CS 61A Lecture 10

Announcements

Lists

['Demo']

Working with Lists

```
>>> digits = [1, 8, 2, 8]
```

```
>>> digits = [2//2, 2+2+2+2, 2, 2*2*2]
```

The number of elements

```
>>> len(digits)
4
```

An element selected by its index

```
>>> digits[3]
8
```

```
>>> getitem(digits, 3)
8
```

Concatenation and repetition

```
>>> [2, 7] + digits * 2
[2, 7, 1, 8, 2, 8, 1, 8, 2, 8]
```

```
>>> add([2, 7], mul(digits, 2))
[2, 7, 1, 8, 2, 8, 1, 8, 2, 8]
```

Nested lists

```
>>> pairs = [[10, 20], [30, 40]]
>>> pairs[1]
[30, 40]
>>> pairs[1][0]
30
```

Containers

Containers

Built-in operators for testing whether an element appears in a compound value

```
>>> digits = [1, 8, 2, 8]
>>> 1 in digits
True
>>> 8 in digits
True
>>> 5 not in digits
True
>>> not(5 in digits)
True
```

(Demo)

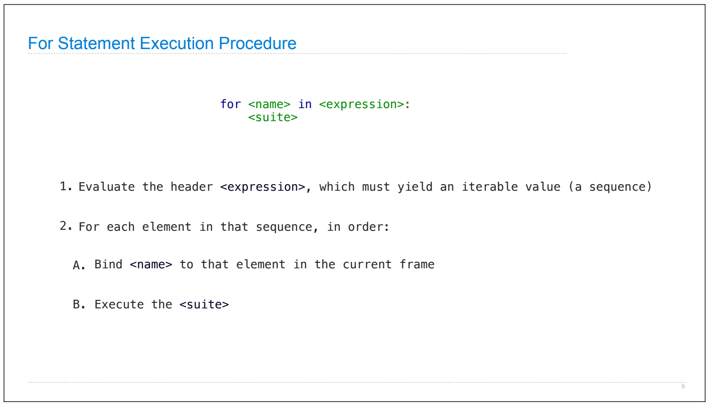
For Statements

(Demo)

Sequence Iteration

```
def count(s, value):
    total = 0
    for element in s:

        if element == value:
            total = total + 1
    return total
```

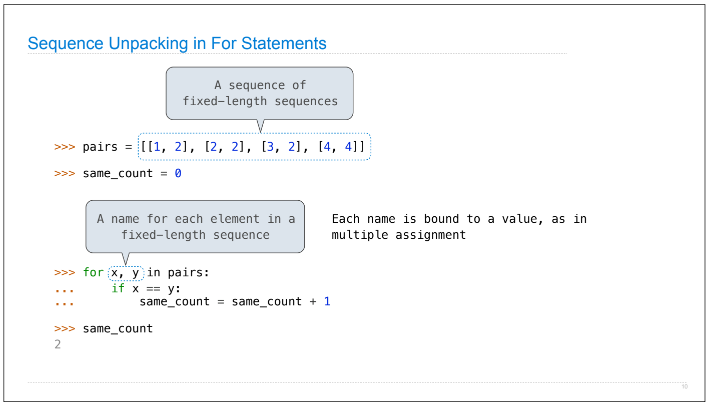
Name bound in the first frame of the current environment (not a new frame)



For Statement Execution Procedure

```
for <name> in <expression>:
    <suite>
```

1. Evaluate the header `<expression>`, which must yield an iterable value (a sequence)
2. For each element in that sequence, in order:
   - A. Bind `<name>` to that element in the current frame
   - B. Execute the `<suite>`



Sequence Unpacking in For Statements

A sequence of fixed-length sequences

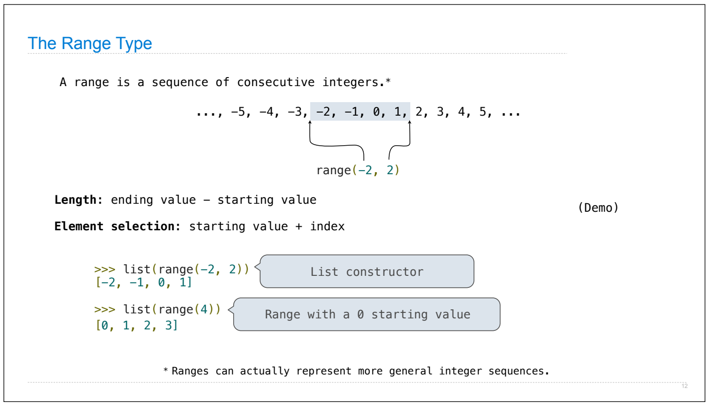
```
>>> pairs = [[1, 2], [2, 2], [3, 2], [4, 4]]
>>> same_count = 0
```

A name for each element in a fixed-length sequence

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

```
>>> for x, y in pairs:
...     if x == y:
...         same_count = same_count + 1

>>> same_count
2
```

Ranges



The Range Type

A range is a sequence of consecutive integers.*

```
..., -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, ...
```

range(-2, 2)

Length: ending value - starting value

Element selection: starting value + index

(Demo)

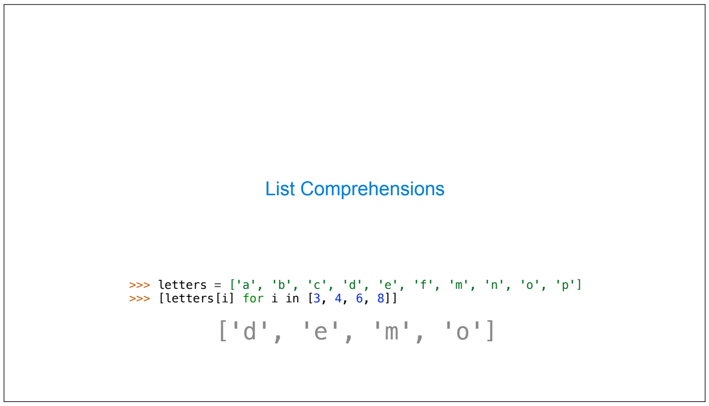
```
>>> list(range(-2, 2))
[-2, -1, 0, 1]
```

List constructor

```
>>> list(range(4))
[0, 1, 2, 3]
```

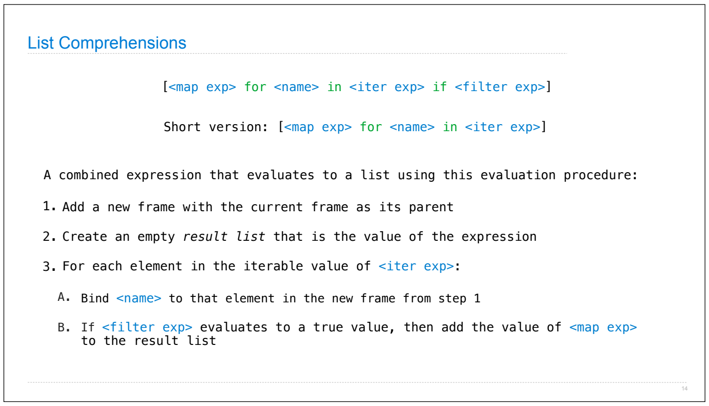
Range with a 0 starting value

* Ranges can actually represent more general integer sequences.



List Comprehensions

```
>>> letters = ['a', 'b', 'c', 'd', 'e', 'f', 'm', 'n', 'o', 'p']
>>> [letters[i] for i in [3, 4, 6, 8]]
['d', 'e', 'm', 'o']
```

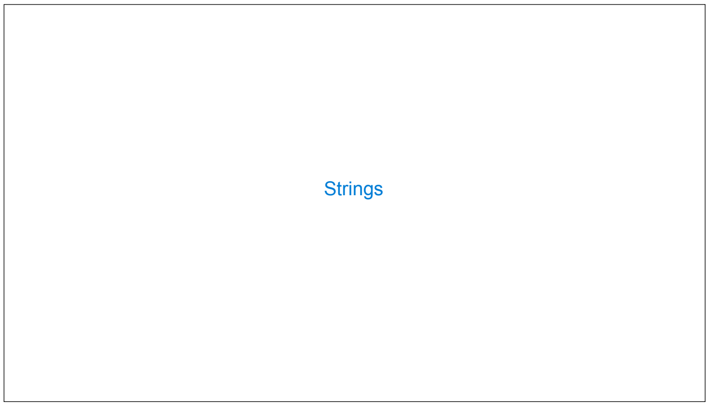


List Comprehensions

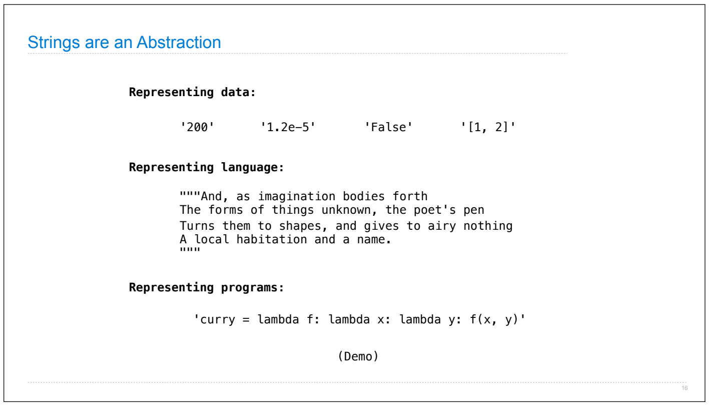
```
[<map exp> for <name> in <iter exp> if <filter exp>]

Short version: [<map exp> for <name> in <iter exp>]
```

A combined expression that evaluates to a list using this evaluation procedure:

1. Add a new frame with the current frame as its parent
2. Create an empty *result list* that is the value of the expression
3. For each element in the iterable value of `<iter exp>`:
   - A. Bind `<name>` to that element in the new frame from step 1
   - B. If `<filter exp>` evaluates to a true value, then add the value of `<map exp>` to the result list



Strings



Strings are an Abstraction

Representing data:

```
'200'      '1.2e-5'      'False'      '[1, 2]'
```

Representing language:

```
"""And, as imagination bodies forth
The forms of things unknown, the poet's pen
Turns them to shapes, and gives to airy nothing
A local habitation and a name.
"""
```

Representing programs:

```
'curry = lambda f: lambda x: lambda y: f(x, y)'
```

(Demo)

String Literals Have Three Forms

```
>>> 'I am string!'
'I am string!'

>>> "I've got an apostrophe"
"I've got an apostrophe"

>>> '您好'
'您好'

>>> """The Zen of Python
claims, Readability counts.
Read more: import this."""
'The Zen of Python\nclaims, Readability counts.\nRead more: import this.'
```

Single-quoted and double-quoted strings are equivalent

A backslash "escapes" the following character

"Line feed" character represents a new line

Dictionaries

`{'Dem': 0}`

Limitations on Dictionaries

Dictionaries are **unordered** collections of key-value pairs

Dictionary keys do have two restrictions:

- A key of a dictionary **cannot be** a list or a dictionary (or any *mutable type*)
- Two **keys cannot be equal;** There can be at most one value for a given key

This first restriction is tied to Python's underlying implementation of dictionaries

The second restriction is part of the dictionary abstraction

If you want to associate multiple values with a key, store them all in a sequence value