

### 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-f-
ile.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_c-
sv('ind_pop_data.csv', chunks-
ize=1000)
```

### Loading and Saving CSVs (cont)

```
# Get the first DataFrame chunk:
df_urb_pop
df_urb_pop = next(urb_pop_re-
ader)
```

### 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.re-
shape(-1, 1)
```

#### # Select multiple Columns

```
clinic_north_south = df[['n-
orth', 'south']]
```

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



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### 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_february_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 dont need the *index* column.

Use `.reset_index(inplace=True)` to prevent a *new DataFrame* from brein 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, 'screwdriver', 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.

### 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)
```



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

