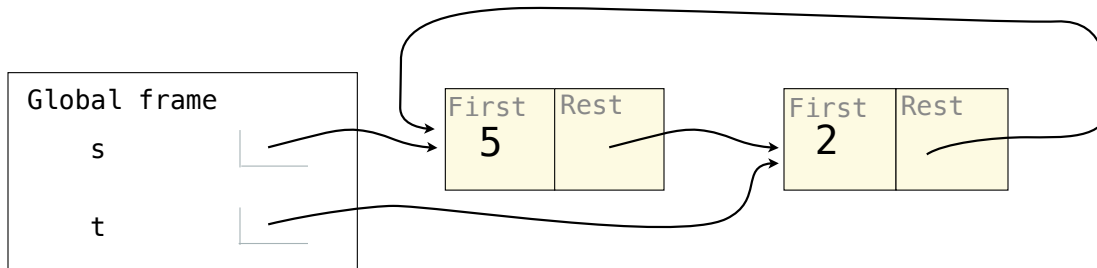
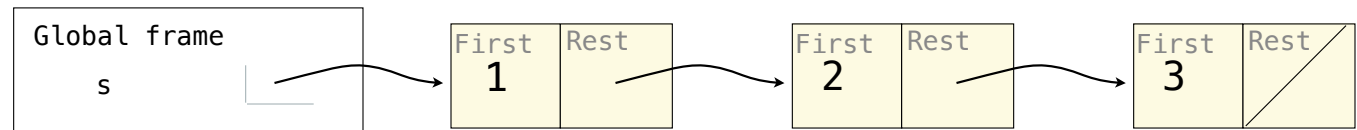
Linked Lists

Recursive Lists Can Change

Attribute assignment statements can change first and rest attributes of a Link

The rest of a linked list can contain the linked list as a sub-list

```
>>> s = Link(1, Link(2, Link(3)))
>>> s.first = 5
>>> t = s.rest
>>> t.rest = s
>>> s.first
5
>>> s.rest.rest.rest.rest.first
2
```



Note: The actual environment diagram is much more complicated.

Environment Diagrams

Go Bears!

```
def oski(bear):
```

```
    def cal(berk):
```

```
        nonlocal bear
```

```
        if bear(berk) == 0:
```

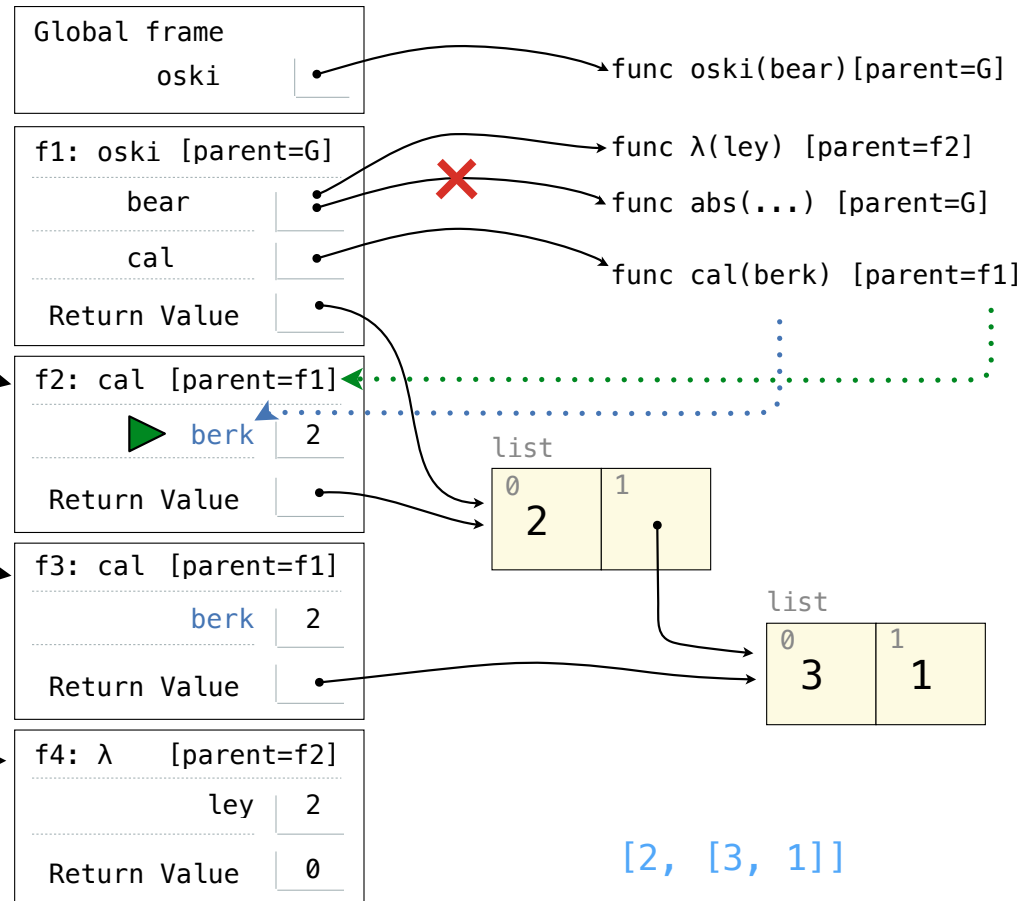
```
            return [berk+1, berk-1]
```

```
        bear = lambda ley: berk-ley
```

```
        return [berk, cal(berk)]
```

```
    return cal(2)
```

```
oski(abs)
```



Objects

Land Owners

Instance attributes are found before class attributes; class attributes are inherited

```
class Worker:
    greeting = 'Sir'
    def __init__(self):
        self.elf = Worker
    def work(self):
        return self.greeting + ', I work'
    def __repr__(self):
        return Bourgeoisie.greeting
```

```
class Bourgeoisie(Worker):
    greeting = 'Peon'
    def work(self):
        print(Worker.work(self))
        return 'I gather wealth'
```

```
jack = Worker()
john = Bourgeoisie()
jack.greeting = 'Maam'
```

```
>>> Worker().work()
'Sir, I work'
```

```
>>> jack
Peon
```

```
>>> jack.work()
'Maam, I work'
```

```
>>> john.work()
Peon, I work
'I gather wealth'
```

```
>>> john.elf.work(john)
'Peon, I work'
```

<class Worker>

greeting: 'Sir'

<class Bourgeoisie>

greeting: 'Peon'

jack <Worker>

elf: _____
greeting: 'Maam'

john <Bourgeoisie>

elf: _____

Trees

Morse Code

Morse code is a signaling protocol that transmits messages by sequences of signals

Problem: Implement `morse` so that `decode` works correctly

```
abcde = {'a': '.-', 'b': '-...', 'c': '-.-.', 'd': '-..', 'e': '.'}
```

```
def decode(signals, tree):  
    """Decode signals into a letter.  
    >>> t = morse(abcde)  
    >>> [decode(s, t) for s in ['-..', '.', '-.-.', '.-', '-...', '.']]  
    ['d', 'e', 'c', 'a', 'd', 'e']  
    """  
    for signal in signals:  
        tree = [b for b in tree.branches if b.entry == signal][0]  
    leaves = [b for b in tree.branches if not b.branches]  
    assert len(leaves) == 1  
    return leaves[0].entry
```

```
def morse(code):  
    ....
```

An empty list is a false value

A: ● ■
B: ■ ● ● ●
C: ■ ● ■ ●
D: ■ ● ●
E: ●
...

