Module	Description	Example	Script
core	dictionary, adding a new entry	co['po'] = 'CO'	g05/demo.py
core	dictionary, creating	co = {'name':'Colorado', 'capital':'Denver'}	g05/demo.py
core	dictionary, creating via comprehension	fips_cols = {col:str for col in fips_vars}	g13/demo.py
core	dictionary, looking up a value	name = ny['name']	g05/demo.py
core	dictionary, making a list of	list1 = [co,ny]	g05/demo.py
core	dictionary, obtaining a list of keys	$names = super_dict.keys()$	g05/demo.py
core	f-string, grouping with commas	<pre>print(f'Total population: {tot_pop:,}')</pre>	g11/demo.py
core	f-string, using a formatting string	print(f"PV of {payment} with T={year} and r={r} is p	g07/demo.py
core	file, closing	fh.close()	g02/demo.py
core	file, opening for reading	fh = open('states.csv')	g05/demo.py
core	file, opening for writing	fh = open(filename, "w")	g02/demo.py
core	file, output using print	<pre>print("It was written during",year,file=fh)</pre>	g02/demo.py
core	file, output using write	<pre>fh.write("Where was this file was written?\n")</pre>	g02/demo.py
core	file, print without adding spaces	<pre>print('\nOuter:\n', join_o['_merge'].value_counts(), s</pre>	g14/demo.py
core	file, reading one line at a time	for line in fh:	g05/demo.py
core	for, looping through a list	for n in a_list:	g04/demo.py
core	for, looping through a list of tuples	for number,name in div_info:	g13/demo.py
core	function, calling	$d1_ssq = sumsq(d1)$	g06/demo.py
core	function, calling with an optional argument	sample_function(100, 10, r=0.07)	g07/demo.py
core	function, defining	def sumsq(values):	g06/demo.py
core	function, defining with optional argument	def sample_function(payment,year,r=0.05):	g07/demo.py
core	function, returning a result	return values	g06/demo.py
core	list, appending an element	a_list.append("four")	g03/demo.py
core	list, create via comprehension	cubes = [n**3 for n in a_list]	g04/demo.py
core	list, creating	$a_list = ["zero", "one", "two", "three"]$	g03/demo.py
core	list, determining length	$n = len(b_list)$	g03/demo.py
core	list, extending with another list	a_list.extend(a_more)	g03/demo.py
core	list, generating a sequence	$b_list = range(1,6)$	g04/demo.py
core	list, joining with spaces	$a_string = "".join(a_list)$	g03/demo.py
core	list, selecting an element	print(a_list[0])	g03/demo.py
core	list, selecting elements 0 to 3	print(a_list[:4])	g03/demo.py
core	list, selecting elements 1 to 2	print(a_list[1:3])	g03/demo.py

Module	Description	Example	Script
core	list, selecting elements 1 to the end	print(a_list[1:])	g03/demo.py
core	list, selecting last 3 elements	print(a_list[-3:])	g03/demo.py
core	list, selecting the last element	print(a_list[-1])	g03/demo.py
core	list, sorting	c_sort = sorted(b_list)	g03/demo.py
core	list, summing	tot_inc = sum(incomes)	g08/demo.py
core	math, raising a number to a power	a_cubes.append(n**3)	g04/demo.py
core	math, rounding a number	rounded = round(ratio, 2)	g05/demo.py
core	sets, computing difference	<pre>print(name_states - pop_states)</pre>	g13/demo.py
core	sets, creating	name_states = set(name_data['State'])	g13/demo.py
core	sets, of tuples	tset1 = set([(1,2), (2,3), (1,3), (2,3)])	g13/demo.py
core	string, concatenating	name = $s1+""+s2+""+s3$	g02/demo.py
core	string, converting to an int	values.append(int(line))	g06/demo.py
core	string, creating	filename = "demo.txt"	g02/demo.py
core	string, including a newline character	fh.write(name+"!\n")	g02/demo.py
core	string, splitting on a comma	parts = line.split(',')	g05/demo.py
core	string, splitting on whitespace	b_list = b_string.split()	g03/demo.py
core	string, stripping blank space	$clean = [item.strip() \; for \; item \; in \; parts]$	g05/demo.py
core	type, obtaining for a variable	<pre>print('\nraw_states is a DataFrame object:', type(raw</pre>	g09/demo.py
CSV	setting up a DictReader object	reader = csv.DictReader(fh)	g08/demo.py
fiona	importing the module	import fiona	g24/demo.py
fiona	list layers in a geopackage	layers = fiona.listlayers(demo_file)	g24/demo.py
geopandas	clip a layer	zips_clip = zips.clip(county,keep_geom_type=True)	g24/demo.py
geopandas	combine all geographies in a layer	water_dis = water_by_name.dissolve()	g24/demo.py
geopandas	combine geographies by attribute	water_by_name = water.dissolve('FULLNAME')	g24/demo.py
geopandas	construct a buffer	near_water = water_dis.buffer(1600)	g24/demo.py
geopandas	drawing a heatmap	near_wv.plot("mil",cmap='Blues',legend=True,ax=ax)	g22/demo.py
geopandas	extracting geometry from a geodataframe	wv_geo = wv['geometry']	g22/demo.py
geopandas	importing the module	import geopandas as gpd	g21/demo.py
geopandas	merging data onto a geodataframe	conus = conus.merge(trim,on='STATEFP',how='left',valida	g22/demo.py
geopandas	obtaining coordinates	print('Number of points:', len(wv_geo.exterior.coords)	g22/demo.py

Module	Description	Example	Script
geopandas	plot with categorical coloring	sel.plot('NAME',cmap='Dark2',ax=ax1)	g22/demo.py
geopandas	plotting a boundary	syr.boundary.plot(color='gray',linewidth=1,ax=ax1)	g21/demo.py
geopandas	project a layer	county = county.to_crs(epsg=utm18n)	g24/demo.py
geopandas	reading a file	$syr = gpd.read_file("tl_2016_36_place-syracuse.zip")$	g21/demo.py
geopandas	reading a shapefile	states = gpd.read_file("cb_2019_us_state_500k.zip")	g22/demo.py
geopandas	setting the color of a plot	county.plot(color='tan',ax=ax1)	g24/demo.py
geopandas	setting transparency via alpha	near_clip.plot(alpha=0.25,ax=ax1)	g24/demo.py
geopandas	spatial join, contains	<pre>c_contains_z = county.sjoin(zips,how='right',predicate=</pre>	g25/demo.py
geopandas	spatial join, crosses	i_crosses_z = inter.sjoin(zips,how='right',predicate='c	g25/demo.py
geopandas	spatial join, intersects	<pre>z_intersect_c = zips.sjoin(county,how='left',predicate=</pre>	g25/demo.py
geopandas	spatial join, overlaps	<pre>z_overlaps_c = zips.sjoin(county,how='left',predicate='</pre>	g25/demo.py
geopandas	spatial join, touches	<pre>z_touch_c = zips.sjoin(county,how='left',predicate='tou</pre>	g25/demo.py
geopandas	spatial join, within	<pre>z_within_c = zips.sjoin(county,how='left',predicate='wi</pre>	g25/demo.py
geopandas	testing if rows touch a geometry	touches_wv = conus.touches(wv_geo)	g22/demo.py
geopandas	writing a layer to a geodatabase	conus.to_file("conus.gpkg",layer="states")	g22/demo.py
json	importing the module	import json	g05/demo.py
json	using to print an object nicely	<pre>print(json.dumps(list1,indent=4))</pre>	g05/demo.py
matplotlib	axes, adding a horizontal line	ax21.axhline(medians['etr'], c='r', ls='-', lw=1)	g12/demo.py
matplotlib	axes, adding a vertical line	$a\times21.a\timesvline(medians['inc'], c='r', ls='-', lw=1)$	g12/demo.py
matplotlib	axes, labeling the X axis	ax2.set_xlabel('Millions')	g11/demo.py
matplotlib	axes, labeling the Y axis	ax1.set_ylabel("Millions")	g11/demo.py
matplotlib	axes, turning off the label	ax.set_ylabel(None)	g13/demo.py
matplotlib	colors, xkcd palette	syr.plot(color='xkcd:lightblue',ax=ax1)	g21/demo.py
matplotlib	figure, adding a title	fig2.suptitle('Pooled Data')	g12/demo.py
matplotlib	figure, four panel grid	fig3, $axs = plt.subplots(2,2,sharex=True,sharey=True)$	g12/demo.py
matplotlib	figure, left and right panels	fig2, $(a\times21,a\times22) = plt.subplots(1,2)$	g12/demo.py
matplotlib	figure, saving	fig2.savefig('figure.png')	g11/demo.py
matplotlib	figure, setting the size	fig, $axs = plt.subplots(1,2,figsize=(12,6))$	g20/demo.py
matplotlib	figure, tuning the layout	fig2.tight_layout()	g11/demo.py
matplotlib	figure, working with a list of axes	for ax in axs:	g20/demo.py
matplotlib	importing pyplot	import matplotlib.pyplot as plt	g11/demo.py
matplotlib	setting the default resolution	plt.rcParams['figure.dpi'] = 300	g11/demo.py
matplotlib	using subplots to set up a figure	fig1, $a \times 1 = plt.subplots()$	g11/demo.py
os	delete a file	os.remove(out_file)	g24/demo.py

Module	Description	Example	Script
os	importing the module	import os	g24/demo.py
os	test if a file or directory exists	if os.path.exists(out_file):	g24/demo.py
pandas	RE, replacing a digit or space	${\sf unit_part} = {\sf values.str.replace(r'\d \s',",regex=True)}$	g23/demo.py
pandas	RE, replacing a non-digit or space	$value_part = values.str.replace(r'\D \s',",regex=True)$	g23/demo.py
pandas	RE, replacing a non-word character	$units = units.str.replace(r' \backslash W', ",regex = True)$	g23/demo.py
pandas	columns, dividing with explicit alignment	$normed2 = 100*states.div(pa_row,axis='columns')$	g09/demo.py
pandas	columns, listing names	<pre>print('\nColumns:', list(raw_states.columns))</pre>	g09/demo.py
pandas	columns, renaming	$county = county.rename(columns = \{'B01001_001E': 'pop'\})$	g10/demo.py
pandas	columns, retrieving one by name	pop = states['pop']	g09/demo.py
pandas	columns, retrieving several by name	<pre>print(pop[some_states]/1e6)</pre>	g09/demo.py
pandas	dataframe, appending	gen_all = pd.concat([gen_oswego, gen_onondaga])	g15/demo.py
pandas	dataframe, boolean row selection	print(trim[has_AM], "\n")	g12/demo.py
pandas	dataframe, dropping a column	both = both.drop(columns='_merge')	g15/demo.py
pandas	dataframe, dropping duplicates	flood = flood.drop_duplicates(subset='TAX_ID')	g14/demo.py
pandas	dataframe, dropping missing data	trim = demo.dropna(subset="Days")	g12/demo.py
pandas	dataframe, finding duplicate records	dups = parcels.duplicated(subset='TAX_ID', keep=False	g14/demo.py
pandas	dataframe, getting a block of rows via index	sel = merged.loc[number]	g13/demo.py
pandas	dataframe, inner 1:1 merge	join_i = parcels.merge(flood, how='inner', on="TAX_ID",	g14/demo.py
pandas	dataframe, inner join	merged = name_data.merge(pop_data,left_on="State",right	g13/demo.py
pandas	dataframe, left 1:1 merge	join_I = parcels.merge(flood, how='left', on="TAX_ID",	g14/demo.py
pandas	dataframe, left m:1 merge	both = gen_all.merge(plants, how='left', on='Plant Code	g15/demo.py
pandas	dataframe, making a copy	trim = trim.copy()	g12/demo.py
pandas	dataframe, outer 1:1 merge	join_o = parcels.merge(flood, how='outer', on="TAX_ID",	g14/demo.py
pandas	dataframe, reading zipped pickle format	sample2 = pd.read_pickle('sample_pkl.zip')	g16/demo.py
pandas	dataframe, resetting the index	hourly = hourly.reset_index()	g17/demo.py
pandas	dataframe, right 1:1 merge	join_r = parcels.merge(flood, how='right', on="TAX_ID",	g14/demo.py
pandas	dataframe, saving in zipped pickle format	sample.to_pickle('sample_pkl.zip')	g16/demo.py
pandas	dataframe, selecting rows by list indexing	print(low_to_high[-5:])	g09/demo.py
pandas	dataframe, selecting rows via boolean	dup_rec = flood[dups]	g14/demo.py
pandas	dataframe, selecting rows via query	trimmed = county.query("state == '04' or state == '36' ")	g10/demo.py
pandas	dataframe, set index keeping the column	states = states.set_index('STUSPS',drop=False)	g22/demo.py
pandas	dataframe, shape attribute	print('number of rows, columns:', conus.shape)	g22/demo.py
pandas	dataframe, sorting by a column	county = county.sort_values('pop')	g10/demo.py
pandas	dataframe, sorting by index	summary = summary.sort_index(ascending=False)	g15/demo.py

Module	Description	Example	Script
pandas	dataframe, summing a boolean	<pre>print('\nduplicate parcels:', dups.sum())</pre>	g14/demo.py
pandas	dataframe, unstacking an index level	bymo = bymo.unstack('month')	g17/demo.py
pandas	dataframe, using a multilevel column index	means = grid['mean']	g20/demo.py
pandas	dataframe, using xs to select a subset	print(county.xs('04',level='state'))	g10/demo.py
pandas	dataframe, using xs with columns	c1 = grid.xs('c1',axis='columns',level=1)	g20/demo.py
pandas	dataframe, writing to a CSV file	merged.to_csv('demo-merged.csv')	g13/demo.py
pandas	datetime, building via to_datetime()	$date = pd.to_datetime(recs['ts'])$	g14/demo.py
pandas	datetime, building with a format	$ymd = pd.to_datetime(sample['TRANSACTION_DT'], format=$	g16/demo.py
pandas	datetime, extracting day attribute	recs['day'] = date.dt.day	g14/demo.py
pandas	datetime, extracting hour attribute	recs['hour'] = date.dt.hour	g14/demo.py
pandas	general, display information about object	sample.info()	g16/demo.py
pandas	general, displaying all columns	pd.set_option('display.max_columns',None)	g16/demo.py
pandas	general, displaying all rows	pd.set_option('display.max_rows', None)	g09/demo.py
pandas	general, importing the module	import pandas as pd	g09/demo.py
pandas	general, using copy_on_write mode	$pd.options.mode.copy_on_write = True$	g16/demo.py
pandas	general, using qcut to create deciles	$dec = pd.qcut(\ county['pop'],\ 10,\ labels = range(1,11)\)$	g10/demo.py
pandas	groupby, cumulative sum within group	${\sf cumulative_inc} = {\sf group_by_state['pop'].cumsum()}$	g10/demo.py
pandas	groupby, descriptive statistics	<pre>inc_stats = group_by_state['pop'].describe()</pre>	g10/demo.py
pandas	groupby, iterating over groups	for t,g in group_by_state:	${\sf g10/demo.py}$
pandas	groupby, median of each group	$pop_med = group_by_state[`pop'].median()$	g10/demo.py
pandas	groupby, quantile of each group	$pop_25th = group_by_state['pop'].quantile(0.25)$	${\sf g10/demo.py}$
pandas	groupby, return group number	$groups = group_by_state.ngroup()$	g10/demo.py
pandas	groupby, return number within group	seqnum = group_by_state.cumcount()	${\sf g10/demo.py}$
pandas	groupby, return rank within group	rank_age = group_by_state['pop'].rank()	${\sf g10/demo.py}$
pandas	groupby, select first records	$first2 = group_by_state.head(2)$	g10/demo.py
pandas	groupby, select largest values	$largest = group_by_state['pop'].nlargest(2)$	${\sf g10/demo.py}$
pandas	groupby, select last records	$last2 = group_by_state.tail(2)$	g10/demo.py
pandas	groupby, size of each group	num_rows = group_by_state.size()	g10/demo.py
pandas	groupby, sum of each group	state = county.groupby('state')['pop'].sum()	g10/demo.py
pandas	index, creating with 3 levels	$county = county.set_index([`state', `county', `NAME'])$	g10/demo.py
pandas	index, listing names	<pre>print('\nIndex (rows):', list(raw_states.index))</pre>	${\sf g09/demo.py}$
pandas	index, renaming values	$div_pop = div_pop.rename(index=div_names)$	g11/demo.py
pandas	index, retrieving a row by name	$pa_row = states.loc['Pennsylvania']$	g09/demo.py

Module	Description	Example	Script
pandas	index, retrieving first rows by location	print(low_to_high.iloc[0:10])	g09/demo.py
pandas	index, retrieving last rows by location	print(low_to_high.iloc[-5:])	g09/demo.py
pandas	index, setting to a column	states = raw_states.set_index('name')	g09/demo.py
pandas	plotting, bar plot	$reg_pop.plot.bar(title='Population',ax=ax1)$	g11/demo.py
pandas	plotting, histogram	hh_data['etr'].plot.hist(ax=ax1,bins=20,title='Distribu	g12/demo.py
pandas	plotting, horizontal bar plot	$div_pop.plot.barh(title='Population',ax=ax2)$	g11/demo.py
pandas	plotting, scatter colored by 3rd var	$tidy_data.plot.scatter(ax=ax4,x=`Income',y=`ETR',c='typ$	g12/demo.py
pandas	plotting, scatter plot	hh_data.plot.scatter(ax=ax21,x='inc',y='etr',title='ETR	g12/demo.py
pandas	plotting, turning off legend	sel.plot.barh(x = `Name', y = `percent', ax = ax, legend = None)	g13/demo.py
pandas	reading, csv data	raw_states = pd.read_csv('state-data.csv')	g09/demo.py
pandas	reading, from an open file handle	$gen_oswego = pd.read_csv(fh1)$	g15/demo.py
pandas	reading, setting index column	$state_data = pd.read_csv('state-data.csv',index_col='na$	g11/demo.py
pandas	reading, using dtype dictionary	county = pd.read_csv('county_pop.csv',dtype=fips)	g10/demo.py
pandas	series, RE at start	$is_LD = trim['Number'].str.contains(r''1 2")$	g12/demo.py
pandas	series, applying a function to each element	name_clean = name_parts.apply(' '.join)	g23/demo.py
pandas	series, automatic alignment by index	$merged['percent'] = 100 'merged['pop']/div_pop$	g13/demo.py
pandas	series, combining via where()	mod['comb_units'] = unit_part.where(unit_part!=" , mo	g23/demo.py
pandas	series, contains RE or RE	$is_TT = trim['Days'].str.contains(r"Tu Th")$	g12/demo.py
pandas	series, contains a plain string	$has_AM = trim['Time'].str.contains("AM")$	g12/demo.py
pandas	series, contains an RE	$has_AMPM = trim['Time'].str.contains(``AM.*PM'')$	g12/demo.py
pandas	series, converting strings to title case	$fixname = subset_view['NAME'].str.title()$	g16/demo.py
pandas	series, converting to a list	print(name_data['State'].to_list())	g13/demo.py
pandas	series, converting to lower case	name = mod[`name'].str.lower()	g23/demo.py
pandas	series, dropping rows using a list	conus = states.drop(not_conus)	g22/demo.py
pandas	series, element-by-element or	is_either = is_ca is_tx	${\sf g16/demo.py}$
pandas	series, filling missing values	<pre>mod['comb_units'] = mod['comb_units'].fillna('feet')</pre>	g23/demo.py
pandas	series, removing spaces	units = units.str.strip()	g23/demo.py
pandas	series, replacing values using a dictionary	units = units.replace(spellout)	g23/demo.py
pandas	series, retrieving an element	<pre>print("\nFlorida's population:", pop['Florida']/1e6)</pre>	${ m g09/demo.py}$
pandas	series, sort in decending order	$div_pop = div_pop.sort_values(ascending = False)$	${\sf g11/demo.py}$
pandas	series, sorting by value	$low_to_high = normed[`med_pers_inc'].sort_values()$	g09/demo.py
pandas	series, splitting strings on whitespace	$name_parts = name.str.split()$	g23/demo.py
pandas	series, splitting via RE	trim[`Split'] = trim[``Time''].str.split(r'': - ``)	g12/demo.py
pandas	series, splitting with expand	exp = trim["Time"].str.split(r": - ", expand=True)	g12/demo.py

Module	Description	Example	Script
pandas	series, summing	${\sf reg_pop} = {\sf by_reg['pop'].sum()/1e6}$	g11/demo.py
pandas	series, unstacking	$tot_wide = tot_amt.unstack('PGI')$	g16/demo.py
pandas	series, using isin()	fixed = flood['TAX_ID'].isin(dup_rec['TAX_ID'])	g14/demo.py
pandas	series, using value_counts()	$print(\ '\nOuter:\n', join_o['_merge'].value_counts(), \ s. \ .$	g14/demo.py
requests	calling the get() method	response = requests.get(api,payload)	g18/demo.py
requests	checking the URL	<pre>print('url:', response.url)</pre>	g18/demo.py
requests	checking the response text	<pre>print(response.text)</pre>	g18/demo.py
requests	checking the status code	<pre>print('status:', response.status_code)</pre>	g18/demo.py
requests	decoding a JSON response	rows = response.json()	g18/demo.py
requests	importing the module	import requests	g18/demo.py
scipy	calling newton's method	<pre>cr = opt.newton(find_cube_root,xinit,maxiter=20,args=[y</pre>	g07/demo.py
scipy	importing the module	import scipy.optimize as opt	g07/demo.py
seaborn	adding a title to a grid object	jg.fig.suptitle('Distribution of Hourly Load')	g17/demo.py
seaborn	barplot	hue='month',palette='deep',ax=ax1)	g17/demo.py
seaborn	basic violin plot	<pre>sns.violinplot(data=janjul,x="month",y="usage")</pre>	g17/demo.py
seaborn	boxenplot	<pre>sns.boxenplot(data=janjul,x="month",y="usage")</pre>	g17/demo.py
seaborn	calling tight_layout on a grid object	jg.fig.tight_layout()	g17/demo.py
seaborn	drawing a heatmapped grid	sns.heatmap(means,annot=True,fmt=".0f",cmap='Spectral',	g20/demo.py
seaborn	importing the module	import seaborn as sns	g17/demo.py
seaborn	joint distribution hex plot	jg = sns.jointplot(data=bymo,x=1,y=7,kind='hex')	g17/demo.py
seaborn	setting axis titles on a grid object	jg.set_axis_labels('January','July')	g17/demo.py
seaborn	setting the theme	<pre>sns.set_theme(style="white")</pre>	${\sf g17/demo.py}$
seaborn	split violin plot	hue="month",palette='deep',split=True)	g17/demo.py
zipfile	importing the module	import zipfile	g15/demo.py
zipfile	opening a file in an archive	fh1 = archive.open('generators-oswego.csv')	g15/demo.py
zipfile	opening an archive	archive = zipfile.ZipFile('generators.zip')	g15/demo.py
zipfile	reading the list of files	<pre>print(archive.namelist())</pre>	g15/demo.py