Pandas Data Structures *Cheat Sheet* https://sunshinescience.github.io/

Customarily import as: `import pandas as pd`

pandas Data Structures

Series
One-dimensional labeled array that can hold any data type

Syntax to create a Series
```
s = pd.Series(data, index)
```
Example:
```
s = pd.Series([1,2,-1,4],
    index=['a','b','c','d'])
```

index →

a	1
b	2
c	-1
d	4

DataFrame
2-D labeled data structure that can have columns (different type per column)

Syntax to create a DataFrame
```
df = pd.DataFrame(data,
index, columns)
```
Example:
```
df = pd.DataFrame([[1,2,3], [4,4,7],
    [5,8,9]], index=['a', 'b', 'c'],
    columns=['A', 'B', 'C'])
```

columns →, index →

	A	B	C
a	1	2	3
b	4	4	7
c	5	8	9

Viewing Data

View top, bottom rows
```
df.head()
df.tail(2)
```

Display index, columns
```
df.index
df.columns
```

NumPy representation of data
```
df.to_numpy()
```

Transpose data
```
df.T
```

Sort by an axis (axis=0 for rows, axis=1 for columns)
```
df.sort_index(axis=0,
ascending=True)
```

Sort by values
```
df.sort_values(by='A')
```

Statistics

Get quick overall statistics
```
df.describe()
```

Count unique values in column
```
df['A'].value_counts()
```

Count distinct values in an axis
```
df['A'].nunique()
```

*Note that for the functions to the right, in order to get values of columns use axis=0, but for rows use axis=1. See example below for df.mean()

Get the mean of the columns
```
df.mean(axis=0) or df.mean()
```
Get the mean of the rows
```
df.mean(axis = 1)
```

Count non-NA values
```
df.count()
```

Sum of values
```
df.sum()
```

Median of values
```
df.median()
```

Minimum
```
df.min()
```

Maximum
```
df.max()
```

Mode
```
df.mode()
```

Standard deviation
```
df.std()
```

Missing Data

Reindexing can change/add/delete
```
df1 = df.reindex(index=
['a', 'b','c', 'd'],
columns=['A', 'B', 'C', 'D'])
```

Set a value to labels in a column
```
df1.loc['a':'b', 'D'] = 1
```

Drop NaN values
```
df1.dropna(how='any')
```

Fill NaN's with a value
```
df1.fillna(0)
```

Replace values with others
```
df1.replace(1.0, 2.0)
```

Get rows with NaN values
```
df1[df1.isna().any(axis=1)]
```
Get columns with NaN values
```
df1.isna().any()
```

Merge

Concat

Break up the DataFrame
```
pieces = [df[0:2], df[2:3]]
```
Concatinate pandas objects
```
pd.concat(pieces)
```

Append

Append a row to a pandas DataFrame
```
s = df.iloc[2].astype(int)
df.append(s)
```

Join
```
left = df.iloc[:, 0:2]
right = df.iloc[:, 2:4]
```

Join two DataFrames
```
pd.merge(left, right,
left_index=True,
right_index=True)
```

Setting/Grouping

Setting a new column
```
df['D'] = ['one','two','one']
```

	A	B	C	D
a	1	2	3	one
b	4	4	7	two
c	5	8	9	one

*Note that this example groups the data based on column 'D', applies the sum() function to each group, and returns a DataFrame

Grouping example
```
df2 = df.groupby('D').sum()
```

D	A	B	C
one	6	10	12
two	4	4	7

Reshaping

Example DataFrame
```
df3 = pd.DataFrame([[1,2], [4,4],
      [5,8], [2,2]],
      index=['a', 'b', 'a', 'b'],
      columns=['A', 'B'])
```

	A	B
a	1	2
b	4	4
a	5	8
b	2	2

*The inverse operation of stack() is unstack()
*Other ways to reshape are to use melt() or pivot()

Reshape by stacking
```
df3.stack()
```

a	A	1
	B	2
b	A	4
	B	4
a	A	5
	B	8
b	A	2
	B	2

Indexing/Selecting

pandas generally has **three** ways to index:

[ ] (use square brackets):

Select a column
```
df['A']
```

Select by label (i.e., rows)
```
df[0:2]
```

Use **.loc** to label index:

Get row by label
```
df.loc['b'[0]]
```

Get multi-axis by label
```
df.loc[:, ['A', 'B']]
```

Slicing with the label
```
df.loc['b':'c', ['A', 'B']]
```

Get a scalar value
```
df.loc['a'[0], 'A']
```

Use **.iloc** to positionally index:

Select via a passed integer
```
df.iloc[2]
```

Slice integers
```
df.iloc[2:3, 0:3]
```

Use lists of position locations
```
df.iloc[[1, 2], [0, 2]]
```

Slice rows
```
df.iloc[1:3, :]
```
Slice columns
```
df.iloc[:, 0:2]
```

Get a specific value
```
df.iloc[1,2]
```

*Boolean indexing can be used:
```
Use a column's values
to select data:
  df[df['A'] > 0]
```

*Use the isin() method to filter:
```
df.loc['a':'b', ['A',
'B']].isin(['1'])
```

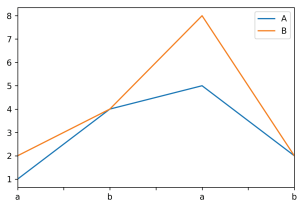
Method chaining

Methods can be called on an object one after another (i.e., method chaining).
For example:
```
df.groupby('D').sum().astype(float)
```

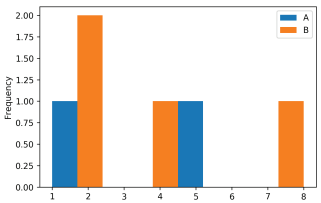
D	A	B	C
one	6.0	10.0	12.0
two	4.0	4.0	7.0

Plotting

`df3.plot()`



`df3.plot.hist()`



I/O

Syntax for reader/writer functions
```
pandas.read_filetype()
DataFrame.to_filetype()
```

Example
```
pandas.read_csv()
DataFrame.to_csv()
```