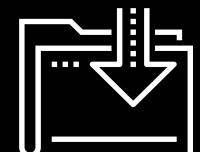




# Web Scraping

Data Boot Camp  
Lesson 12.2



# Class Objectives

---

By the end of today's class you will be able to:



Use BeautifulSoup to scrape their own data from the web.



Learn to save the results of web scraping into MongoDB.



# Instructor Demonstration

## Introduction to BeautifulSoup

# Introduction to BeautifulSoup

---

## What is BeautifulSoup?

- A Python library created to pull data out from HTML and XML files. It works with your favorite parser resulting in idiomatic ways of navigating, searching, and modifying the parse tree.



# Introduction to BeautifulSoup

---

## BeautifulSoup - The Basics

- `from bs4 import BeautifulSoup as bs`

```
In [1]: # import dependency
from bs4 import BeautifulSoup as bs
```

- `bs(html_string, 'html.parser')` - This line of code is to create a BeautifulSoup object. The object is assigned to a variable. In this case `soup`.

```
In [2]: html_string = """
<html>
<head>
<title>
A Simple HTML Document
</title>
</head>
<body>
<p>This is a very simple HTML document</p>
<p>It only has two paragraphs</p>
</body>
</html>
"""
```

```
In [3]: # create a BS object
soup = bs(html_string, 'html.parser')
```

# Introduction to BeautifulSoup

---

## BeautifulSoup - The Basics

- `type()` - This method will return the type of ...
- `prettify()` - This method returns a more readable way of the...

```
In [4]: type(soup)
```

```
Out[4]: bs4.BeautifulSoup
```

```
In [5]: print(soup.prettify())
```

```
<html>
  <head>
    <title>
      A Simple HTML Document
    </title>
  </head>
  <body>
    <p>
      This is a very simple HTML document
    </p>
    <p>
      It only has two paragraphs
    </p>
  </body>
</html>
```

# Introduction to BeautifulSoup

---

## BeautifulSoup - The Basics

- `soup.title` - You can extract only the title from a BS object. This in particular will return the whole 'title' element including the tags.
- `.text` - Adding this to the end of the call returns the text containing within the title element. Note that will return still surrounded by white spaces.
- `.strip()` - If you desire to further clean the return, this can be added to the end of the chain.

```
In [7]: soup.title
```

```
Out[7]: <title>
A Simple HTML Document
</title>
```

```
In [8]: soup.title.text
```

```
Out[8]: '\nA Simple HTML Document\n'
```

```
In [9]: soup.title.text.strip()
```

```
Out[9]: 'A Simple HTML Document'
```

# Introduction to BeautifulSoup

---

## BeautifulSoup - The Basics

- `soup.body` - This will return the entire body of the HTML file and adding the below will return
- `.text`
- `.strip()`
- `.p.text`

```
In [10]: soup.body
```

```
Out[10]: <body>
<p>This is a very simple HTML document</p>
<p>It only has two paragraphs</p>
</body>
```

```
In [11]: soup.body.text
```

```
Out[11]: '\nThis is a very simple HTML document\nIt only has two paragraphs\n'
```

```
In [14]: soup.body.text.strip()
```

```
Out[14]: 'This is a very simple HTML document\nIt only has two paragraphs'
```

```
In [15]: soup.body.p.text
```

```
Out[15]: 'This is a very simple HTML document'
```

# Introduction to BeautifulSoup

---

## BeautifulSoup - The Basics

- `find_all(<element>)` - method returns a list containing all of the HTML elements of a specific type.
- `('p')` - this element will return all the paragraphs.
- `[an index number]` - you can also return an specific paragraph using the index number.

```
In [17]: soup.body.find_all('p')
```

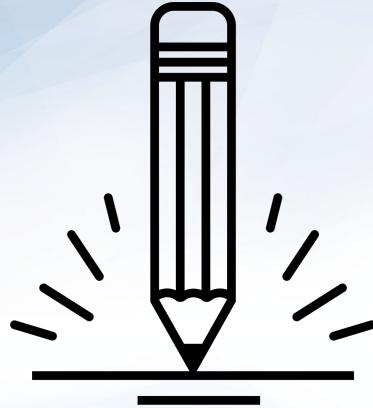
```
Out[17]: [<p>This is a very simple HTML document</p>, <p>It only has two paragraphs</p>]
```

```
In [18]: soup.body.find_all('p')[0]
```

```
Out[18]: <p>This is a very simple HTML document</p>
```

```
In [19]: soup.body.find_all('p')[1]
```

```
Out[19]: <p>It only has two paragraphs</p>
```



## Activity: CNN Soup

In this activity, you will take your first step in web scraping by taking an external HTML file, parsing it, and then printing out specific elements to the console.

Suggested Time:  
15 Minutes



# Activity: CNN Soup

---

## Instructions:

- Believe it or not, CNN's website for [1996: Year in Review](#) is still alive on the web! We have, however, stored the HTML document as a string in your starter file.
- Your task, should you accept it (and you should), is to use BeautifulSoup to scrape and print the following pieces of information:
  - The title of the webpage
  - All paragraph texts on the page
  - The top 10 headlines for the year. This last one is a bit tricky and may not come out perfectly!

- **Hint:**



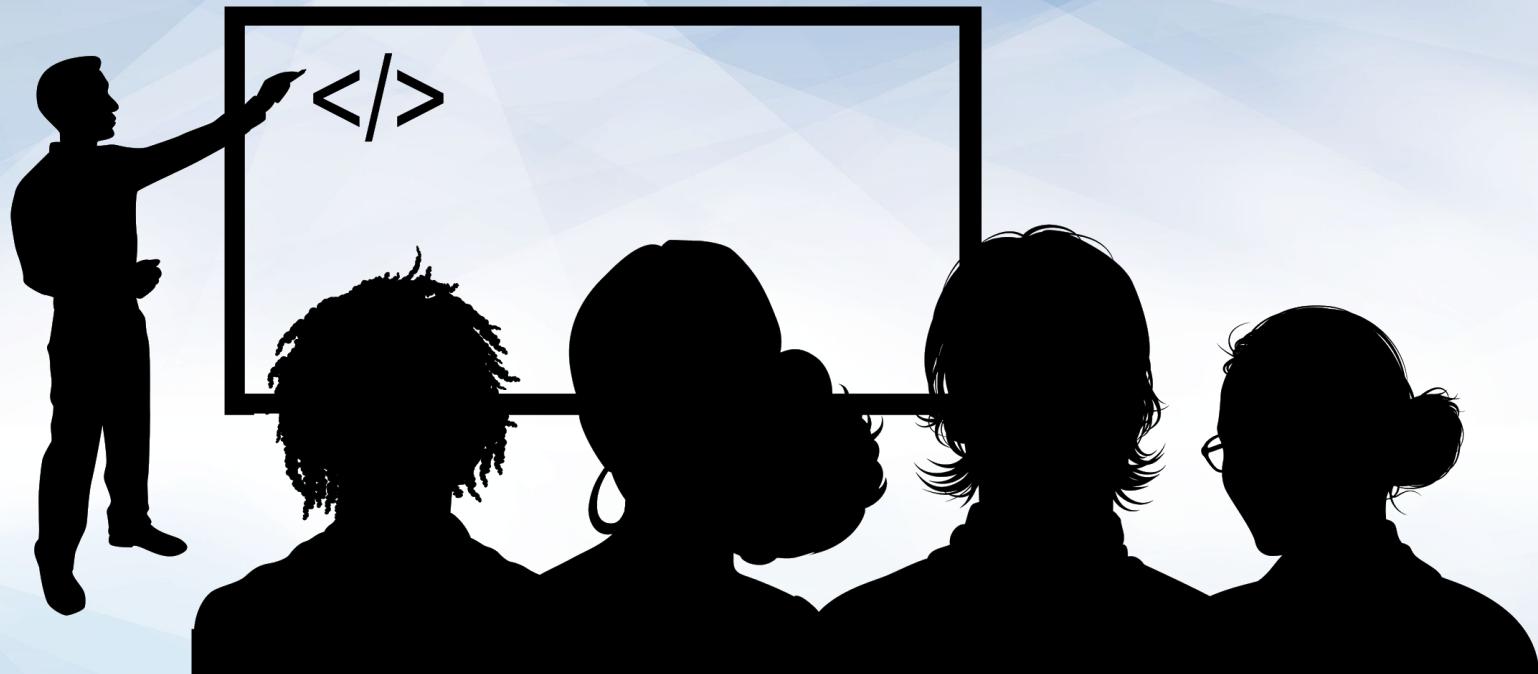
- For the third task in this activity you will need a means of filtering the data... Perhaps over multiple iterations... With a loop... HINT HINT!

- **Bonus:**

- If you finish early, head over to the BeautifulSoup documentation to read up on accessing attributes and navigating the DOM.



**Time's Up! Let's Review.**



## Instructor Demonstration Computer Wishlist

# Computer Wishlist

---

## BeautifulSoup - Live Website!

- So far you have only parsed HTML strings with BeautifulSoup. Now it is time to scrape a live website!  
→ Look at the code below. Notice anything different from what we have learned so far?

```
[1]: # Dependencies
from bs4 import BeautifulSoup
import requests

[2]: # URL of page to be scraped
url = 'https://webscraper.io/test-sites/e-commerce/allinone/computers/laptops'

[3]: # Retrieve page with the requests module
response = requests.get(url)

[4]: # Create BeautifulSoup object; parse with 'html.parser'
soup = BeautifulSoup(response.text, 'html.parser')

[5]: # Examine the results, then determine element that contains sought info
print(soup.prettify())
<!DOCTYPE html>
<html lang="en">
<head>
<!-- Anti-flicker snippet (recommended) -->
<style>
.async-hide {
    opacity: 0 !important
}
</style>
<script>
(function (a, s, y, n, c, h, i, d, e) {
    s.className += ' ' + y;
    h.start = 1 * new Date();
    a[y] = {
        el: i,
        href: d,
        title: e
    };
})(
    document,
    window,
    'async-hide',
    document.documentElement,
    document.createElement('div'),
    document.querySelector('.list-item-link'),
    document.querySelector('.list-item-link'),
    document.querySelector('.list-item-link'),
    document.querySelector('.list-item-link')
);</script>
```

# Computer Wishlist

# **BeautifulSoup - Live Website!**

- Another way to look into the HTML is to open it in a browser and open up the page's source within the inspector.

Home

Computers

Laptops

Tablets

Phones

# Computers / Laptops



Asus VivoBook X4...\$295.99

Asus VivoBook X441NA-GA190  
Chocolate Black, 14", Celeron  
N3450, 4GB, 128GB SSD, Endless  
 14 reviews



Prestigio SmartB...\$299.00

Prestigio SmartBook 133S Dark  
Grey, 13.3" FHD IPS, Celeron N3350  
1.1GHz, 4GB, 32GB, Windows 10 Pro  
 8 reviews



Prestigio SmartB...\$299.00

Prestigio SmartBook 133S Gold,  
13.3" FHD IPS, Celeron N3350  
1.1GHz, 4GB, 32GB, Windows 10 Pro  
 12 reviews

Elements Console Sources Network Performance Memory Application Security Lighthouse AdBlock

:before

```
> <div class="col-md-3 sidebar">...</div>
<div class="col-md-9">
  <h1 class="page-header">Computers / Laptops</h1>
  <div class="row">
    ::before
    <div class="col-sm-4 col-lg-4 col-md-4">...</div>
    <div class="col-sm-4 col-lg-4 col-md-4">...</div>
    <div class="col-sm-4 col-lg-4 col-md-4">...</div> == $0
    <div class="col-sm-4 col-lg-4 col-md-4">...</div>
    <div class="col-sm-4 col-lg-4 col-md-4">...</div>
    <div class="col-sm-4 col-lg-4 col-md-4">...</div>
    <div class="col-sm-4 col-lg-4 col-md-4">...</div>
    <div class="col-sm-4 col-lg-4 col-md-4">...</div>
```

Styles Computed Layout Event Listeners

Filter

```
.element.style {
}
@media (min-width: 1200px)
.col-lg-4 {
  width: 33.3333333333%;}
}
@media (min-width: 1200px)
.col-lg-1, .col-lg-
  app.css?id=_e604046e:5
, .col-lg-3, .col-
```

# Computer Wishlist

## BeautifulSoup - Live Website!

- The listing price can also be found to exist within an `h4` element whose class is `price`.
- To retrieve the content of these elements you can call the `find_all('div', class_='caption')` method on the `soup` object.

```

<div class="caption">
    <h4 class="pull-right price">$295.99</h4>
    ▼<h4>
        <a href="/test-sites/e-commerce/allinone/product/545" class="title" title="Asus VivoBook X441NA-GA190">Asus
            VivoBook X4...
        </a>
    </h4>
    ▼<p class="description">
        "Asus VivoBook X441NA-GA190 Chocolate Black, 14", Celeron N3450, 4GB, 128GB SSD, Endless OS, ENG kbd"
    </p>
```

```
# results are returned as an iterable list
results = soup.find_all('div', class_='caption')
```

# Computer Wishlist

---

## BeautifulSoup - Live Website!

- By iterating through the listings, specific information can then be pulled from the BeautifulSoup object.
- Each listing's title can therefore be gathered using `result.find('a', class_='title').text`, their prices collected with `result.find('h4', class_='price').text`, and their links retrieved by accessing the "href" attribute of each listing using `result.a['href']`.

```
[7]: # Loop through returned results
for result in results:
    # Error handling
    try:
        # Identify and return title of listing
        title = result.find('a', class_='title').text
        # Identify and return price of listing
        price = result.find('h4', class_='price').text
        # Identify and return link to listing
        link = result.a['href']

        # Print results only if title, price, and link are available
        if (title and price and link):
            print('-----')
            print(title)
            print(price)
            print(link)
    except AttributeError as e:
        print(e)

Aspire E1-510
$306.99
/test-sites/e-commerce/allinone/product/517
-----
Lenovo V110-15IA...
$321.94
/test-sites/e-commerce/allinone/product/548
-----
Lenovo V110-15IA...
$356.49
/test-sites/e-commerce/allinone/product/549
```



## Activity: Reddit Scraper

In this activity, you will scrape the Python Reddit for potentially interesting content. You will also have to filter for threads with twenty or more comments in them.

**Suggested Time:**  
**15 Minutes**



# Reddit Scraper

---

## Instructions:

- In this activity, you will scrape the [Python Reddit](#) using BeautifulSoup. Scrape only threads that have twenty or more comments and then print the thread's title, number of comments, as well as the URL for the thread.
- 

Doing conditionals

Comments: 258

[https://www.reddit.com/r/ProgrammerHumor/comments/7pw5qk/doing\\_conditionals/](https://www.reddit.com/r/ProgrammerHumor/comments/7pw5qk/doing_conditionals/)

-----

Perfect date

Comments: 58

[https://www.reddit.com/r/ProgrammerHumor/comments/7pyyl2/perfect\\_date/](https://www.reddit.com/r/ProgrammerHumor/comments/7pyyl2/perfect_date/)

-----

The truth about java.

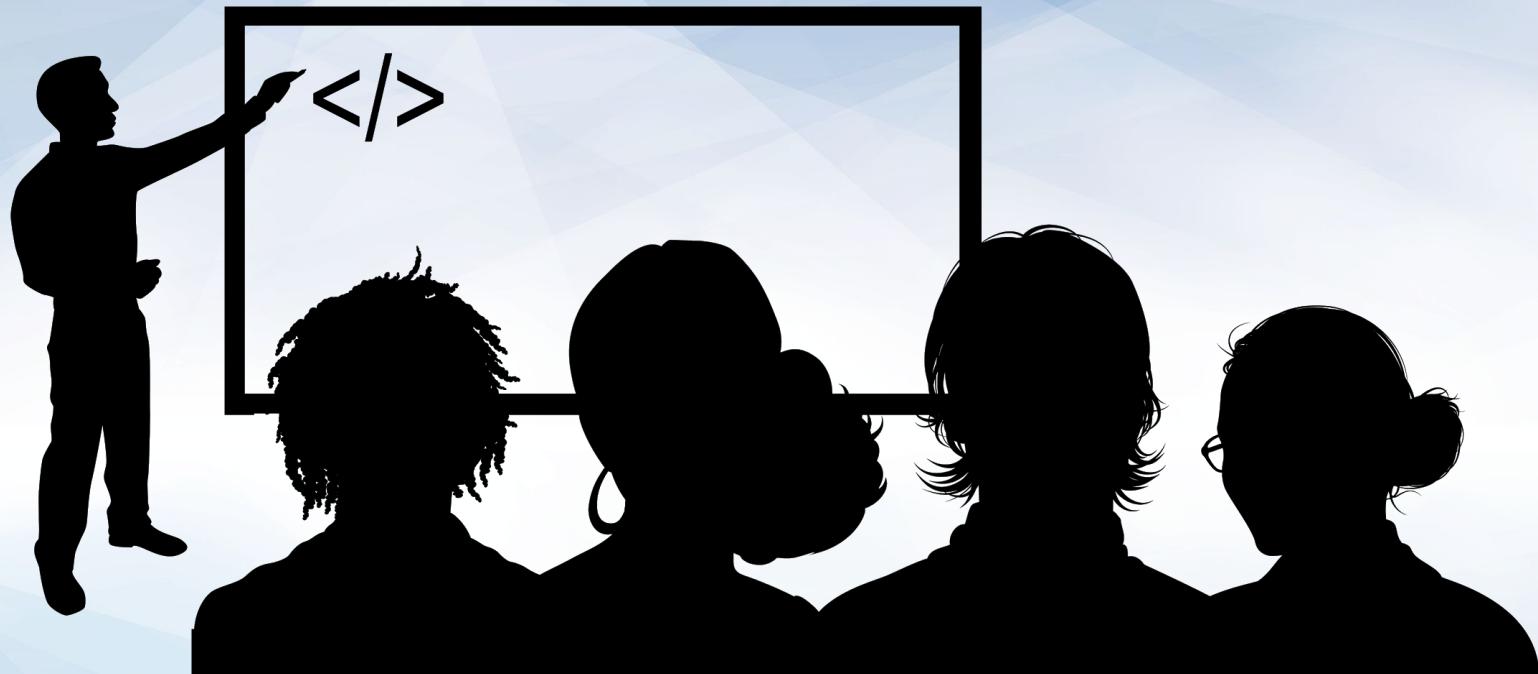
Comments: 61

[https://www.reddit.com/r/ProgrammerHumor/comments/7pxod4/the\\_truth\\_about\\_java/](https://www.reddit.com/r/ProgrammerHumor/comments/7pxod4/the_truth_about_java/)

-----



**Time's Up! Let's Review.**



Instructor Demonstration  
Mongo Scrape

# Mongo Scrape

## Translate the results of a web scraper to a MongoDB database

- For this particular application we are going to use the `lxml` parser instead of `html.parser`. Check out the BeautifulSoup documentation and check an informative table on the various parsers available to BS.

```
[1]: # Dependencies
from bs4 import BeautifulSoup
import requests
import pymongo

[2]: # Initialize PyMongo to work with MongoDBs
conn = 'mongodb://localhost:27017'
client = pymongo.MongoClient(conn)

[3]: # Define database and collection
db = client.commerce_db
collection = db.items

[4]: # URL of page to be scraped
url = 'https://webscraper.io/test-sites/e-commerce/allinone/computers/laptops'

# Retrieve page with the requests module
response = requests.get(url)
# Create BeautifulSoup object; parse with 'lxml'
soup = BeautifulSoup(response.text, 'lxml')
```

# Mongo Craig

## Translate the results of a web scraper to a MongoDB database



```
[5]: # Examine the results, then determine element that contains sought info
# results are returned as an iterable list
results = soup.find_all('div', class_='caption')

# Loop through returned results
for result in results:
    # Error handling
    try:
        # Identify and return title of listing
        title = result.find('a', class_='title').text
        # Identify and return price of listing
        price = result.find('h4', class_='price').text
        # Identify and return link to listing
        link = result.a['href']

        # Run only if title, price, and link are available
        if (title and price and link):
            # Print results
            print('-----')
            print(title)
            print(price)
            print(link)

            # Dictionary to be inserted as a MongoDB document
            post = {
                'title': title,
                'price': price,
                'url': link
            }

            collection.insert_one(post)

    except Exception as e:
        print(e)
```

```
Asus VivoBook X4...
$295.99
/test-sites/e-commerce/allinone/product/545
-----
Prestigio SmartB...
$299.00
/test-sites/e-commerce/allinone/product/546
-----
Prestigio SmartB...
$299.00
/test-sites/e-commerce/allinone/product/547
-----
Aspire E1-510
```

# Mongo Craig

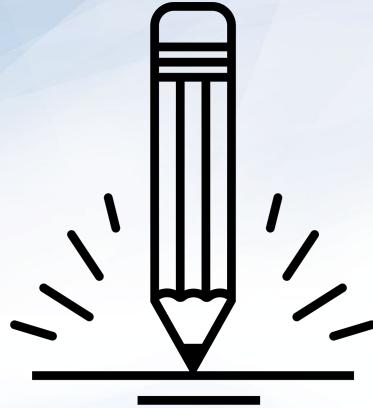
## Translate the results of a web scraper to a MongoDB database

- After the application has pushed all of the scraped data into the Mongo database, this can be verified by querying the database one and printing out all of the results to the console.

```
[6]: # Display items in MongoDB collection
listings = db.items.find()

for listing in listings:
    print(listing)

{'_id': ObjectId('60490ef581aa420dd7a2057f'), 'title': 'Asus VivoBook X4...', 'price': '$295.99', 'url': '/test-sites/e-commerce/allinone/product/545'}
{'_id': ObjectId('60490ef581aa420dd7a20580'), 'title': 'Prestigio SmartB...', 'price': '$299.00', 'url': '/test-sites/e-commerce/allinone/product/546'}
{'_id': ObjectId('60490ef581aa420dd7a20581'), 'title': 'Prestigio SmartB...', 'price': '$299.00', 'url': '/test-sites/e-commerce/allinone/product/547'}
{'_id': ObjectId('60490ef581aa420dd7a20582'), 'title': 'Aspire E1-510', 'price': '$306.99', 'url': '/test-sites/e-commerce/allinone/product/517'}
{'_id': ObjectId('60490ef581aa420dd7a20583'), 'title': 'Lenovo V110-15IA...', 'price': '$321.94', 'url': '/test-sites/e-commerce/allinone/product/548'}
{'_id': ObjectId('60490ef581aa420dd7a20584'), 'title': 'Lenovo V110-15IA...', 'price': '$356.49', 'url': '/test-sites/e-commerce/allinone/product/549'}
{'_id': ObjectId('60490ef581aa420dd7a20585'), 'title': 'Hewlett Packard...', 'price': '$364.46', 'url': '/test-sites/e-commerce/allinone/product/550'}
```



## Activity: Hockey Headers

In this activity, you will scrape the news page of the NHL website for the articles and then post the title/header of each code block to the best of your ability.

**Suggested Time:**  
**15 Minutes**



# Hockey Headers

---

## Instructions:

- Teamwork! Speed! Mental and physical toughness! Passion! Excitement! Unpredictable matchups down to the wire! What could be better? While these terms could easily be applied to a data science hackathon, we're talking about the magnificent sport of hockey.
- Your assignment is to scrape the articles on the news page of the [NHL website](#) - which is frequently updated - and then post the results of your scraping to MongoDB.
- Use BeautifulSoup and requests to scrape the header and subheader of each article on the front page.
- Post the above information as a MongoDB document and then print all of the documents on the database to the console.
- In addition to the above, post the date of the article publication as well.

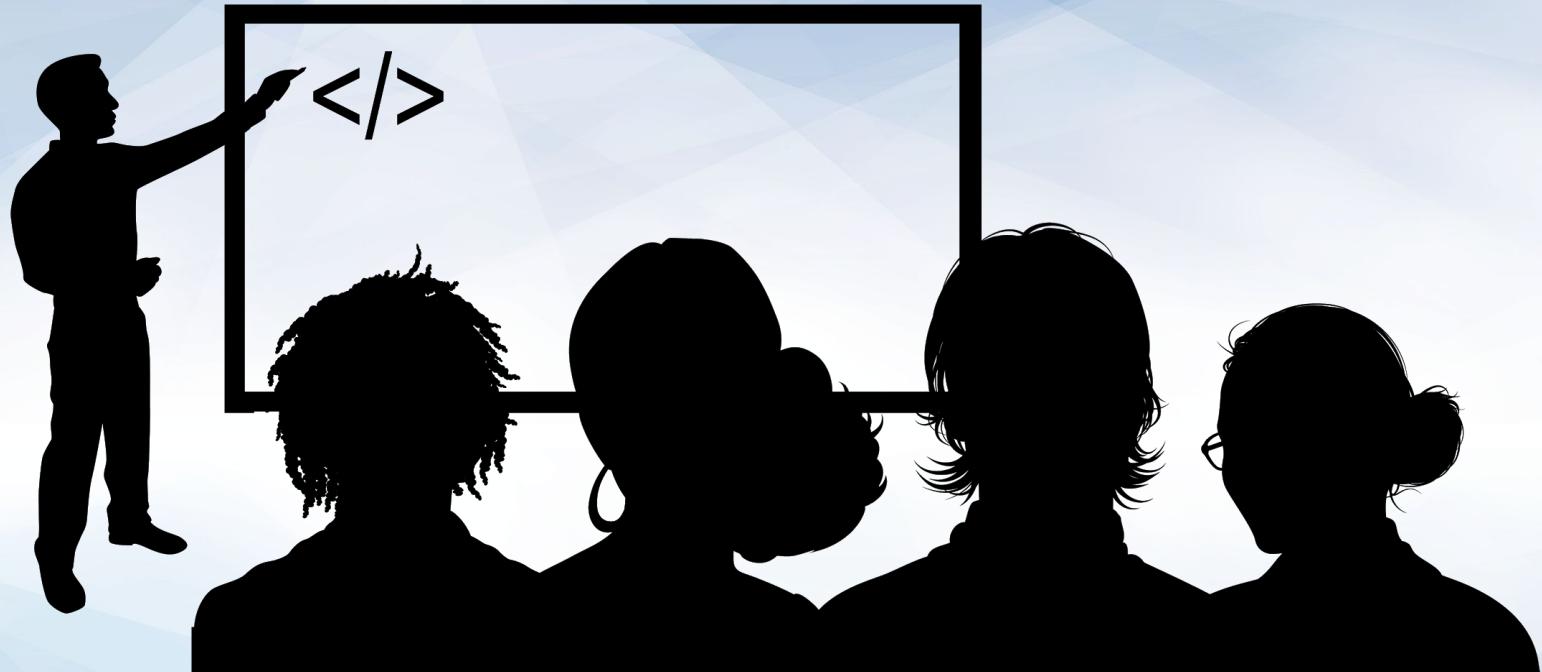


**Time's Up! Let's Review.**



Break





## Instructor Demonstration Introduction to Splinter

# Introduction to Splinter

---

- **Important:** You must have the webdriver-manager installed for this activity.

→ Installation

```
pip install  
webdriver_manager
```

# Introduction to Splinter

```
from splinter import Browser
from bs4 import BeautifulSoup
from webdriver_manager.chrome import ChromeDriverManager
```

```
# Setup splinter
executable_path = {'executable_path': ChromeDriverManager().install()}
browser = Browser('chrome', **executable_path, headless=False)
```

Note: You might need to install splinter using `pip install splinter`

The screenshot shows a web browser window titled "Quotes to Scrape". The address bar says "Not Secure | quotes.toscrape.com". A red box highlights the status bar message "Chrome is being controlled by automated test software.". The page displays five quote cards:

- "The world as we have created it is a process of our thinking. It cannot be changed without changing our thinking." by Albert Einstein (about)  
Tags: change, deep-thoughts, thinking, world
- "It is our choices, Harry, that show what we truly are, far more than our abilities." by J.K. Rowling (about)  
Tags: abilities, choices
- "There are only two ways to live your life. One is as though nothing is a miracle. The other is as though everything is a miracle." by Albert Einstein (about)  
Tags: inspirational, life, live, miracle, miracles
- "The person, be it gentleman or lady, who has not pleasure in a good novel, must be intolerably stupid." by Jane Austen (about)  
Tags: literacy, books, classic, humor
- "Imperfection is beauty, madness is genius and it's better to be absolutely ridiculous than absolutely boring." by Marilyn Monroe (about)  
Tags: be-yourself, inspirational

# Introduction to Splinter

- Open the Chrome inspector to identify the element that the application will need to click.

The screenshot shows a web browser window displaying a quote from Eleanor Roosevelt. Below the quote, there is a 'Next' button. The Chrome developer tools are open, with the 'Elements' tab selected. A red box highlights the 'Next' button, and the browser's address bar shows the URL: `Not Secure | quotes.toscrape.com`. The developer tools show the DOM structure, including the `<a href="/page/2/">Next</a>` element under the `<ul class="pager">` node. The right panel of the developer tools displays the CSS styles for the highlighted element, including properties like `margin`, `border`, and `padding`.

## Top Ten tags

love  
inspirational  
life  
humor  
books  
reading  
memories  
memories  
memories

Quotes by: GoodReads.com

Made with ❤ by Scrapinghub

# Introduction to Splinter

---

- The `click_link_by_partial_text()` method.

```
In [18]: for x in range(1, 6):
    html = browser.html
    soup = BeautifulSoup(html, 'html.parser')

    quotes = soup.find_all('span', class_='text')

    for quote in quotes:
        print('page:', x, '-----')
        print(quote.text)

    browser.links.find_by_partial_text('Next')
page: 1 -----
"The world as we have created it is a process of our thinking. It cannot be changed without changing our thinking."
page: 1 -----
"It is our choices, Harry, that show what we truly are, far more than our abilities."
page: 1 -----
"There are only two ways to live your life. One is as though nothing is a miracle. The other is as though everything
is a miracle."
page: 1 -----
"The person, be it gentleman or lady, who has not pleasure in a good novel, must be intolerably stupid."
page: 1 -----
"Imperfection is beauty, madness is genius and it's better to be absolutely ridiculous than absolutely boring."
page: 1 -----
"Try not to become a man of success. Rather become a man of value."
page: 1 -----
"It is better to be hated for what you are than to be loved for what you are not."
page: 1 -----
"I have not failed. I've just found 10,000 ways that won't work."
page: 1 -----
"A woman is like a tea bag; you never know how strong it is until it's in hot water."
page: 1 -----
```



## Activity: Bookscraper

In this activity, you will practice your webscraping skills on a site similar to the one shown in the instructor demonstration.

**Suggested Time:**  
**15 Minutes**



# Hockey Headers

---

## Instructions:

- Go to <http://books.toscrape.com/>
- Scrape the titles and the URLs to all books on this fictional online bookstore. Display the results in console.
- That's it!
- If you're craving extra challenge, try scraping all books by category. Good luck!



**Time's Up! Let's Review.**



## Instructor Demonstration Pandas Scraping

# Pandas Scraping

- In Python the Pandas library includes a simple web scraper capability that pulls HTML table data into a dataframe.
- Inserting the URL to the method `read_html()` will return the data in a list format.

```
In [1]: import pandas as pd

In [2]: url = 'https://en.wikipedia.org/wiki/List_of_capitals_in_the_United_States'

In [3]: tables = pd.read_html(url)
tables
```

	Albany Congress	Albany Congress
0	Albany, New York	Stadt Huys
1	Stamp Act Congress	Stamp Act Congress
2	New York, New York	City Hall
3	First Continental Congress	First Continental Congress
4	Philadelphia, Pennsylvania	Carpenters' Hall
5	Second Continental Congress	Second Continental Congress
6	Philadelphia, Pennsylvania	Independence Hall
7	Baltimore, Maryland	Henry Fite House
8	Philadelphia, Pennsylvania	Independence Hall
9	Lancaster, Pennsylvania	Court House
10	York, Pennsylvania	Court House
11	Philadelphia, Pennsylvania	College Hall
12	Congress of the Confederation	Congress of the Confederation
13	Philadelphia, Pennsylvania	Independence Hall
14	Princeton, New Jersey	Nassau Hall
15	Annapolis, Maryland	Maryland State House
16	Trenton, New Jersey	French Arms Tavern
17	New York, New York	City Hall

```
In [4]: type(tables)
Out[4]: list
```

# Pandas Scraping

- The wikipedia page scraped contains four HTML table data. Hence, the returned list contains four tables within the list. In order to specify what table we want to grab we can use list indexing.

We can slice off any of those dataframes that we want using normal indexing.

```
In [5]: df = tables[0]
df.head()
```

Out[5]:

	City	Building	Start Date	End Date	Duration	Ref
	Albany Congress					
0	Albany, New York	Stadt Huys	June 19, 1754	July 11, 1754	22 days	[8]
1	Stamp Act Congress					
2	New York, New York	City Hall	October 7, 1765	October 25, 1765	23 days	[9]
3	First Continental Congress					
4	Philadelphia, Pennsylvania	Carpenters' Hall	September 5, 1774	October 26, 1774	1 month and 21 days	[10]



Scraped data from the Wikipedia page:

City	Building	Start Date	End Date	Duration	Ref
Albany, New York	Stadt Huys	June 19, 1754	July 11, 1754	22 days	[8]
Stamp Act Congress	Stamp Act Congress				
New York, New York	City Hall	October 7, 1765	October 25, 1765	23 days	[9]
First Continental Congress	First Continental Congress				
Philadelphia, Pennsylvania	Carpenters' Hall	September 5, 1774	October 26, 1774	1 month and 21 days	[10]

Wikipedia page screenshot:

The cities below served either as the meeting place for colonial American congresses or as official capitals of the United States under the United States Constitution. The cities listed below the Congress of the Confederation are those where the Congress met. The Congress of the Confederation was the first national legislature of the United States. It passed the "Treaty of Peace" with Great Britain in 1783. It also passed the "Treaty of Amity, Commerce, and Consular Regulation" over a dozen that "was by creation of particular States, and the acceptance of Congress, before the last of the Government of the United States." The US Congress met at Federal Hall in New York.<sup>[8]</sup> In 1790, it passed the Residence Act, which established the capital at a site along the Potowmack River that would become Washington, D.C.<sup>[9]</sup> For the next ten years, Philadelphia served as the temporary capital.<sup>[10]</sup> Congress met at Congress Hall.<sup>[11]</sup> On November 17, 1800, the 6th United States Congress formally convened in Washington, D.C.<sup>[12]</sup> Congress has met outside of Washington, D.C. only once since, on July 16, 1867, at Independence Hall in Philadelphia, to commemorate the 100th anniversary of the Declaration of Independence. The city of Philadelphia has been the permanent seat of the United States Congress since the September 17, 1799, Constitutional Convention.

**City**    **Building**    **Start Date**    **End Date**    **Duration**    **Ref**

City	Building	Start Date	End Date	Duration	Ref
Albany, New York	Stadt Huys	June 19, 1754	July 11, 1754	22 days	[8]
Stamp Act Congress	Stamp Act Congress				
New York, New York	City Hall	October 7, 1765	October 25, 1765	23 days	[9]
First Continental Congress	First Continental Congress				
Philadelphia, Pennsylvania	Carpenters' Hall	September 5, 1774	October 26, 1774	1 month and 21 days	[10]
Second Continental Congress	Second Continental Congress				
Philadelphia, Pennsylvania	Independence Hall	May 10, 1775	December 20, 1776	1 year, 5 months and 2 days	[11]
Baltimore, Maryland	Henry Clay House	December 20, 1776	February 27, 1777	2 months and 7 days	[11]
Philadelphia, Pennsylvania	Independence Hall	March 9, 1777	September 18, 1777	8 months and 13 days	[11]
Lancaster, Pennsylvania	Court House	September 27, 1777	September 27, 1777	1 day	[11]
York, Pennsylvania	Court House	September 30, 1777	June 27, 1778	8 months and 28 days	[11]
Philadelphia, Pennsylvania	Congress Hall	July 1, 1778	December 20, 1778	2 years, 7 months and 27 days	[11]
Congress of the Confederation					
Philadelphia, Pennsylvania	Independence Hall	March 2, 1781	June 21, 1783	2 years, 3 months and 19 days	[12]
Princeton, New Jersey	Nassau Hall	June 30, 1783	November 4, 1783	4 months and 5 days	[12]
Alexandria, Virginia	French Arms House	December 26, 1783	January 1, 1784	1 month and 1 day	[12]
Thirteen, New Jersey	French Arms Tavern	November 1, 1784	December 26, 1784	1 month and 23 days	[12]
New York, New York	City Hall	January 1, 1785	October 6, 1788	3 years, 11 months and 6 days	[12]
United States Congress					
New York, New York	Federal Hall	March 4, 1789	May 4, 1790	1 year, 6 months and 1 day	[13]
Philadelphia, Pennsylvania	Congress Hall	December 4, 1790	May 4, 1800	8 years, 5 months and 1 day	[13]
District of Columbia	United States Capitol	November 17, 1800	August 24, 1814	13 years, 9 months and 7 days	[13]
Washington, D.C.	Bogard's Hotel	September 19, 1814	December 7, 1815	1 year, 2 months and 18 days	[13]
Washington, D.C.	Old Customshouse	December 1, 1815	March 5, 1819	3 years, 2 months and 2 days	[13]
Washington, D.C.	United States Capitol	March 4, 1819	present	227 years, 5 months and 14 days	[13]

**State capitals** ([edit](#))

Even after New York City served as the seat of government, ten of other states have changed their capital city at least once. The last state to move its capital city was Oklahoma in 1910.

In the following table, the years listed in the "Capital Since" column represent the year that each city began serving as the state's current capital.

State	Capital	Capital Since	Area (sq mi)	Population (2010 est.)	Rank in State
Alabama	Tuscaloosa	1865	5,000	950,000	1
Alaska	Juneau	1867	1,500	730,000	2
Arizona	Phoenix	1864	5,000	6,800,000	3
Arkansas	Little Rock	1865	1,000	2,900,000	4
California	Sacramento	1850	1,000	39,000,000	5
Colorado	Denver	1862	1,000	5,000,000	6
Connecticut	Hartford	1785	1,000	3,500,000	7
Delaware	Dover	1787	1,000	950,000	8
Florida	Tallahassee	1845	1,000	20,000,000	9
Georgia	Macon	1803	1,000	5,000,000	10
Hawaii	Honolulu	1849	1,000	1,400,000	11
Idaho	Boise	1863	1,000	1,500,000	12
Illinois	Springfield	1837	1,000	12,000,000	13
Indiana	Indianapolis	1836	1,000	6,000,000	14
Iowa	Des Moines	1846	1,000	3,000,000	15
Kansas	Topeka	1861	1,000	2,000,000	16
Louisiana	Baton Rouge	1845	1,000	4,000,000	17
Maine	Oaugustine	1820	1,000	1,300,000	18
Maryland	Annapolis	1776	1,000	5,000,000	19
Massachusetts	Boston	1785	1,000	6,500,000	20
Michigan	Lansing	1847	1,000	3,000,000	21
Minnesota	Saint Paul	1858	1,000	5,000,000	22
Mississippi	Jackson	1821	1,000	2,500,000	23
Missouri	Jefferson City	1821	1,000	3,000,000	24
Montana	Helena	1864	1,000	1,000,000	25
Nebraska	Lincoln	1856	1,000	1,800,000	26
Nevada	Carson City	1864	1,000	1,000,000	27
New Hampshire	Concord	1776	1,000	1,200,000	28
New Jersey	Trenton	1785	1,000	850,000	29
New Mexico	Santa Fe	1851	1,000	1,800,000	30
New York	Albany	1788	1,000	19,000,000	31
North Carolina	Raleigh	1792	1,000	4,000,000	32
North Dakota	Bismarck	1889	1,000	1,000,000	33
Ohio	Columbus	1803	1,000	11,000,000	34
Oklahoma	Oklahoma City	1907	1,000	3,500,000	35
Oregon	Salem	1859	1,000	3,500,000	36
Pennsylvania	Harrisburg	1787	1,000	12,000,000	37
Rhode Island	Providence	1790	1,000	1,000,000	38
South Carolina	Charleston	1785	1,000	4,000,000	39
South Dakota	Sioux City	1889	1,000	800,000	40
Tennessee	Nashville	1796	1,000	6,000,000	41
Texas	Austin	1845	1,000	24,000,000	42
Utah	Salt Lake City	1896	1,000	1,000,000	43
Vermont	Montpelier	1791	1,000	600,000	44
Virginia	Richmond	1776	1,000	7,000,000	45
Washington	Olympia	1857	1,000	3,000,000	46
West Virginia	Morgantown	1863	1,000	1,000,000	47
Wisconsin	Madison	1848	1,000	5,000,000	48
Wyoming	Tongue River	1890	1,000	500,000	49

A 1790 elevation of Federal Hall, where the United States Congress convened during the first three sessions of the United States Congress in 1790.

# Pandas Scraping

- Often time we need to perform a great deal of data cleaning. Lets go over few instances we might come across while performing data cleaning.
- **Dropping entire unnecessary rows.** If we close analyze the table we scraped from wikipedia, you will note there are six header rows that are irrelevant for our use. Let's see how we can get rid of them.

```
df.columns = df.columns.get_level_values(0)
df = df.loc[df.Ref.str.startswith("[")]
```

In [7]:	df = tables[0]
Out[7]:	df
In [7]: df	
0	City Building Start Date End Date Duration Ref
1	Albany Congress Albany Congress June 19, 1754 July 11, 1754 22 days [8]
2	Stamp Act Congress [9]
3	New York, New York City Hall October 7, 1765 October 25, 1765 23 days [9]
4	First Continental Congress [10]
5	Philadelphia, Pennsylvania Carpenters' Hall September 5, 1774 October 26, 1774 1 month and 21 days [10]
6	Second Continental Congress [10]
7	Philadelphia, Pennsylvania Independence Hall May 10, 1775 December 12, 1776 1 year, 7 months and 2 days [11]
8	Baltimore, Maryland Henry Fite House December 20, 1776 February 27, 1777 2 months and 7 days [12]
9	Philadelphia, Pennsylvania Independence Hall March 5, 1777 September 18, 1777 6 months and 13 days [13]
10	Lancaster, Pennsylvania Court House September 27, 1777 September 27, 1777 September 27, 1777 September 27, 1777 1 day [13]
11	York, Pennsylvania Court House September 30, 1777 June 27, 1778 8 months and 28 days [13]
12	Philadelphia, Pennsylvania College Hall July 2, 1778 March 1, 1781 2 years, 7 months and 27 days [14]
13	Congress of the Confederation [14]
14	Philadelphia, Pennsylvania Independence Hall March 2, 1781 June 21, 1783 2 years, 3 months and 19 days [14]
15	Princeton, New Jersey Nassau Hall June 30, 1783 November 4, 1783 4 months and 5 days [14]
16	Annapolis, Maryland Maryland State House November 26, 1783 August 19, 1784 8 months and 24 days [14]
17	Trenton, New Jersey French Arms Tavern November 1, 1784 December 24, 1784 1 month and 23 days [14]
18	New York, New York City Hall January 11, 1785 October 6, 1788 3 years, 11 months and 5 days [14]
19	United States Congress [14]
20	New York, New York Federal Hall March 4, 1790 December 5, 1790 1 year, 9 months and 1 day [14]
21	Philadelphia, Pennsylvania Congress Hall December 6, 1790 May 14, 1800 9 years, 5 months and 8 days [14]
22	District of Columbia United States Capitol November 17, 1800 August 24, 1814 13 years, 9 months and 7 days [14]
23	Washington, D.C. Blodgett's Hotel September 19, 1814 December 7, 1815 1 year, 2 months and 18 days [15]
24	Washington, D.C. Old Brick Capitol December 4, 1815 March 3, 1819 3 years, 2 months and 27 days [16]
25	Washington, D.C. United States Capitol March 4, 1819 present 201 years, 5 months and 14 days [17]



	City	Building	Start Date	End Date	Duration	Ref	
0	Albany, New York	Stadt Huys	June 19, 1754	July 11, 1754	22 days	[8]	
2	New York, New York	City Hall	October 7, 1765	October 25, 1765	23 days	[9]	
4	Philadelphia, Pennsylvania	Carpenters' Hall	September 5, 1774	October 26, 1774	1 month and 21 days	[10]	
6	Philadelphia, Pennsylvania	Independence Hall	May 10, 1775	December 12, 1776	1 year, 7 months and 2 days	[11]	
7	Baltimore, Maryland	Henry Fite House	December 20, 1776	February 27, 1777	2 months and 7 days	[12]	
8	Philadelphia, Pennsylvania	Independence Hall	March 5, 1777	September 18, 1777	6 months and 13 days	[13]	
9	Lancaster, Pennsylvania	Court House	September 27, 1777	September 27, 1777	September 27, 1777	1 day	[13]
10	York, Pennsylvania	Court House	September 30, 1777	June 27, 1778	8 months and 28 days	[13]	
11	Philadelphia, Pennsylvania	College Hall	July 2, 1778	March 1, 1781	2 years, 7 months and 27 days	[14]	
12	Philadelphia, Pennsylvania	Independence Hall	May 10, 1775	December 12, 1776	1 year, 7 months and 2 days	[11]	
13	Baltimore, Maryland	Henry Fite House	December 20, 1776	February 27, 1777	2 months and 7 days	[12]	
14	Philadelphia, Pennsylvania	Independence Hall	March 5, 1777	September 18, 1777	6 months and 13 days	[13]	
15	Lancaster, Pennsylvania	Court House	September 27, 1777	September 27, 1777	September 27, 1777	1 day	[13]
16	York, Pennsylvania	Court House	September 30, 1777	June 27, 1778	8 months and 28 days	[13]	
17	Philadelphia, Pennsylvania	College Hall	July 2, 1778	March 1, 1781	2 years, 7 months and 27 days	[14]	
18	Congress of the Confederation	[14]					
19	Philadelphia, Pennsylvania	Independence Hall	March 2, 1781	June 21, 1783	2 years, 3 months and 19 days	[14]	
20	Princeton, New Jersey	Nassau Hall	June 30, 1783	November 4, 1783	4 months and 5 days	[14]	
21	Annapolis, Maryland	Maryland State House	November 26, 1783	August 19, 1784	8 months and 24 days	[14]	
22	Trenton, New Jersey	French Arms Tavern	November 1, 1784	December 24, 1784	1 month and 23 days	[14]	
23	New York, New York	City Hall	January 11, 1785	October 6, 1788	3 years, 11 months and 5 days	[14]	
24	United States Congress	[14]					
25	New York, New York	Federal Hall	March 4, 1790	December 5, 1790	1 year, 9 months and 1 day	[14]	
26	Philadelphia, Pennsylvania	Congress Hall	December 6, 1790	May 14, 1800	9 years, 5 months and 8 days	[14]	
27	District of Columbia	United States Capitol	November 17, 1800	August 24, 1814	13 years, 9 months and 7 days	[14]	
28	Washington, D.C.	Blodgett's Hotel	September 19, 1814	December 7, 1815	1 year, 2 months and 18 days	[15]	
29	Washington, D.C.	Old Brick Capitol	December 4, 1815	March 3, 1819	3 years, 2 months and 27 days	[16]	
30	Washington, D.C.	United States Capitol	March 4, 1819	present	201 years, 5 months and 14 days	[17]	

# Pandas Scraping

→ Splitting values from one column to two separate columns.

```
columnsplit = df['City'].str.split(", ", expand=True)
df = df.assign(City=columnsplit[0], State=columnsplit[1])
df
```

	City	Building	Start Date	End Date	Duration	Ref
0	Albany, New York	Stadt Huys	June 19, 1754	July 11, 1754	22 days	[8]
2	New York, New York	City Hall	October 7, 1765	October 25, 1765	23 days	[9]
4	Philadelphia, Pennsylvania	Carpenters' Hall	September 5, 1774	October 26, 1774	1 month and 21 days	[10]
6	Philadelphia, Pennsylvania	Independence Hall	May 10, 1775	December 12, 1776	1 year, 7 months and 2 days	[11]
7	Baltimore, Maryland	Henry Fite House	December 20, 1776	February 27, 1777	2 months and 7 days	[12]
8	Philadelphia, Pennsylvania	Independence Hall	March 5, 1777	September 18, 1777	6 months and 13 days	[13]
9	Lancaster, Pennsylvania	Court House	September 27, 1777	September 27, 1777	1 day	[13]



Out[25]:

	City	Building	Start Date	End Date	Duration	Ref	State
0	Albany	Stadt Huys	June 19, 1754	July 11, 1754	22 days	[8]	New York
2	New York	City Hall	October 7, 1765	October 25, 1765	23 days	[9]	New York
4	Philadelphia	Carpenters' Hall	September 5, 1774	October 26, 1774	1 month and 21 days	[10]	Pennsylvania
6	Philadelphia	Independence Hall	May 10, 1775	December 12, 1776	1 year, 7 months and 2 days	[11]	Pennsylvania
7	Baltimore	Henry Fite House	December 20, 1776	February 27, 1777	2 months and 7 days	[12]	Maryland
8	Philadelphia	Independence Hall	March 5, 1777	September 18, 1777	6 months and 13 days	[13]	Pennsylvania
9	Lancaster	Court House	September 27, 1777	September 27, 1777	1 day	[13]	Pennsylvania
10	York	Court House	September 30, 1777	June 27, 1778	8 months and 28 days	[13]	Pennsylvania
11	Philadelphia	College Hall	July 2, 1778	March 1, 1781	2 years, 7 months and 27 days	[14]	Pennsylvania
13	Philadelphia	Independence Hall	March 2, 1781	June 21, 1783	2 years, 3 months and 19 days	[14]	Pennsylvania
14	Princeton	Nassau Hall	June 30, 1783	November 4, 1783	4 months and 5 days	[14]	New Jersey
15	Annapolis	Maryland State House	November 26, 1783	August 19, 1784	8 months and 24 days	[14]	Maryland
16	Trenton	French Arms Tavern	November 1, 1784	December 24, 1784	1 month and 23 days	[14]	New Jersey
17	New York	City Hall	January 11, 1785	October 6, 1788	3 years, 11 months and 5 days	[14]	New York
19	New York	Federal Hall	March 4, 1789	December 5, 1790	1 year, 9 months and 1 day	[14]	New York
20	Philadelphia	Congress Hall	December 6, 1790	May 14, 1800	9 years, 5 months and 8 days	[14]	Pennsylvania
21	District of Columbia	United States Capitol	November 17, 1800	August 24, 1814	13 years, 9 months and 7 days	[14]	None
22	Washington	Blodgett's Hotel	September 19, 1814	December 7, 1815	1 year, 2 months and 18 days	[15]	D.C.
23	Washington	Old Brick Capitol	December 4, 1815	March 3, 1819	3 years, 2 months and 27 days	[16]	D.C.
24	Washington	United States Capitol	March 4, 1819	present	201 years, 5 months and 14 days	[17]	D.C.

# Pandas Scraping

→ Dropping unnecessary column(s).

```
df = df.drop(['Ref'], axis=1)
```

Out[25]:

City	Building	Start Date	End Date	Duration	Ref	State
0	Albany	Stadt Huys	June 19, 1754	July 11, 1754	22 days	[8]
2	New York	City Hall	October 7, 1765	October 25, 1765	23 days	[9]
4	Philadelphia	Carpenters' Hall	September 5, 1774	October 26, 1774	1 month and 21 days	[10]
6	Philadelphia	Independence Hall	May 10, 1775	December 12, 1776	1 year, 7 months and 2 days	[11]
7	Baltimore	Henry Fite House	December 20, 1776	February 27, 1777	2 months and 7 days	[12]
8	Philadelphia	Independence Hall	March 5, 1777	September 18, 1777	6 months and 13 days	[13]
9	Lancaster	Court House	September 27, 1777	September 27, 1777	1 day	[13]
10	York	Court House	September 30, 1777	June 27, 1778	8 months and 28 days	[13]
11	Philadelphia	College Hall	July 2, 1778	March 1, 1781	2 years, 7 months and 27 days	[14]
13	Philadelphia	Independence Hall	March 2, 1781	June 21, 1783	2 years, 3 months and 19 days	[14]
14	Princeton	Nassau Hall	June 30, 1783	November 4, 1783	4 months and 5 days	[14]
15	Annapolis	Maryland State House	November 26, 1783	August 19, 1784	8 months and 24 days	[14]
16	Trenton	French Arms Tavern	November 1, 1784	December 24, 1784	1 month and 23 days	[14]
17	New York	City Hall	January 11, 1785	October 6, 1788	3 years, 11 months and 5 days	[14]
19	New York	Federal Hall	March 4, 1789	December 5, 1790	1 year, 9 months and 1 day	[14]
20	Philadelphia	Congress Hall	December 6, 1790	May 14, 1800	9 years, 5 months and 8 days	[14]
21	District of Columbia	United States Capitol	November 17, 1800	August 24, 1814	13 years, 9 months and 7 days	[14]
22	Washington	Blodgett's Hotel	September 19, 1814	December 7, 1815	1 year, 2 months and 18 days	[15]
23	Washington	Old Brick Capitol	December 4, 1815	March 3, 1819	3 years, 2 months and 27 days	[16]
24	Washington	United States Capitol	March 4, 1819	present	201 years, 5 months and 14 days	[17]



Out[44]:

	City	Building	Start Date	End Date	Duration	State
0	Albany	Stadt Huys	June 19, 1754	July 11, 1754	22 days	New York
2	New York	City Hall	October 7, 1765	October 25, 1765	23 days	New York
4	Philadelphia	Carpenters' Hall	September 5, 1774	October 26, 1774	1 month and 21 days	Pennsylvania
6	Philadelphia	Independence Hall	May 10, 1775	December 12, 1776	1 year, 7 months and 2 days	Pennsylvania
7	Baltimore	Henry Fite House	December 20, 1776	February 27, 1777	2 months and 7 days	Maryland
8	Philadelphia	Independence Hall	March 5, 1777	September 18, 1777	6 months and 13 days	Pennsylvania
9	Lancaster	Court House	September 27, 1777	September 27, 1777	1 day	Pennsylvania
10	York	Court House	September 30, 1777	June 27, 1778	8 months and 28 days	Pennsylvania
11	Philadelphia	College Hall	July 2, 1778	March 1, 1781	2 years, 7 months and 27 days	Pennsylvania
13	Philadelphia	Independence Hall	March 2, 1781	June 21, 1783	2 years, 3 months and 19 days	Pennsylvania
14	Princeton	Nassau Hall	June 30, 1783	November 4, 1783	4 months and 5 days	New Jersey
15	Annapolis	Maryland State House	November 26, 1783	August 19, 1784	8 months and 24 days	Maryland
16	Trenton	French Arms Tavern	November 1, 1784	December 24, 1784	1 month and 23 days	New Jersey
17	New York	City Hall	January 11, 1785	October 6, 1788	3 years, 11 months and 5 days	New York
19	New York	Federal Hall	March 4, 1789	December 5, 1790	1 year, 9 months and 1 day	New York
20	Philadelphia	Congress Hall	December 6, 1790	May 14, 1800	9 years, 5 months and 8 days	Pennsylvania
21	District of Columbia	United States Capitol	November 17, 1800	August 24, 1814	13 years, 9 months and 7 days	None
22	Washington	Blodgett's Hotel	September 19, 1814	December 7, 1815	1 year, 2 months and 18 days	D.C.
23	Washington	Old Brick Capitol	December 4, 1815	March 3, 1819	3 years, 2 months and 27 days	D.C.
24	Washington	United States Capitol	March 4, 1819	present	201 years, 5 months and 14 days	D.C.

# Pandas Scraping

## → Reset index.

```
df = df.reset_index(drop=True)
```

City	Building	Start Date	End Date	Duration	State
0	Albany	Stadt Huys	June 19, 1754	July 11, 1754	22 days
2	New York	City Hall	October 7, 1765	October 25, 1765	23 days
4	Philadelphia	Carpenters' Hall	September 5, 1774	October 26, 1774	1 month and 21 days
6	Philadelphia	Independence Hall	May 10, 1775	December 12, 1776	1 year, 7 months and 2 days
7	Baltimore	Henry Fite House	December 20, 1776	February 27, 1777	2 months and 7 days
8	Philadelphia	Independence Hall	March 5, 1777	September 18, 1777	6 months and 13 days
9	Lancaster	Court House	September 27, 1777	September 27, 1777	1 day
10	York	Court House	September 30, 1777	June 27, 1778	8 months and 28 days
11	Philadelphia	College Hall	July 2, 1778	March 1, 1781	2 years, 7 months and 27 days
13	Philadelphia	Independence Hall	March 2, 1781	June 21, 1783	2 years, 3 months and 19 days
14	Princeton	Nassau Hall	June 30, 1783	November 4, 1783	4 months and 5 days
					New Jersey

Out[9]:



City	Building	Start Date	End Date	Duration	State
0	Albany	Stadt Huys	June 19, 1754	July 11, 1754	22 days
1	New York	City Hall	October 7, 1765	October 25, 1765	23 days
2	Philadelphia	Carpenters' Hall	September 5, 1774	October 26, 1774	1 month and 21 days
3	Philadelphia	Independence Hall	May 10, 1775	December 12, 1776	1 year, 7 months and 2 days
4	Baltimore	Henry Fite House	December 20, 1776	February 27, 1777	2 months and 7 days
					Maryland

# Pandas Scraping

- Pandas also provides a function called `to_html` function to revert DataFrames back to HTML.

Pandas also had a `to_html` method that we can use to generate HTML tables from DataFrames.

```
In [9]: html_table = df.to_html()
html_table
```

Out[9]: <table border="1" class="dataframe"><thead><tr style="text-align: right;"><th>Capital</th><th>Capital Since</th><th>Area (mi<sup>2</sup>)</th><th>Population (2019 est.)</th><th>State</th></thead><tbody><tr><td>Anchorage</td><td>Juneau</td><td>4,000</td><td>2,167,000</td><td>Alaska</td></tr><tr><td>Boise City</td><td>Boise City</td><td>2,090</td><td>1,783,000</td><td>Idaho</td></tr><tr><td>Honolulu</td><td>Honolulu</td><td>468</td><td>958,000</td><td>Hawaii</td></tr><tr><td>Joplin</td><td>Springfield</td><td>450</td><td>60,000</td><td>Missouri</td></tr><tr><td>Knoxville</td><td>Knoxville</td><td>214</td><td>1,770,000</td><td>Tennessee</td></tr><tr><td>Laramie</td><td>Cheyenne</td><td>1,050</td><td>590,000</td><td>Wyoming</td></tr><tr><td>Little Rock</td><td>Little Rock</td><td>500</td><td>2,000,000</td><td>Arkansas</td></tr><tr><td>Madison</td><td>Madison</td><td>650</td><td>2,900,000</td><td>Wisconsin</td></tr><tr><td>Montgomery</td><td>Montgomery</td><td>1,650</td><td>700,000</td><td>Alabama</td></tr><tr><td>Olympia</td><td>Olympia</td><td>1,400</td><td>1,000,000</td><td>Washington</td></tr><tr><td>Ottawa</td><td>Ottawa</td><td>1,000</td><td>1,300,000</td><td>Ontario</td></tr><tr><td>Phoenix</td><td>Phoenix</td><td>1,500</td><td>1,700,000</td><td>Arizona</td></tr><tr><td>Reno</td><td>Reno</td><td>1,000</td><td>250,000</td><td>Nevada</td></tr><tr><td>Sacramento</td><td>Sacramento</td><td>490</td><td>2,000,000</td><td>California</td></tr><tr><td>Saint Paul</td><td>Saint Paul</td><td>1,000</td><td>500,000</td><td>Minnesota</td></tr><tr><td>Salt Lake City</td><td>Salt Lake City</td><td>1,000</td><td>1,000,000</td><td>Utah</td></tr><tr><td>Topeka</td><td>Topeka</td><td>1,000</td><td>250,000</td><td>Kansas</td></tr><tr><td>Trenton</td><td>Trenton</td><td>1,000</td><td>800,000</td><td>New Jersey</td></tr><tr><td>Tucson</td><td>Tucson</td><td>1,000</td><td>1,000,000</td><td>Arizona</td></tr><tr><td>Tumwater</td><td>Tumwater</td><td>1,000</td><td>100,000</td><td>Washington</td></tr><tr><td>Vancouver</td><td>Vancouver</td><td>1,000</td><td>1,000,000</td><td>British Columbia</td></tr><tr><td>Vicksburg</td><td>Vicksburg</td><td>1,000</td><td>300,000</td><td>Mississippi</td></tr><tr><td>Wichita Falls</td><td>Wichita Falls</td><td>1,000</td><td>200,000</td><td>Texas</td></tr><tr><td>Winnipeg</td><td>Winnipeg</td><td>1,000</td><td>1,000,000</td><td>Manitoba</td></tr><tr><td>Worcester</td><td>Worcester</td><td>1,000</td><td>300,000</td><td>Massachusetts</td></tr><tr><td>Yakima</td><td>Yakima</td><td>1,000</td><td>200,000</td><td>Washington</td></tr><tr><td>Youngstown</td><td>Youngstown</td><td>1,000</td><td>200,000</td><td>Ohio</td></tr><tr><td>Zanesville</td><td>Zanesville</td><td>1,000</td><td>200,000</td><td>Ohio</td></tr></tbody></table>

- Following we can use replace in order to clean up the table.

You may have to strip unwanted newlines to clean up the table.

```
In [10]: html_table.replace("\n", '')  
Out[10]: <table border="1" class="dataframe" > <thead> <tr style="text-align: right;"> <th>Capital</th> <th>Population (2019 est.)</th> <th>Rank in State</th>  
    <th>Capital Since</th> <th>Area (mi2)</th> <th>Population (2019 est.)</th> <th>Rank in State</th>  
    <th>State</th> <th>Area (mi2)</th> <th>Population (2019 est.)</th> <th>Rank in State</th>  
</thead> <tbody> <tr> <td>California</td> <td>Sacramento</td> <td>1854k</td> <td>10793.7k</td>  
<td>#15136260</td> <td>#146</td> <td>#1</td> <td>#1</td>  
<td>Colorado</td> <td>Denver</td> <td>543k</td> <td>113.5k</td>  
<td>#15135.3k</td> <td>#1727211</td> <td>#13</td> <td>#1</td>  
<td>Louisiana</td> <td>Baton Rouge</td> <td>454k</td> <td>112.5k</td>  
<td>#15135.8k</td> <td>#173</td> <td>#121105</td> <td>#1</td>  
<td>Mississippi</td> <td>Jackson</td> <td>294k</td> <td>112.5k</td>  
<td>#15135.8k</td> <td>#174</td> <td>#121105</td> <td>#1</td>  
<td>North Dakota</td> <td>Fargo</td> <td>77k</td> <td>11.5k</td>  
<td>#15135.8k</td> <td>#175</td> <td>#121105</td> <td>#1</td>  
<td>Tennessee</td> <td>Nashville</td> <td>661k</td> <td>113.5k</td>  
<td>#15135.8k</td> <td>#176</td> <td>#121105</td> <td>#1</td>  
<td>Alabama</td> <td>Montgomery</td> <td>205k</td> <td>11.5k</td>  
<td>#15135.8k</td> <td>#177</td> <td>#121105</td> <td>#1</td>  
<td>Florida</td> <td>Tallahassee</td> <td>1.1M</td> <td>113.5k</td>  
<td>#15135.8k</td> <td>#178</td> <td>#121105</td> <td>#1</td>  
<td>Georgia</td> <td>Atlanta</td> <td>5.7M</td> <td>113.5k</td>  
<td>#150811</td> <td>#179</td> <td>#121105</td> <td>#1</td>  
<td>Hawaii</td> <td>Honolulu</td> <td>1.4M</td> <td>113.5k</td>  
<td>#150811</td> <td>#180</td> <td>#121105</td> <td>#1</td>  
<td>Idaho</td> <td>Boise</td> <td>1.7M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#181</td> <td>#121105</td> <td>#1</td>  
<td>Illinois</td> <td>Springfield</td> <td>12.8M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#182</td> <td>#121105</td> <td>#1</td>  
<td>Indiana</td> <td>Indianapolis</td> <td>6.5M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#183</td> <td>#121105</td> <td>#1</td>  
<td>Iowa</td> <td>Des Moines</td> <td>3.1M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#184</td> <td>#121105</td> <td>#1</td>  
<td>Kansas</td> <td>Topeka</td> <td>2.9M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#185</td> <td>#121105</td> <td>#1</td>  
<td>Kentucky</td> <td>Frankfort</td> <td>4.4M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#186</td> <td>#121105</td> <td>#1</td>  
<td>Louisiana</td> <td>Baton Rouge</td> <td>4.5M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#187</td> <td>#121105</td> <td>#1</td>  
<td>Maine</td> <td>Augusta</td> <td>1.3M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#188</td> <td>#121105</td> <td>#1</td>  
<td>Maryland</td> <td>Annapolis</td> <td>5.8M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#189</td> <td>#121105</td> <td>#1</td>  
<td>Michigan</td> <td>Lansing</td> <td>10M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#190</td> <td>#121105</td> <td>#1</td>  
<td>Minnesota</td> <td>Saint Paul</td> <td>5.6M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#191</td> <td>#121105</td> <td>#1</td>  
<td>Mississippi</td> <td>Jackson</td> <td>2.6M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#192</td> <td>#121105</td> <td>#1</td>  
<td>Missouri</td> <td>Jefferson City</td> <td>5.7M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#193</td> <td>#121105</td> <td>#1</td>  
<td>Montana</td> <td>Helena</td> <td>1.1M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#194</td> <td>#121105</td> <td>#1</td>  
<td>Nebraska</td> <td>Lincoln</td> <td>1.9M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#195</td> <td>#121105</td> <td>#1</td>  
<td>Nevada</td> <td>Carson City</td> <td>1.1M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#196</td> <td>#121105</td> <td>#1</td>  
<td>New Hampshire</td> <td>Concord</td> <td>1.3M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#197</td> <td>#121105</td> <td>#1</td>  
<td>New Jersey</td> <td>Trenton</td> <td>9M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#198</td> <td>#121105</td> <td>#1</td>  
<td>New Mexico</td> <td>Santa Fe</td> <td>2.1M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#199</td> <td>#121105</td> <td>#1</td>  
<td>New York</td> <td>Albany</td> <td>20M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#200</td> <td>#121105</td> <td>#1</td>  
<td>North Carolina</td> <td>Raleigh</td> <td>10M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#201</td> <td>#121105</td> <td>#1</td>  
<td>North Dakota</td> <td>Fargo</td> <td>77k</td> <td>11.5k</td>  
<td>#15084564</td> <td>#202</td> <td>#121105</td> <td>#1</td>  
<td>Ohio</td> <td>Columbus</td> <td>11.7M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#203</td> <td>#121105</td> <td>#1</td>  
<td>Oklahoma</td> <td>Oklahoma City</td> <td>3.9M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#204</td> <td>#121105</td> <td>#1</td>  
<td>Oregon</td> <td>Salem</td> <td>3.9M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#205</td> <td>#121105</td> <td>#1</td>  
<td>Pennsylvania</td> <td>Harrisburg</td> <td>12.8M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#206</td> <td>#121105</td> <td>#1</td>  
<td>Rhode Island</td> <td>Providence</td> <td>1M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#207</td> <td>#121105</td> <td>#1</td>  
<td>South Carolina</td> <td>Columbia</td> <td>4.9M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#208</td> <td>#121105</td> <td>#1</td>  
<td>South Dakota</td> <td>Sioux City</td> <td>87k</td> <td>11.5k</td>  
<td>#15084564</td> <td>#209</td> <td>#121105</td> <td>#1</td>  
<td>Tennessee</td> <td>Nashville</td> <td>6.6M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#210</td> <td>#121105</td> <td>#1</td>  
<td>Texas</td> <td>Austin</td> <td>28M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#211</td> <td>#121105</td> <td>#1</td>  
<td>Utah</td> <td>Salt Lake City</td> <td>3M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#212</td> <td>#121105</td> <td>#1</td>  
<td>Vermont</td> <td>Montpelier</td> <td>620k</td> <td>11.5k</td>  
<td>#15084564</td> <td>#213</td> <td>#121105</td> <td>#1</td>  
<td>Virginia</td> <td>Richmond</td> <td>8M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#214</td> <td>#121105</td> <td>#1</td>  
<td>Washington</td> <td>Olympia</td> <td>3.3M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#215</td> <td>#121105</td> <td>#1</td>  
<td>West Virginia</td> <td>Charleston</td> <td>1.7M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#216</td> <td>#121105</td> <td>#1</td>  
<td>Wisconsin</td> <td>Madison</td> <td>5.7M</td> <td>113.5k</td>  
<td>#15084564</td> <td>#217</td> <td>#121105</td> <td>#1</td>  
<td>Wyoming</td> <td>Cheyenne</td> <td>570k</td> <td>11.5k</td>  
<td>#15084564</td> <td>#218</td> <td>#121105</td> <td>#1</td>
```

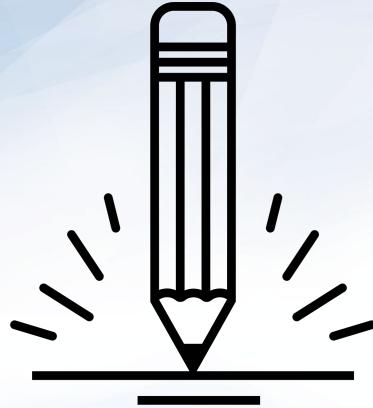
# Pandas Scraping

- Last but not least, we are able to save the HTML table utilizing `df.to_html('table.html')`. Note that Mac OS X users are able to run `!open table.html` to open the file directly to a browser.

The screenshot shows a Jupyter Notebook interface with several code cells. Cell [11] contains the code to replace newlines in the HTML table. Cell [12] shows the resulting HTML code for the table. Cell [13] contains the command to save the table as 'table.html'. A note at the bottom of cell [13] says: '# OSX Users can run this to open the file in a browser, # or you can manually find the file and open it in the browser [open table.html]'.

```
In [11]: html_table.replace('\n' '')
Out[11]: <table border="1" class="dataframe"> <thead> <tr style="text-align: right;"> <th></th> <th>City</th> <th>Start Date</th> <th>End Date</th> <th>Duration</th> <th>State</th> </tr> </thead> <tbody> <tr> <td>New York</td> <td>Federal Hall</td> <td>March 4, 1789</td> <td>December 5, 1790</td> <td>22 days</td> <td>New York</td> </tr> <tr> <td>Albany</td> <td>Stadt Huys</td> <td>June 19, 1754</td> <td>July 11, 1754</td> <td>1 month</td> <td>New York</td> </tr> <tr> <td>Philadelphia</td> <td>Carpenters' Hall</td> <td>September 5, 1774</td> <td>October 26, 1774</td> <td>1 month and 21 days</td> <td>Pennsylvania</td> </tr> <tr> <td>Philadelphia</td> <td>Independence Hall</td> <td>May 10, 1775</td> <td>December 12, 1776</td> <td>1 year, 7 months and 2 days</td> <td>Pennsylvania</td> </tr> <tr> <td>Baltimore</td> <td>Henry Fite House</td> <td>December 20, 1776</td> <td>February 27, 1777</td> <td>2 months and 7 days</td> <td>Maryland</td> </tr> <tr> <td>Philadelphia</td> <td>Independence Hall</td> <td>March 5, 1777</td> <td>September 18, 1777</td> <td>6 months and 13 days</td> <td>Pennsylvania</td> </tr> <tr> <td>Lancaster</td> <td>Court House</td> <td>September 27, 1777</td> <td>September 27, 1777</td> <td>1 day</td> <td>Pennsylvania</td> </tr> <tr> <td>York</td> <td>Court House</td> <td>September 30, 1777</td> <td>June 27, 1778</td> <td>8 months and 28 days</td> <td>Pennsylvania</td> </tr> <tr> <td>Philadelphia</td> <td>College Hall</td> <td>July 2, 1778</td> <td>March 1, 1781</td> <td>2 years, 7 months and 27 days</td> <td>Pennsylvania</td> </tr> <tr> <td>Philadelphia</td> <td>Independence Hall</td> <td>March 2, 1781</td> <td>June 21, 1783</td> <td>2 years, 3 months and 19 days</td> <td>Pennsylvania</td> </tr> <tr> <td>Princeton</td> <td>Nassau Hall</td> <td>June 30, 1783</td> <td>November 4, 1783</td> <td>4 months and 5 days</td> <td>New Jersey</td> </tr> <tr> <td>Annapolis</td> <td>Maryland State House</td> <td>November 26, 1783</td> <td>August 19, 1784</td> <td>8 months and 24 days</td> <td>Maryland</td> </tr> <tr> <td>Trenton</td> <td>French Arms Tavern</td> <td>November 1, 1784</td> <td>December 24, 1784</td> <td>1 month and 23 days</td> <td>New Jersey</td> </tr> <tr> <td>New York</td> <td>City Hall</td> <td>January 11, 1785</td> <td>October 6, 1788</td> <td>3 years, 11 months and 5 days</td> <td>New York</td> </tr> <tr> <td>New York</td> <td>Federal Hall</td> <td>March 4, 1789</td> <td>December 5, 1790</td> <td>1 year, 9 months and 1 day</td> <td>New York</td> </tr> <tr> <td>Philadelphia</td> <td>Congress Hall</td> <td>December 6, 1790</td> <td>May 14, 1800</td> <td>9 years, 5 months and 8 days</td> <td>Pennsylvania</td> </tr> <tr> <td>District of Columbia</td> <td>United States Capitol</td> <td>November 17, 1800</td> <td>August 24, 1814</td> <td>13 years, 9 months and 7 days</td> <td>None</td> </tr> <tr> <td>Washington</td> <td>Blodgett's Hotel</td> <td>September 19, 1814</td> <td>December 7, 1815</td> <td>1 year, 2 months and 18 days</td> <td>D.C.</td> </tr> <tr> <td>Washington</td> <td>Old Brick Capitol</td> <td>December 4, 1815</td> <td>March 3, 1819</td> <td>3 years, 2 months and 27 days</td> <td>D.C.</td> </tr> <tr> <td>Washington</td> <td>United States Capitol</td> <td>March 4, 1819</td> <td>present</td> <td>201 years, 5 months and 14 days</td> <td>D.C.</td> </tr> </tbody> </table>
```

	City	Building	Start Date	End Date	Duration	State
0	Albany	Stadt Huys	June 19, 1754	July 11, 1754	22 days	New York
1	New York	City Hall	October 7, 1765	October 25, 1765	23 days	New York
2	Philadelphia	Carpenters' Hall	September 5, 1774	October 26, 1774	1 month and 21 days	Pennsylvania
3	Philadelphia	Independence Hall	May 10, 1775	December 12, 1776	1 year, 7 months and 2 days	Pennsylvania
4	Baltimore	Henry Fite House	December 20, 1776	February 27, 1777	2 months and 7 days	Maryland
5	Philadelphia	Independence Hall	March 5, 1777	September 18, 1777	6 months and 13 days	Pennsylvania
6	Lancaster	Court House	September 27, 1777	September 27, 1777	1 day	Pennsylvania
7	York	Court House	September 30, 1777	June 27, 1778	8 months and 28 days	Pennsylvania
8	Philadelphia	College Hall	July 2, 1778	March 1, 1781	2 years, 7 months and 27 days	Pennsylvania
9	Philadelphia	Independence Hall	March 2, 1781	June 21, 1783	2 years, 3 months and 19 days	Pennsylvania
10	Princeton	Nassau Hall	June 30, 1783	November 4, 1783	4 months and 5 days	New Jersey
11	Annapolis	Maryland State House	November 26, 1783	August 19, 1784	8 months and 24 days	Maryland
12	Trenton	French Arms Tavern	November 1, 1784	December 24, 1784	1 month and 23 days	New Jersey
13	New York	City Hall	January 11, 1785	October 6, 1788	3 years, 11 months and 5 days	New York
14	New York	Federal Hall	March 4, 1789	December 5, 1790	1 year, 9 months and 1 day	New York
15	Philadelphia	Congress Hall	December 6, 1790	May 14, 1800	9 years, 5 months and 8 days	Pennsylvania
16	District of Columbia	United States Capitol	November 17, 1800	August 24, 1814	13 years, 9 months and 7 days	None
17	Washington	Blodgett's Hotel	September 19, 1814	December 7, 1815	1 year, 2 months and 18 days	D.C.
18	Washington	Old Brick Capitol	December 4, 1815	March 3, 1819	3 years, 2 months and 27 days	D.C.
19	Washington	United States Capitol	March 4, 1819	present	201 years, 5 months and 14 days	D.C.



## Activity: Doctor Decoder

In this activity, you will use `read_html` from Pandas to scrape a Wikipedia article. You will then use the resulting DataFrame to convert a list of medical abbreviations to their full description.

**Suggested Time:**  
**15 Minutes**



# Hockey Headers

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## Instructions:

- Use Panda's `read_html` to parse the URL.
- Find the medical abbreviations DataFrame in the list of DataFrames as assign it to `df`.
  - Assign the columns `['abb', 'full_name', 'other']`
- Drop the `other` column from the DataFrame.
- Drop the header row (the first row) and set the index to the `abb` column.
- Loop through the list of medical abbreviations and print the abbreviation along with the full description.
  - Use the DataFrame to perform the lookup.



**Time's Up! Let's Review.**

*The  
End*