



# Tuples

## Chapter 10

Python for Informatics: Exploring Information  
[www.pythonlearn.com](http://www.pythonlearn.com)



open.michigan

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# Tuples are like lists

- Tuples are another kind of sequence that function much like a list - they have elements which are indexed starting at 0

```
>>> x = ('Glenn', 'Sally', 'Joseph')
```

```
>>> print x[2]
```

```
Joseph
```

```
>>> y = ( 1, 9, 2 )
```

```
>>> print y
```

```
(1, 9, 2)
```

```
>>> print max(y)
```

```
9
```

```
>>> for iter in y:
```

```
...     print iter
```

```
...
```

```
1
```

```
9
```

```
2
```

```
>>>
```

# ..but..Tuples are "immutable"

- Unlike a list, once you create a **tuple**, you **cannot alter** its contents - similar to a string

```
>>> x = [9, 8, 7]
>>> x[2] = 6
>>> print x
[9, 8, 6]
>>>
```

```
>>> y = 'ABC'
>>> y[2] = 'D'
Traceback:
'str' object does
not support item
assignment
>>>
```

```
>>> z = (5, 4, 3)
>>> z[2] = 0
Traceback:
'tuple' object does
not support item
assignment
>>>
```

# Things **not** to do with **tuples**

```
>>> x = (3, 2, 1)
```

```
>>> x.sort()
```

```
Traceback:
```

```
AttributeError: 'tuple' object has no attribute 'sort'
```

```
>>> x.append(5)
```

```
Traceback:
```

```
AttributeError: 'tuple' object has no attribute 'append'
```

```
>>> x.reverse()
```

```
Traceback:
```

```
AttributeError: 'tuple' object has no attribute 'reverse'
```

```
>>>
```

# A Tale of Two Sequences

```
>>> l = list()
>>> dir(l)
['append', 'count', 'extend', 'index', 'insert',
'pop', 'remove', 'reverse', 'sort']
```

```
>>> t = tuple()
>>> dir(t)
['count', 'index']
```

# Tuples are more efficient

- Since Python does not have to build tuple structures to be modifiable, they are simpler and more efficient in terms of memory use and performance than lists
- So in our program when we are making "temporary variables" we prefer tuples over lists.

# Tuples and Assignment

- We can also put a **tuple** on the **left hand side** of an assignment statement
- We can even omit the parenthesis

```
>>> (x, y) = (4, 'fred')
>>> print y
fred
>>> a, b = (99, 98)
>>> print a
99
```



# Tuples and Dictionaries

- The `items()` method in dictionaries returns a list of (key, value) **tuples**

```
>>> d = dict()
>>> d['csev'] = 2
>>> d['cwen'] = 4
>>> for (k,v) in d.items():
...     print k, v
...
csev 2
cwen 4
>>> tups = d.items()
>>> print tups
[('csev', 2), ('cwen', 4)]
```

# Tuples are Comparable

- The comparison **operators** work with **tuples** and other sequences. If the first item is equal, Python goes on to the next element, and so on, until it finds elements that differ.

```
>>> (0, 1, 2) < (5, 1, 2)
```

```
True
```

```
>>> (0, 1, 2000000) < (0, 3, 4)
```

```
True
```

```
>>> ( 'Jones', 'Sally' ) < ( 'Jones', 'Fred' )
```

```
False
```

```
>>> ( 'Jones', 'Sally' ) > ( 'Adams', 'Sam' )
```

```
True
```

# Sorting Lists of Tuples

- We can take advantage of the ability to sort a list of **tuples** to get a sorted version of a dictionary
- First we sort the dictionary by the key using the **items()** method

```
>>> d = {'a':10, 'b':1, 'c':22}
>>> t = d.items()
>>> t
[('a', 10), ('c', 22), ('b', 1)]
>>> t.sort()
>>> t
[('a', 10), ('b', 1), ('c', 22)]
```

# Using sorted()

We can do this even more directly using the built-in function `sorted` that takes a sequence as a parameter and returns a sorted sequence

```
>>> d = {'a':10, 'b':1, 'c':22}
>>> d.items()
[('a', 10), ('c', 22), ('b', 1)]
>>> t = sorted(d.items())
>>> t
[('a', 10), ('b', 1), ('c', 22)]

>>> for k, v in sorted(d.items()):
...     print k, v
...
a 10
b 1
c 22
```

# Sort by values instead of key

- If we could construct a list of **tuples** of the form **(value, key)** we could **sort** by value
- We do this with a **for** loop that creates a list of tuples

```
>>> c = {'a':10, 'b':1, 'c':22}
>>> tmp = list()
>>> for k, v in c.items() :
...     tmp.append( (v, k) )
...
>>> print tmp
[(10, 'a'), (22, 'c'), (1, 'b')]
>>> tmp.sort(reverse=True)
>>> print tmp
[(22, 'c'), (10, 'a'), (1, 'b')]
```

```
fhand = open('romeo.txt')
counts = dict()
for line in fhand:
    words = line.split()
    for word in words:
        counts[word] = counts.get(word, 0) + 1

lst = list()
for key, val in counts.items():
    lst.append( (val, key) )

lst.sort(reverse=True)

for val, key in lst[:10] :
    print key, val
```

The top 10 most  
common words.

## Even Shorter Version (adv)

```
>>> c = {'a':10, 'b':1, 'c':22}
>>> print sorted( [ (v,k) for k,v in c.items() ] )
[(1, 'b'), (10, 'a'), (22, 'c')]
```

List comprehension creates a dynamic list. In this case, we make a list of reversed tuples and then sort it.

<http://wiki.python.org/moin/HowTo/Sorting>

# Summary

- Tuple syntax
- Mutability (not)
- Comparability
- Sortable
- Tuples in assignment statements
- Tuples in functions (adv)
- Using sorted()
- Sorting dictionaries by either key or value