LECTURE 11

STRING METHODS

MATH AND RANDOM MODULES

MCS 260 Fall 2021

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REMINDERS

- Project 1 due today at 6pm central
- Homework 4 open, worksheet 4 solutions available
- Project 2 due Fri 8 Oct

METHODS

Every value in Python is actually an **object**: data packaged together with functions that operate on the data.

Functions that are part of an object are called **methods**.

They are called with a special *dot* syntax:

```
>>> L=[1,2,3]
>>> L.append(4)  # method of list
>>> s="sharks with lasers"
>>> s.split()    # method of str
['sharks', 'with', 'lasers']
```

We've seen a lot of methods so far:

list	
.append(x)	add x to end
.insert(i,x)	add x at index i
.remove(x)	remove first instance of x
.pop()	remove and return last element
.index(x)	get index of first x in the list

dict	
.keys()	return iterable of all keys
.values()	return iterable of all values
.items()	return iterable of key-value pairs

str	
.split()	split along whitespace, return list
.lower()	convert letters to lowercase

Note: **whitespace** means consecutive characters that all produce spaces or newlines (tab, space, `"\n"`, ...)

Here are some additional str methods that are useful:

str	
.strip()	remove leading and trailing whitespace
.index(x)	search for substring x and return index
.upper()	convert to uppercase
.isdigit()	Boolean: all characters digits?
.isalpha()	Boolean: all characters letters?
.isspace()	Boolean: all characters whitespace?
.splitlines()	Split along newline characters (returns list)
.replace(old,new)	Replace each occurrence of old with new.

EXAMPLE

Let's write a program that takes a passage of text and computes the number of words and the number of distinct words.

.JOIN()

The .join() method of a string **s** takes an iterable as parameter, and concatenates each element of the iterable with **s** between them.

```
>>> s = "+"
>>> L = ["me","laser-sharks","Shakespeare"]
>>> s.join(L)
'me+laser-sharks+Shakespeare'
>>> "".join(L)
'melaser-sharksShakespeare'
```

Using "".join(iterable) might be the most common case.

.strip(), .split(), .join(), .splitlines(), .replace() are probably the most-used methods for basic string processing.

MORE ON .STRIP() AND .SPLIT()

The .strip() method takes an optional parameter, **`chars`** which must be a string. It removes any characters from **`chars`** from the start and end.

```
>>> s = "mathematics"
>>> s.strip("sam")
'thematic'
```

The .split() method takes an optional parameter, **`sep`**, which if given is the delimiter (instead of whitespace).

```
>>> s = "spiders and ticks and mites"
>>> s.split(" and ")
['spiders', 'ticks', 'mites']
```

THE MATH MODULE

The statement

```
import math
```

loads the **math module**, after which functions and constants in that module can be used in your code, e.g.

```
math.sqrt(2)            # square root of 2
math.exp(-1)            # 1/e
math.sin(0.5*math.pi) # 1.0
```

The math module includes all common trig functions, logarithms and exponentials, and the constants pi and e. The the math module docs have a full list.

THE RANDOM MODULE

The random module, imported with

```
import random
```

includes functions to generate (pseudo)random numbers, e.g.

```
>>> random.random()      # Random float in [0,1)
0.482824082899013
>>> random.randint(1,6) # Random int between 1 and 6 inclusive
5
>>> random.choice( ["Yes", "No", "Maybe"] ) # random item of s
'No'
>>> L = ["a","b","c","d"]
>>> random.shuffle(L)    # IN-PLACE shuffle of a list
>>> L
['a', 'd', 'c', 'b']
```

PSEUDORANDOM NUMBERS

Python uses an equation to generate pseudorandom numbers, starting from some initial data, the **seed**. By default, the seed is computed from the current time.

So the numbers returned are not random at all!

The PRNG can be manually seeded using random.seed(value).

```
>>> random.seed(42)
>>> random.random()
0.6394267984578837
>>> random.seed(42)
>>> random.random()
0.6394267984578837
```

REFERENCES

- In *Downey*:
  - Section 8.8 discusses a few string methods
  - Section 10.9 discusses split()
  - Section 3.2 discusses the math module
  - Section 13.2 discusses the random module

REVISION HISTORY

- 2021-09-16 Initial publication