Intro to Python Class 4

Review

- Functions
- Method calls
- Data Type: Dictionaries

What we will cover for the rest of today

- (Even) More Data Types
- Combining data types

Data Type: Sets

Sets are unordered data types whose elements are unique. Therefore, adding a value to a set that already has it, does nothing.

Sets can be created with comma separated elements enclosed in {}.

Very often, one will make a list and use the set() function to eliminate duplicates.

```
>>> list_a = [0, 3, 2, 0, 2, 7]
>>> set_a = set(list_a)
>>> print(set_a)
set([0, 2, 3, 7])

>>> set_b = {1, 2, 1, 3}
>>> print(set_b)
set([1, 2, 3])
```

Sets have an add method, which like append for lists, adds an element to a set.

Data Type: Lists of ... Lists

As we have already seen, an element in a list can be other lists.

Lists inside of a list are referred to as nested

The following is a list of lists:

```
game_board = [
    ['O', 'X', ' '],
    [' ', 'X', ' '],
    [' ', ' ', ' '],
]
```

This can be indexed successively with `game_board[0][1]`

Nested Lists continued

A list can be appended to a list as well

```
mary_shopping_list = ['apples', 'bananas', 'chicken', 'ice cream']
fran_shopping_list = ['ice cream', 'beef', 'peppers', 'apples']
bob_shopping_list = ['chicken', 'peppers']

family_shopping_list = []
family_shopping_list.append(mary_shopping_list)
family_shopping_list.append(fran_shopping_list)
family_shopping_list.append(bob_shopping_list)

print(family_shopping_list)

for shop_list in family_shopping_list:
    for food_item in shop_list:
        print(food_item)
```

What if we want to flatten the family shopping list?

What if we want the food items in the family shopping list to be unique?

Lists of Dictionaries

One of the most common and useful nested data structures, is a list of dictionaries

```
card_a = {
    'suit': 'spades',
    'number': '4',
}

card_b = {
    'suit': 'hearts',
    'number': '8',
}

hand = [card_a, card_b]

print('The hand contains:')
for card in hand:
    print('A ' + card['number'] + ' of ' +  card['suit'])
```

Dictionary of Lists

A dictionary can also contain values that are themselves other data types, such as lists.

Let's revisit the group of to do lists and find a better representation:

```
mary_shopping_list = ['apples', 'bananas', 'chicken', 'ice cream']
fran_shopping_list = ['ice cream', 'beef', 'peppers', 'apples']
bob_shopping_list = ['chicken', 'peppers']

family_shopping_list = {
    'mary': mary_shopping_list,
    'fran': fran_shopping_list,
    'baby': bob_shopping_list,
}

for name, shop_list in family_shopping_list.items():
    print(name + ' needs to buy: ' + ' '.join(shop_list))

# Changing this later can be accomplished with
family_shopping_list['fran'].append('strawberries')
```

Now the to do lists can be indexed or modified by name

Means of Combination

Lists, dictionaries, and other data types are all a means of combination.

They can be freely combined to create the data structure needed for a particular problem.

Eg. A list of dictionaries with lists

```
all_tweets = [
    {
        'author': 'mary',
        'handle': '@hadalittlelamb',
        'date': '2013-01-22',
        'tweets': [
            'at Loco Pops enjoying a Raspberry Sage popsicle',
            'Learning Python is so much fun',
        ],
    },
]
```

Functions on Dictionaries

```
character = {
    'level': 'beginner',
    'health': 100,
}

def injure(damage):
    character['health'] = character['health'] - damage
    if character['health'] < 0:
        character['health'] = 0

def heal(amount):
    character['health'] = character['health'] + amount
    if character['health'] > 100:
        character['health'] = 100
```

Functional Python: Map

Python is a not a purely functional language, but it can be used (and is commonly used) for functional programming.

There are four functions that are used for functional programming: Range, Filter, Map, and Reduce

One commonly used, higher order function (that is a Python builtin) is called map

```python
# Define any function
def square(number):
    return number ** 2

# Pass the function to map along with an iterable
squares = map(square, range(10))
```

Let's Develop It

Write a function that prints the double of every number from 0 to 10 using a for loop

Write a function that prints the double of every number from 0 to 10 using a range

Write a function that prints the double of every number from 0 to 10 using a map

Write a map that takes in a list and appends "or I'll be a monkey's uncle" to every item in that list. (input: [1,4], output: ["1 or I'll be a monkey's uncle"], "2 or I'll be a monkey's uncle"])

Let's Develop It

Choose among any of these projects:

(Resources available on the next page)

- Search the Web - Write a program that searches the web using DuckDuckGo and displays results.
- Encryption - Write a program that encrypts a string from user input, or file and is able to decrypt it as well.
- Command Line Game - Create a simple game that runs inside the terminal.

Let's Develop It Resources

Search the Web	python-duckduckgo library to get started. Download duckduckgo.py and put it in the same directory as your code. Use the query() function it provides to begin. (HINT: Results are often empty, but 'related' list usually has a few hits.)
Encryption	Read about the Caesar Cipher or find a similarly simple encryption mechanism online. You should find the ord() and chr() functions helpful, as well as the modulus operator '%'

Let's Develop It Resources Continued

Command Line Game	This might be a text adventure with paragraphs of text followed by a series of choices for the user. A choice maps to another node in the story (another paragraph with choices). You might try storing the paragraphs separately in a text file. The format might be something different, such as a series of "rooms", each with a description, for the user to explore by entering commands such as "go west". Examples of these kinds of games are Colossal Cave Adventure and Zork

Future Resources

Automate the Boring Stuff with Python	Online book of 'practical programming for total beginners'.
Python.org Documentation	Official Python Documentation
Think Python	Online and print book with exercises.
Learn Python the Hard Way	Online and print book with exercises
Google's Python Class	Video lectures coupled with exercises
New Coder	Ideas for slightly larger projects and resources to get you started. Projects include accessing API's, scraping pages, writing IRC bots, and others.
Girl Develop It	Local workshops, events, and coding sessions

Survey

Please fill out this survey to let us know how you felt about this class, and if there's any ways we can improve.

Questions?