Data Examples

Announcements

Examples: Lists

Lists in Environment Diagrams

Assume that before each example below we execute:

```
s = [2, 3]
t = [5, 6]
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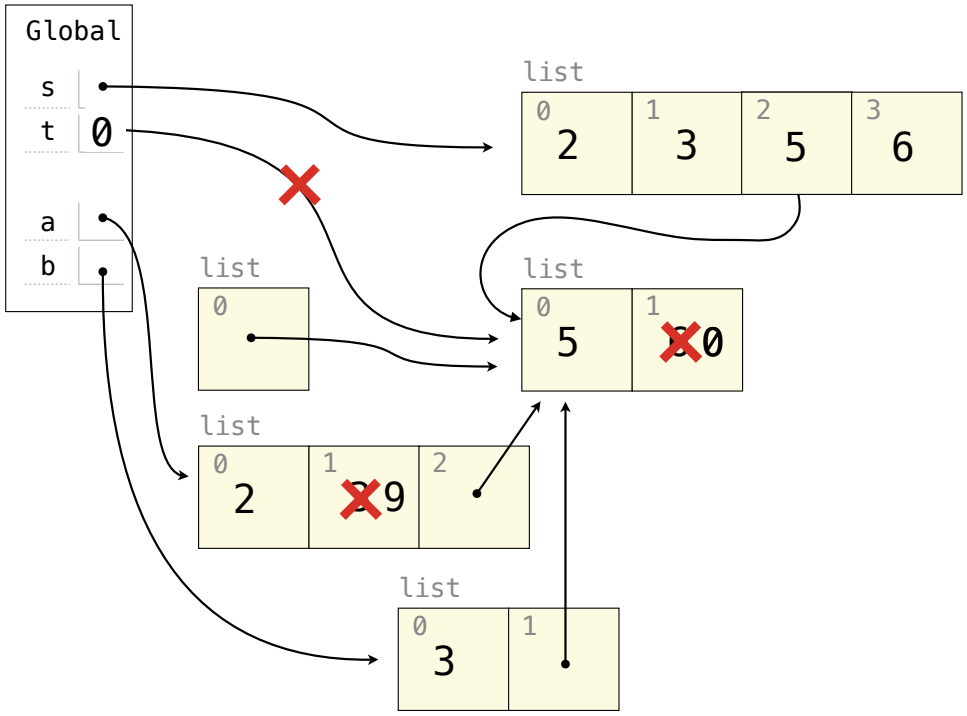
Operation	Example	Result
append adds one element to a list	`s.append(t)` `t = 0`	`s → [2, 3, [5, 6]]` `t → 0`
extend adds all elements in one list to another list	`s.extend(t)` `t[1] = 0`	`s → [2, 3, 5, 6]` `t → [5, 0]`

addition & **slicing** create new lists containing existing elements	`a = s + [t]`
	`b = a[1:]`
	`a[1] = 9`
	`b[1][1] = 0`
		`s → [2, 3]`
		`t → [5, 0]`
		`a → [2, 9, [5, 0]]`
		`b → [3, [5, 0]]`



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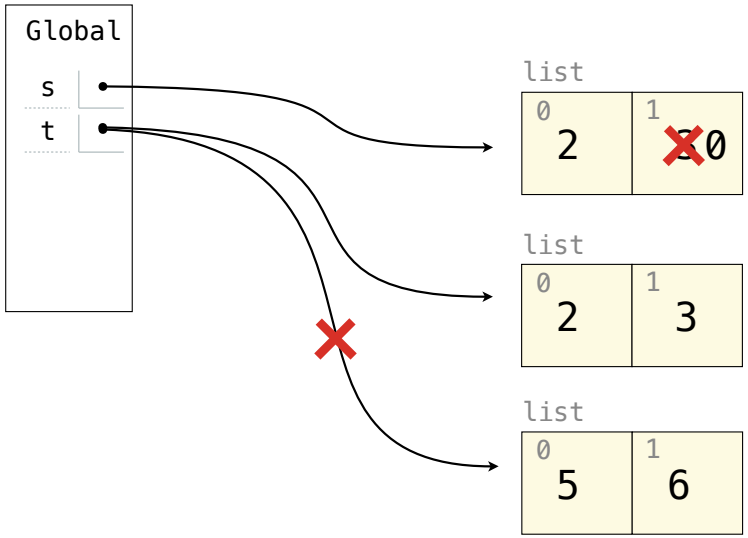
The **list** function also creates a new list containing existing elements	`t = list(s)` `s[1] = 0`	`s → [2, 0]` `t → [2, 3]`



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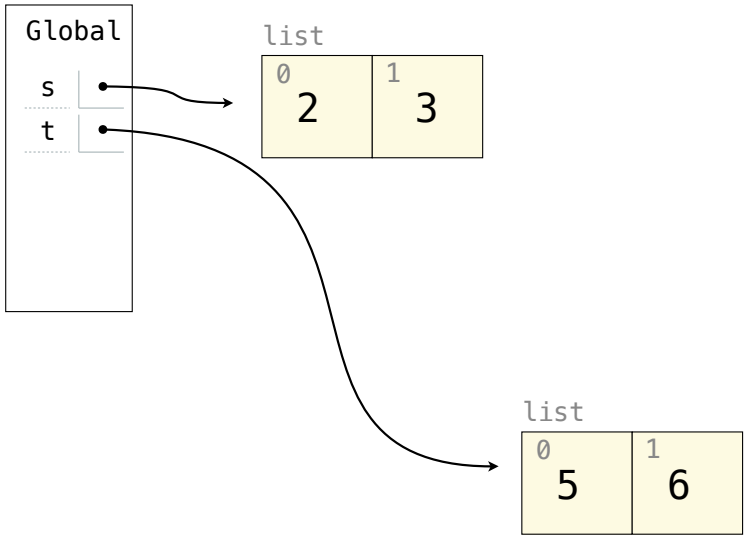
slice assignment replaces a slice with new values	`s[0:0] = t`
	`s[3:] = t`
	`t[1] = 0`	



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slice assignment replaces a slice with new values	`s[0:0] = t`
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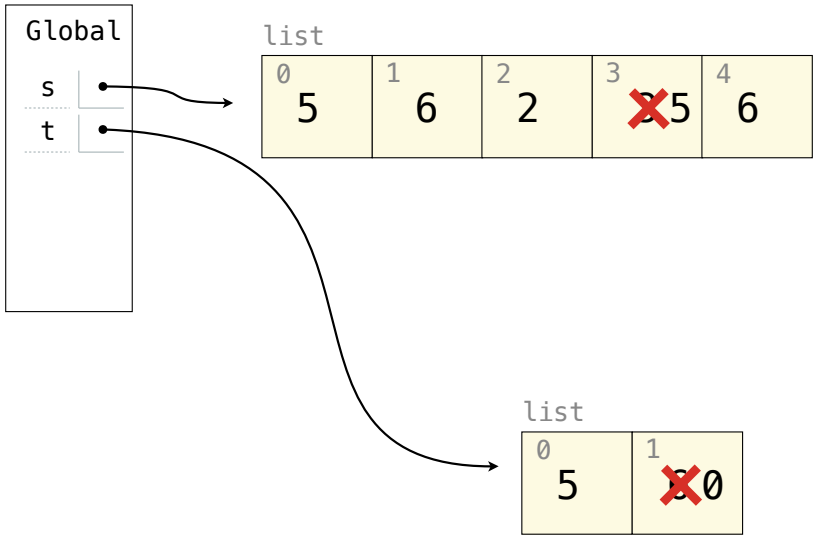
		`s → [5, 6, 2, 5, 6]`
		`t → [5, 0]`



Lists in Environment Diagrams

Assume that before each example below we execute:

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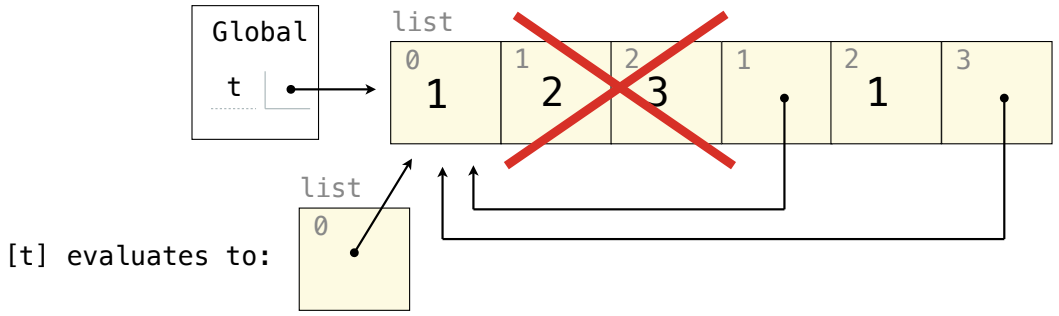
Operation	Example	Result
pop removes & returns the last element	`t = s.pop()`	`s → [2]` `t → 3`
remove removes the first element equal to the argument	`t.extend(t)` `t.remove(5)`	`s → [2, 3]` `t → [6, 5, 6]`
slice assignment can remove elements from a list by assigning [] to a slice.	`s[:1] = []` `t[0:2] = []`	`s → [3]` `t → []`

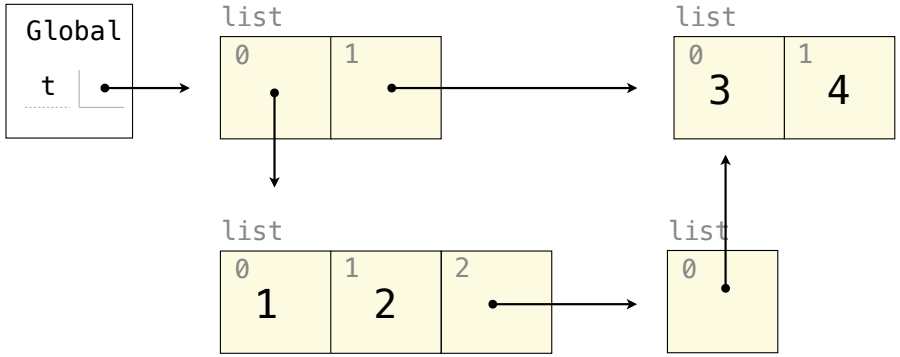
Lists in Lists in Lists in Environment Diagrams

```
t = [1, 2, 3]
t[1:3] = [t]
t.extend(t)
```




```
[1, [...], 1, [...]]
```

```
t = [[1, 2], [3, 4]]
t[0].append(t[1:2])
```




```
[[1, 2, [[3, 4]]], [3, 4]]
```

Examples: 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'
```

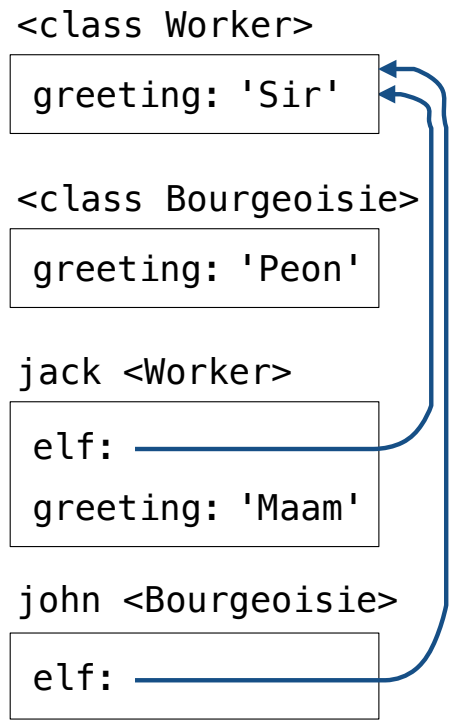
```
>>> Worker().work()
'Sir, I work'

>>> jack
Peon

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

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

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



Examples: Iterables & Iterators

Using Built-In Functions & Comprehensions

What are the indices of all elements in a list s that have the smallest absolute value?

```
[-4, -3, -2,  3,  2,  4]
  0   1   2   3   4   5
```

`[2, 4]`

`[1, 2, 3, 4, 5]`  `[0]`

What's the largest sum of two adjacent elements in a list s? (Assume len(s) > 1)

`[-4, -3, -2,  3,  2,  4]`  `6`

`[-4,  3, -2, -3,  2, -4]`  `1`

Create a dictionary mapping each digit d to the lists of elements in s that end with d.

`[5, 8, 13, 21, 34, 55, 89]`  `{1: [21], 3: [13], 4: [34], 5: [5, 55], 8: [8], 9: [89]}`

Does every element equal some other element in s?

`[-4, -3, -2,  3,  2,  4]`  `False`

`[4, 3, 2, 3, 2, 4]`  `True`

Examples: Linked Lists

Linked List Exercises

Is a linked list s ordered from least to greatest?

Is a linked list s ordered from least to greatest by absolute value (or a key function)?

Create a sorted Link containing all the elements of both sorted Links s & t.

Do the same thing, but never call Link.