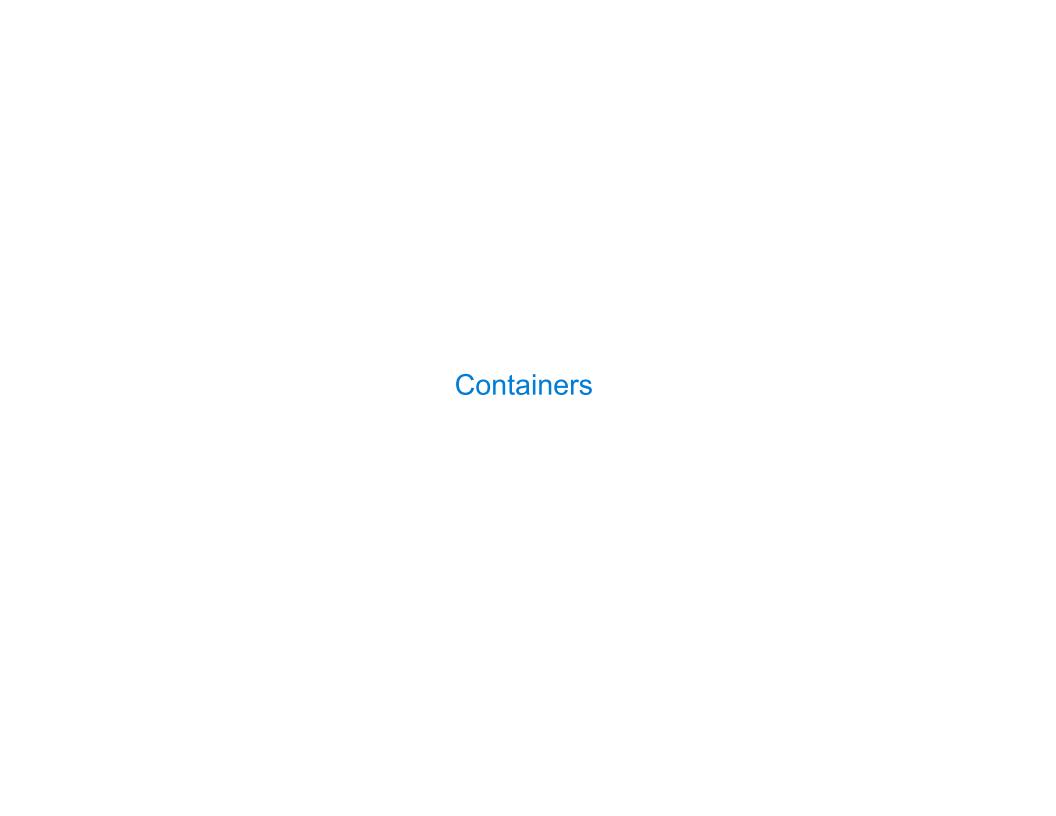


Lists

['Demo']

Working with Lists

```
>>> digits = [1, 8, 2, 8]
                                          \Rightarrow digits = [2//2, 2+2+2+2, 2, 2*2*2]
The number of elements
   >>> len(digits)
An element selected by its index
   >>> digits[3]
                                          >>> getitem(digits, 3)
Concatenation and repetition
                           >>> add([2, 7], mul(digits, 2))
   >>> [2, 7] + digits * 2
    [2, 7, 1, 8, 2, 8, 1, 8, 2, 8]
                                         [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

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:

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

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

8

For Statement Execution Procedure

- 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>

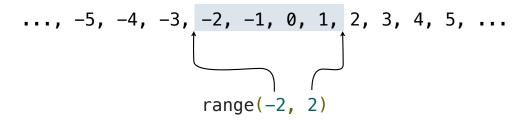
Sequence Unpacking in For Statements

```
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
                                       Each name is bound to a value, as in
         fixed-length sequence
                                       multiple assignment
>>> for(x, y) in pairs:
        if x == y:
            same_count = same_count + 1
>>> same_count
```



The Range Type

A range is a sequence of consecutive integers.*



Length: ending value - starting value

(Demo)

Element selection: starting value + index

^{*} 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]]

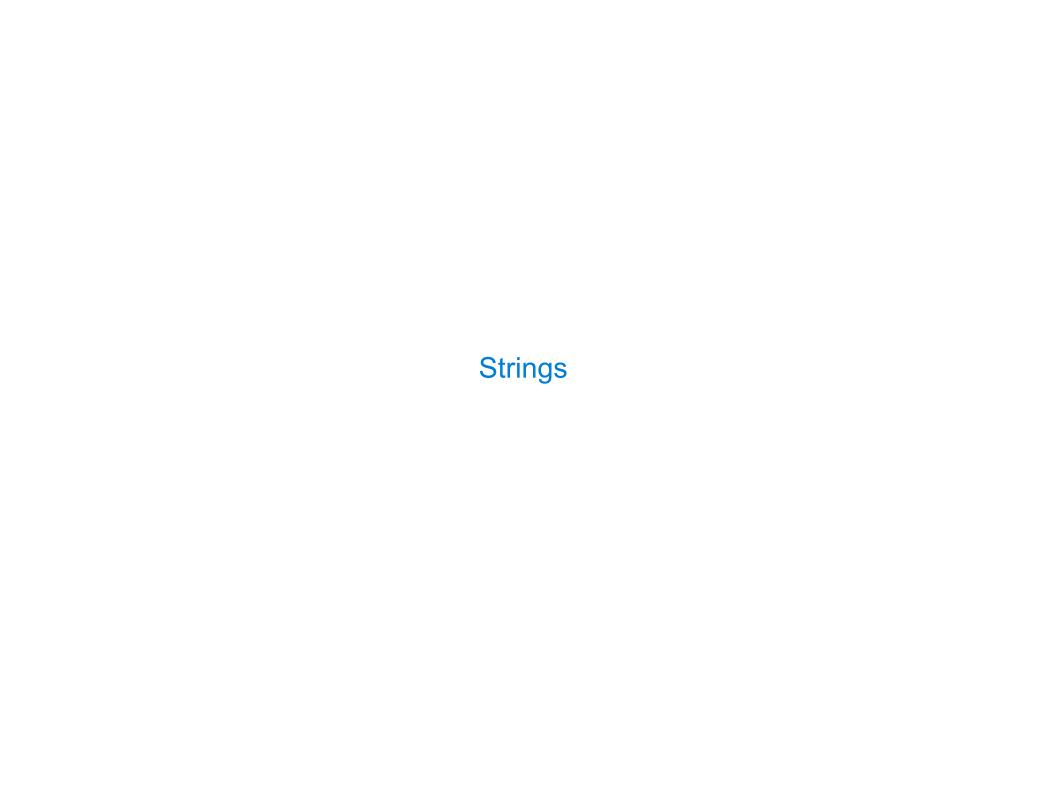
['d', 'e', 'm', 'o']
```

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 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:

String Literals Have Three Forms

```
>>> 'I am string!'
'I am string!'
>>> "I've got an apostrophe"
                                Single-quoted and double-quoted
"I've got an apostrophe"
                                     strings are equivalent
>>> '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.'
      A backslash "escapes" the
                                          "Line feed" character
         following 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