



***Lesson #04***  
***Exploring Data with Pandas***  
***July. 2019***

*Real Python*



**Introduction to Pandas**

**Exploring Data with Pandas**

**Data Cleaning Basics**

**Data Aggregation**

**Combining Data with Pandas**

**Transforming Data with Pandas**

**Working with String in Pandas**

**Working with missing and duplicate data**

- Select columns, rows and individual items using their integer location.
- Work with integer axis labels.
- How to use pandas methods to produce boolean arrays.
- Use boolean operators to combine boolean comparisons to perform more complex analysis.
- Use index labels to align data.
- Use aggregation to perform advanced analysis using loops.

	A	B	C
x			
y			
z			

	A	B	C
x			
y			
z			

```
df.loc["z", "A"]
```

*located at row with label z,  
column with label A*

```
df.loc["y"]
```

*located at row with label y*



# Using iloc to select by integer position

	A	B	C
x			
y			
z			

```
df.iloc[2,0]
```

	A	B	C
x			
y			
z			

```
df.iloc[1]
```

```
first_column = f500.iloc[:,0]  
print(first_column)
```

```
0           Walmart  
1       State Grid  
2       Sinopec Group  
...  
497  Wm. Morrison Supermarkets  
498           TUI  
499       AutoNation  
Name: company, dtype: object
```



# Slicing with iloc

With `loc[]`, the ending slice is **included**.

With `iloc[]`, the ending slice is **not included**.

```
1 | f500[1:4].
```

	rank	revenues
State Grid	2	315199
Sinopec Group	3	267518
China National Petroleum	4	262573

```
1 | f500.iloc[1:4].
```

	rank	revenues
State Grid	2	315199
Sinopec Group	3	267518
China National Petroleum	4	262573

# Loc vs iLoc

`df.iloc[1]`

`iloc[1]` uses the integer position of the row to select the second row

	A	B	C
0			
1			
2			

`df.iloc[1]`

`iloc[1]` uses the integer position of the row to select the second row

	A	B	C
0			
2			
1			

`df.loc[1]`

`loc[1]` uses the label of the row to select the row with an axis label of `1`.

	A	B	C
0			
1			
2			

`df.loc[1]`

`loc[1]` uses the label of the row to select the row with an axis label of `1`.

	A	B	C
0			
2			
1			

# Using pandas methods to create boolean masks

---

```
>>> is_california = usa["hq_location"].str.endswith("CA")
```

```
>>> print(is_california.head())
```

```
0      False
```

```
7      False
```

```
8       True
```

```
9      False
```

```
10     True
```

```
Name: hq_location, dtype: bool
```

```
0      Bentonville, AR
```

```
7      Omaha, NE
```

```
8      Cupertino, CA
```

```
9      Irving, TX
```

```
10     San Francisco, CA
```

```
Name: hq_location, dtype: object
```



# Using boolean operators to select items

	company	revenues	country
0	Walmart	485873	USA
1	State Grid	315199	China
2	Sinopec Group	267518	China
3	China Nation...	262573	China
4	Toyota Motor	254694	Japan

f500\_sel

```
over_265 = f500_sel["revenues"] > 265000
china = f500_sel["country"] == "China"
```

0	True
1	True
2	True
3	False
4	False

over\_265

0	False
1	True
2	True
3	True
4	False

china

```
combined = over_265 & china
```

0	True	&	0	False	=	0	False
1	True	&	1	True	=	1	True
2	True	&	2	True	=	2	True
3	False	&	3	True	=	3	False
4	False	&	4	False	=	4	False

over\_265      china      combined

# Using boolean operators to select items

```
final_cols = ["company", "revenues"]  
result = f500_sel.loc[combined, final_cols]
```

		company	revenues	country			company	revenues
0	False	0	Walmart	485873	USA			
1	True	→ 1	State Grid	315199	China	→ 1	State Grid	315199
2	True	→ 2	Sinopec Group	267518	China	→ 2	Sinopec Group	267518
3	False	3	China Nation...	262573	China			
4	False	4	Toyota Motor	254694	Japan			
combined		f500_sel			result			

# Pandas Index Alignment

	fruit_veg	qty		
tomato	fruit	4	corn	yellow
carrot	veg	2	carrot	orange
lime	fruit	4	tomato	red
corn	veg	1	lime	green
eggplant	veg	2	eggplant	purple

**food**                      **colors**

	fruit_veg	qty	color
tomato	fruit	4	red
carrot	veg	2	orange
lime	fruit	4	green
corn	veg	1	yellow
eggplant	veg	2	purple

**food**

```
food["color"] = colors
```

	fruit_veg	qty		
tomato	fruit	4	corn	yellow
carrot	veg	2	carrot	orange
lime	fruit	4	tomato	red
corn	veg	1	lime	green
eggplant	veg	2	eggplant	purple

**food**                      **colors**

# Pandas Index Alignment

---

arugula	rocket
eggplant	aubergine
corn	maize

**alt\_name**

```
food["alt_name"] = alt_name
```

	fruit_veg	qty	color	alt_name
tomato	fruit	4	red	NaN
carrot	veg	2	orange	NaN
lime	fruit	4	green	NaN
corn	veg	1	yellow	maize
eggplant	veg	2	purple	aubergine

**food**

# Challenge: calculating return on assets by sector

---

```
{ 'Aerospace & Defense': 'Lockheed Martin',  
  'Apparel': 'Nike',  
  'Business Services': 'Adecco Group',  
  'Chemicals': 'LyondellBasell Industries',  
  'Energy': 'National Grid',  
  'Engineering & Construction': 'Pacific Construction Group',  
  'Financials': 'Berkshire Hathaway',  
  'Food & Drug Stores': 'Publix Super Markets',  
  'Food, Beverages & Tobacco': 'Philip Morris International',  
  'Health Care': 'Gilead Sciences',  
  'Hotels, Restaurants & Leisure': 'McDonalds',  
  'Household Products': 'Unilever',  
  'Industrials': '3M',  
  'Materials': 'CRH',  
  'Media': 'Disney',  
  'Motor Vehicles & Parts': 'Subaru',  
  'Retailing': 'H & M Hennes & Mauritz',  
  'Technology': 'Accenture',  
  'Telecommunications': 'KDDI',  
  'Transportation': 'Delta Air Lines',  
  'Wholesalers': 'McKesson' }
```

$$\text{return on assets} = \frac{\text{profits}}{\text{assets}}$$

# Lesson#04 Exploring Data with pandas.ipynb

