

Import the Pandas Module

```
import pandas as pd
```

Create a DataFrame

Method 1

```
df1 = pd.DataFrame({
    'name': ['John Smith',
            'Jane Doe'],
    'address': ['13 Main St.',
               '46 Maple Ave.'],
    'age': [34, 28]
})
```

Method 2

```
df2 = pd.DataFrame([
    ['John Smith', '123 Main
    St.', 34],
    ['Jane Doe', '456 Maple
    Ave.', 28],
    ['Joe Schmo', '9
    Broadway', 51]
],
    columns=['name', 'address',
            'age'])
```

Loading and Saving CSVs

Load a CSV File in to a DataFrame

```
df = pd.read_csv('my_csv_file.csv')
```

Saving DataFrame to a CSV File

```
df.to_csv('new_csv_file.csv')
```

Load DataFrame in Chunks (For large Datasets)

```
# Initialize reader object:
urb_pop_reader
urb_pop_reader = pd.read_csv('indpop_data.csv',
                               chunksize=1000)
```

Loading and Saving CSVs (cont)

```
> # Get the first DataFrame chunk:
df_urb_pop
df_urb_pop = next(urb_pop_reader)
```

Inspect a DataFrame

```
df.head(5)    First 5 rows
```

```
df.info()     Statistics of columns (row
              count, null values, datatype)
```

Reshape (for Scikit)

```
nums = np.array(range(1, 11))
-> [ 1  2  3  4  5  6  7  8  9 10]
nums = nums.reshape(-1, 1)
-> [[1],
    [2],
    [3],
    [4],
    [5],
    [6],
    [7],
    [8],
    [9],
    [10]]
```

You can think of `reshape()` as rotating this array. Rather than one big row of numbers, `nums` is now a big column of numbers - there's one number in each row.

Converting Datatypes

Convert argument to numeric type

```
pandas.to_numeric(arg, errors =
    'raise')
```

errors:

"raise" -> raise an exception

"coerce" -> invalid parsing will be set as NaN

DataFrame for Select Columns / Rows

```
df = pd.DataFrame([
    ['January', 100, 100, 23,
    100],
    ['February', 51, 45, 145,
    45],
    ['March', 81, 96, 65, 96],
    ['April', 80, 80, 54, 180],
    ['May', 51, 54, 54, 154],
    ['June', 112, 109, 79,
    129]],
    columns=['month',
            'east', 'north', 'south',
            'west'])
```

Select Columns

Select one Column

```
clinic_north = df.north
```

--> Reshape values for Scikit

```
learn: clinic_north.values.reshape(-1, 1)
```

Select multiple Columns

```
clinic_north_south = df[['north',
                          'south']]
```

Make sure that you have a *double set of brackets* `[[]]`, or this command won't work!



Select Rows

```
# Select one Row
march = df.iloc[2]

# Select multiple Rows
jan_feb_march = df.iloc[:3]
feb_march_april = df.iloc[1:4]
may_june = df.iloc[-2:]

# Select Rows with Logic
january = df[df.month == 'January']
-> <, >, <=, >=, !=, ==
march_april = df[(df.month == 'March') | (df.month == 'April')]
-> &, |
january_feb_march = df[df.month.isin(['January', 'February', 'March'])]
-> column_name.isin([" ", " "])
```

Selecting a Subset of a Dataframe often results in **non-consecutive indices**.

Using `.reset_index()` will create a *new DataFrame* move the old indices into a new column called *index*.

Use `.reset_index(drop=True)` if you don't need the *index* column.

Use `.reset_index(inplace=True)` to prevent a *new DataFrame* from being created.

Adding a Column

```
df = pd.DataFrame([
    [1, '3 inch screw', 0.5, 0.75],
    [2, '2 inch nail', 0.10, 0.25],
    [3, 'hammer', 3.00, 5.50],
    [4, 'screw driver', 2.50, 3.00]
],
    columns=['Product ID', 'Description', 'Cost to Manufacture', 'Price'])

# Add a Column with specified row-values
df['Sold in Bulk?'] = ['Yes', 'Yes', 'No', 'No']

# Add a Column with same value in every row
df['Is taxed?'] = 'Yes'

# Add a Column with calculation
df['Revenue'] = df['Price'] - df['Cost to Manufacture']
```

Performing Column Operation

```
df = pd.DataFrame([
    ['JOHN SMITH', 'john.smith@gmail.com'],
    ['Jane Doe', 'jdoe@yahoo.com'],
    ['joe schmo', 'joeschmo@hotmail.com']
],
    columns=['Name', 'Email'])

# Changing a column with an Operation
df['Name'] = df.Name.apply(lower)
```

Performing Column Operation (cont)

```
> -> lower, upper
# Perform a lambda Operation on a Column
get_last_name = lambda x: x.split(" ")[-1]
df['last_name'] = df.Name.apply(get_last_name)
```

Performing a Operation on Multiple Columns

```
df = pd.DataFrame([
    ["Apple ", 1.00, " No"],
    ["Milk", 4.20, " No"],
    ["Paper Towels ", 5.00, " Yes"],
    ["Light Bulbs", 3.75, " Yes"],
],
    columns=["Item", "Price", "Is taxed?"])

# Lambda Function
df['Price with Tax'] = df.apply(lambda row:
    row['Price'] * 1.075
    if row['Is taxed?'] == 'Yes'
    else row['Price'],
    axis=1)
```

We apply a **lambda to rows**, as opposed to columns, when we want to perform functionality that needs to access more than one column at a time.



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Page 2 of 4.

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Rename Columns

```
# Method 1
df.columns = ['NewName_1',
              'NewName_2', 'NewName_3',
              ...]

# Method 2
df.rename(columns={
            'OldName_1': 'NewName_1',
            'OldName_2': 'NewName_2'
          }, inplace=True)
```

Using `inplace=True` lets us edit the original DataFrame.

Series vs. Dataframes

```
# Dataframe and Series
print(type(clinic_north)):
# <class 'pandas.core.series.Series'>
print(type(df)):
# <class 'pandas.core.frame.DataFrame'>
print(type(clinic_north_south)):
# <class 'pandas.core.frame.DataFrame'>
```

In Pandas

- a **series** is a one-dimensional object that contains any type of data.

- a **dataframe** is a two-dimensional object that can hold multiple columns of different types of data.

A single column of a dataframe is a series and a dataframe is a container of two or more series objects.

Column Statistics

Mean = Average	<code>df.column.mean()</code>
Median	<code>df.column.median()</code>
Minimal Value	<code>df.column.min()</code>
Maximum Value	<code>df.column.max()</code>
Number of Values	<code>df.column.count()</code>
Unique Values	<code>df.column.nunique()</code>
Standard Deviation	<code>df.column.std()</code>
List of Unique Values	<code>df.column.unique()</code>

Don't forget `reset_index()` at the end of a `groupby` operation

Calculating Aggregate Functions

```
# Group By
grouped = df.groupby(['col1',
                      'col2']).col3
                .measurement().reset_index()
# -> group by column1 and
      column2, calculate values of
      column3

# Percentile
high_earners = df.groupby('category').wage
                .apply(lambda x: np.percentile(x, 75))
                .reset_index()
# np.percentile can calculate
  any percentile over an array of
  values
```

Don't forget `reset.index()`

Pivot Tables

```
orders =
pd.read_csv('orders.csv')
shoe_counts = orders.
groupby(['shoe_type',
        'shoe_color']).
id.count().reset_index()
shoe_counts_pivot = shoe_counts.
pivot(
    index='shoe_type',
    columns='shoe_color',
    values='id').reset_index()
```

We have to build a temporary table where we group by the columns we want to include in the pivot table

Merge (Same Column Name)

```
sales = pd.read_csv('sales.csv')
targets = pd.read_csv('targets.csv')
men_women = pd.read_csv('men_women_sales.csv')

# Method 1
sales_targets = pd.merge(sales,
                        targets, how="")
# how: "inner"(default), "outer", "left", "right"

#Method 2 (Method Chaining)
all_data =
sales.merge(targets).merge(men_women)
```



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Page 3 of 4.

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Inner Merge (Different Column Name)

```
orders =
pd.read_csv('orders.csv')
products = pd.read_csv('products.csv')
# Method 1: Rename Columns
orders_products =
pd.merge(orders,
products.rename(columns={'id': 'product_id'}), how=" ")
.reset_index()
# how: "inner"(default), "outer", "left", "right"
# Method 2:
orders_products =
pd.merge(orders, products,
         left_on="product_id",
         right_on="id",
         suffixes=["_orders", "_products"])
```

Method 2:

If we use this syntax, we'll end up with **two columns called id**.

Pandas won't let you have two columns with the same name, so it will change them to `id_x` and `id_y`.

We can help make them more useful by using the keyword **suffixes**.

Concatenate

```
bakery =
pd.read_csv('bakery.csv')
ice_cream = pd.read_csv('ice_cream.csv')
menu = pd.concat([bakery,
ice_cream])
```

Melt

```
pandas.melt(DataFrame, id_vars, value_vars, var_name, value_name=
value')
```

id_vars: Column(s) to use as identifier variables.

value_vars: Column(s) to unpivot. If not specified, uses all columns that are not set as `id_vars`.

var_name: Name to use for the 'variable' column.

value_name: Name to use for the 'value' column.

Unpivot a DataFrame from wide to long format, optionally leaving identifiers set.

Assert Statements

```
# Test if country is of type
object
assert gapminer.country.dtypes == np.object
# Test if year is of type int64
assert gapminer.year.dtypes == np.int64
# Test if life_expectancy is
of type float64
assert gapminer.life_expectancy.dtypes == np.float64
# Assert that country does not
contain any missing values
assert pd.notnull(gapminer.country).all()
# Assert that year does not
contain any missing values
assert pd.notnull(gapminer.year).all()
```



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