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')	${\sf g05/demo.py}$
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	fh.write("Where was this file was written?\n")	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 = $[n**3 \text{ for n in a\_list}]$	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	adding a heatmap legend	slices.plot('s_pop',edgecolor='yellow',linewidth=0.2,le	g26/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	computing areas	zips[ˈz_area'] = zips.area	g26/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 obtaining coordinates optimit (Number of points: , len(w_geo_exterior.coords) g22/demo_py geopandas overlaying a layer using union sices = _zips.overlay(county,how='unioth=1,ax=ax1) g22/demo_py geopandas plot with categorical coloring sel.plot('NAME'.cmap='Dark2',ax=ax1) g22/demo_py geopandas point point gate boundary syr.boundary.plot(color='gray_linewith=1,ax=ax1) g22/demo_py geopandas project a layer county to_crs(epse_utml8n) 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('tl_2016_36_place-syracuse.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 setting transparency via alpha spatial join, coroses spatial join, coroses spatial join, intersects z_incrosses_z = inter.sjoin(zips,how='right',predicate= g25/demo_py geopandas spatial join, intersects z_incrosse_z = inter.sjoin(county,how=left',predicate= g25/demo_py geopandas spatial join, touches z_overlaps_c = zips.sjoin(county,how=left',predicate= g25/demo_py geopandas spatial join, touches z_overlaps_c = zips.sjoin(county,how=left',predicate= g25/demo_py geopandas spatial join, touches z_overlaps_c = zips.sjoin(county,how=left',predicate= g25/demo_py geopandas writing a layer to a geodatabase conus.to_file("conus.gpkg",layer="states") g22/demo_py geopandas writing a layer to a geodatabase conus.to_file("conus.gpkg",layer="states") g22/demo_py geopandas writing a layer to a geodatabase conus.to_file("conus.gpkg",layer="states") g22/demo_py g22/demo_py geopandas spatial join, intersects savis ax2.set_xlabel("Millions") g22/demo_py g22/dem	Module	Description	Example	Script
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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. (ax21,ax22) = 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:	matplotlib	axes, turning off the label	ax.set_ylabel(None)	
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$\begin{array}{llllllllllllllllllllllllllllllllllll$	matplotlib	colors, xkcd palette	syr.plot(color='xkcd:lightblue',ax=ax1)	g21/demo.py
$\begin{array}{llllllllllllllllllllllllllllllllllll$	matplotlib	figure, adding a title	fig2.suptitle('Pooled Data')	g12/demo.py
$\begin{array}{llllllllllllllllllllllllllllllllllll$	matplotlib	figure, four panel grid	fig3, axs = plt.subplots(2,2,sharex=True,sharey=True)	g12/demo.py
$\begin{array}{llllllllllllllllllllllllllllllllllll$	matplotlib	figure, left and right panels	fig2, (ax21,ax22) = plt.subplots(1,2)	g12/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			g11/demo.py
matplotlib figure, working with a list of axes for ax in axs: g20/demo.py	matplotlib	figure, setting the size	fig, $axs = plt.subplots(1,2,figsize=(12,6))$	
	matplotlib	figure, tuning the layout	fig2.tight_layout()	g11/demo.py
$matplotlib \qquad importing \ pyplot \qquad import \ matplotlib.pyplot \ as \ plt \qquad \qquad g11/demo.py$	matplotlib	figure, working with a list of axes		g20/demo.py
	matplotlib	importing pyplot	import matplotlib.pyplot as plt	g11/demo.py

Module	Description	Example	Script
matplotlib	setting an edge color	slices.plot('COUNTYFP',edgecolor='yellow',linewidth=0.2	g26/demo.py
matplotlib	setting the default resolution	plt.rcParams['figure.dpi'] = 300	g11/demo.py
matplotlib	using subplots to set up a figure	fig1, ax1 = plt.subplots()	g11/demo.py
OS	delete a file	os.remove(out_file)	g24/demo.py
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	$unit\_part = values.str.replace(r' \backslash d   \backslash s','',regex = True)$	g23/demo.py
pandas	RE, replacing a non-digit or space	$value\_part = values.str.replace(r' \setminus D  \setminus s', ", regex = True)$	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	print( pop[some_states]/1e6 )	g09/demo.py
pandas	dataframe, appending	gen_all = pd.concat( [gen_oswego, gen_onondaga] )	g15/demo.py
pandas	dataframe, boolean row selection	<pre>print( trim[ has_AM ], "\n" )</pre>	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

Module	Description	Example	Script
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
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	<pre>print( county.xs('04',level='state') )</pre>	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	cumulative_inc = 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:	g10/demo.py
pandas	groupby, median of each group	<pre>pop_med = group_by_state['pop'].median()</pre>	g10/demo.py
pandas	groupby, quantile of each group	pop_25th = group_by_state['pop'].quantile(0.25)	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()	g10/demo.py
pandas	groupby, return rank within group	rank_age = group_by_state['pop'].rank()	g10/demo.py
pandas	groupby, select first records	$first2 = group\_by\_state.head(2)$	g10/demo.py
pandas	groupby, select largest values	$largest = group\_by\_state['pop'].nlargest(2)$	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
pariuas	groupby, size or each group	11111_10115	820/ 400.

Module	Description	Example	Script
			10 / 1
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>	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
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	g16/demo.py
pandas	series, filling missing values	mod['comb_units'] = mod['comb_units'].fillna('feet')	g23/demo.py
pandas	series, removing spaces	units = units.str.strip()	g23/demo.py
pandas	series, replacing values using a dictionary	units = units.strip() units = units.replace(spellout)	g23/demo.py
Paridas	series, retrieving an element	print( "\nFlorida's population:", pop['Florida']/1e6 )	g09/demo.py

Module	Description	Example	Script
pandas	series, sort in decending order	div_pop = div_pop.sort_values(ascending=False)	g11/demo.py
pandas	series, sorting by value	<pre>low_to_high = normed['med_pers_inc'].sort_values()</pre>	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
pandas	series, summing	$reg\_pop = by\_reg['pop'].sum()/1e6$	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()	<pre>print( '\nOuter:\n', join_o['_merge'].value_counts(), s</pre>	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	cr = opt.newton(find_cube_root,xinit,maxiter=20,args=[y	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	sns.set_theme(style="white")	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