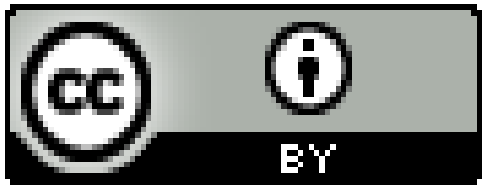
Python

Strings



Strings are sequences of characters

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Indexed exactly like lists

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Indexed exactly like lists

```
name = 'Darwin'
print name[0], name[-1]
D n
```

`for` iterates through characters

for iterates through characters

```
name = 'Darwin'
for c in name:
    print c
```

```
D
a
r
w
i
n
```

Use either ' or " (as long as they match)

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```
print 'Alan', "Turing"
```
Alan Turing

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```
Alan Turing
```

Strings are the same no matter how they're created

Use either ' or " (as long as they match)

```
print 'Alan', "Turing"
```
Alan Turing

Strings are the same no matter how they're created

```
print 'Alan' == "Alan"
```
True

Strings are compared character by character from left to right

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```
print 'a' < 'b'
```
True

Strings are compared character by character from left to right

```
print 'a' < 'b'
True
print 'ab' < 'abc'
True
```

Strings are compared character by character from left to right

```
print 'a' < 'b'
True
print 'ab' < 'abc'
True
print '1' < '9'
True
```

Strings are compared character by character from left to right

```
print 'a' < 'b'
True
print 'ab' < 'abc'
True
print '1' < '9'
True
print '100' < '9'
True
```

Strings are compared character by character from left to right

```
print 'a' < 'b'
True
print 'ab' < 'abc'
True
print '1' < '9'
True
print '100' < '9'
True
print 'A' < 'a'
True
```

Strings are *immutable* : cannot be changed in place

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```
name = 'Darwin'
name[0] = 'C'
```

TypeError: 'str' object does not support item assignment

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name = 'Darwin'
name[0] = 'C'
```

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Immutability improves performance

Strings are *immutable* : cannot be changed in place

```
name = 'Darwin'
name[0] = 'C'
```

TypeError: 'str' object does not support item assignment

Immutability improves performance

See later how immutability improves programmers' performance

Use + to concatenate strings

Use + to concatenate strings

```
name = 'Charles' + ' ' + 'Darwin'
print name
```
Charles Darwin

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```
name = 'Charles' + ' ' + 'Darwin'
print name
Charles Darwin
```

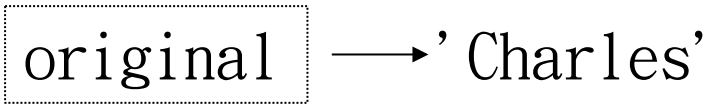
Concatenation always produces a new string

Use + to concatenate strings

```
name = 'Charles' + ' ' + 'Darwin'
print name
```
Charles Darwin

Concatenation always produces a new string

```
original = 'Charles'
```

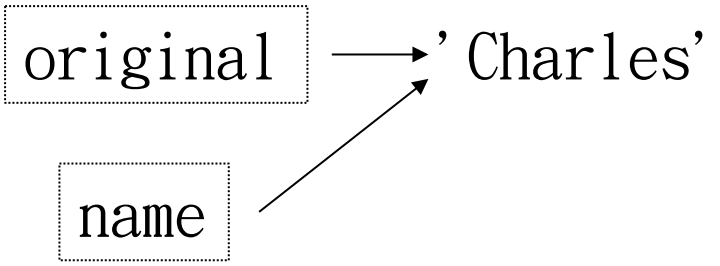


Use + to concatenate strings

```
name = 'Charles' + ' ' + 'Darwin'
print name
```
Charles Darwin

Concatenation always produces a new string

```
original = 'Charles'
name = original
```

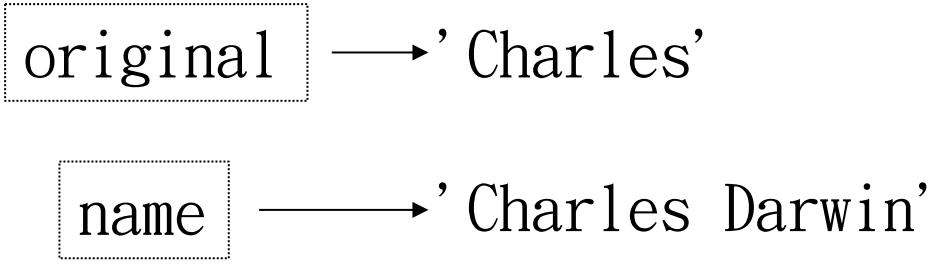


Use + to concatenate strings

```
name = 'Charles' + ' ' + 'Darwin'
print name
```
Charles Darwin

Concatenation always produces a new string

```
original = 'Charles'
name = original
name += ' Darwin'
```



Often used to format output

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```
print 'reagant: ' + str(reagant_id) + ' produced ' + \
      str(percentage_yield) + '% yield'
```

Often used to format output

```
print 'reagant: ' + str(reagant_id) + ' produced ' + \
      str(percentage_yield) + '% yield'
```

There's a better way...

Use `string % value` to format output

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```
output = 'reagant: %d' % 123
print output
```
reagant: 123

Use `string % value` to format output

```
output = 'reagant: %d' % 123
print output
```
reagant: 123

```
percentage_yield = 12.3
print 'yield: %6.2f' % percentage_yield
```
yield: 12.30

And `string % (v1, v2, ...)` for multiple values

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```
reagant_id = 123
percentage_yield = 12.3
print 'reagant: %d produced %f%% yield' % \
      (reagant_id, percentage_yield)
```

reagant: 123 produced 12.30% yield

And `string % (v1, v2, ...)` for multiple values

```
reagant_id = 123
percentage_yield = 12.3
print 'reagant: %d produced %f%% yield' % \
      (reagant_id, percentage_yield)
```

reagant: 123 produced 12.30% yield

% operator turns double '%%' into single '%'

Use \n to represent a newline character

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Use \' for single quote, \" for double quote

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Use \' for single quote, \" for double quote

```
print 'There isn\'t time\nto do it right.'
```

```
There isn't time
to do it right.
```

Use \n to represent a newline character

Use \' for single quote, \" for double quote

```
print 'There isn\'t time\nto do it right.'
```

There isn't time
to do it right.

```
print "But you said,\n\"There is time to do it over.\""
```

But you said,
"There is time to do it over."

Use \\ for a literal \ character

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```
print 'Most mathematicians write a\\b instead of a%b.'
Most mathematicians write a\b instead of a%b.
```

Use \\ for a literal \ character

```
print 'Most mathematicians write a\\b instead of a%b.'
Most mathematicians write a\b instead of a%b.
```

Common pattern with *escape sequences*

Use \\ for a literal \ character

```
print 'Most mathematicians write a\\b instead of a%b.'
Most mathematicians write a\b instead of a%b.
```

Common pattern with *escape sequences*

- Use a character to mean "what follows is special"

Use \\ for a literal \ character

```
print 'Most mathematicians write a\\b instead of a%b.'
Most mathematicians write a\b instead of a%b.
```

Common pattern with *escape sequences*

- Use a character to mean "what follows is special"
- Double it up to mean "that character itself"

Use triple quotes (either kind) for multi-line strings

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```
quote = '''We can only see
a short distance ahead,
but we can see plenty there
that needs to be done.'''
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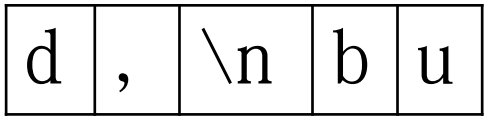

Use triple quotes (either kind) for multi-line strings

```
quote = '''We can only see
a short distance ahead,
but we can see plenty there
that needs to be done.'''

quote = 'We can only see\na short distance ahead\n' + \
    'but we can see plenty there\nthat needs to be done.'
```

Strings have methods

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```
name = 'newTON'
print name.capitalize(), name.upper(), name.lower(), name
Newton NEWTON newton newTON
```

Strings have methods

```
name = 'newTON'
print name.capitalize(), name.upper(), name.lower(), name
Newton NEWTON newton newTON
dna = 'acggtggtcac'
print dna.count('g'), dna.count('x')
4 0
```

Strings have methods

```
name = 'newTON'
print name.capitalize(), name.upper(), name.lower(), name
Newton NEWTON newton newTON
dna = 'acggtggtcac'
print dna.count('g'), dna.count('x')
4 0
print dna.find('t'), dna.find('t', 5), dna.find('x')
4 7 -1
```

Strings have methods

```
name = 'newTON'
print name.capitalize(), name.upper(), name.lower(), name
Newton NEWTON newton newTON
dna = 'acggtggtcac'
print dna.count('g'), dna.count('x')
4 0
print dna.find('t'), dna.find('t', 5), dna.find('x')
4 7 -1
print dna.replace('t', 'x'), dna
acggxggxcac acggtggtcac
```

Strings have methods

```
name = 'newTON'
print name.capitalize(), name.upper(), name.lower(), name
Newton NEWTON newton newTON
dna = 'acggtggtcac'
print dna.count('g'), dna.count('x')
4 0
print dna.find('t'), dna.find('t', 5), dna.find('x')
4 7 -1
print dna.replace('t', 'x')
acggxggxcac acggtggtcac
print dna.replace('gt', '')
acggcac
```

Can chain method calls together

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```
element = 'cesium'
print element.upper().center(10, '.')
```

Can chain method calls together

```
element = 'cesium'
print element.upper().center(10, '.')
```


convert to upper case

Can chain method calls together

```
element = 'cesium'
print element.upper().center(10, '.')
```


center in a field

10 characters wide

Can chain method calls together

```
element = 'cesium'
print element.upper().center(10, '.')
..CESIUM..
```

The power of **regular expressions**

When programming in any language you will want to know about *regular expressions* – for advanced string/text processing. In Python use the “re” library. Example uses are:

`/<([A-Z][A-Z0-9]*)\b[^>]*>(.*?)</\1>/` Matches the opening and closing pair of any HTML tag; captures tag name and content.

`/b[aeiou]+t/` Matches "bat" and "bit" etc, but also "boot" and "boat“.

`/(\[0-9]{1,3})\.(\[0-9]{1,3})\.(\[0-9]{1,3})\.(\[0-9]{1,3})/`
Matches any IP address ((e.g. 66.70.7.154) and captures the each number for re-use.

See: http://docs.python.org/2/howto/regex.html

narrated by

Dominique Vuvan

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