CS 931: Even More Python

Avoiding Insanity: Raw Strings

```
>>> x='\a'                    >>> x=r'\a'
>>> len(x)                    >>> len(x)
1                             2
>>> x='\b'                    >>> x=r'\b'
>>> len(x)                    >>> len(x)
1                             2
>>> x='\c'                    >>> x=r'\c'
>>> len(x)                    >>> len(x)
2                             2
>>> x='\''                    >>> x=r'\''
>>> len(x)                    >>> len(x)
1                             2
>>>                           >>>
```

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"r" introduces a "raw" character string. In such strings Python treats characters following back slashes as normal characters, but does not remove the back slashes. For example, `'\n'` is a string containing just one character, the newline character. Whereas `r'\n'` is a string containing two characters, back slash and lower-case n. The string `'\''` consists of one character, a single quote, while `r'\''` consists of two characters, a backslash and a single quote. The string `r'\'` is a syntax error, since the second single quote doesn't delimit a string (and thus there is no single quote to match the first).

Raw strings are particularly important with regular expressions. For example, \b, as a regular expression, matches a word boundary. But \b also is the way to write the backspace character. Thus the string `'\ba\b'`, when used as a regular expression, matches the backspace character, followed by a lower-case a, followed by a backspace character. Once could write `'\\ba\\b'` to get a regular expression that matches the word consisting of the single character a. But the same effect as achieved with `r'\ba\b'`.

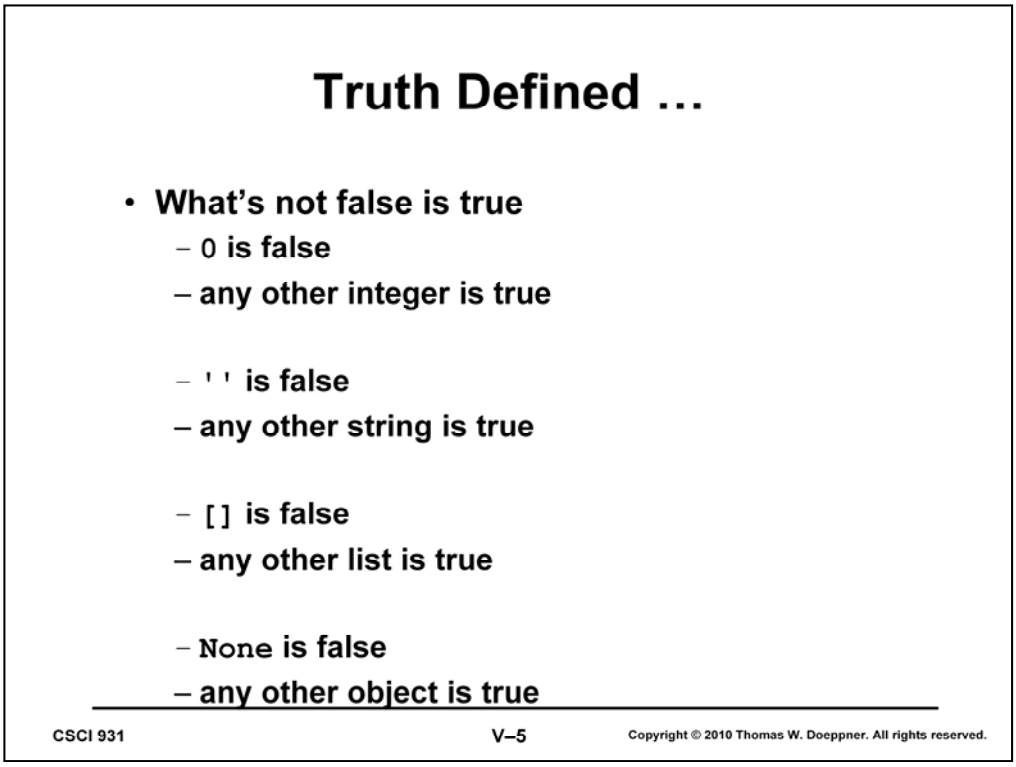
Using Regular Expressions

- `import re`
  - **must be done first**
- `re.search(pattern, string)`
  - **returns True if r.e. *pattern* occurs in *string***
  - `re.search("dog", "nice doggie")` **is True**
- `re.match(pattern, string)`
  - **returns True if r.e. *pattern* occurs starting at the beginning of *string***
  - `re.match("dog", "nice doggie")` **is False**

Match Objects

```
>>> import re
>>> re.match('(\w+) +(\w+)', 'Shriram Krishnamurthi, computer
  scientist')
<_sre.SRE_Match object at 0x02A93F98>
>>> x=re.match('(\w+) +(\w+)', 'Shriram Krishnamurthi, computer
  scientist')
>>> x.group(0)
'Shriram Krishnamurthi'
>>> x.group(1)
'Shriram'
>>> x.group(2)
'Krishnamurthi'
```


Some Python functions that deal with regular expressions, such as re.match and re.search, return "match objects". These are thingies (a technical term) that represent what the regular expression has matched. As shown in the slide, if *x* is a match object, then *x.group(0)* produces what was matched. But note that if the regular expression contains parenthesized terms, as in the slide, then *x.group(1)* produces what was matched by the first parenthesized term, *x.group(2)* produces what was matched by the second parenthesized term, and so forth.



Note that `re.match` and `re.search` return `None` if they don't find a match, otherwise they return match objects. Thus their results can be used in *if* statements.

Using Regular Expressions

- `re.split(pattern, string)`
  - **divides the *string* into pieces separated by substrings that match *pattern***

```
>>> re.split("[aeiou]+", "good dog")
['g', 'd d', 'g']
```

- `re.sub(pattern, repl, string)`
  - **replaces all instances of *pattern* in *string* with *repl***

```
>>> re.sub('d[aeiou]+g', "cat", "good dog")
'good cat'
```

finditer

```
def findthem(pat, s):
    """ return a list containing all occurrences of
        the regular expression pat in string s """
    iter = re.finditer(pat, s)
    result = []
    for i in iter:
        result += [i.group(0)]
    return result
```

- `finditer` **returns an *iterator* object**
  - **iterates over all matches of** `pat` **in** `s`

Roughly speaking, an iterator is a list.

Miscellany

```
>>> text = "This is a sentence that doesn't say much."
>>> words = text.split()
>>> words
['This', 'is', 'a', 'sentence', 'that', "doesn't",
  'say', 'much.']
>>> ' '.join(words)
"This is a sentence that doesn't say much."
```

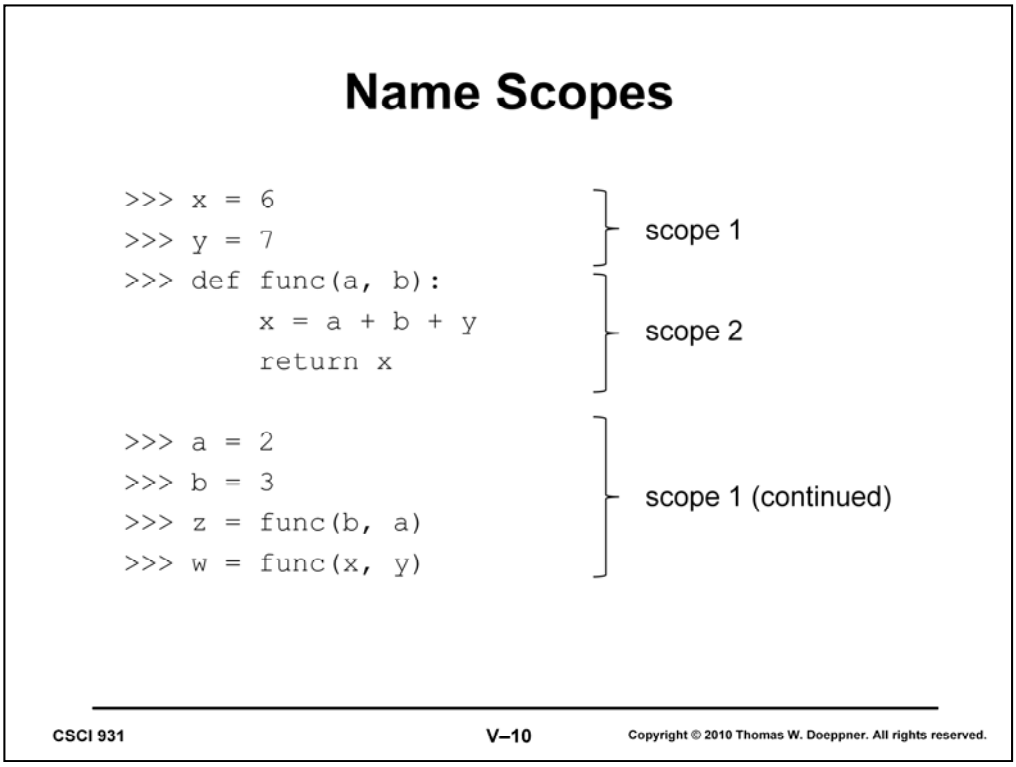

`str.join(list)` produces a string that's the result of concatenating the words in `list`, with `str` placed between each successive pair. By default, `str` is the space character.

Miscellany

```
>>> animals = ['cat', 'dog', 'canary', 'iguana']
>>> for i,a in enumerate(animals):
        animals[i] = a+'s'
```

iterates over (index, value) pairs

```
>>> animals
['cats', 'dogs', 'canarys', 'iguanas']
```



A *scope* is a part of a program in which identical names refer to the same things. Function definitions are unique scopes. Thus the slide shows two scopes, with the function defining a new scope, while the original scope (1) continues after the end of the function. We think of scope 1 as being the *outer scope* and scope 2 as being the *inner scope*. The two references to y in scope 1 refer to the same thing. The references to a and b in the two scopes refer to different things in each scope. What does y refer to in scope 2? It turns out that, in this case, it refers to the same thing that y refers to in scope 1. The rule is that if a name is used just to look at something within a scope, but nothing has yet been assigned to that name, then the name refers to the same thing it does in the outer scope (if there is one — otherwise it's an error). However, if a name is assigned to, such as x in scope 2, then the name becomes distinct from the same name used in the outer scope. Thus x in scope 2 is distinct from x in scope 1.

Name Scopes (more)

```
>>> x = 6
>>> y = 7
>>> def func(a, b):
        global x
        x = a + b + y
        return x

>>> a = 2
>>> b = 3
>>> z = func(b, a)
>>> w = func(x, y)
```


Here we've inserted a *global* statement in scope 2. It indicates that the name following it is the same as the name that appears in the outer scope. Thus assigning to x within the function modifies the x in the outer scope.

Name Spaces

```
>>> import redict1 # getbook is defined in redict1.py
>>> def getbook(s):
    return 'got book ' + s

>>> b1 = getbook('MobyDick.txt')
>>> b2 = redict1.getbook('MobyDick.txt')
```


The first reference to *getbook* is to the one defined in the current scope. If there were no *getbook* in the scope, then the statement would fail.

The second reference to *getbook* explicitly refers to the redict1 module, which has its own separate name space.