Announcements
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• Homework 3 due Tuesday 10/1 @ 11:59pm
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• Optional Hog Contest due Thursday 10/3 @ 11:59pm
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• Project 2 due Thursday 10/10 @ 11:59pm
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• Guerrilla Section 2 this Saturday 10/5 & Sunday 10/6 10am–1pm in Soda
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  • Topics: Data abstraction, sequences, non-local assignment
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• Guerrilla Section 2 this Saturday 10/5 & Sunday 10/6 10am–1pm in Soda
  • Topics: Data abstraction, sequences, non-local assignment
  • Meet outside Soda 306
For Statements

(Demo)
Sequence Iteration
Sequence Iteration

```python
def count(s, value):
    total = 0
    for element in s:
        if element == value:
            total = total + 1
    return total
```
def count(s, value):
    total = 0
    for element in s:
        if element == value:
            total = total + 1
    return total
For Statement Execution Procedure
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```python
for <name> in <expression>:
    <suite>
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```

1. Evaluate the header `<expression>`, which must yield an iterable value (a sequence).
For Statement Execution Procedure

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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:
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 first frame of the current environment.
For Statement Execution Procedure

```python
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 first frame of the current environment.
   
   B. Execute the `<suite>`.
Sequence Unpacking in For Statements
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```python
>>> pairs = ((1, 2), (2, 2), (2, 3), (4, 4))
>>> same_count = 0
```
Sequence Unpacking in For Statements

```python
>>> pairs = ((1, 2), (2, 2), (2, 3), (4, 4))

>>> same_count = 0
```
Sequence Unpacking in For Statements

A sequence of fixed-length sequences

```python
>>> pairs = ((1, 2), (2, 2), (2, 3), (4, 4))

>>> same_count = 0

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

>>> same_count
2
```
Sequence Unpacking in For Statements

A sequence of fixed-length sequences

```python
>>> pairs = ((1, 2), (2, 2), (2, 3), (4, 4))
```

```python
>>> same_count = 0
```

A name for each element in a fixed-length sequence

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

```python
>>> same_count
2
```
Sequence Unpacking in For Statements

A sequence of fixed-length sequences

```python
define_pairs = [(1, 2), (2, 2), (2, 3), (4, 4)]
define_same_count = 0

for x, y in define_pairs:
    if x == y:
        define_same_count += 1

define_same_count
```

A name for each element in a fixed-length sequence

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

```python
for x, y in define_pairs:
    if x == y:
        define_same_count += 1

define_same_count
```
Ranges
The Range Type

A range is a sequence of consecutive integers.*
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* Ranges can actually represent more general integer sequences.
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..., −5, −4, −3, −2, −1, 0, 1, 2, 3, 4, 5, ...

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range(−2, 2)

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\[\ldots, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, \ldots\]

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**Length:** ending value – starting value

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Length: ending value - starting value

Element selection: starting value + index

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Length: ending value - starting value

Element selection: starting value + index

```python
>>> tuple(range(-2, 2))
(-2, -1, 0, 1)

>>> tuple(range(4))
(0, 1, 2, 3)
```

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The Range Type

A range is a sequence of consecutive integers.*

\[ \ldots, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, \ldots \]

length = ending value - starting value

element selection = starting value + index

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(-2, -1, 0, 1)

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(0, 1, 2, 3)

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Membership & Slicing

The Python sequence abstraction has two more behaviors!
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Membership & Slicing

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Membership.

```python
>>> digits = (1, 8, 2, 8)
>>> 2 in digits
True
>>> 1828 not in digits
True
```
Membership & Slicing

The Python sequence abstraction has two more behaviors!

Membership.

```python
>>> digits = (1, 8, 2, 8)
>>> 2 in digits
True
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True
```

Slicing.
Membership & Slicing

The Python sequence abstraction has two more behaviors!

**Membership.**

```python
>>> digits = (1, 8, 2, 8)
>>> 2 in digits
True
>>> 1828 not in digits
True
```

**Slicing.**

```python
>>> digits[0:2]
(1, 8)
>>> digits[1:]
(8, 2, 8)
```
Membership & Slicing

The Python sequence abstraction has two more behaviors!

**Membership.**

```python
>>> digits = (1, 8, 2, 8)
>>> 2 in digits
True
>>> 1828 not in digits
True
```

**Slicing.**

```python
>>> digits[0:2] # Slicing creates a new object
(1, 8)
>>> digits[1:]
(8, 2, 8)
```
Membership & Slicing

The Python sequence abstraction has two more behaviors!

Membership.

```python
>>> digits = (1, 8, 2, 8)
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True
>>> 1828 not in digits
True
```

Slicing.

```python
>>> digits[0:2]
(1, 8)
>>> digits[1:]
(8, 2, 8)
```

Slicing creates a new object.
Lists

['Demo']

http://docs.python.org/py3k/library/stdtypes.html#mutable-sequence-types
List Comprehensions
List Comprehensions

\[
[\text{map exp} \ for \ <name> \ in \ <iter \ exp> \ if \ <filter \ exp>]
\]
List Comprehensions

\[
\left[ \text{map exp} \mid \text{for } \text{name} \text{ in } \text{iter exp} \mid \text{if } \text{filter exp}\right]
\]

Short version: \[
\left[ \text{map exp} \mid \text{for } \text{name} \text{ in } \text{iter exp}\right]
\]
List Comprehensions

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

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

A combined expression that evaluates to a list using this evaluation procedure:
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 extending the current frame.
List Comprehensions

\[
\begin{align*}
\text{[<map exp> for <name> in <iter exp> if <filter exp>]} \\
\text{Short version: [<map exp> for <name> in <iter exp>]
}
\end{align*}
\]

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

1. Add a new frame extending the current frame.
2. Create an empty \textit{result list} that is the value of the expression.
List Comprehensions

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

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

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

1. Add a new frame extending the current frame.
2. Create an empty result list that is the value of the expression.
3. For each element in the iterable value of `<iter exp>`:
List Comprehensions

\[
\text{[<map exp> for <name> in <iter exp> if <filter exp>]}
\]

Short version: \[
\text{[<map exp> for <name> in <iter exp>]}
\]

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

1. Add a new frame extending the current frame.
2. Create an empty result list that is the value of the expression.
3. For each element in the iterable value of \(<\text{iter exp}>\):
   
   A. Bind \(<\text{name}>\) to that element in the new frame from step 1.
List Comprehensions

\[
[\text{map exp} \ for \ <name> \ in \ <iter \ exp> \ if \ <filter \ exp>]
\]

Short version: \[
[\text{map exp} \ for \ <name> \ in \ <iter \ exp>]
\]

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

1. Add a new frame extending the current frame.
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.
Dictionaries

{"Dem": 0}
Limitations on Dictionaries
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Dictionaries are unordered collections of key-value pairs.
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Dictionary keys do have two restrictions:
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- A key of a dictionary cannot be an object of a mutable built-in type.
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- A key of a dictionary cannot be an object of a mutable built-in type.

- Two keys cannot be equal. There can be at most one value for a given key.
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- A key of a dictionary cannot be an object of a mutable built-in type.
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This first restriction is tied to Python's underlying implementation of dictionaries.
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The second restriction is an intentional consequence of the dictionary abstraction.
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This first restriction is tied to Python's underlying implementation of dictionaries.

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

If you want to associate multiple values with a key, store them all in a sequence.
Identity and Equality

(Demo)

Example: http://goo.gl/5AbYNM