

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

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core	list, selecting last 3 elements	<code>print(a_list[-3:])</code>	g03/demo.py
core	list, selecting the last element	<code>print(a_list[-1])</code>	g03/demo.py
core	list, sorting	<code>c_sort = sorted(b_list)</code>	g03/demo.py
core	list, summing	<code>tot_inc = sum(incomes)</code>	g08/demo.py
core	math, raising a number to a power	<code>a_cubes.append( n**3 )</code>	g04/demo.py
core	math, rounding a number	<code>rounded = round(ratio,2)</code>	g05/demo.py
core	sets, computing difference	<code>print( name_states - pop_states )</code>	g13/demo.py
core	sets, creating	<code>name_states = set( name_data['State'] )</code>	g13/demo.py
core	sets, of tuples	<code>tset1 = set( [ (1,2), (2,3), (1,3), (2,3) ] )</code>	g13/demo.py
core	string, concatenating	<code>name = s1+" "+s2+" "+s3</code>	g02/demo.py
core	string, converting to an int	<code>values.append( int(line) )</code>	g06/demo.py
core	string, creating	<code>filename = "demo.txt"</code>	g02/demo.py
core	string, including a newline character	<code>fh.write(name+"!\n")</code>	g02/demo.py
core	string, splitting on a comma	<code>parts = line.split(',')</code>	g05/demo.py
core	string, splitting on whitespace	<code>b_list = b_string.split()</code>	g03/demo.py
core	string, stripping blank space	<code>clean = [item.strip() for item in parts]</code>	g05/demo.py
core	type, obtaining for a variable	<code>print( '\nraw_states is a DataFrame object:', type(raw_ . .</code>	g09/demo.py
csv	setting up a DictReader object	<code>reader = csv.DictReader(fh)</code>	g08/demo.py
fiona	importing the module	<code>import fiona</code>	g24/demo.py
fiona	list layers in a geopackage	<code>layers = fiona.listlayers(demo_file)</code>	g24/demo.py
geopandas	clip a layer	<code>zips_clip = zips.clip(county,keep_geom_type=True)</code>	g24/demo.py
geopandas	combine all geographies in a layer	<code>water_dis = water_by_name.dissolve()</code>	g24/demo.py
geopandas	combine geographies by attribute	<code>water_by_name = water.dissolve('FULLNAME')</code>	g24/demo.py
geopandas	construct a buffer	<code>near_water = water_dis.buffer(1600)</code>	g24/demo.py
geopandas	extracting geometry from a geodataframe	<code>wv_geo = wv['geometry']</code>	g22/demo.py
geopandas	importing the module	<code>import geopandas as gpd</code>	g21/demo.py
geopandas	merging data onto a geodataframe	<code>conus = conus.merge(trim,on='STATEFP',how='left',valida. . .</code>	g22/demo.py
geopandas	obtaining coordinates	<code>print( 'Number of points:', len(wv_geo.exterior.coords). . .</code>	g22/demo.py
geopandas	plot with categorical coloring	<code>sel.plot('NAME',cmap='Dark2',ax=ax1)</code>	g22/demo.py
geopandas	plotting a boundary	<code>syr.boundary.plot(color='gray',linewidth=1,ax=ax1)</code>	g21/demo.py

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geopandas	project a layer	<code>county = county.to_crs(epsg=utm18n)</code>	<code>g24/demo.py</code>
geopandas	reading a file	<code>syr = gpd.read_file("tl_2016_36_place-syracuse.zip")</code>	<code>g21/demo.py</code>
geopandas	reading a shapefile	<code>states = gpd.read_file("cb_2019_us_state_500k.zip")</code>	<code>g22/demo.py</code>
geopandas	setting the color of a plot	<code>county.plot(color='tan',ax=ax1)</code>	<code>g24/demo.py</code>
geopandas	setting transparency via alpha	<code>near_clip.plot(alpha=0.25,ax=ax1)</code>	<code>g24/demo.py</code>
geopandas	spatial join, contains	<code>c_contains_z = county.sjoin(zips,how='right',predicate=.</code>	<code>g25/demo.py</code>
geopandas	spatial join, crosses	<code>i_crosses_z = inter.sjoin(zips,how='right',predicate='c.</code>	<code>g25/demo.py</code>
geopandas	spatial join, intersects	<code>z_intersect_c = zips.sjoin(county,how='left',predicate=.</code>	<code>g25/demo.py</code>
geopandas	spatial join, overlaps	<code>z_overlaps_c = zips.sjoin(county,how='left',predicate='.</code>	<code>g25/demo.py</code>
geopandas	spatial join, touches	<code>z_touch_c = zips.sjoin(county,how='left',predicate='tou.</code>	<code>g25/demo.py</code>
geopandas	spatial join, within	<code>z_within_c = zips.sjoin(county,how='left',predicate='wi.</code>	<code>g25/demo.py</code>
geopandas	testing if rows touch a geometry	<code>touches_wv = conus.touches(wv_geo)</code>	<code>g22/demo.py</code>
geopandas	writing a layer to a geodatabase	<code>conus.to_file("conus.gpkg",layer="states")</code>	<code>g22/demo.py</code>
json	importing the module	<code>import json</code>	<code>g05/demo.py</code>
json	using to print an object nicely	<code>print( json.dumps(list1,indent=4) )</code>	<code>g05/demo.py</code>
matplotlib	axes, adding a horizontal line	<code>ax21.axhline(medians['etr'], c='r', ls='-', lw=1)</code>	<code>g12/demo.py</code>
matplotlib	axes, adding a vertical line	<code>ax21.axvline(medians['inc'], c='r', ls='-', lw=1)</code>	<code>g12/demo.py</code>
matplotlib	axes, labeling the X axis	<code>ax1.set_xlabel('Millions')</code>	<code>g11/demo.py</code>
matplotlib	axes, labeling the Y axis	<code>ax1.set_ylabel("Population, Millions")</code>	<code>g11/demo.py</code>
matplotlib	axes, setting a title	<code>ax1.set_title('Population')</code>	<code>g11/demo.py</code>
matplotlib	axes, turning off the label	<code>ax.set_ylabel(None)</code>	<code>g13/demo.py</code>
matplotlib	colors, xkcd palette	<code>syr.plot(color='xkcd:lightblue',ax=ax1)</code>	<code>g21/demo.py</code>
matplotlib	figure, adding a title	<code>fig2.suptitle('Pooled Data')</code>	<code>g12/demo.py</code>
matplotlib	figure, four panel grid	<code>fig3, axs = plt.subplots(2,2,sharex=True,sharey=True)</code>	<code>g12/demo.py</code>
matplotlib	figure, left and right panels	<code>fig2, (ax21,ax22) = plt.subplots(1,2)</code>	<code>g12/demo.py</code>
matplotlib	figure, saving	<code>fig1.savefig('figure.png')</code>	<code>g11/demo.py</code>
matplotlib	figure, setting the size	<code>fig, axs = plt.subplots(1,2,figsize=(12,6))</code>	<code>g20/demo.py</code>
matplotlib	figure, tuning the layout	<code>fig1.tight_layout()</code>	<code>g11/demo.py</code>
matplotlib	figure, working with a list of axes	<code>for ax in axs:</code>	<code>g20/demo.py</code>
matplotlib	importing pyplot	<code>import matplotlib.pyplot as plt</code>	<code>g11/demo.py</code>
matplotlib	setting the default resolution	<code>plt.rcParams['figure.dpi'] = 300</code>	<code>g11/demo.py</code>
matplotlib	using subplots to set up a figure	<code>fig1, ax1 = plt.subplots()</code>	<code>g11/demo.py</code>
os	delete a file	<code>os.remove(out_file)</code>	<code>g24/demo.py</code>
os	importing the module	<code>import os</code>	<code>g24/demo.py</code>

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

Module	Description	Example	Script
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 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	inc_stats = group_by_state['pop'].describe()	g10/demo.py
pandas	groupby, iterating over groups	for t,g in group_by_state:	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)	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
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	print( '\nIndex (rows):', list(raw_states.index) )	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

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pandas	index, setting to a column	<code>states = raw_states.set_index('name')</code>	g09/demo.py
pandas	plotting, bar plot	<code>reg_pop.plot.bar(ax=ax1)</code>	g11/demo.py
pandas	plotting, histogram	<code>hh_data['etr'].plot.hist(ax=ax0,bins=20,title='Distribu. . .</code>	g12/demo.py
pandas	plotting, horizontal bar plot	<code>div_pop.plot.barh(ax=ax1)</code>	g11/demo.py
pandas	plotting, scatter colored by 3rd var	<code>tidy_data.plot.scatter(ax=ax4,x='Income',y='ETR',c='typ. . .</code>	g12/demo.py
pandas	plotting, scatter plot	<code>hh_data.plot.scatter(ax=ax21,x='inc',y='etr',title='ETR. . .</code>	g12/demo.py
pandas	plotting, turning off legend	<code>sel.plot.barh(x='Name',y='percent',ax=ax,legend=None)</code>	g13/demo.py
pandas	reading, csv data	<code>raw_states = pd.read_csv('state-data.csv')</code>	g09/demo.py
pandas	reading, setting index column	<code>state_data = pd.read_csv('state-data.csv',index_col='na. . .</code>	g11/demo.py
pandas	reading, using dtype dictionary	<code>county = pd.read_csv('county_pop.csv',dtype=fips)</code>	g10/demo.py
pandas	series, RE at start	<code>is_LD = trim['Number'].str.contains(r"1 2")</code>	g12/demo.py
pandas	series, applying a function to each element	<code>name_clean = name_parts.apply(' '.join)</code>	g23/demo.py
pandas	series, automatic alignment by index	<code>merged['percent'] = 100*merged['pop']/div_pop</code>	g13/demo.py
pandas	series, combining via where()	<code>mod['comb_units'] = unit_part.where( unit_part!="", mo. . .</code>	g23/demo.py
pandas	series, contains RE or RE	<code>is_TT = trim['Days'].str.contains(r"Tu Th")</code>	g12/demo.py
pandas	series, contains a plain string	<code>has_AM = trim['Time'].str.contains("AM")</code>	g12/demo.py
pandas	series, contains an RE	<code>has_AMPM = trim['Time'].str.contains("AM.*PM")</code>	g12/demo.py
pandas	series, converting strings to title case	<code>fixname = subset_view['NAME'].str.title()</code>	g16/demo.py
pandas	series, converting to a list	<code>print( name_data['State'].to_list() )</code>	g13/demo.py
pandas	series, converting to lower case	<code>name = mod['name'].str.lower()</code>	g23/demo.py
pandas	series, dropping rows using a list	<code>conus = states.drop(not_conus)</code>	g22/demo.py
pandas	series, element-by-element or	<code>is_either = is_ca   is_tx</code>	g16/demo.py
pandas	series, filling missing values	<code>mod['comb_units'] = mod['comb_units'].fillna('feet')</code>	g23/demo.py
pandas	series, removing spaces	<code>units = units.str.strip()</code>	g23/demo.py
pandas	series, replacing values using a dictionary	<code>units = units.replace(spellout)</code>	g23/demo.py
pandas	series, retrieving an element	<code>print( "\nFlorida's population:", pop['Florida']/1e6 )</code>	g09/demo.py
pandas	series, sort in decending order	<code>div_pop = div_pop.sort_values(ascending=False)</code>	g11/demo.py
pandas	series, sorting by value	<code>low_to_high = normed['med_pers_inc'].sort_values()</code>	g09/demo.py
pandas	series, splitting strings on whitespace	<code>name_parts = name.str.split()</code>	g23/demo.py
pandas	series, splitting via RE	<code>trim['Split'] = trim["Time"].str.split(r":  -   ")</code>	g12/demo.py
pandas	series, splitting with expand	<code>exp = trim["Time"].str.split(r":  -   ", expand=True)</code>	g12/demo.py
pandas	series, summing	<code>reg_pop = by_reg['pop'].sum()/1e6</code>	g11/demo.py
pandas	series, unstacking	<code>tot_wide = tot_amt.unstack('PGI')</code>	g16/demo.py
pandas	series, using isin()	<code>fixed = flood['TAX_ID'].isin( dup_rec['TAX_ID'] )</code>	g14/demo.py

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