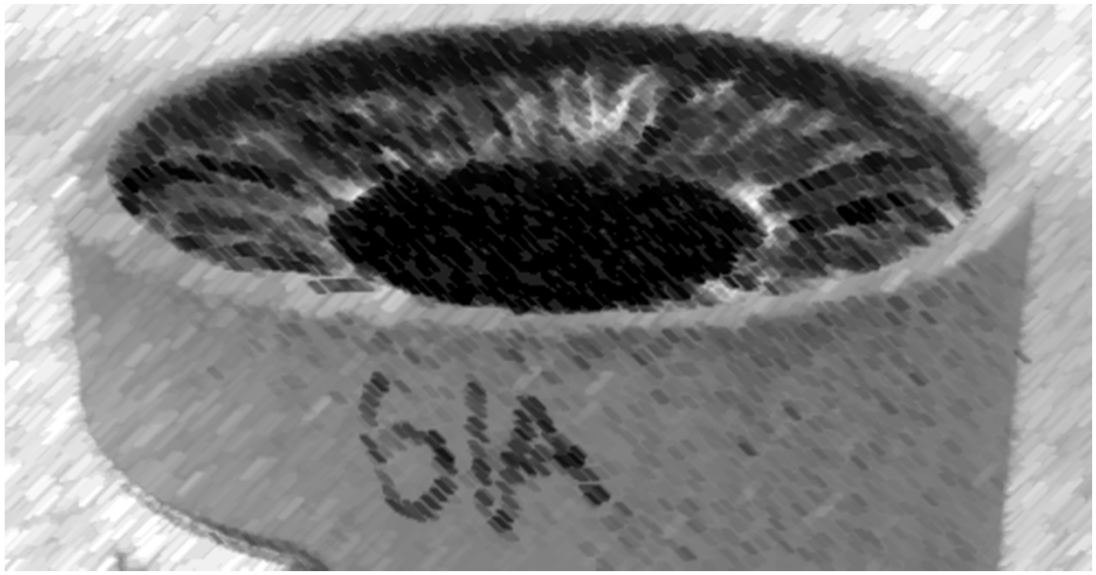

CS61A Lecture 16

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UC Berkeley
February 27, 2013

Announcements

- HW5 due tonight

- Trends project due on Tuesday
  - Partners are required; find one in lab or on Piazza
  - Will not work in IDLE
  - New bug submission policy; see Piazza

Iterables

Iterables provide access to some elements in order but do not provide length or element selection

Python-specific construct; more general than a sequence

Many built-in functions take iterables as argument

`tuple`	Construct a tuple containing the elements
`map`	Construct a map that results from applying the given function to each element
`filter`	Construct a filter with elements that satisfy the given condition
`sum`	Return the sum of the elements
`min`	Return the minimum of the elements
`max`	Return the maximum of the elements

For statements also operate on iterable values.

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Precise evaluation rule introduced in Chapter 4.

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Like accumulate from Homework 2, but with iterables

```
def accumulate(combiner, start, n, term):
    return reduce(combiner,
                  map(term, range(1, n + 1)),
                  start)
```

More Functions on Iterables (Bonus)

Create an iterable of fixed-length sequences

```
>>> a, b = (1, 2, 3), (4, 5, 6, 7)
>>> for x, y in zip(a, b):
...     print(x + y)
...
5
7
9
```

Produces tuples with one element from each argument, up to length of smallest argument

The **`itertools`** module contains many useful functions for working with iterables

```
>>> from itertools import product, combinations
>>> tuple(product(a, b[:2]))
((1, 4), (1, 5), (2, 4), (2, 5), (3, 4), (3, 5))
>>> tuple(combinations(a, 2))
((1, 2), (1, 3), (2, 3))
```

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```
>>> type(4)
<class 'int'>

>>> type([4])
<class 'list'>
```

Object Attributes

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Notice that we did not have to pass in the list as an argument; the method already knows the object on which it is operating

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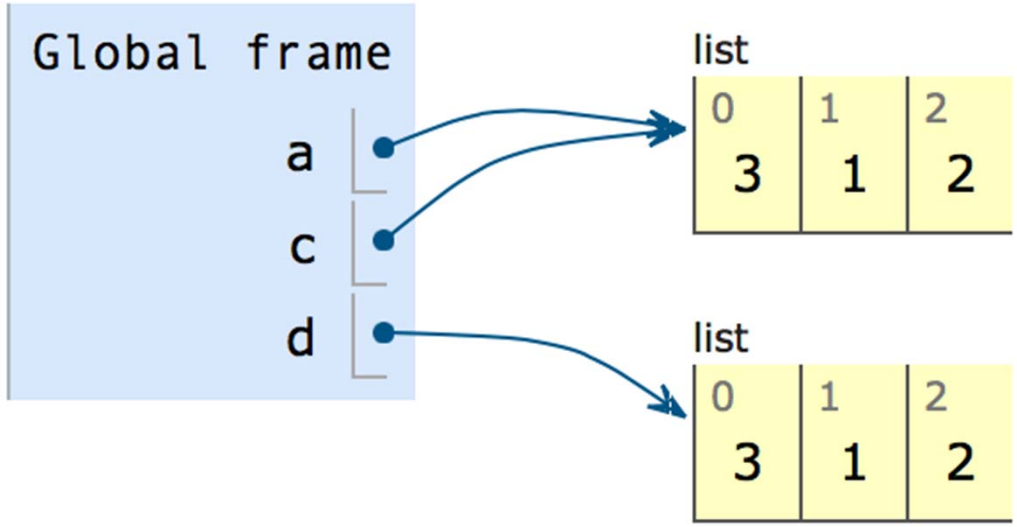

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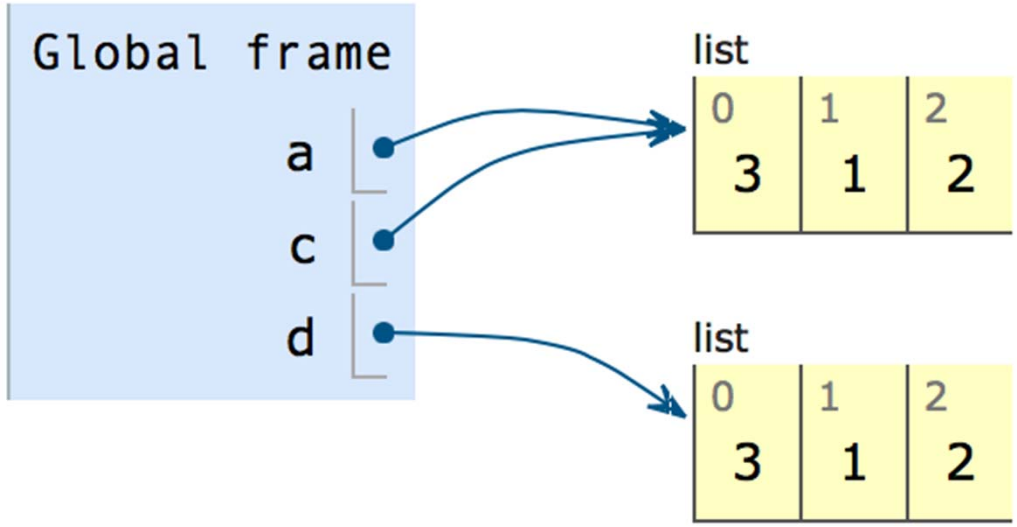

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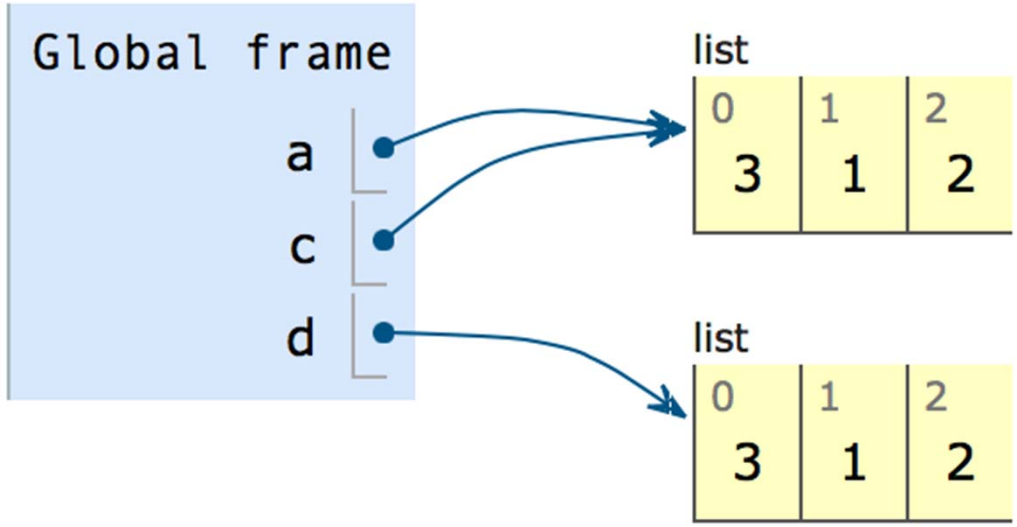

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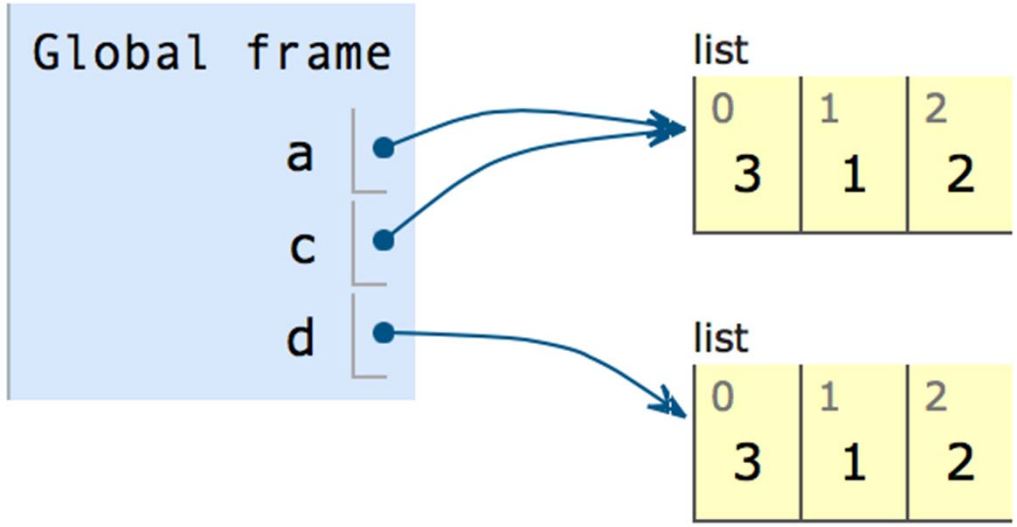

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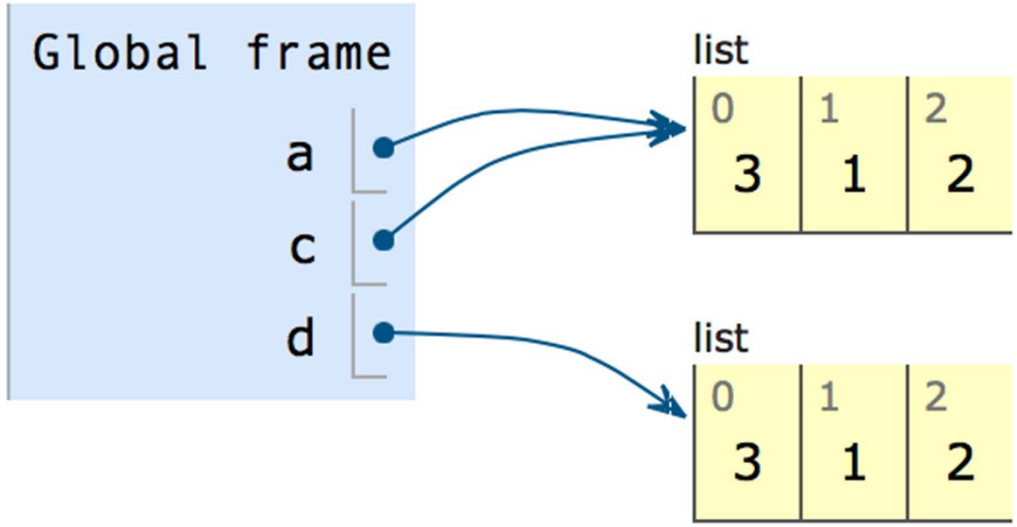

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Multiple names can *point to* or *reference* the same object

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```
>>> e, f = 1e12, 1e12
>>> e is f
True
>>> e = 1e12
>>> f = 1e12
>>> e is f
False
```

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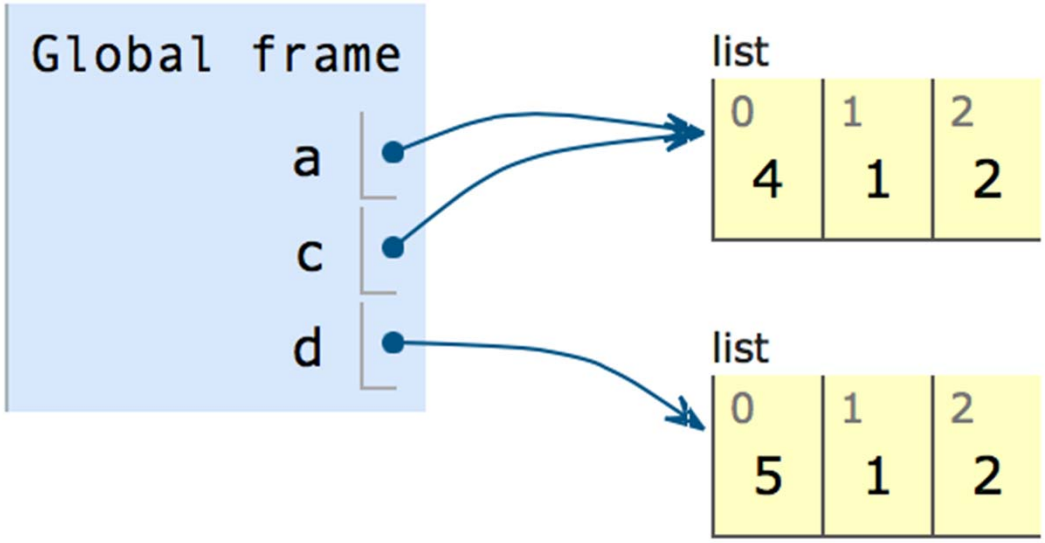

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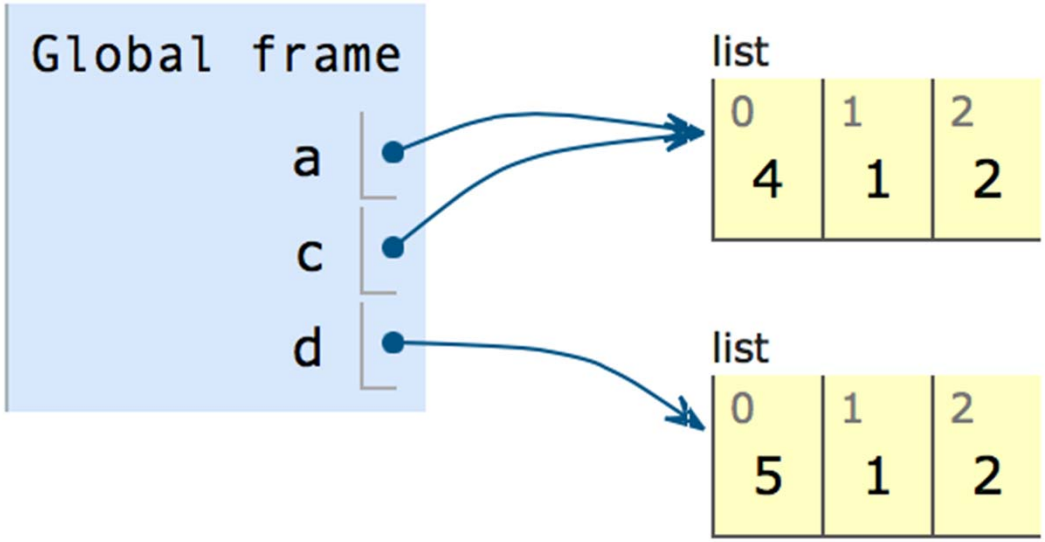

So we need to be careful with mutation

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- **`append`**: add an element to the end of a list
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Compare to **`sorted(x)`**, which returns a new list

Call **`dir(list)`** to see a full list of attributes

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- <iter exp> is evaluated once.
- <name> is bound to an element, and <filter exp> is evaluated. If it evaluates to a true value, then <map exp> is evaluated, and its value is added to the resulting list.

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What if we wanted arbitrary values in the domain?

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```
'cain'      -> 2.79
'bumgarner' -> 3.37
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'lincecum'  -> 5.18
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            'bumgarner':  3.37,
            'vogelsong':  3.37,
            'lincecum':   5.18,
            'zito':       4.15}
>>> eras['cain']
2.79
```

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'zito'      -> 4.15
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```
>>> {p: round(eras[p]-1, 3) for p in eras}
{'zito': 3.15, 'cain': 1.79, 'bumgarner': 2.37,
'lincecum': 2.0, 'vogelsong': 2.37}
```

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The second restriction is an intentional consequence of the dictionary abstraction.